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MODIFICATION TO MATH MODEL FOR SMALL INDEPENDENT ACTION FORCES (SIAF)

TRW Systems Group

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MODIFICATION TO MATH MODEL FOR SMALL INDEPENDENT ACTION FORCES (SIAF)
FINAL REPORT

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MODIFICATION TO MATH MODEL FOR SMALL INDEPENDENT ACTION FORCES (SIAF) FINAL REPORT

INTRODUCTION

This document, prepared by TRW Systems Group, One Space Park, Redondo Beach, California, constitutes the final technical report on the "Modification to Math Model for SIAF" program. This program was conducted under ARPA/AMICOM Contract Number DAAH01-73-C-0914 during the period 25 May 1973 to 31 December 1973. The original study sponsor was the USACDC Systems Analysis Group. Shortly after the start of the work, cognizance was transferred to the U. S. Army Infantry School. The principal product of this program was a revision to a computerized simulation model of a SIAF operating in both reconnaissances and combat modes developed by TRW under previous ARPA contracts.

The SIAF simulation model is provided as computer software installed on the CDC 6500 computer at Fort Leavenworth, Kansas, and additions to and replacements for a six-volume User's Manual as follows:

Volume I-Model Description and Programming Guide (This Final Report serves as a forward to Volume I)

Volume II-Model Subroutines (Terrain, Weather, Targets)

Volume III-Model Subroutines (SIAF Function and Ancillary Routines)

Volume IV-Model Program Listing

Volume V-Combat Initialization Subroutines

Volume VI-Combat Execution Subroutines

These six volumes are to be considered as part of the final report.

This final report provides a background to the SIAF program, a brief description of the features of the integrated SIAF model, and a summary of the tasks performed durinn the current contract.

Section 2 of Volume I provides a more complete overview of the SIAF model. Full details of the individual submodels are provided in Volumes II through VI.

BACKGROUND

In recognition of the increasing importance and complexity of small military patrols in low intensity guerilla warfare, ARPA activated the Small Independent Action Forces (SIAF) program in 1968. This continued project has as its ultimate objective the improvement of the operational effectiveness of SIAF units. One aspect of this objective has been the need to develop a rapid and economical means of measuring patrol effectiveness to permit the effects of postulated improvements or changes to be evaluated. Namely, a capability is required to

- Study effects of changes in equipment
- Establish tradeoffs for organization/equipment mixes
- Expose alternative doctrine options

In furtherance of this objective, ARPA has sponsored several types of research and development programs. These have included the collection of extensive field data on the various aspects of patrol operations in Southeast Asia, equipment development programs, field test programs, and a SIAF computer model simulation program by TRW Systems. The model is the subject of this report.

The SIAF simulation model has been developed by TRW Systems under seven successive programs. The first, under ARPA/AMICOM Contract DAAH01-70-C-0141 running from August 1969 to June 1970, was to determine the feasibility of structuring a SIAF model for use as an evaluation tool. The second, under ARPA/AMICOM Contract DAAH01-71-C-0100 running from August 1970 to August 1971 was to develop a computerized simulation of a SIAF patrol in a reconnaissance role. The primary effort was formulation and programming of the model itself. Volumes II and III of the SIAF Users Manual describe primarily the results of that effort.

The third TRW SIAF program was the SIAF External Fire Support Study, under ARPA/AMICOM Contract DAAH01-71-C-1115 running from May 1971 to May 1972. An output of that study was an External Fire Support Submodel that was incorporated into the SIAF Reconnaissance Model.

The fourth SIAF model development program provided for the development and programming of a fully computerized stochastic combat submodel which provided dynamic deployment logic as well as fully simulated small arms fire. This work was performed under ARPA/AMICOM Contract DAAH01-72-C-0305 running from November 1971 to December 1972. The results were fully integrated with the previous SIAF Reconnaissance Model.

Two subsequent contracts, DAAH01-73-C-0222 and DAAH01-73-C-0257 which were performed in December 1972 and from March 1973 to July 1973, respectively, were used to reprogram the SIAF model to run on the CDC 6500 computer.

The final SIAF model development contract was used to modify the SIAF Model. This has been performed under Contract DAAH01-73-C-0914 from June 1973 to December 1973. The work performed is the subject of this report.

MODEL SUMMARY

The Small Independent Action Forces (SIAF) Model is a computer simulation intended for use in evaluating the effectiveness of alternative SIAF concepts. The model essentially accepts as input a military operations plan, such as would be prepared by a military commander in the field for an actual patrol operation, and simulates this operation on a computer. It considers both reconnaissance and combat missions. The SIAF Model simulates the interactions of the operations plan with the terrain, weather, and enemy situation. It considers a total mission from beginning to end. The output of the model is the effectiveness of the particular operation under consideration. During the simulation of activities and events which occur during SIAF operations, the model calculates statistics pertaining to movement, navigation, surveillance and detection, fire support, supply maintenance, human maintenance, communications, and casualties.

The model is checked out and is ready for use. It can be applied to a variety of problems involving the effectiveness of SIAF operations, such as the effects of postulated improvements and determination of performance capabilities of these type units. It can also be used to study the sensitivities with respect to numerous input variables.

Listed below are some of the features of the SIAF model compared to other models which might be used for the same purpose:

1) It simulates the entire mission from start to finish and is capable of considering up to 10-day missions. This differs from many existing models of patrol operation which consider only a partial mission segment. The functions of movement, navigation, surveillance and detection, fire support, supply maintenance, human maintenance and external communications and their interactions are explicitly considered in the model.

2) It includes a detailed and realistic treatment of terrain considering relief, vegetation, obstacles, cultural features and surface material. This differs from other existing models in that for this model relief is represented by a continuous surface, and vegetation is represented throughout the entire area of operations instead of just locally.

3) It has an explicit detailed treatment of visual detection considering instantaneous locations of each SIAF and target individual as well as light level, reflectivity and background.

4) It includes dynamic movement of the patrol and detailed target movement. The patrols can advance toward targets or can be made to move around them.

5) The suppressive effect of incoming fire is considered for both movement and outgoing fire.

The combat model has the following detailed features:

1) It considers the events and conditions just prior to entering combat as well as the combat itself. Thus allowing study of the effect of pre-combat conditions and of entry into and exit from combat.

2) It considers ambush, attack, defense and meeting engagements.

3) It is stochastic and considers the attributes of each man on both sides. It considers individual fire-target combinations.

4) It relates the progress and the outcome of combat operations to environmental variables such as terrain, weather, etc., as well as to the combat power on each side.

5) It allows a study of combat alone or combat in combination with reconnaissance and/or in combination with the complete SIAF mission.

6) It considers EFS and organic weapon combat.

7) It allows user-input to many of the variables and decision factors so as to study the effect of variations of these.

SUMMARY OF ACTIVITY

Technical Objective

The objective of Contract DAAH01-73-C-0914 "Modification to Math Model for Small Independent Action Forces", is to improve the capability and utility of the previously developed SIAF model.

Technical Requirements

This section discusses each of the requirements specified in Technical Requirement Number 1816, which is an attachment to the contract.

1.0 Digital Elevation Data - The SIAF model now has the capability to use digital elevation data from tapes provided by the Defense Mapping Agency. Using subroutines created by the Systems Analyses Group of USACDC, a TOPOCOM tape is unpacked and a disk file is created for the area of operations. This disk file contains elevation data at the maximum resolution. When the SIAF model is run, the elevation data is read from the disk at the desired resolution. Changes were made to the storage sequence for elevation data such that the area of operations can be of any dimensions. The USACDC supplied subroutines are described in Volume III, Sections 10.5 to 10.7 (MAPGEN, CONVERT, ROTATE).

1.1 Tape Supplied - The SIAF sample case was run using a TOPOCOM tape containing elevations from the northern half of map sheet 1755I. This area is part of the Hunter-Liggett Military Reservation near King City, California. The maximum resolution of the data is 12.7 meters.

1.2 Variable Terrain Resolution - The capability is provided for varying the terrain resolution when changing from a reconnaissance mode to a combat mode and vice versa. At the start of the model the elevation data is read from the disk according to reconnaissance resolution by Subroutine RCREAD (See Volume III, Section 10.9). When a combat decision is made, the reconnaissance data is saved on a temporary file while Subroutine CMREAD obtains from the original disk file the elevation data at combat resolution (See Volume III, Section 10.8). Due to the requirement for more storage at greater resolution, the area considered during combat is smaller than the entire area of operations. The center of the combat area is determined dynamically by considering the SIAF position, target position, projected deployment point, and projected engagement point. The best shaped rectangle for containing these points is selected. In case the boundary of this area is crossed during combat the combat area is shifted. This is done by Subroutine OUTSID (See Volume III, Section 10.10). When the simulation returns to a reconnaissance mode, the old elevation data is retrieved by Subroutine CONMIS (See Volume VI, Section 3.14)

2.0 Vegetation, Microrelief, and Soil Shapes - The Terrain Submodel has been reprogrammed to consider vegetation, microrelief, and surface features as polygons. These polygons are input as rectangles, circles, or triangles. Dominant classes are used to describe the area not covered by a polygon. (See Volume II, Section 2.1)

3.0 Antipersonnel Mines - Capability has been added to allow a preplanned Claymore mine ambush. In the reconnaissance mode the SIAF moves to the mine deployment area and hand emplaces the mines. When a target comes within detection range, control is shifted to the Combat Submodel to consider detailed detection, movement, and lethality of the mines. (See Subroutine MINES in Volume VI, Section 3.18).

4.0 Dynamic Action/Reaction - Provisions have been made to allow dynamic actions and reactions of the two opposing forces in combat. The action is taken following detection of the adversary. When the target detects the attacker, it can either

- withdraw
- deploy in place
- open fire
- ignore the detection
- rotate the formation
- move to best deployment position

The desired option is a user input. If the attacker detects a change in the original status of the target, it can withdraw, change its deployment point, or exchange roles between the maneuver unit and the base of fire. The target then gets to react one more time to a subsequent detection of a change in the attacker's intent. This capability is described in Subroutines REACT and CREACT (See Volume VI, Sections 3.16 and 3.17).

5.0 Internal Communications - An internal communications submodel has been added to the SIAF Combat Model to introduce delay times for communications between maneuver units. Three messages were incorporated for use requiring internal communications. These are "break contact" "change deployment point", and "exchange roles between the base of fire and the moving maneuver unit". For each message an heirarchy of preferred communications means is input. These are selected from visual hand signals, aural communication, radio, smoke grenades, and sending a messenger. Additional messages could be easily added to this list. Internal communications are controlled by Subroutine IC (See Volume III, Section 8.2).

6.0 Hand Grenades - Hand grenades have been added as an alternative weapon for a firefight. Logic was developed such that hand grenades are used at short ranges when the firer is highly suppressed. Existing routines in the Fire Control and Lethality Submodel were expanded to cover the employment decision and the simulation of the lethality of hand grenades. (See Volume VI, Section 2)

7.0 External Fire Support - An extensive effort was undertaken to provide a stochastic, dynamic model of external fire support during combat. Subroutines EFSTIM (See Volume III, Section 5.3) computes the times of arrival of either artillery shells or bombs. This is based on the tactical situation and the input delay times associated with requesting fire support. Subroutine EFS1 (See Volume III, Section 5.2) stochastically computes the effects of each burst. This is based on input range and deflection errors, ballistic dispersion errors, and lethality data. Provisions are included to adjust firing between volleys when an observer is present.

8.0 Model Demonstration and Validation - This requirement calls for the performance of test runs on the USACDC 6500 computer at Fort Leavenworth, Kansas. These test runs are to be selected from historical examples, field tests, or other appropriate sources. They are to be used to verify the predictive capabilities of the integrated reconnaissance and combat SIAF model. Considerable effort was undertaken to discover appropriate data soruces to use for a test case. The SIAF model requires very specific inputs in terms of a detailed operations plan, a tape containing the elevation and vegetation data for the area of operations, the weather, and detailed information on the locations of the targets. In the Combat Model, the SIAF makes decisions based on input decision criteria. Although extensive data was collected by The Vertex Group of the Research Management Corporation on historical SIAF operations, the data requirements for a simulation were not met. In the area of field tests, it was found that the only appropriate field test was the reconnaissance test performed at Hunter-Liggett in 1971. This was previously simulated and the results are presented in Volume I, Section 6. It does not include any of the combat model.

The approach taken by TRW to satisfy this task was in two parts. The first is a detailed validation through an experimental field test of the line-of-sight prediction portion of the model. This was felt important because it is a key driver of the events in the model. For this purpose an experiment was performed at the Hunter-Liggett Military Reservation where line of sight distances were measured from known locations at various headings. This test was simulated using the appropriate portions of the SIAF model with the elevation data tape from the Defense Mapping Agency. Resolution was varied from 12.7, 25.4 and 50.8 meters between elevation points. Results were found to be very close for rolling terrain at the 12.7 meter resolution, with a fast decline in accuracy as resolution was lowered. The simulation was also performed using the ASARS technique of modelling relief. It was found that the SIAF technique was slightly more accurate at 12.7 meter resolution and that the ASARS technique did not give credible results at lesser resolutions. This test is described in Volume I, Section 8.

The second step in model verification is to present a detailed examination of a sample case. This case is to be demonstrated at the SIAF Executive Overview Meeting on 18 January 1974 at Fort Benning, Georgia. The presentation will show the decisions, events, actions, and results of the SIAF simulation for a typical scenario. A qualitative assessment is to be made by experienced SIAF personnel. The sample case is also presented in Volume I, Section 6.

9.0 Documentation - The documentation for the current contract is provided as augmentation to the documentation from previous contracts. The most recent version was published in December 1972. All routines that were added or modified are to be replaced or added as specified in the augmentation instructions. The result is an integrated whole.

10.0 Train Government Personnel - A training class is scheduled for the week of 14 January 1974 at Fort Benning, Georgia. This class will teach analysts and programmers to understand, use, and modify the SIAF model. The class sessions are to be videotaped and placed in the videotape library at the U.S. Army Infantry School.

11.0 Stop/Restart - Capability has been added to the model to allow several stop points. At the point in the model that the stop point is reached, all of the common blocks are copied onto a disk. The model can then be restarted from that point for later use. This allows playing the combat portion separately and running it many times without repeating the earlier portions of the mission. This is performed by Subroutine RESTRT (See Volume III, Section 10.4).

12.0 Integrated, Debugged Model - The additions to the SIAF Model have been fully integrated with the previous version. The model has been debugged and is operational. At the time of this writing, it is scheduled to be installed on the CDC 6500 computer at Fort Leavenworth, Kansas within a few days. Since the previous version is currently installed, no difficulties are foreseen.

13.0 Model and Documentation Requirements - Standards for the model and the documentation have been fully followed from USACDC supplement 1 to AR-18-7 Appendix M.

This document, prepared under ARPA Contract DAAH01-73-C-0914, contains changes and additions to Volume I, of the SIAF System Model User's Manual, 15 December 1972; hence, these pages replace or augment appropriate pages of the above referenced document. Table I provides instructions for accomplishing these changes to Volume I. (The pages in this document appear in the order in which they are referenced in Table I. As shown in Table I, for example, Pages i through ix of this document replace Pages i through xiii of Volume I of the User's Manual dated 15 December 1972.

Table I. Instructions for Changing and Augmenting Volume I, SIAF System Model User's Manual, 15 December 1972 (Sheet 1)

Page or Section	Replacement	Augmentation
Pages 1 through 12		Go in front of Volume I
Pages i through ix	Replace Pages i through xiii	
Page 1-1	Replaces Page 1-1	
Pages 2-1 through 2-84	Replaces Pages 2-1 through 2-80	
Pages 3-1 through 3-57	Replaces Pages 3-1 through 3-37	
Pages 4-1 through 4-17	Replaces Pages 4-1 through 4-15	
Pages 5-1 through 5-12	Replaces Pages 5-1 through 5-10	
Pages 6-137 through 6-221	Replaces 6-137 through 6-204	
Pages 8-1 through 8-30	Replaces Page 8-1	
Page 9-1		Goes behind Page 8-30

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1.0 INTRODUCTION

The Small Independent Action Forces (SIAF) System Model User's Manual consists of six volumes. Volume I provides the information necessary to actually operate the model on the computer while Volumes II, III, V and VI provide the more detailed analysis and discussion of the subroutines.

Volumes II and III contain the reconnaissance routines developed under ARPA Contract DAAH01-71-C-0100 while Volumes V and VI are the combat routines developed under Contract DAAH01-72-C-0305. All of the volumes have been modified under Contract DAAH01-73-C-0914.

These volumes are as follows:

- Volume I - Model Description and Programming Guide
- Volume II - Reconnaissance Subroutines (Terrain, Weather, Targets)
- Volume III - Reconnaissance Subroutines (SIAF Functions and Ancillary Routines)
- Volume IV - Model Program Listing
- Volume V - Combat Initialization Subroutines
- Volume VI - Combat Execution Subroutines

The first volume contains general information concerning the use of the model. The first section contains a qualitative description of the model and associated subroutines. This is followed by sections which present alphabetical lists of the model input and output variables. Next, the model subroutines are presented and summarized (details of each subroutine are contained in Volumes II, III, V and VI). Finally, a sample case consisting in part of the simulation of a test conducted at Hunter Liggett Military Reservation and computer operating procedures are included.

2.0 PROGRAM DESCRIPTION

The SIAF system model is a computer simulation intended for use in evaluating the effectiveness of alternative SIAF concepts. This model essentially accepts as input a military operations plan, such as would be prepared by the military commander for an actual patrol operation, and simulates this operation in a computer environment. It considers a small independent action force which follows this operations plan, and considers both reconnaissance and combat missions. The SIAF model simulates the interaction of the operations plan with the terrain, weather, and enemy situation and considers a total mission from beginning to end. The output of the model is the effectiveness of the particular operation under consideration. During the simulation of the activities and events which occur during SIAF operations, the model calculates statistics pertaining to movement, navigation, surveillance and detection, fire support, supply maintenance, human maintenance, and communications. The specific objectives of this modeling effort were as follows:

1) Develop a methodology for modeling a SIAF patrol and implement the methodology.

2) Quantitatively measure the reconnaissance and combat effectiveness of alternative SIAF concepts.

3) Identify those variables which have the greatest impact on the overall effectiveness of SIAF.

2.1 SIAF MEASURES OF EFFECTIVENESS

In order to satisfy the objectives stated above, one of the first tasks that had to be performed was that of defining appropriate measures of effectiveness for SIAF since these are essentially the outputs of the model. For this purpose, experienced patrol leaders representing various military organizations were interviewed. Based upon these discussions, a list of measures of effectiveness was identified. Some of these measures are shown in Figure 2.1.

As an example of how these measures are applied to a SIAF problem, consider a situation where the user desires to compare the relative merits of two sensor systems, one of which is bulkier and requires a larger crew but is very reliable, versus less reliable equipment which is lighter and

MOVEMENT MOE'S

- INSERTION SUCCESSES/ATTEMPTS
- PATROL DURATION
- DISTANCE TRAVELED

NAVIGATION MOE'S

- NAVIGATION ACCURACY
- TARGET LOCATION ERROR

SURVEILLANCE MOE'S

- NUMBER OF TARGETS DETECTED
- NUMBER OF TARGETS IDENTIFIED
- NUMBER OF TIMES SIAF IS DETECTED

FIRE SUPPORT MOE'S

- NUMBER OF SIAF CASUALTIES
- NUMBER OF ENEMY CASUALTIES
- NUMBER OF TIMES ENEMY IS HIT BY FIRE

SUPPLY MAINTENANCE

- PATROL WEIGHT
- PERCENT SUPPLIES CONSUMED
- PERCENT AMMUNITION EXPENDED

HUMAN MAINTENANCE

- HUMAN PERFORMANCE DEGRADATION

COMMUNICATION MOE'S

- COMMUNICATION SUCCESSES/COMMUNICATION ATTEMPTS

Figure 2.1, Typical SIAF Measures of Effectiveness requires a smaller crew. For this purpose, measures such as detection per detection opportunity and man days per detection might be selected as being fundamental. Given such data, trade-offs are readily obtained providing useful guidance for research and development decision making. For examining and answering questions pertaining to engagement, the classical measures: casualties, exchange ratio (enemy casualties/SIAF casualties), and survivor ratio (SIAF survivors/enemy survivors) are computed. These measures are often used in the evaluation of competing patrol weapons mixes. Another possibility is that one might not be interested in casualties, per se, but in the number of times SIAF is able to direct fire on the enemy. This measure is also calculated by the model.

Ancillary statistics are intended to be of value for elucidation of cause and effect relationships. As a simple example in the use of these statistics, suppose that it is consistently found that battery life is a principal cause of communication failures. Given typical patrol durations and communication frequencies, a clear justification is available for a development effort aimed at extending power source endurance.

In summary, because of the requirement for the model to apply to general SIAF problems, a large number of measures and ancillary statistics are calculated and provided by the model. Application of the model requires that the user select from these data those statistics which pertain to the particular problem of interest. (Details of the model outputs are provided in Section 4.0 of this volume.)

2.2 MODEL APPROACH AND REQUIREMENTS

The approaches considered for the SIAF model included an analytical model, war gaming, and computer simulation. During this evaluation, a purely analytic model was discarded since it does not have the generality necessary to meet project requirements. War gaming is too slow and unwieldy for most SIAF purposes and is usually valuable only if copious resources and time are available. Field exercises and combat testing were also considered but were ruled out since, at times, conceptual systems must be studied by the decision maker. Simulation using analytical submodels was judged to combine the necessary generality and flexibility with acceptable speed and economy. The computer simulation method allows for comparing alternative concepts (i. e., different mixes of personnel, material, and procedures) within a scenario of fixed conditions and assumptions. For the SIAF project, it constituted a clear first choice.

Once simulation was selected for developing the SIAF mathematical model, the next task was to prepare specifications for developing this model. The purpose of these specifications was to identify required model inputs, outputs, and submodels. To this end, it was recognized that the measures of effectiveness illustrated in Figure 2.1 depend upon five basic factors which are the terrain, weather, enemy situation, friendly situation in terms of units which support SIAF operations, and the specific SIAF operations plan being considered. Since the basic purpose of the model is to estimate the effectiveness of SIAF operations as a function of changes in these factors, they were essentially identified as inputs to the model. This is illustrated in Figure 2.2.

In identifying the submodel areas, a vigorous effort was made to develop a model which is as realistic as possible. To this end, it was recognized that in the real world a patrol leader prepares an operations plan before he starts the mission. In this operations plan, he considers the functions of movement, navigation, surveillance and detection, fire support, supply maintenance, human maintenance, communications, and command and control. In addition, these are the essential functions the patrol performs during the execution of the plan. Hence, these areas, in addition to terrain, weather, and enemy, were identified as the major areas for submodel development. (See Figure 2.3.)

Although submodels in each of these areas could conceivably be independently developed, a realistic simulation of patrol operation must also consider the interactions of the functions shown in Figure 2.3 with each other and the weather, terrain, and enemy situation. For example, the movement rate a patrol selects will be a function of the terrain and weather, pack weight, and fatigue of the patrol members. This will have an impact on the patrol duration, distance traveled, the visual detection capability of the patrol, and the possibility that the patrol is detected. That is, if the patrol moves rapidly over rough terrain, the patrol surveillance capability is decreased since more attention must be devoted to

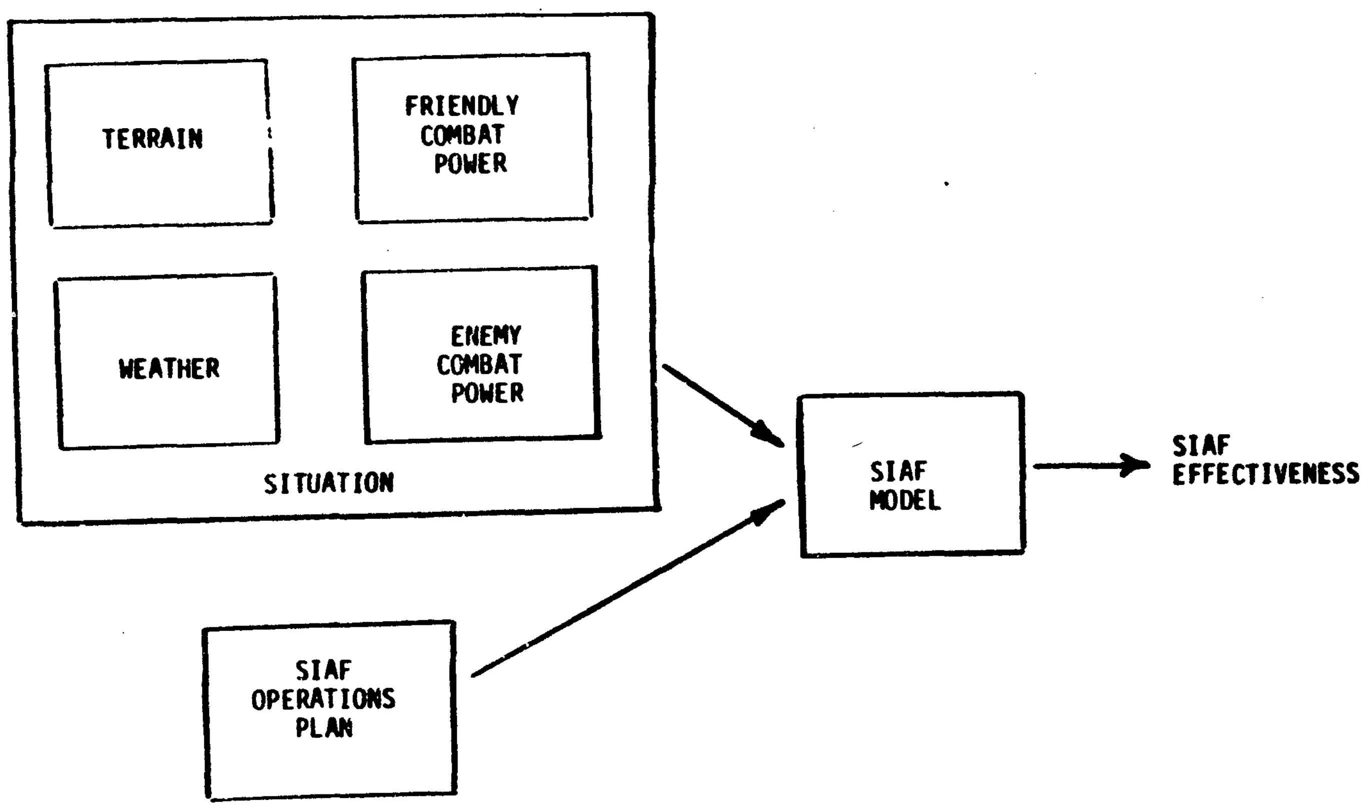


Figure 2.2, SIAF Model Overview

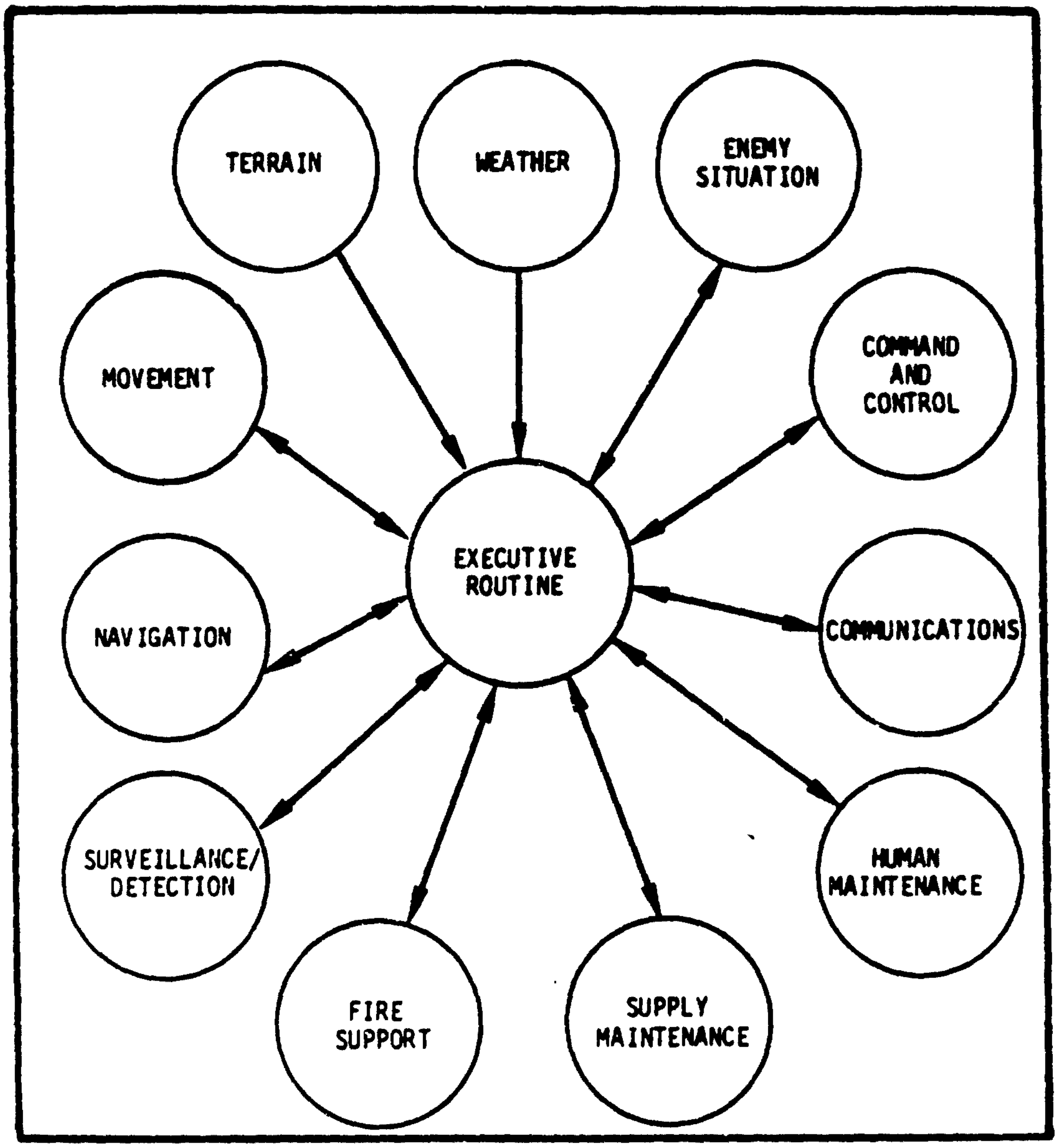


Figure 2.3, SIAF Model Elements

movement and, consequently, less can be devoted to surveillance. In addition, movement is a cue for visual detection and, hence, increases the possibility of detection by the enemy. This patrol movement rate also influences the energy expenditure rate of the patrol and the food and water requirements which are functions of the temperature and humidity and which, in turn, influence subsequent patrol movement rates. These are examples of the complex interactions which are considered in this model. These interactions are extremely important since equipments and tactics which lead to improvements in some areas could possibly result in a decrease in effectiveness in other areas (see Figure 2.1).

2.3 THE EXECUTIVE ROUTINE

The performance of many of the functions identified previously depend upon physical environment parameters of terrain and weather; as such, these subroutines use this information as input data. The problem here is that the physical environment parameters change with the location of the patrol on a route such as that shown in Figure 2.4; however, the subroutines are constrained to accept only a single value for a particular variable. A simple solution to the problem is to time step the patrol through the route using small time intervals. The idea, of course, is that if the time intervals are sufficiently small, one can assume that the appropriate physical environment parameters are constant during this interval. This approach, however, was not selected since it was felt that this would result in excessive model running time. A time step of 30 seconds, for example, would result in 28,800 time intervals for a patrol with a 10-day mission. Also, visual detection probability changes drastically as a function of light level; hence, it is desirable to examine events on a shorter time interval basis during periods of sunrise and sunset.

The possibility of using a purely distance driven simulation was also considered. However, this approach is complicated by the fact that the patrol may conduct stationary reconnaissance operations for long periods of time and normally reports its position and status to the base on a periodic basis (a function of time). Also, some targets are of such a nature that they may enter and leave the simulation as a function of time,

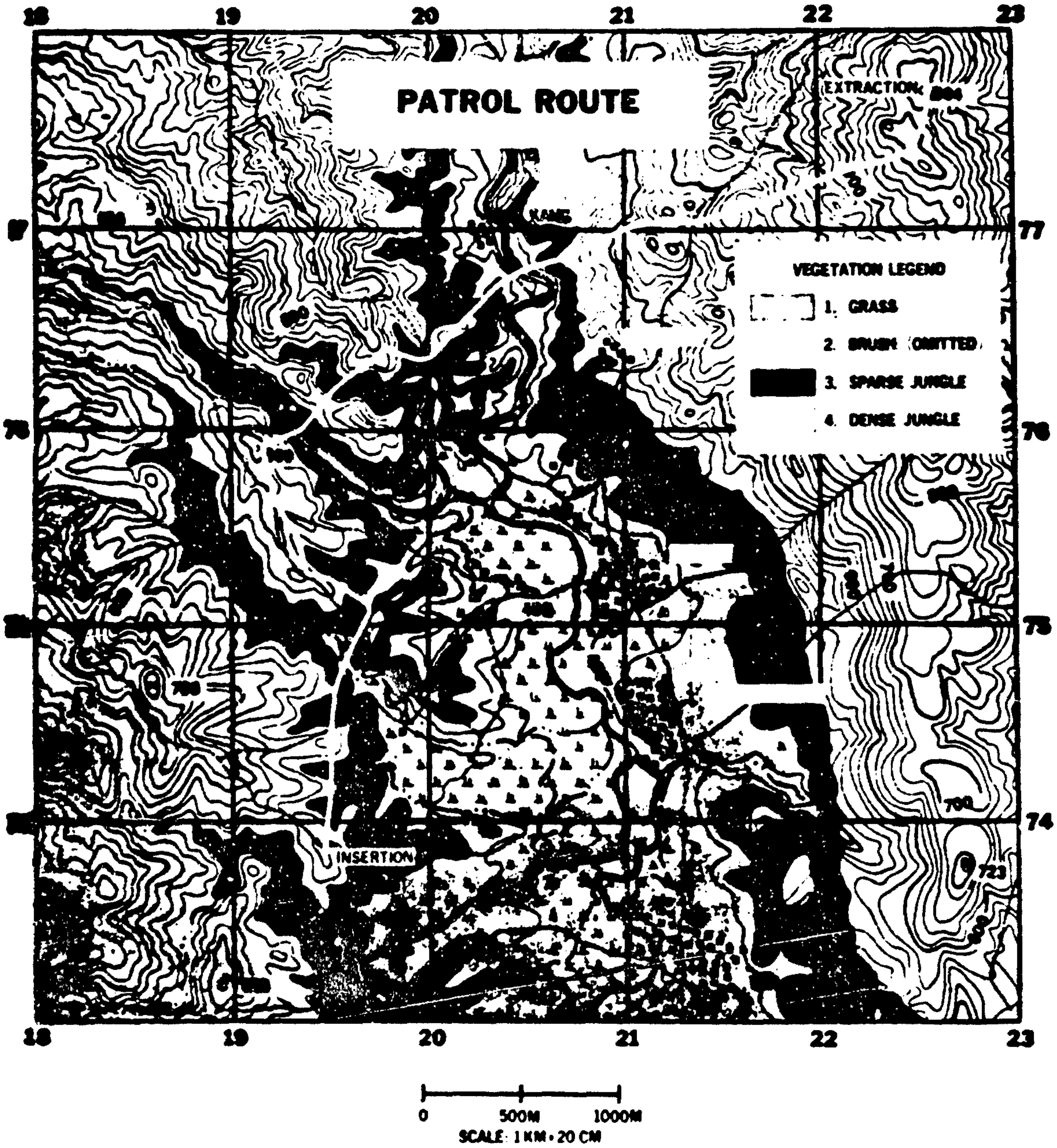


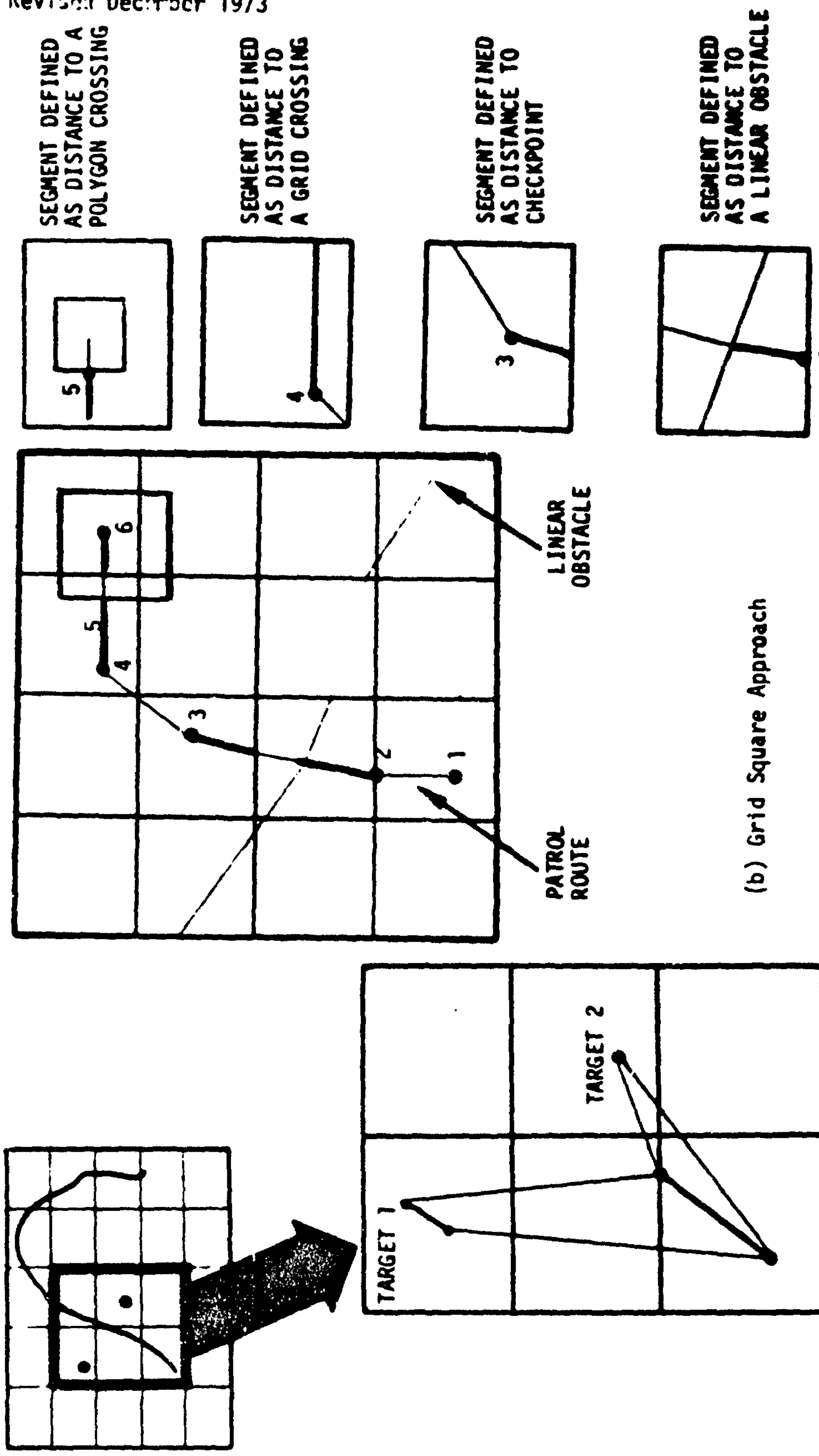
Figure 2.4, Patrol Route

further complicating the manner in which the model is driven. Likewise, a purely event driven simulation was discarded since events such as movement and surveillance and detection are continuously occurring in patrol operations.

The resulting executive routine essentially consists of a marriage of these ideas. The basis of the concept is a grid square approach for inputting digitized terrain data and is illustrated in Figure 2.5. With this approach, a map of the area of operations is divided into grid squares whose resolution is user input. The total area is assigned a vegetation class with exceptions to this as subareas (polygons), in the form of rectangles, circles, and triangles (user input) assigned to the total (see Volume II for discussion of the terrain model). Based upon the axis of advance of the patrol, a segment, defined as the distance of the first grid crossing, checkpoint, obstacle, or polygon crossing, whichever is smaller, is first generated as shown in Figure 2.5(b). The movement rate over this segment is next calculated and a segment time is computed. This segment time is then checked to see if any target movement or communication events are to occur within the segment. If so, the segment is redefined as the distance the patrol moves to the time that particular event is scheduled to occur. Once a segment is defined, statistics pertaining to the functions shown in Figure 2.3 are calculated and accumulated for the segment. After these calculations, another segment is generated and the process is continued until the last checkpoint is reached.

If the SIAF patrol is stationary, a time driver subroutine drives the model and uses criteria of light level and target movement for determining the time step. During periods where the light level is relatively constant and targets are beyond feasible detection ranges, the time interval selected is large. When light level changes rapidly the time step is automatically reduced to account for the change in visual detection capability which occurs in this situation. Again, statistics pertaining to the functions shown in Figure 2.3 are accumulated for each time segment.

In addition to the distance and time segments defined previously, a subset of these called mini-segments are also generated when detections are feasible. Figure 2.6 illustrates this concept which operates as follows: During a simulation of the mission, many of the targets in the area of operations are not feasible of being detected because of the distance between them and the SIAF patrol. For each segment, feasibility of



(a) Area of Operations

(b) Grid Square Approach

Figure 2.5, Generation of a Distance Segment

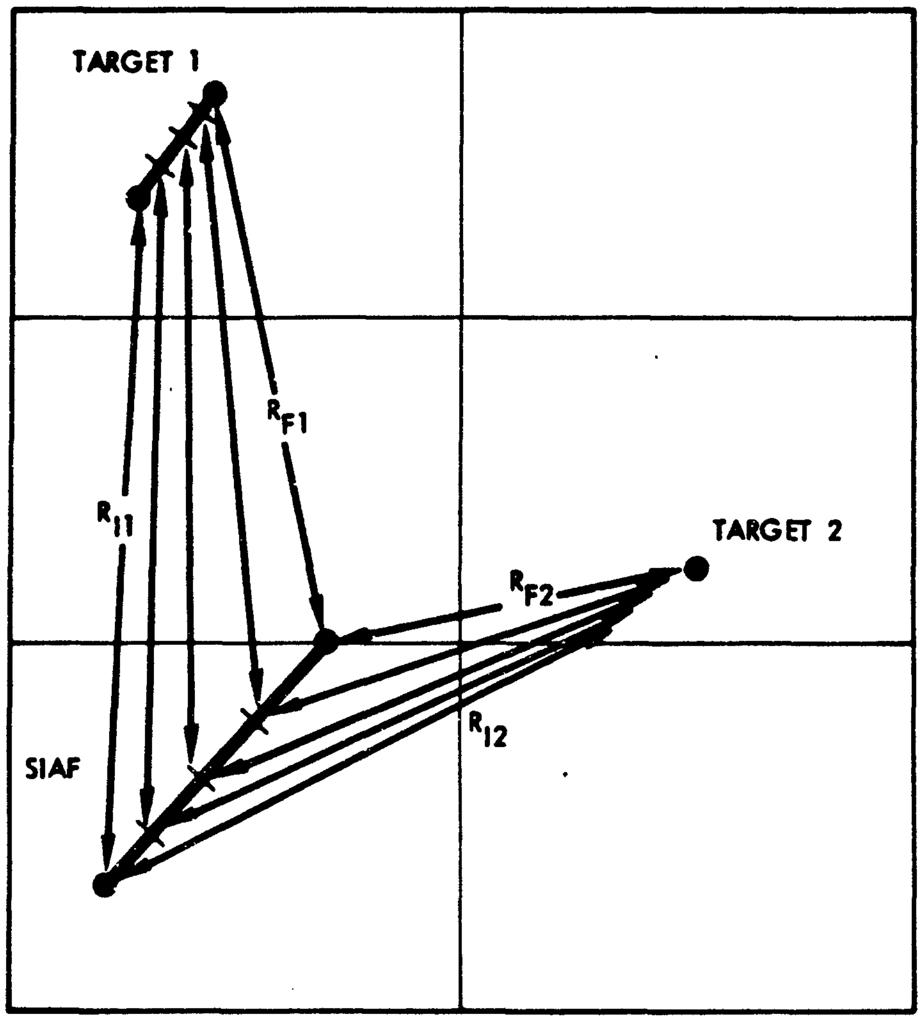


Figure 2.6, Illustration of Mini-Segments

target detection is checked at the minimum range point and, if not feasible, the target is not considered during the next series of calculations. If feasible, on the other hand, the line of sight between SIAF and the target could change as a function of their relative positions in the segments. In this situation, both SIAF and target segments are divided into mini-segments. The length of the mini-segments are user input. In this situation, the program advances SIAF and each feasible target, a mini-segment at a time, and determines a detection verdict for each mini-segment. For this calculation two options are available: In the first of these, the centroid of the patrol and each target are examined to determine if line of sight exists. If so, then it is assumed that line of sight exists between all members of each group. The user also has the option of treating man-to-man intervisibility in which he can consider the relative location of each individual in both the patrol and target formations (see the Surveillance/Detection Submodel, Volume III, Section 4.0, for the details). This option accounts for the fact that some of the individuals in a particular group may not be visible by all members of the other group. Thus, the user can consider the patrol as one point or consider individuals as desired. These options essentially serve to automatically increase the resolution of the model when required and use less detail resolution when this is appropriate. All of these features serve to minimize the running time of the model and provide the user the option of selecting the resolution he desires.

2.4 SIAF SUBMODELS AND SUBROUTINES

In this section, each of the submodels shown in Figure 2.3 is summarized and the interactions among them are described. The subroutines described herein are listed in Section 5.0 of this volume for ease in referencing. Volumes II, III, V and VI contain detailed information concerning these submodels and subroutines.

2.4.1 SIAF Terrain Submodel

The purpose of the SIAF Terrain Submodel is to provide a representation of the terrain for use in line-of-sight and slope calculations, and for considering factors such as the vegetation at various points in the area of operations as required by the other subroutines. This submodel considers the following factors:

- Relief
- Vegetation
- Obstacles and Cultural Features
- Micro-Relief
- Surface Materials

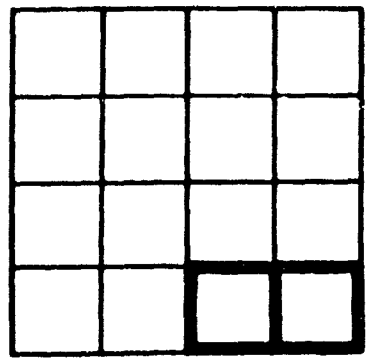
The manner in which these factors are treated in this submodel is summarized below.

Relief

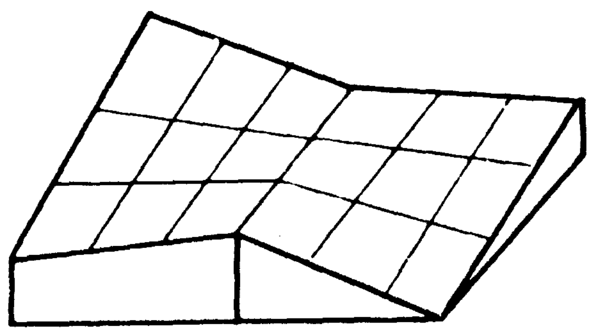
The basic approach for treating relief is to divide the map into grids, whose size is a user input. The grid elevation data is obtained from a military "TOPOCOM" tape of the area of operations. The tape contains digitized elevation data of various areas and is of a high resolution. Thus, the elevation data represents the elevation at each corner of the grid square. Based upon these data, the model generates a hyperbolic surface between the points for each grid square. Figure 2.7 illustrates this surface for two grid squares. In order to explain and illustrate the results which are obtained with this approach, an ionic model of four grid squares was developed. Figure 2.8 is a photograph of this model. It illustrates the curved surface which is obtained from the four-corner input data.

As an example of the impact of various resolutions on the accuracy of the relief representation, a study was made using Army map sheet 1755 IV NE, Alder Peak California, 1:25,000. Figure 2.9 shows actual contours and the contours which result from this model using 100-meter resolution. These 100-meter data were obtained from a listing of an Army digitized terrain tape of the area. The Figure illustrates how much of the section of road can be observed from the observation post for both sets of contours; there is considerable error in the results obtained from the model when the 100-meter resolution is used. Figure 2.10 shows the same situation for 50-meter resolution. These illustrations show that accuracy

TERRAIN DATA INPUT SCHEME



RELIEF REPRESENTATION



VEGETATION CLASSIFICATION SCHEME

1 NO VEGETATION
2 SPARSE GRASS OR BRUSH
3 MODERATE GRASS OR BRUSH
4 DENSE GRASSLAND
5 LIGHT FOREST WITH BRUSH
6 SPARSE FOREST
7 MODERATE FOREST
8 HEAVY FOREST
9 DENSE BRUSH WITH TREES
10 SPARSE JUNGLE
11 MODERATE JUNGLE
12 HEAVY JUNGLE

GENERALLY EACH VEGETATION CLASS CONTAINS

- GRASS
- BRUSH
- TREE TRUNKS
- TREE CROWNS

Figure 2.7, Terrain Model - Relief and Vegetation Summary

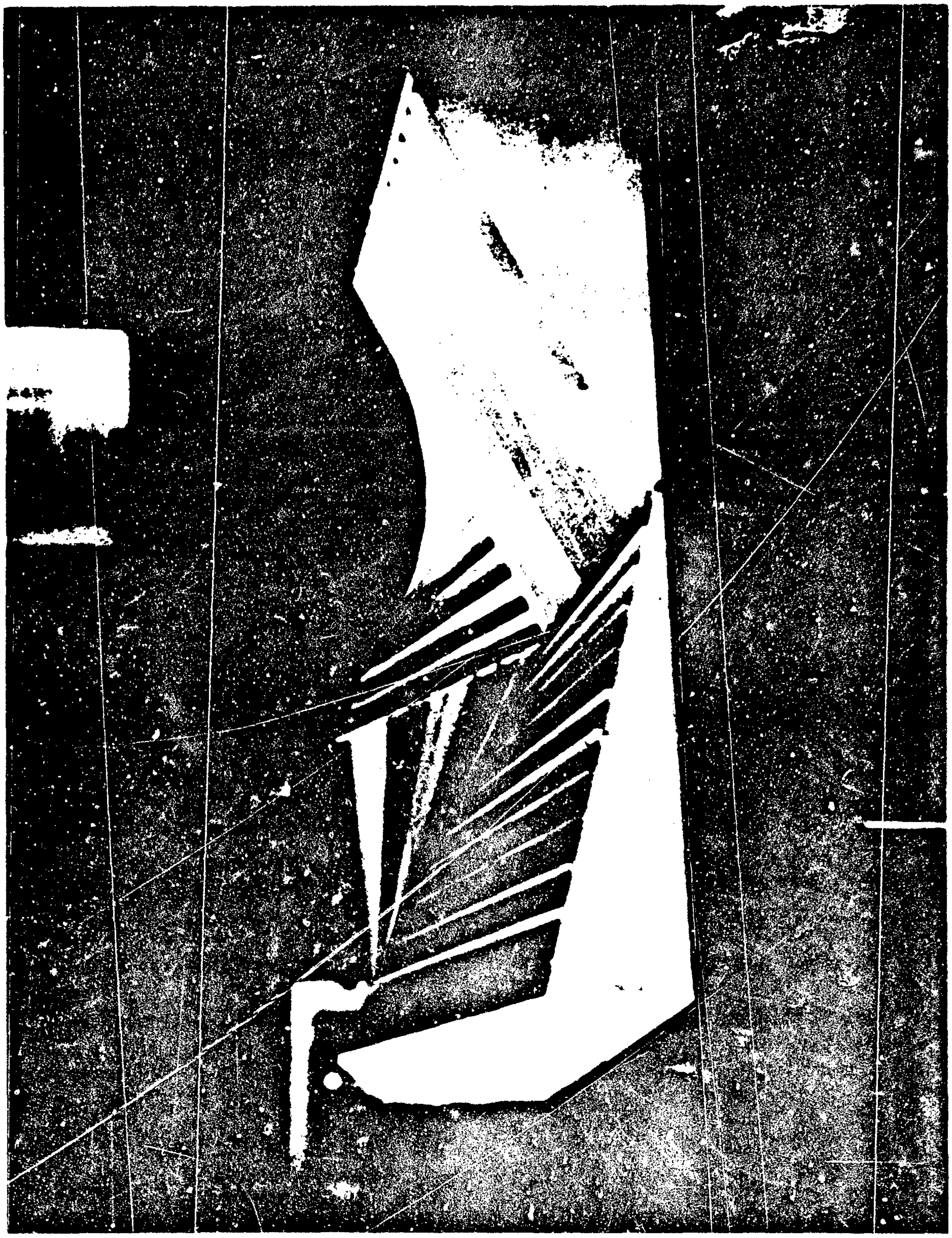


Figure 2.8, Photograph of an Iconic Model of the STAF Mathematical Terrain Model

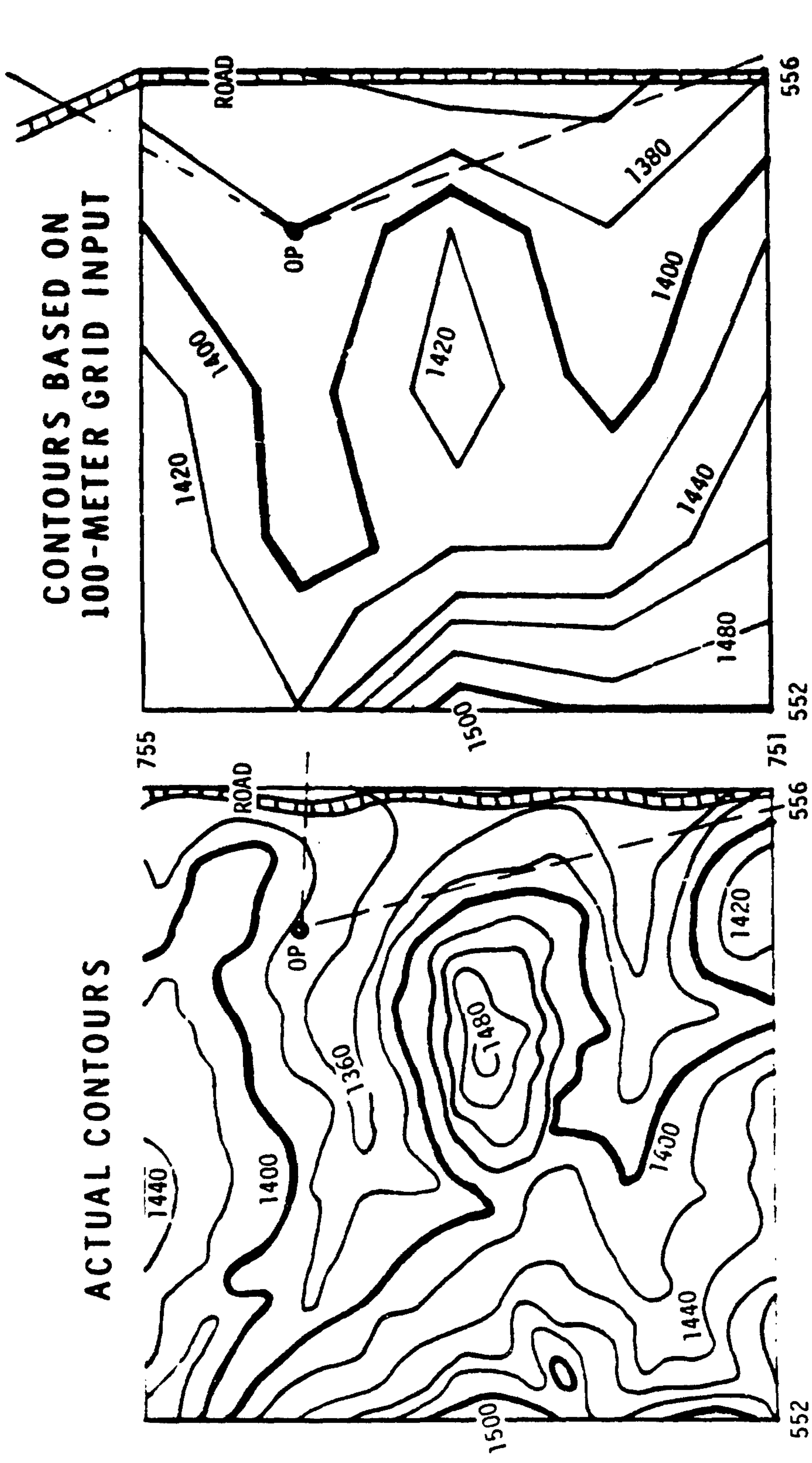


Figure 2.9, Comparison of 100-Meter Resolution Digitized Data with Map Contours

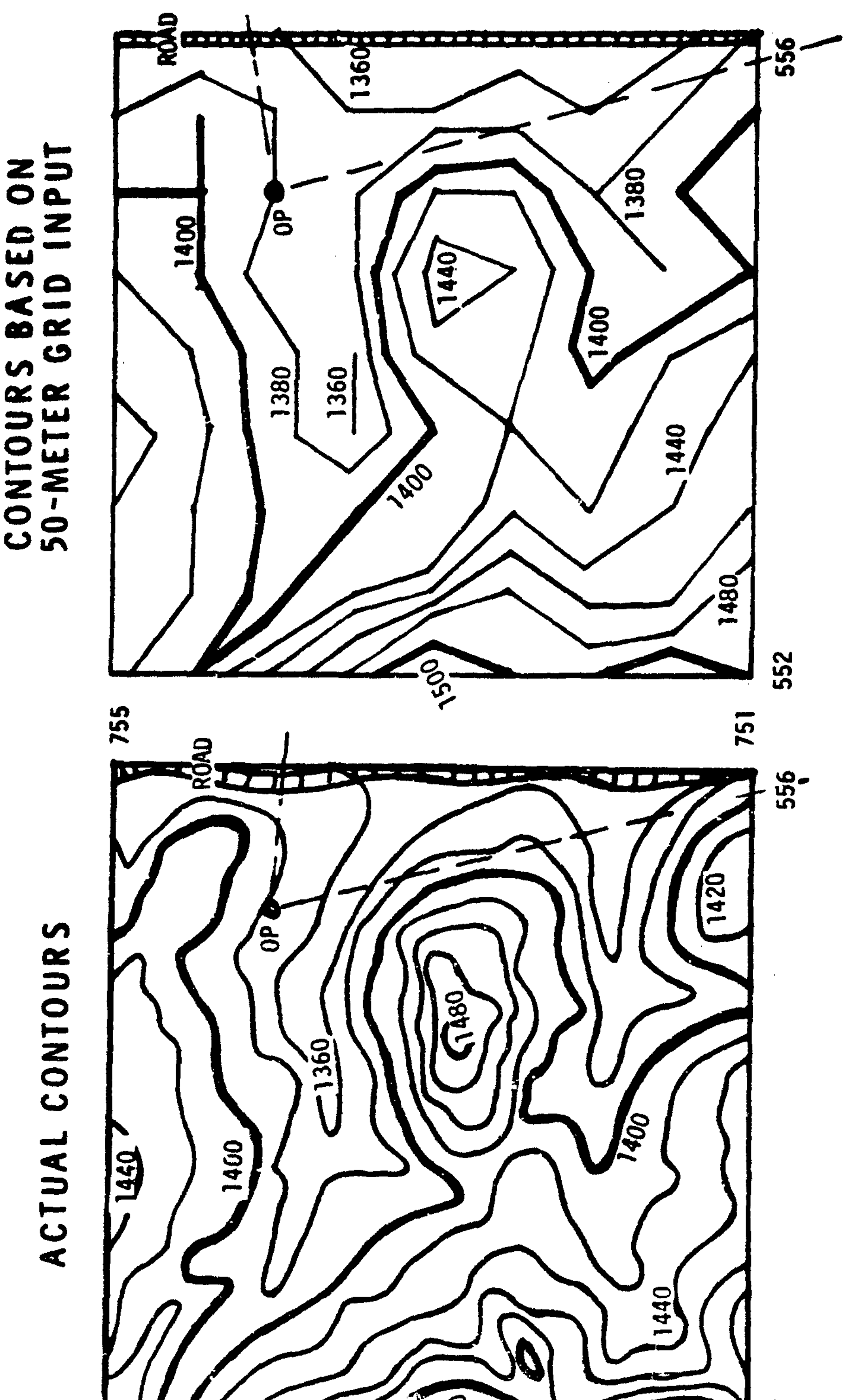


Figure 2.10. Comparison of 50-Meter Resolution
Manual Data with Map Contours

of relief representation is considerably better with 50-meter resolution. It is interesting to note that the terrain for which this comparison was made is fairly rugged. Hence, the preceding analysis probably represents a worst-case situation.

Further comparison of the relief part of this model to field experiments is presented in Section 8.0 of this model.

Vegetation

The problem of appropriately modeling the vegetation factor of terrain for SIAF was approached in two steps. First, it was necessary to develop an appropriate vegetation classification scheme. Second, it was necessary to determine the manner in which this scheme could best be used, in conjunction with the relief portion of the Terrain Submodel.

The vegetation classes considered in this submodel are summarized in Figure 2.7. As shown in the figure, each class of vegetation consists of a certain amount of grass, brush, and trees. The features within each class are assumed to be distributed at random. To the total area for which elevation is input is assigned one number from 1 to 12 to represent the class (dominant) of vegetation to be found within the area. Exceptions to this are inputted as subareas in the form of triangles, circles, and rectangles and are also assigned a number from 1 to 12 and are used to represent subareas of vegetation other than the dominant within the total area.

In developing this classification scheme, an attempt was made to include consideration of the types of vegetation which might be found in various parts of the world. In addition, an attempt was also made to gather realistic data concerning the density and size of the vegetation features within each class. To this end, various references (indicated in Volume II) were studied. The data in these references were augmented by a field trip to Hunter Liggett Military Reservation where aerial photographs of the area were obtained and a ground survey was conducted.

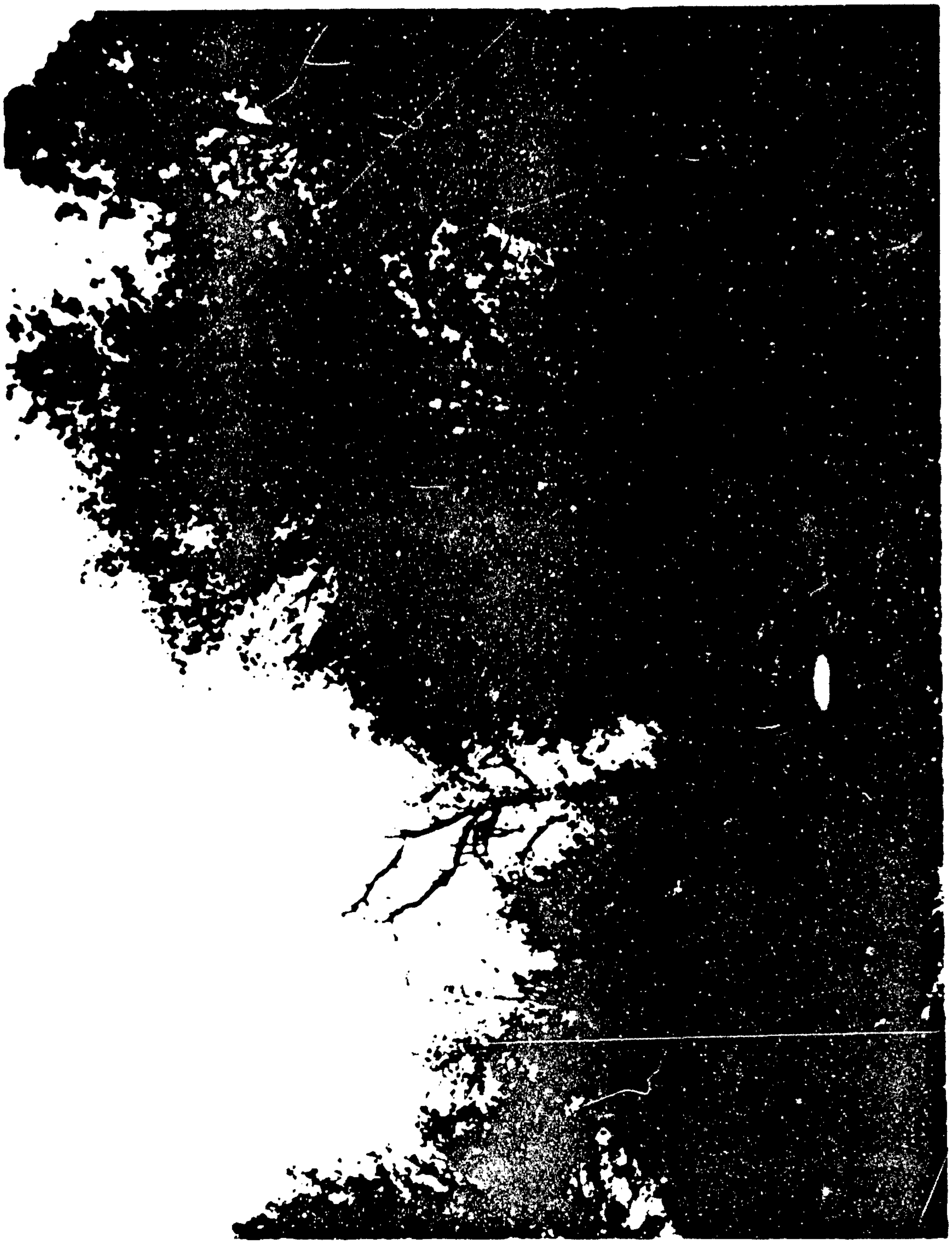


Figure 2.12, Class 5 Vegetation: Light Forest with Brush

Figure 2.13, Class 3 Vegetation: Moderate Brush

Figure 2.11 presents one of these aerial photographs while Figure 2.12 provides a closeup view of the vegetation in the square of Figure 2.11. Figure 2.13 is a view of the vegetation in the area of the circle of Figure 2.11. The vegetation shown in the photograph of Figure 2.12 was subsequently defined as class 5, light forest with brush. Results of the ground survey indicated that there were approximately 63 features of brush per 50- by 50-meter square, each feature being approximately 2 meters wide and 3 meters high. In addition, the 42 trees in this area were judged to be an average of 10 meters high with 3-meter wide crowns. The vegetation shown in Figure 2.13 was found to be considerably different as might be expected from an inspection of Figure 2.11. This area was defined as class 3, moderate grass or brush, and was found to consist of 500 features of brush per 50-meter square. Each feature was judged to be a sphere with a diameter of approximately 1.5 meters.

As an example of the impact of the polygon (triangles, rectangles, and circles) overlay method of vegetation representation, Figure 2.14 shows the accuracy of realism that can be obtained through this method. As can be observed, considerable accuracy can be obtained.

Obstacles and Cultural Features

For the purposes of modeling, cultural features and obstacles are treated in the same manner as vegetation in that a polygon configuration resembling the feature or obstacle is overlaid on the area and is assigned a number which indicates the type of area obstacle. Cultural features such as roads, on the other hand, are input by means of straight line segments. Figure 2.15 summarizes obstacles and cultural features considered in this submodel and presents an example which illustrates the input procedure described above.

Surface Materials

The surface materials or soil classifications considered in this submodel are summarized in Figure 2.15. In preparing the inputs to the submodel, a dominant soil classification is assigned to the area of operations. Thus, if the area is considered to consist mainly of sand, then the number 2 would be associated with the area. Exceptions to this are input by a means of subareas in the form of circles, rectangles, and triangles illustrated in Figure 2.15. Thus, for example the shown, the cross-hatched area would consist of high plasticity silt (class [illegible]) while the reaminder of the area would have the dominant soil class (class 2).

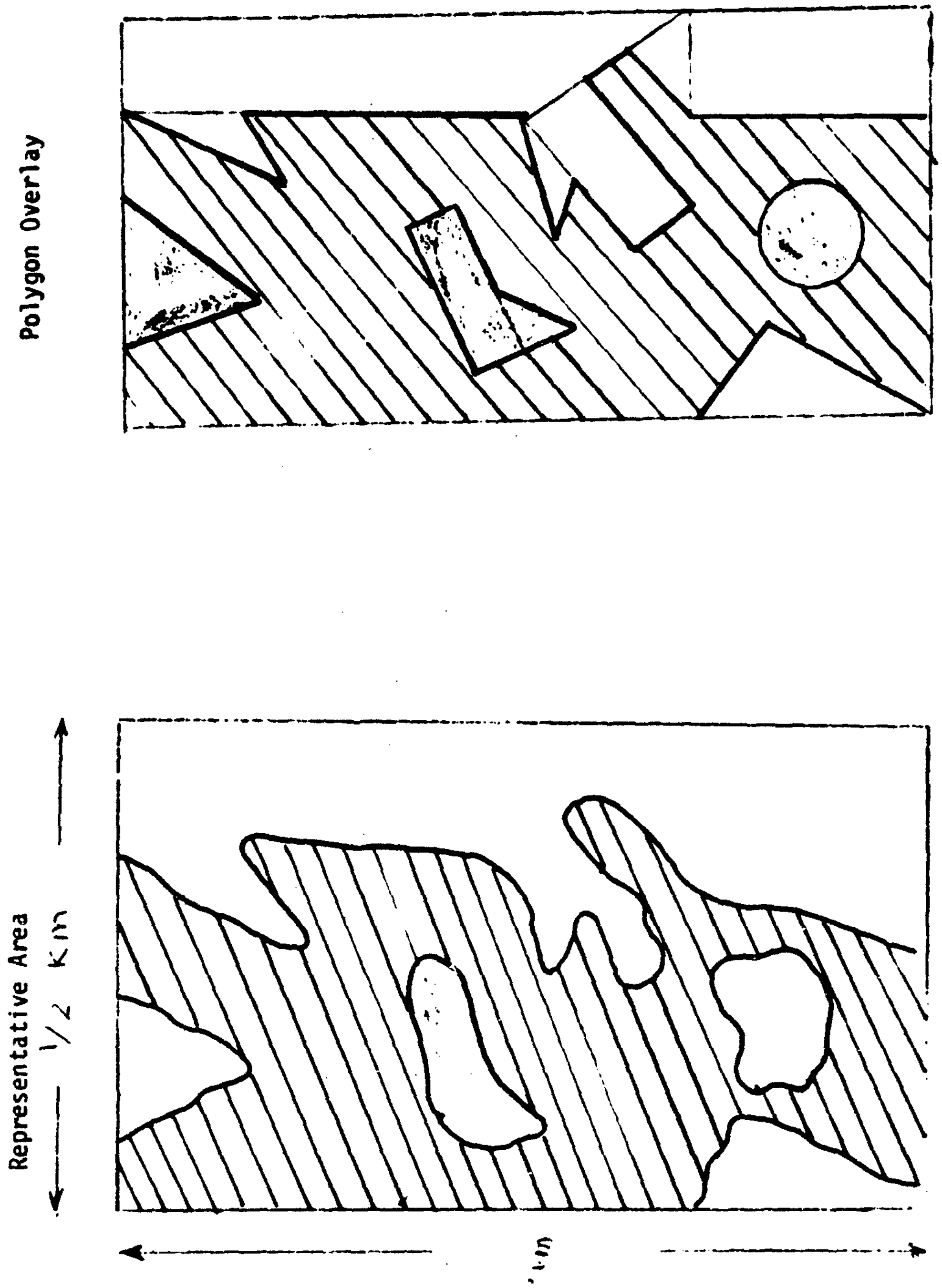
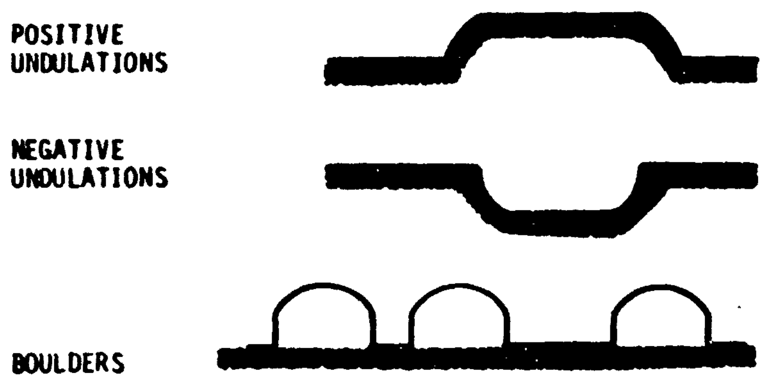


Figure 2.14. Effect of Polygon Overlay on Vegetation Representation

OBSTACLES AND CULTURAL FEATURES

AREA	LINEAR
SWAMPS	RIVER
CULTIVATED LAND	STREAM
VILLAGES	RAVINE
	DIKE
	CANAL
	CLIFF
	ROAD
	TRAIL
	LAKE BOUNDARIES

MICRO RELIEF (5 CLASSES)



SOIL CLASSIFICATION

1 GRAVEL
2 SAND
3 CLAY - LOW PLASTICITY
4 CLAY - HIGH PLASTICITY
5 SILT - LOW PLASTICITY
6 SILT - HIGH PLASTICITY
7 PLOWED EARTH (SOFT)
8 FROZEN GROUND

POLYGON BY EXCEPTION METHOD OF INPUTTING SOIL, MICRORELIEF AND VEGETATION

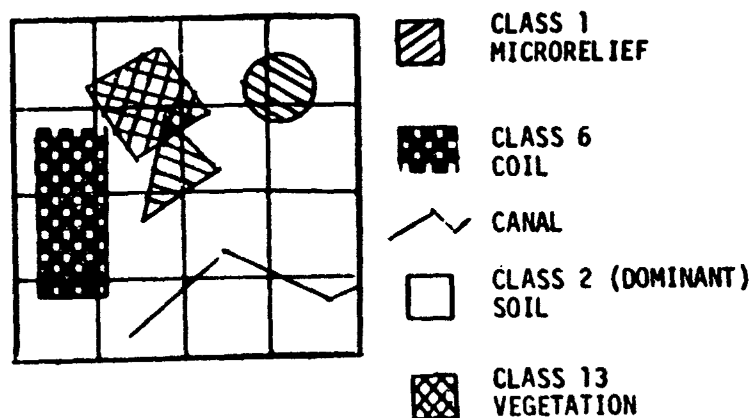


Figure 2.15. Terrain Model - Additional Factors Considered

Micro-Relief

In addition to the factors considered in the foregoing discussion, certain terrain irregularities must now be considered. Figure 2.16 photographically illustrates some of these irregularities that exist at the Hunter Liggett Military Reservation. These irregularities are called micro-relief for this model. Here, positive undulations, negative undulations, and boulders are considered. Each class of micro-relief consists of a combination of these features of varying densities and sizes. These features are assumed to be distributed randomly within an area; they are input by means of circles, rectangles and triangles as illustrated in Figure 2.15. Thus, the cross-hatched region, as shown in Figure 2.15, would consist of that class of micro-relief desired by the user while the remainder of the area of operations would consist of a dominant micro-relief class.

Summary

To illustrate how these factors of terrain are combined in the model, Figure 2.17, which presents a top view of six grid squares, was developed. A profile view of this situation is shown in Figure 2.18. A study of Figure 2.17 and 2.18 indicates that line of sight could be obstructed for a variety of reasons. For example, line of sight could be obstructed by relief, an obstacle, features of brush, crowns of trees, or trunks of trees. The relief and obstacle line-of-sight decision is essentially a deterministic one which is based upon the geometry of the situation while the line-of-sight verdict due to vegetation and micro-relief is a probabilistic one. Furthermore, this probabilistic verdict depends upon the relative location of the vegetation features and the micro-relief features with respect to the observer and the target. For example, features close to the observer tend to have a greater impact on concealment probability than do those further away. See Sections 2.5, 2.10, and 2.11 in Volume II for concealment analysis and description of equations.

This total line-of-sight decision calculation is made by Subroutine TERCON which in turn calls eight other terrain subroutines as illustrated in Figure 2.19. Here, Subroutines MICSOL and MITFEA essentially determine if a target is on a micro-relief feature or on an obstacle such as a swamp. Both of these factors are used to adjust the height of the target

Figure 2.16. Micro-Relief Features

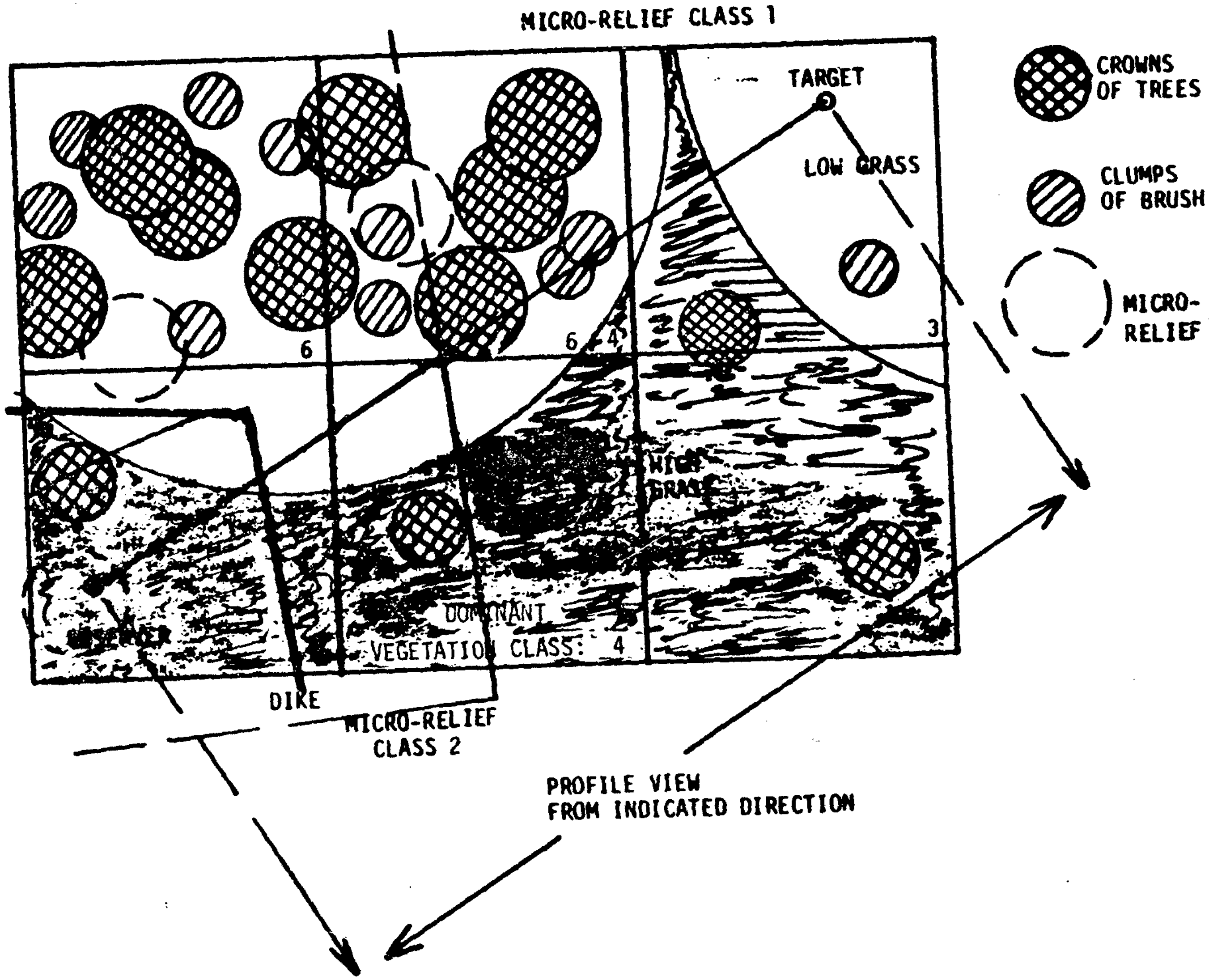


Figure 2.17. General Line-of-Sight Situation "Top View"

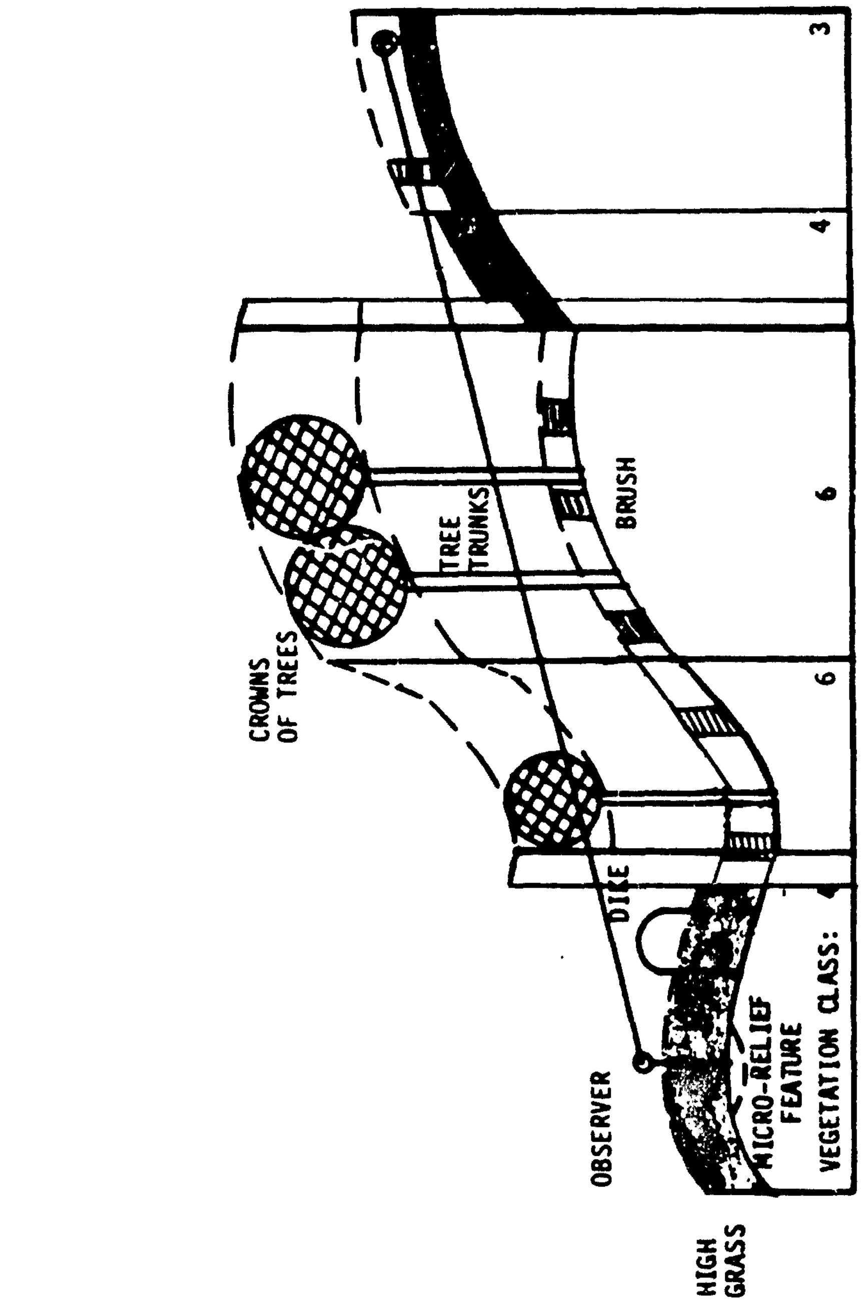


Figure 2.18, General Line-of-Sight Situation "Profile View"

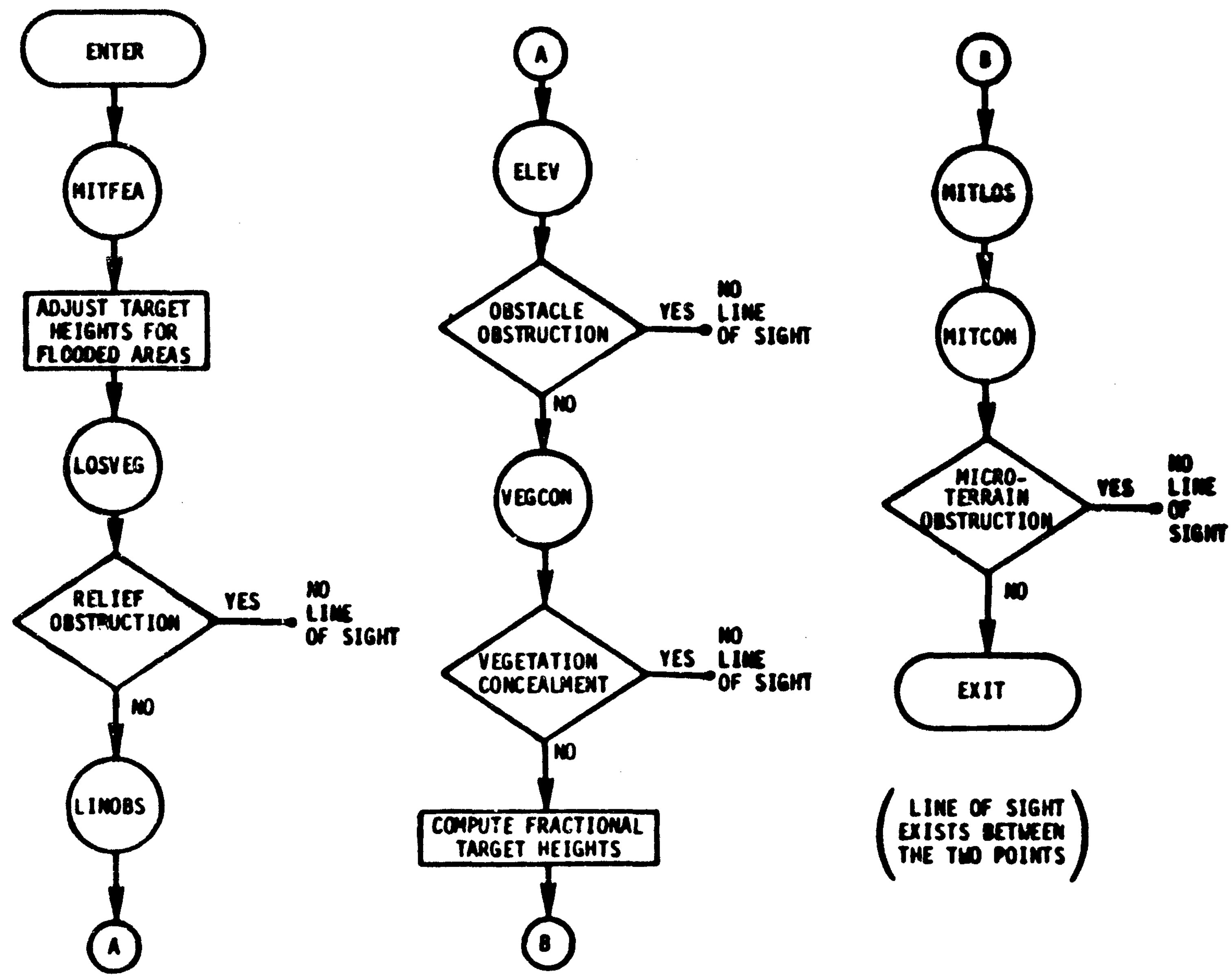


Figure 2.19, Terrain Concealment Subroutine (TERCON)

appropriately. Next, Subroutine LOSVEG is called and determines if there is a relief intercept between the two points of interest. If so, a no-line-of-sight verdict is returned by the subroutine. If there is not a relief obstruction, Subroutines LINOBS and ELEV are next called. These subroutines essentially determine if there is an obstacle between the two points of interest and determine the elevation of the obstacle. Based upon these calculations, a check is made for an obstacle obstruction and a line-of-sight/no-line-of-sight verdict is again made as shown in Figure 2.19. If line of sight exists, then Subroutine VEGCON is called to check the vegetation concealment. As part of this calculation it could turn out that a target is partially concealed because of vegetation. If so, the area of the target visible is calculated. The final two subroutines, called MITLOS and MITCON, determine if there is a micro-relief obstruction between the two points of interest.

In summary, Subroutine TERCON determines if there is line of sight between any two points in the area of operations. The line-of-sight verdict is based upon an examination of relief, obstacles and cultural features, vegetation, and micro-relief which exists between the two points under consideration.

2.4.2 SIAF Weather Model

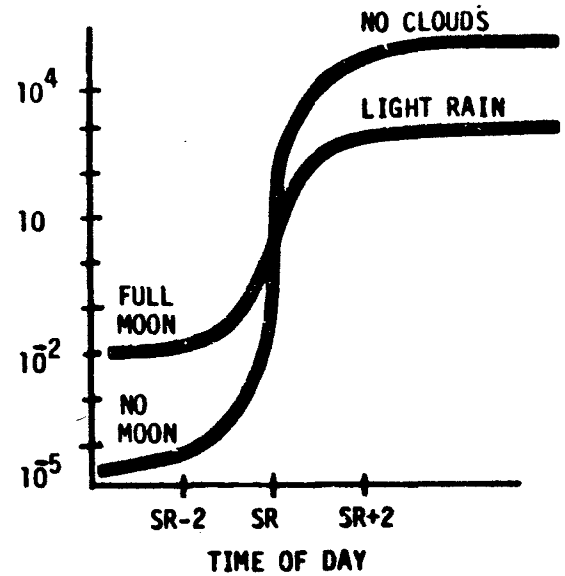
Figure 2.20 shows Weather Subroutine variables for weather classification, light level, temperature, and wind velocity. In the model, these variables are functions of time. When a subroutine needs a particular weather variable, the model simply examines the weather variables at the time in question and selects the appropriate values. The 11 classes of weather which vary from clear to heavy fog are input by the user as a function of time. Figure 2.21 is an example of the procedure to input variables for the Weather Subroutine.

The light level data of Figure 2.20 (foot lamberts versus time) were obtained from Reference 1 and, as shown, varies rapidly near sunrise (SR) and sunset (SS). (Only sunrise is illustrated in the Figure since sunset is essentially the reverse of this.) The model also considers the interaction of these basic light level data with the weather in that the light level is degraded appropriately depending upon the weather conditions which exist at the time the light level is sampled.

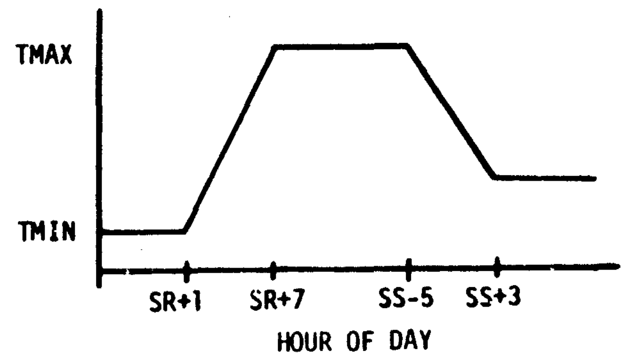
WEATHER CLASSIFICATION SCHEME

1 VERY CLEAR
2 CLEAR
3 LIGHT OVERCAST
4 HEAVY OVERCAST
5 HAZE
6 LIGHT RAIN
7 MODERATE RAIN
8 HEAVY RAIN
9 LIGHT FOG/DUST
10 MODERATE FOG/DUST
11 HEAVY FOG/DUST

LIGHT LEVEL (FOOT LAMBERTS)

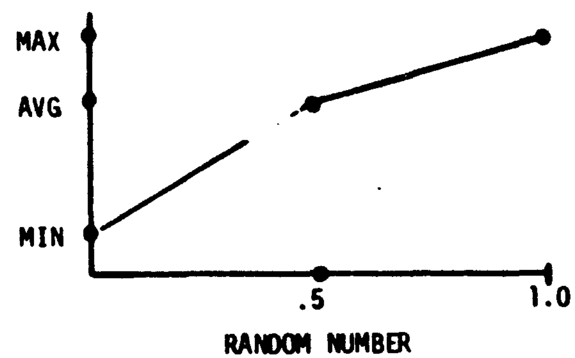


TEMPERATURE
(TYPICAL CHARACTERISTIC)*



*Use local data for time scale.

WIND VELOCITY



DAY	MOON RISE	MOON SET	MOON TYPE	TEMPERATURE MAX	TEMPERATURE MIN	RELATIVE HUMIDITY MAX	RELATIVE HUMIDITY MIN	WIND VELOCITY (KNOTS) MIN	WIND VELOCITY (KNOTS) AVG	WIND VELOCITY (KNOTS) MAX	WIND DIRECTION
01	1148	0156	1st Q.	78°F	30°F	98%	24%	0	2	7	360
02	1249	0235	"	84	32	98	16	0	0.25	2	330
03	1349	0307	"	78	32	99	18	0	0	0	0
04	1446	0335	"	60	41	99	45	0	1	8	320
05	1542	0400	"	59	32	99	46	0	2	8	060
06	1638	0423	"	68	26	99	27	0	3	12	090
07	1733	0446	"	66	32	98	32	0	5	18	250

Figure 2.21, Example Weather Input Values

The temperature curve was derived empirically from data collected at Los Angeles Civic Center and Hunter Liggett Military Reservation. Examination of these data revealed that the temperature begins to increase approximately one hour after sunrise (SR) and reaches its maximum value about seven hours after sunrise. Then it stays relatively constant with time, starts decreasing approximately five hours before sunset (SS), and reaches its minimum value at three hours after sunset. Based upon these observations, the temperature model shown in Figure 2.20 was constructed. The maximum and minimum temperatures and the time scale for any locality for each day of the operation would be input by the user; then the model will generate a curve as shown in the Figure. Relative humidity (not shown is treated in a similar manner, but it decreases as temperature increases.

Finally, the maximum, average, and minimum wind velocity is input by the user, and a random number is drawn to determine the appropriate velocit; Wind direction is input as constant. This sample procedure essentially accounts for gusts. If a constant wind scenario is desired, the user can simulate this by equating the minimum, average, and maximum velocities.

2.4.3 Enemy Situation

Three options are provided in the model for treating the enemy. These are illustrated in Figure 2.22. As shown in the Figure, the user can have fixed enemy positions, can simulate an enemy movement in a random manner within a circular area of operations, or can simulate the enemy moving on a pre-planned path. For the random movement within a circle on the fixed targets, the user can either pre-select the initial positions of these targets or can have the computer select these positions at random. Targets such as trucks, personnel, and enemy caches are simulated by inputting appropriate target characteristics. Analyses and discussion of target movement are contained in Sections 4.1 and 4.3 of Volume II.

Subroutines pertaining to the SIAF functions are described next. These subroutines are exercised for each segment as discussed in Section 2.3.

2.4.4 Movement

This subroutine calculates the movement rate of the patrol to be consistent with maintaining good surveillance and detection capability. Figure 2.23 presents a simplified flow diagram of how this movement rate,

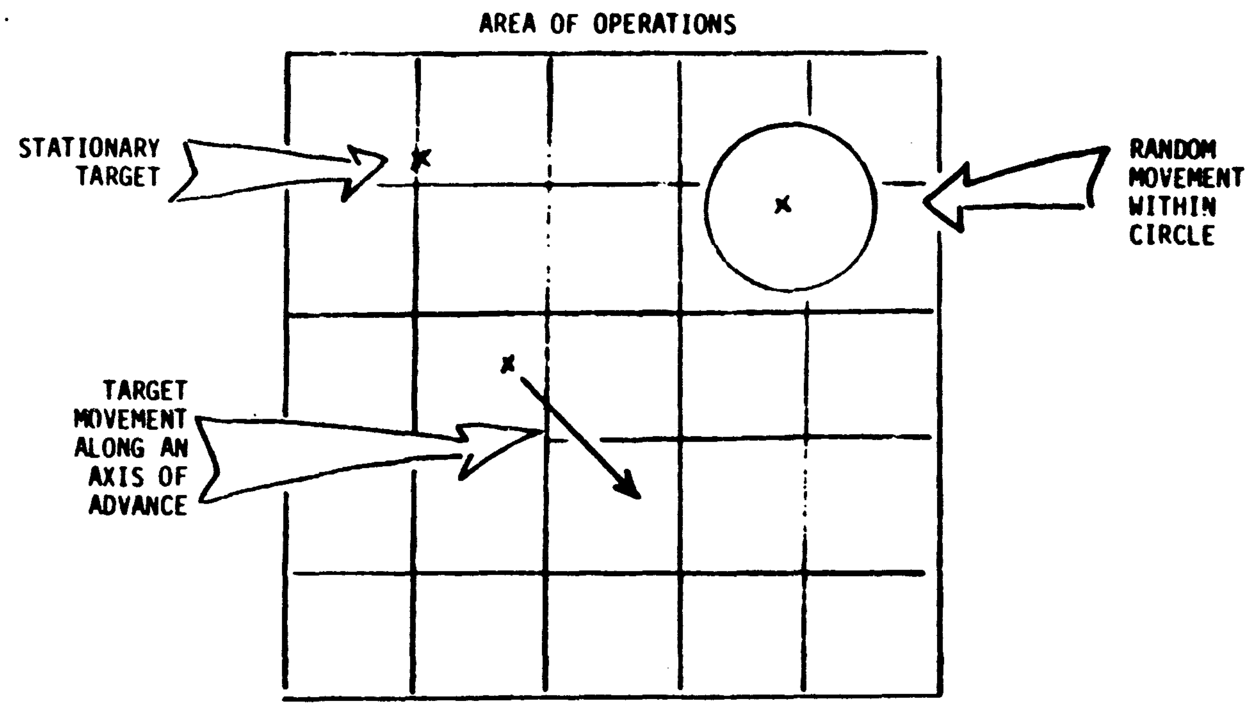
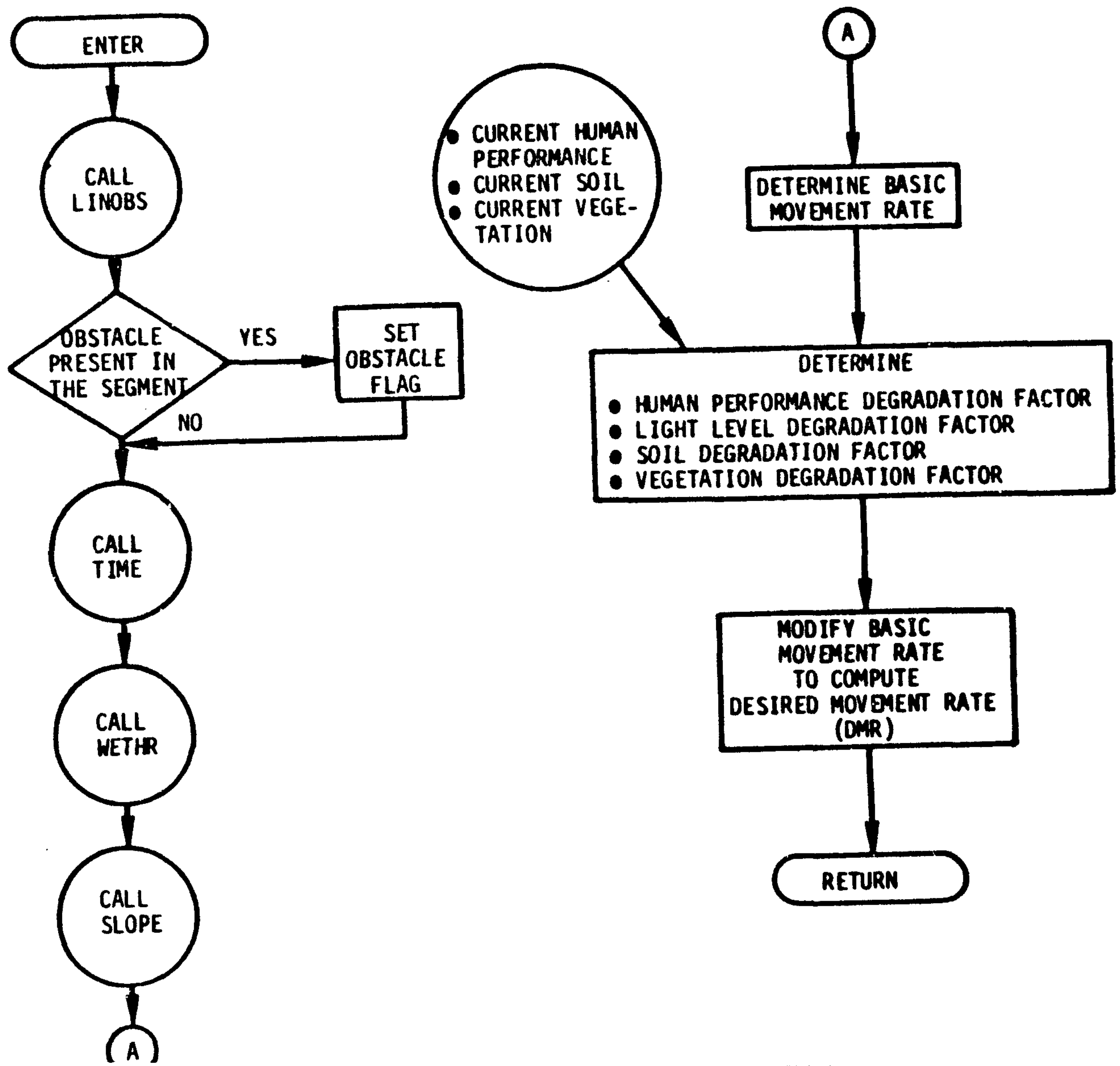


Figure 2.22, SIAF Model Threat Options


ENTER
CALL LINOBS
OBSTACLE PRESENT IN THE SEGMENT
YES
NO
SET OBSTACLE FLAG
CALL TIME
CALL WETHR
CALL SLOPE
A
A
DETERMINE BASIC MOVEMENT RATE
● CURRENT HUMAN PERFORMANCE
● CURRENT SOIL
● CURRENT VEGETATION
DETERMINE
● HUMAN PERFORMANCE DEGRADATION FACTOR
● LIGHT LEVEL DEGRADATION FACTOR
● SOIL DEGRADATION FACTOR
● VEGETATION DEGRADATION FACTOR
MODIFY BASIC MOVEMENT RATE TO COMPUTE DESIRED MOVEMENT RATE (DMR)
RETURN

called desired movement rate, is calculated. Upon entering this subroutine, a distance segment (see Figure 2.5), based upon the minimum of the distance to a checkpoint, terrain polygon crossing, or grid crossing, has already been calculated by a segment generator subroutine (see Volume III). The first check made in this subroutine is one to determine if the segment intersects a linear obstacle. For this purpose, Subroutine LINOBS is called and an appropriate flag is set if required. After this calculation, Subroutines Time, Weather, and Slope are called as shown in Figure 2.23, and a basic patrol movement rate is determined by means of a table look-up procedure. This movement rate is then modified to account for the current human performance level of the patrol, and the current soil and vegetation the patrol is moving through (these interactions among subroutines are illustrated by means of circles in Figure 2.23). The output of this subroutine is called the desired movement rate and is defined as that movement rate consistent with good surveillance and detection capability.

Although a desired patrol movement rate has been determined in the previous subroutine, it could turn out that time contingencies require that the patrol move faster than this rate. In order to determine an actual patrol movement rate, a movement command and control subroutine, illustrated in Figure 2.24, is used. As shown in the Figure, the checkpoints from the present patrol position to the end of the patrol route are first checked to determine if there is an arrival time constraint associated with any of them. If not, the actual movement rate is set equal to the desired movement rate. If a checkpoint has an associated arrival time, then the required movement rate, based upon the distance from the patrol to the checkpoint, and the remaining time is calculated. These calculations essentially simulate the commander's estimate of his required movement rate which he would obtain in a similar manner.

Since it is possible that this required movement rate could exceed certain human and physical, environmentally constrained limits, both critical and marginal movement rate limits are next calculated. This marginal movement rate limit is defined as the minimum of the desired movement rate and a 10 percent margin associated with a movement rate consistent with zero body heat storage. The critical movement rate is defined as the minimum of three times the desired movement rate (which is

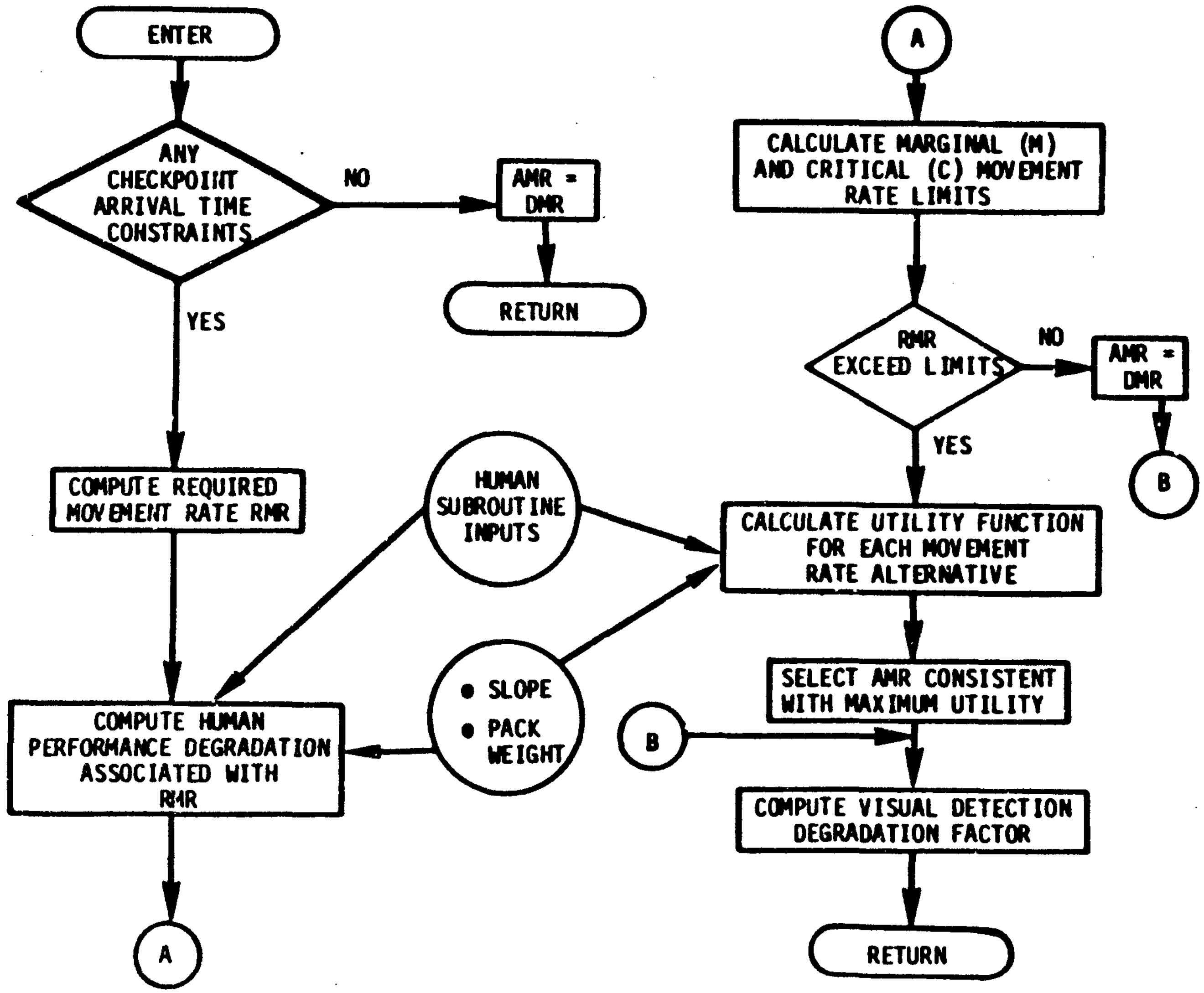


Figure 2.24. Movement Command and Control Subroutine (CCMOV)

estimated to be the nominal movement rate due to the terrain and weather) and that movement rate at which the body just maintains thermal equilibrium. As shown in Figure 2.24, these factors are functions of the current status of the patrol which is available in the communication block of the program. If the required movement rate is less than these limits, then the actual movement rate is set equal to the desired movement rate. If the required rate exceeds these limits, then the patrol leader must trade off his surveillance capability and time. For this purpose, weighting factors for each of these performance variables are provided as input, thus allowing the user the capability to consider alternative movement rate tactics. Based upon these input weighting factors, an actual patrol movement rate is selected and the visual performance degradation factor associated with this movement rate (used by the Visual Detection Subroutine) is calculated.

2.4.5 Navigation

The purpose of this subroutine is to determine the CEP of the patrol location. During the conduct of a mission, the patrol normally determines its location at the various checkpoints and reports its position to the base. However, if a target is detected or another contingency develops, the patrol may need to know its location at positions in between checkpoints. This location error is a function of the distance the patrol has traveled since it last updated its position. Figure 2.25 summarizes the calculations made in this subroutine which starts by computing the range and azimuth errors associated with navigation from the last checkpoint. These dead-reckoning errors are then combined with map, base, and recording errors, and a basic patrol CEP is calculated. Next, the user has the option of adjusting this calculated CEP in accordance with the specifications provided in Reference 2. Independent of these specifications, the patrol could improve its initial estimate of its location by map terrain association if the light level is favorable. This essentially adjusts the location estimate to account for readily identifiable terrain features which the patrol leader could use to more accurately determine his position. Finally, the user has the option of specifying certain patrol location equipment which aids the patrol in determining its position. If this equipment is specified, then the patrol location is adjusted, based upon the amount of

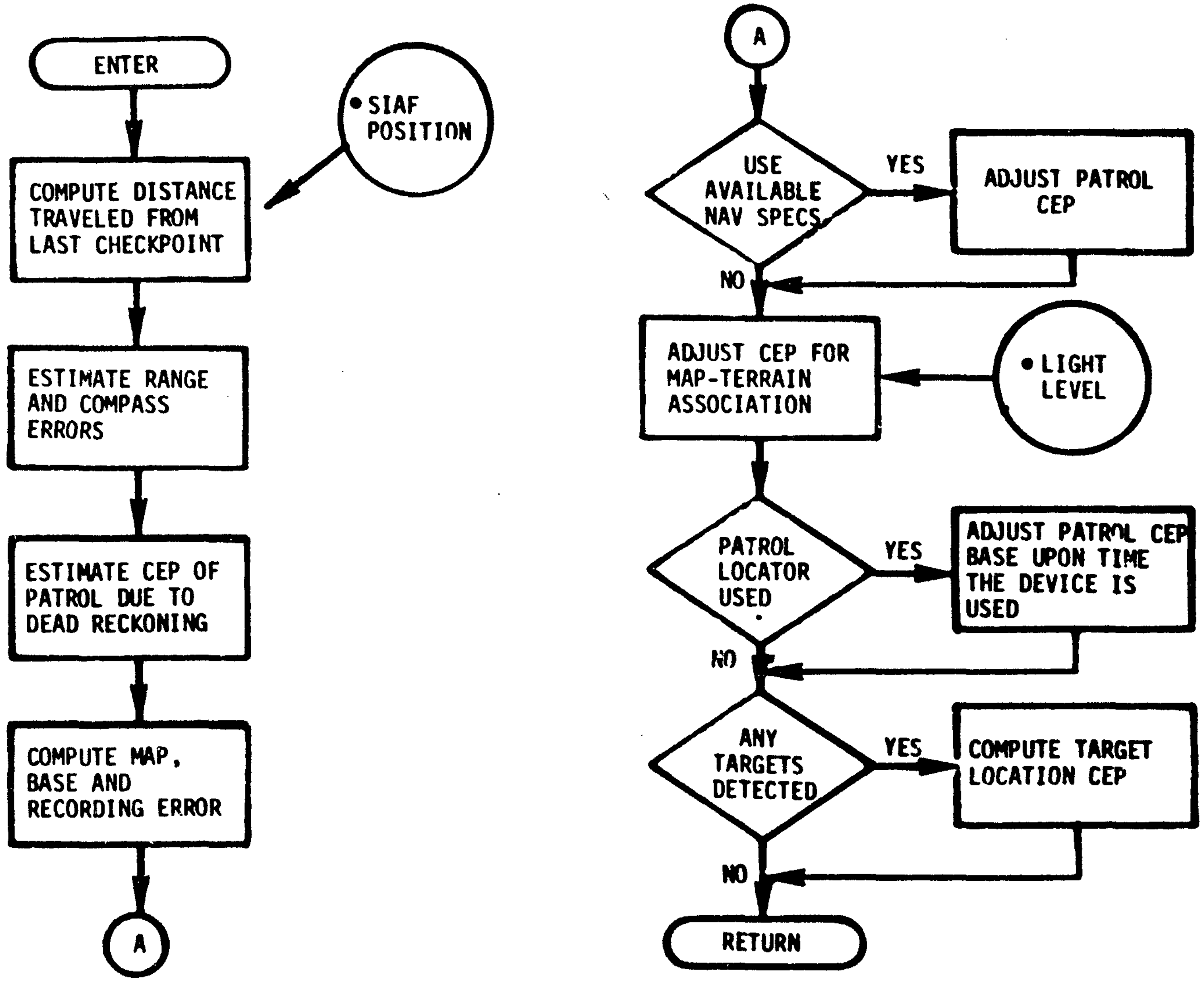


Figure 2.25, Navigation Subroutine (NAV)

time this equipment is used. These steps serve to determine a CEP of the patrol location. As shown in Figure 2.25, if a target is detected, this subroutine also calculates the CEP of the location of the target with respect to the patrol. This calculation is based upon considerations similar to those previously described.

2.4.6 Surveillance/Detection

Aural Detection

The purpose of this subroutine is to determine an aural detection verdict for SIAF against the targets in the area of operations and for the targets against SIAF. The aural detection capability of an individual depends upon the local background sound level and the sound level being made by the individual. The first calculation made in this subroutine, shown in Figure 2.26, is to determine the local aural background level for SIAF and for the targets. This background level is a function of the vegetation, time of day, and weather. Next, the source noise level for SIAF and the targets is computed. This source noise level depends upon the number of men in the unit, their disposition, and their present activity. If, for example, the patrol is moving through heavy vegetation, then its source noise level is considerably higher than it would be if the patrol were conducting a stationary reconnaissance. Based upon these two calculations, the sound level arriving at the listener is computed (considering range and vegetation attenuation) and is compared with the hearing threshold and the local background noise. If the threshold is exceeded, then the appropriate detection opportunity is stored in a vector for subsequent analysis by the Detect and Decision Subroutines.

Visual Detection

The Visual Detection Subroutine is illustrated in Figure 2.27. The purpose of this subroutine is to calculate probability of making a single glimpse, visual detection of targets that are feasible of being detected by SIAF, and for targets to detect SIAF. In this calculation, line of sight between SIAF and the targets is assumed. Hence, the calculation mainly considers light level for the detection computation. As shown in Figure 2.27, the first calculation is to determine the target reflectance, background reflectance, the light level at the target, and the light level

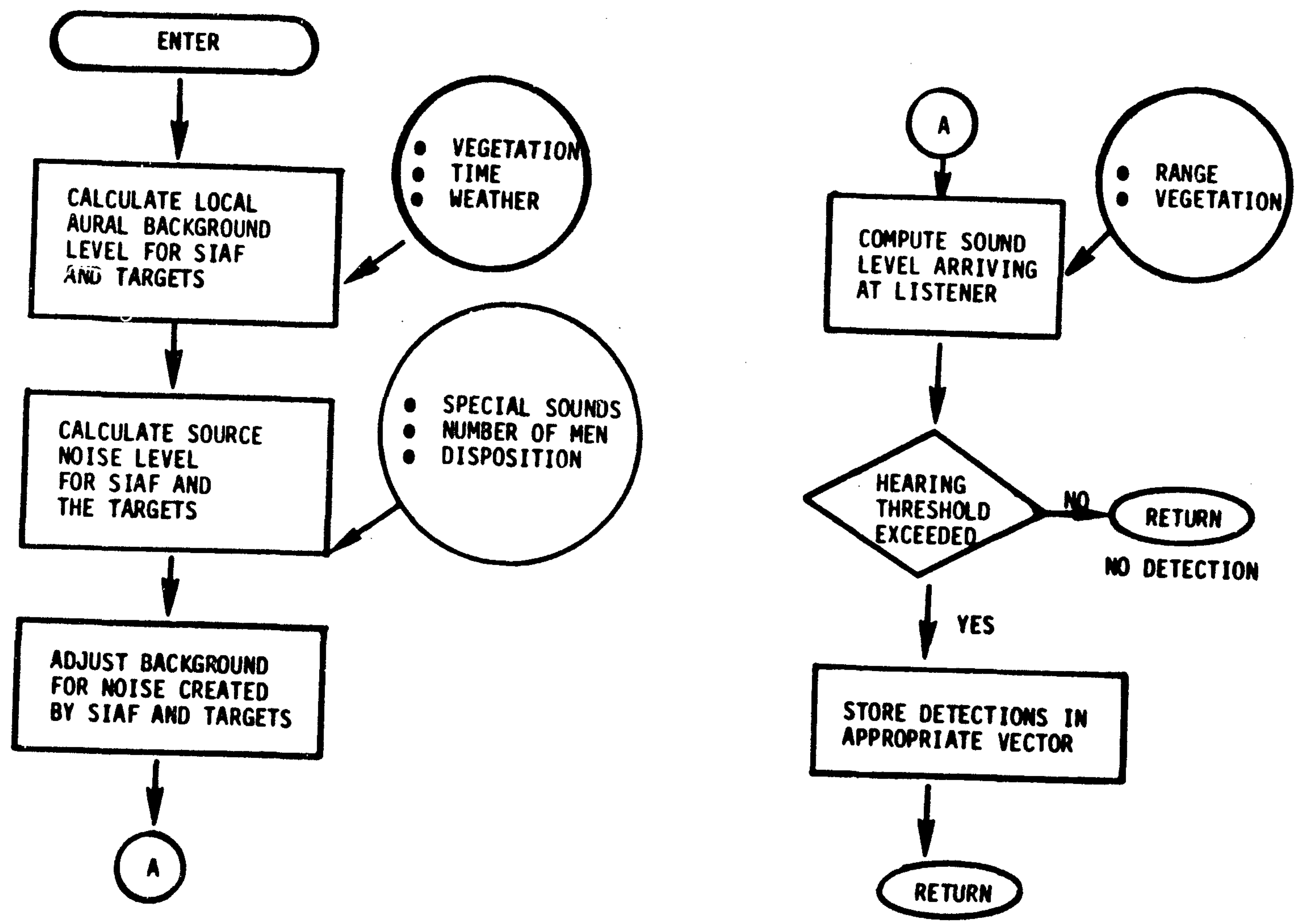


Figure 2.26, Aural Detection Subroutine (AURAL)

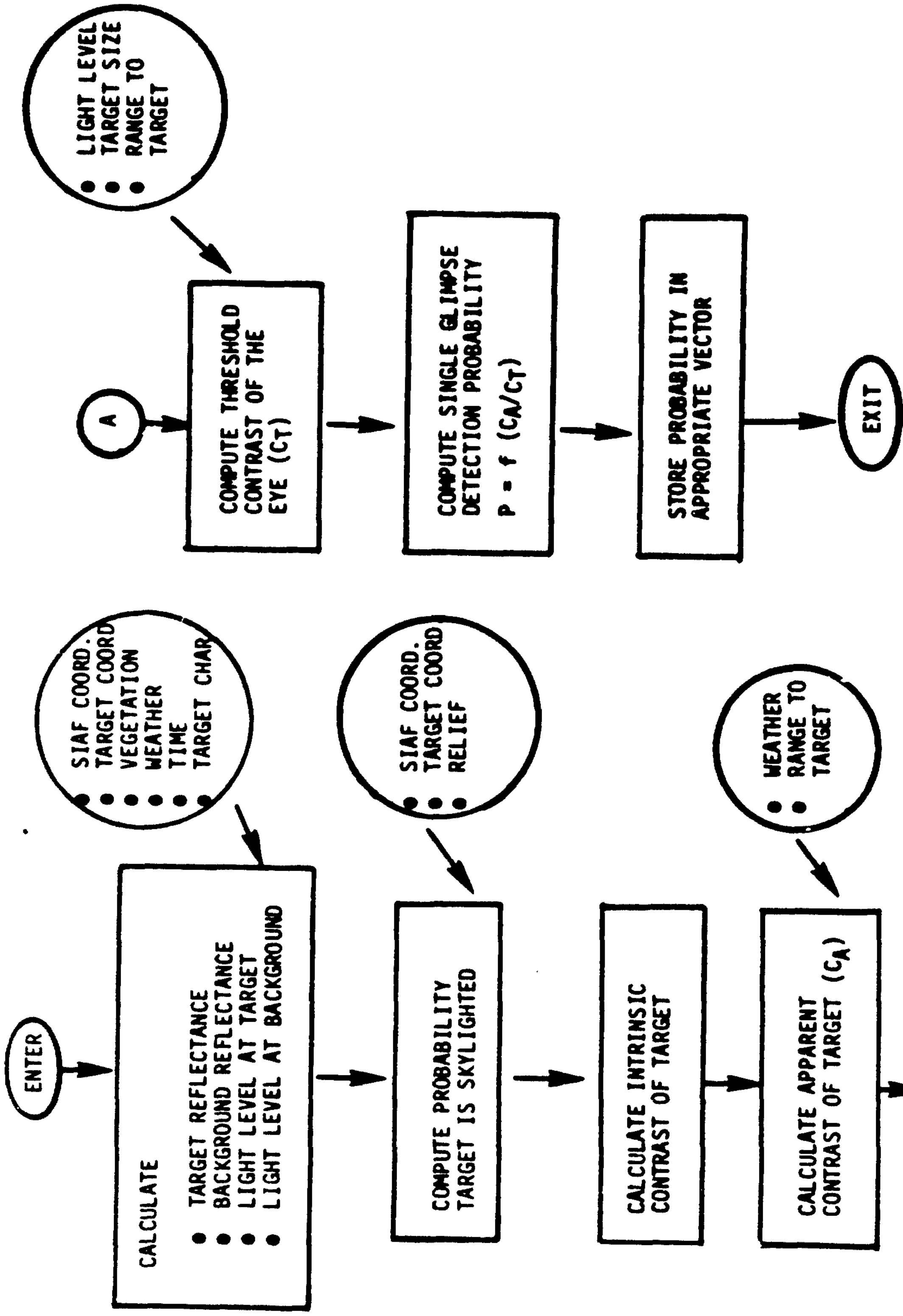


Figure 2.27, Visual Detection Subroutine (VISUAL)

of the background. Depending upon the location of SIAF and the particular target under consideration, there is a possibility that the target may be skylighted. The next calculation is then made using the Terrain Concealment Subroutine to determine background conditions, including skylighting. Based upon this information, the intrinsic contrast of the target is computed. This intrinsic contrast is essentially the ratio of the brightness of the target to the brightness of the background. Depending upon the range between SIAF and the target and the weather conditions, the contrast of the target as observed by the eye differs from the intrinsic contrast. This is called apparent contrast and is next calculated considering the factors mentioned above. The third contrast calculated in this subroutine is threshold contrast of the eye. As indicated in Figure 2.27, this threshold contrast is a function of the light level, target size, and the range to the target. The ratio of apparent contrast to threshold contrast is then used to determine a single glimpse detection probability. This probability is then stored in an appropriate vector as further indicated in Figure 2.27.

Detect

The described calculations serve to determine detection opportunities and are independent of line of sight. Subroutine Detect, illustrated in Figure 2.28, combines these calculations with the relief and vegetation and considers the physical location of SIAF and the target. As mentioned previously in Section 2.3, this detection calculation is made once for each mini-segment and can consider man-to-man detection if desired by the user. The first calculation made is to determine which patrol members are looking in the correct sector to potentially see the target. If, for example, no patrol members are viewing any targets, then detection is not feasible. For all feasible targets, Subroutines TERCON, AURAL, and VISUAL are next called. These subroutines essentially examine line of sight between SIAF and the target, sound levels made by SIAF and the target, and light level to determine whether detection or several detections can possibly occur in the mini-segment. Based upon this information and the time available, detection verdicts are calculated in a Monte Carlo fashion for SIAF and all detectable targets. The order and interval between detections is created to identify who sees who first and later is used in the decision model to determine simultaneous detection/counterdetection situations.

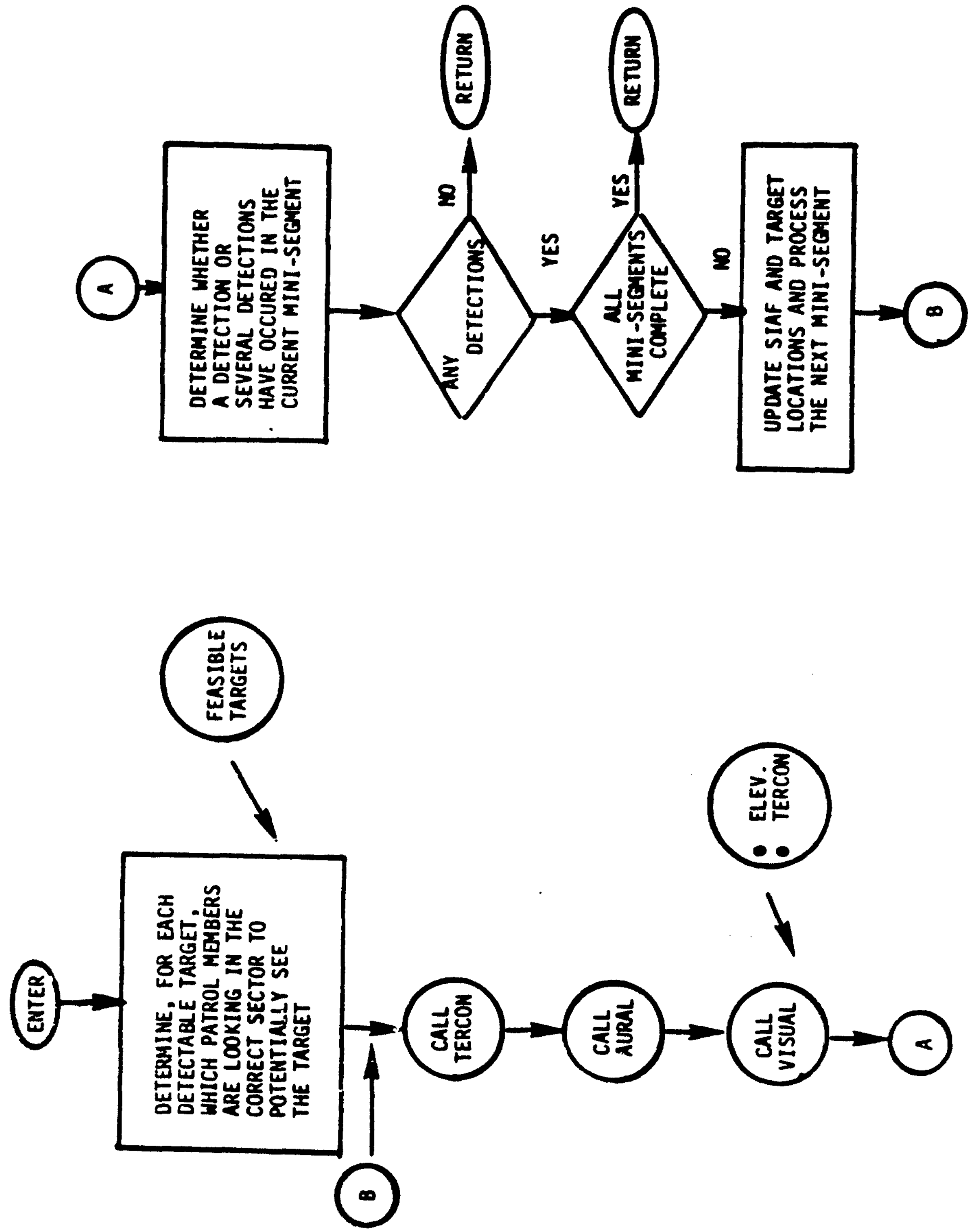


Figure 2.28, Detection Subroutine (DETECT)

2.4.7 Fire Support

If a patrol detects a target, it may elect to direct fire on the target, without engaging in a firefight depending upon the mission and the situation at the time of detection. For this purpose, an external fire support subroutine (EPS) is called by the Executive Routine. As shown in Figure 2.29, the user can select air, artillery, or manual gunfire for analysis. If air is selected, then the assumption is made that the target movement provides negligible error in ordnance delivery CEP. Because of the response time of artillery and naval guns, a moving target could introduce decreased accuracy in delivery CEP; hence, the user can examine this situation if desired. As shown in Figure 2.29, factors such as surprise and adjusted fire, target reaction to the first round hit, and the interactions of the effectiveness of the fire support mission with the patrol and target location errors are considered. If preliminary fire support is to be used prior to attacking a target, a detailed simulation of external fire support effectiveness is used. This is discussed in the Combat Submodel description.

2.4.8 Supply Maintenance

The Supply Maintenance Subroutine illustrated in Figure 2.30 is essentially a booking subroutine which increments and/or decrements the supply status of the patrol during each segment. As shown in the Figure, food, water, ammunition, and pack weight are incremented if the patrol was resupplied during the last segment and decremented for combat operation and for normal food and water consumption. The normal food and water consumption requirements are calculated in the Human Maintenance Subroutine which follows.

2.4.9 Human Maintenance

This subroutine computes food and water requirements for the patrol and calculates the current human performance degradation of the patrol. As illustrated in Figure 2.31, the current energy expenditure rate of the patrol members is first determined. This is based on the current patrol activity which includes rest, sleep, stationary reconnaissance activities, or movement. During movement, the energy expenditure rate is a function of the slope, pack weight, and movement rate, for which values are available to this subroutine via the communication block of the program. Once the energy expenditure rate is determined, the value of the segment time is used

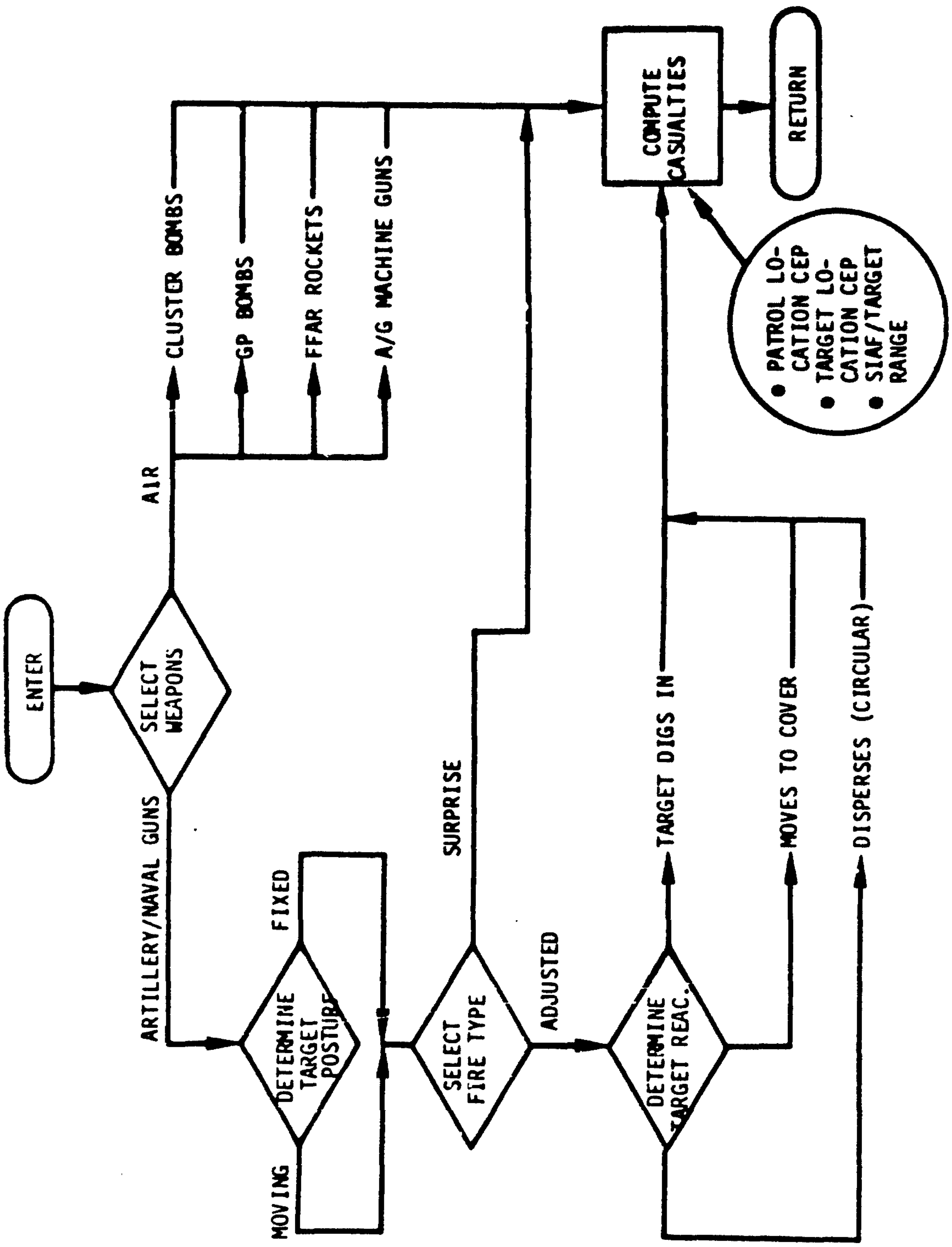


Figure 2.29, External Fire Support Subroutine (EFS)

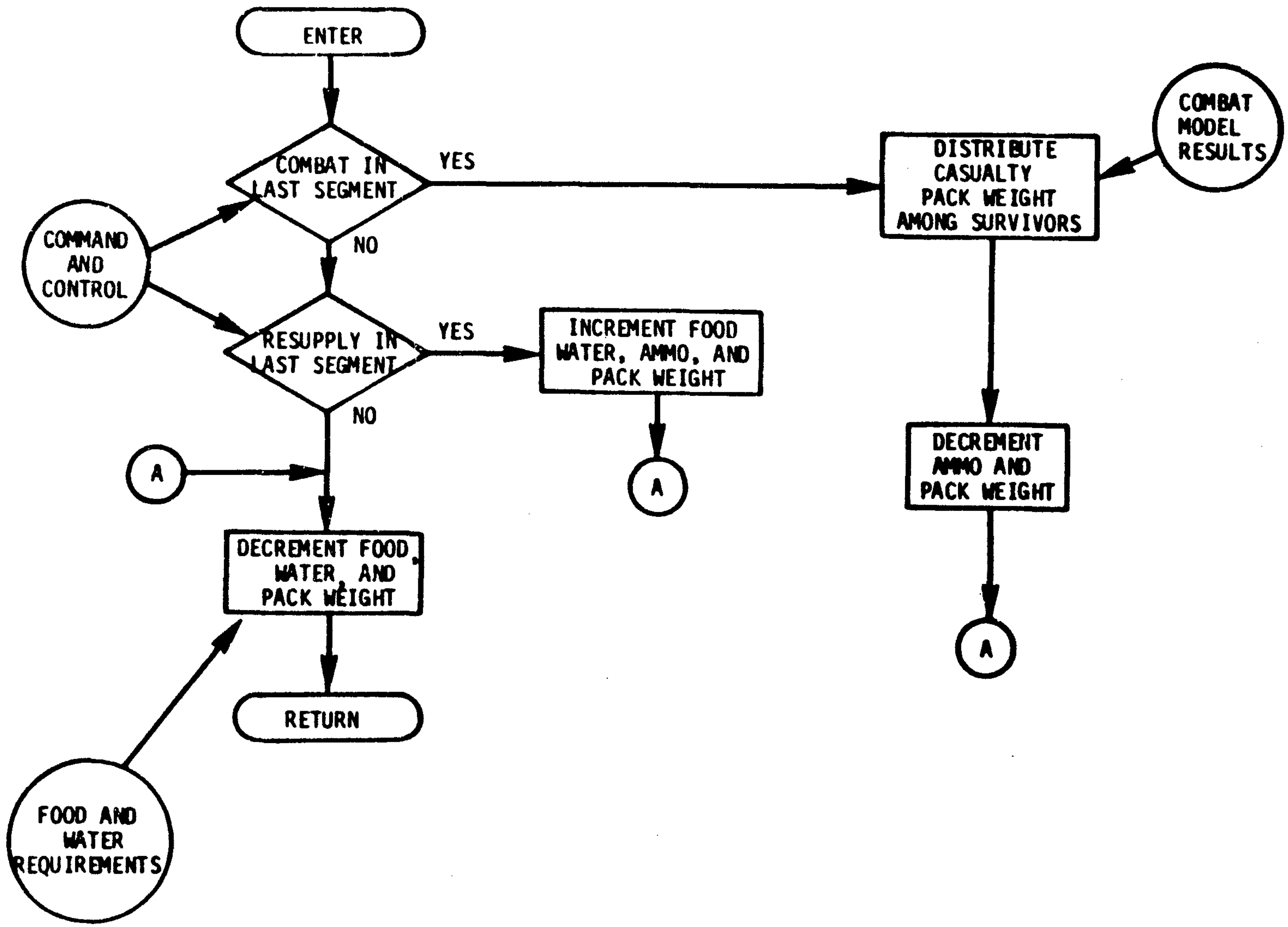


Figure 2.30. Supply Maintenance Subroutine (LOGIS)

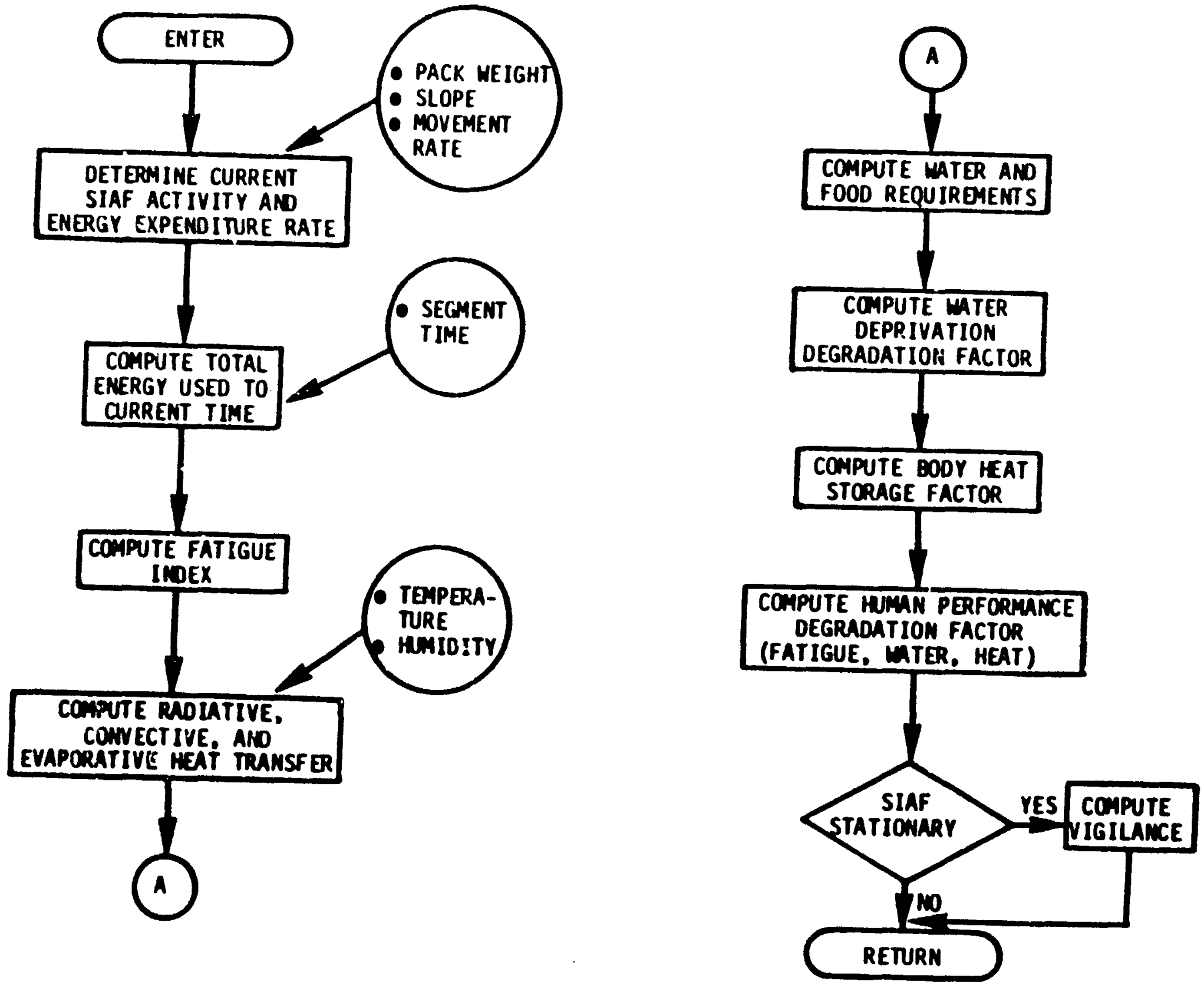


Figure 2.31, Human Maintenance Subroutine (HUMAN)

to compute energy expenditure and an associated fatigue index as shown in Figure 2.31. This energy expenditure is then used to compute the body heat lost through radiation, convection and evaporation. From this, food and water requirements and body heat storage are calculated. These factors are then combined and a human performance degradation factor is computed. This human performance degradation factor is the amount in percent by which the performance of patrol functions such as visual detection are degraded due to fatigue, body heat storage, and water deprivation. In addition, visual detection performance is influenced by a factor called vigilence which accounts for the decrease in the alertness of patrol members as a function of the time they have been conducting stationary reconnaissance operations. If the patrol is stationary, this calculation is also made as shown in Figure 2.31.

2.4.10 External Communications

The External Communications Subroutine shown in Figure 2.32 calculates an external communication verdict for the patrol on each communication attempt. First, the total ampere hours currently available to the patrol are computed to determine if the battery life is expended. If so, a no-communication verdict is returned by the subroutine. If power is available, then a power budget analysis is conducted; and vegetation, defraction, and space losses are computed. These calculations depend upon the current distance from the patrol to the base and the terrain between SIAF and the base. The results of this power budget are used to compute the signal-to-noise ratio at the receiver. This signal-to-noise ratio is then used to compute message intelligibility. As shown in Figure 2.32, the model simulates the actions of the patrol repeating the message until the intelligibility criteria (a user input) is satisfied. If the intelligibility criteria is not satisfied with N trials (N is a user input), then a no-communications verdict is returned by the subroutine. If the criteria is satisfied, then the communication is said to be successful.

2.4.11 Command and Control

The current SIAF command and control model consists of a movement command and control subroutine (described in Section 9.1) and a post detection decision subroutine (Section 9.2).

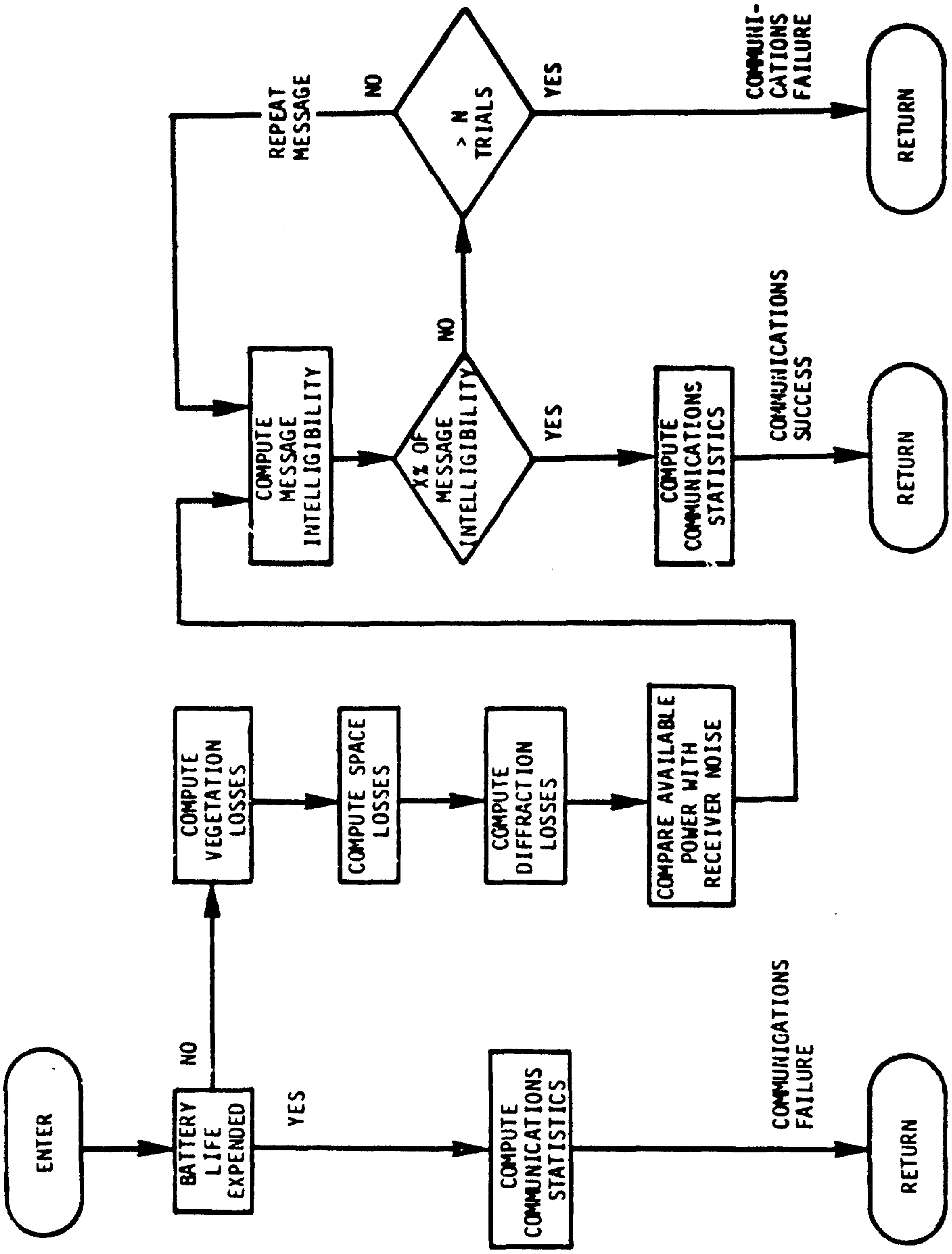


Figure 2.32, External Communications Subroutine (EXCOM)

With respect to patrol movement, the required movement rate which a patrol must sustain in order to arrive at a next checkpoint on time is compared with a desired movement rate that is consistent with being able to maintain good surveillance. If the required rate exceeds the desired rate, trade-offs are made between time and detection performance to select the most satisfactory movement rate for the patrol. The trade-off results can be controlled by adjusting input weighting factors.

In the post detection subroutine of Section 9.2, alternatives are provided which cause the patrol to move along a dynamic route toward the target to identify it or to move around the target to avoid it. Logic is also provided for calling external fire support on targets. Input variables are provided which allow the user the capability of exercising these model options (see Section 9.0 for details).

2.5 SIAF COMBAT SUBROUTINES

Thus far an overview of the reconnaissance model has been presented in previous sections. Once the SIAF patrol detects a target, however, it may decide to combat the target, and once the combat is completed the patrol may decide to continue the reconnaissance mission. The SIAF model considers these possibilities. In the following section an overview of the combat decision and execution subroutines are presented. (Details of these routines are described in Volumes V and VI.) Included is a description of the decision logic and decision optimization routines, and a discussion of the combat executive routine. Finally an overview of the withdrawal and the continue mission routine which allows the patrol to continue on its reconnaissance mission once the combat operating is completed, is presented.

2.5.1 Combat Decision Logic and Optimization Logic

In the SIAF reconnaissance model many detection and identification possibilities exist. For example, the SIAF patrol could possibly identify two targets simultaneously or several targets could identify and detect SIAF at the same time. Because of the complications involved in developing logic to model these situations, combat operations where more than one target is involved are not considered in the model. Instead if it turns out that several targets detect SIAF or SIAF has detected and identified several targets then a no combat decision is made and the SIAF patrol avoids the targets. Considering the fact that SIAF normally operates as an independent force this is probably a reasonable simulation of what they would in fact do. That is, should they detect and identify more than one target they would probably avoid the target area.

Now consider the case in the simulation model where SIAF detects and identifies a single target. In this case if its mission is combat, the patrol must decide what kind of combat action to initiate. Here decision logic is necessary since it is impossible to determine exactly where the patrol will be and exactly what and where the target is when the detection occurs during the simulation. Hence this logic dynamically examines the current tactical situation and selects a course of action. The movement to contact and deployment decision logic shown in Figure 2.33 indicates that five courses of action are possible. The first course of action is that the patrol could call in external fire support on the target. The second alternative is that the patrol could deploy for ambush. This alternative, for example, would probably be selected if the target were moving toward the SIAF patrol. On the other hand the target may be moving in a direction away from the patrol or may be out of range of the patrol. In this case the SIAF patrol could decide to move to a deployment position and call for external fire support if available, before initiating the fire fight. Another alternative, even before a detection occurs, is to move to an ambush area to deploy Claymore mines. The fifth alternative, of course, is a no combat decision. The decision logic subroutines examine the current tactical situation and select one of these alternatives based on the following decision variables.

1) Mission (ambush, attack, or deploy Claymore mines)

2) Force ratio (i.e., the relative size of the target vs the size of the SIAF)

3) SIAF-target range

4) Direction of travel of the target

5) The terrain between the SIAF patrol and the target as to its effects on cover, concealment, and observability.

The decision logic is constructed so that the user can adjust the input data and choose different criteria for selecting a course of action. Thus the decision variables are examined, the tactical situation determined by the model and a combat option is dynamically selected.

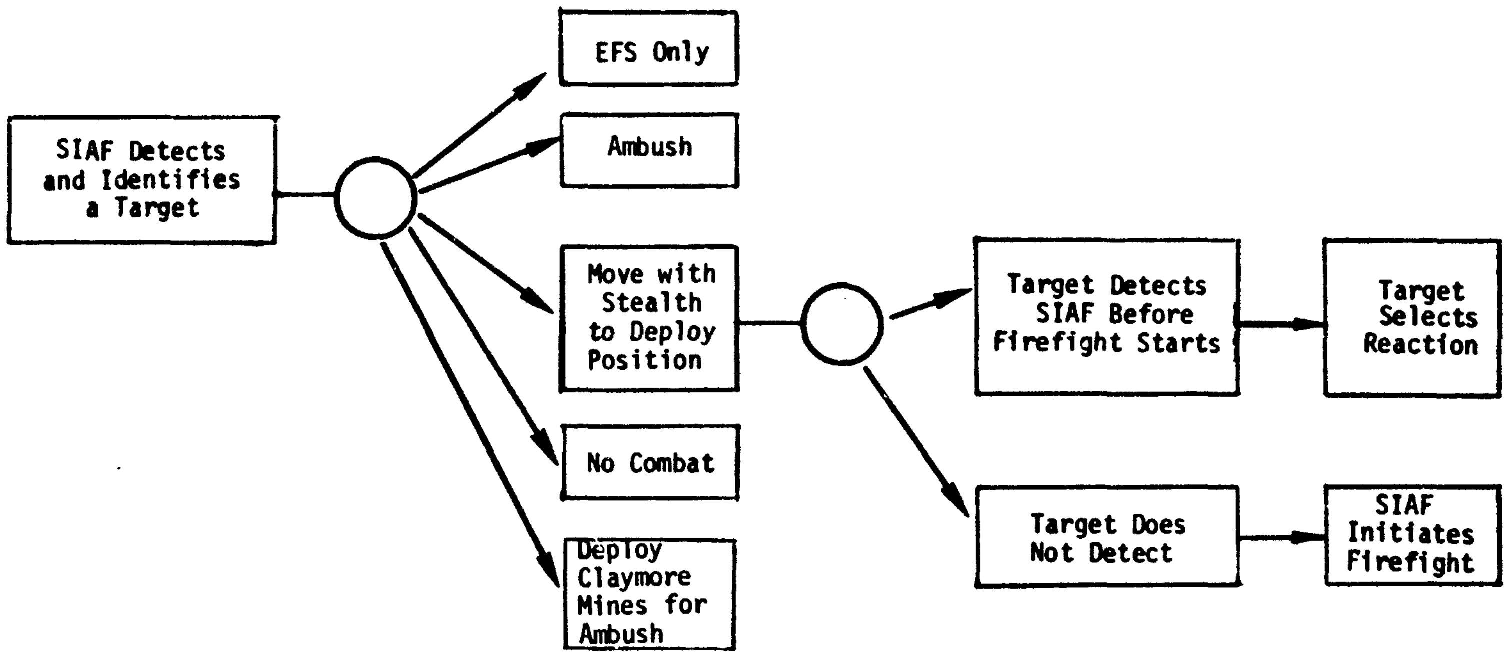


Figure 2.33, Movement to Contact and Deployment Logic

In the case of external fire support only the external fire support (EFS) subroutine is then called, external fire support simulated, and the patrol then makes a "continue the mission" decision and would probably, in this case, decide to return to continue the reconnaissance patrol. In the case where deployment is selected, optimization logic optimally selects the exact deployment position of each maneuver unit in the terrain. The most complicated situation evolves when the patrol decides to move to a deployment position. In this case the dynamic route selector routine (DROUTE) selects movement points based upon different movement criteria which again are user input. As shown in Figure 2.33 when the patrol is involved in this type of a movement the target could possibly detect the patrol before the fire fight occurs. In this event the target could react by moving, deploying, or opening fire. If, on the other hand, the target does not detect the patrol in movement to the deployment position, SIAF initiates the fire fight. If the target should move toward a better defensive position, the SIAF may reselect its deployment points or exchange roles between maneuver units and and the base of fire. Thus, the combat decision and optimization logic provide a mechanism for the user to select various combat alternatives based upon the current tactical situation.

2.5.2 Combat Executive

In Section 2.3 the executive routine used to drive a reconnaisance model was described. In this section an overview of the executive routine used to drive the combat model is presented. In this regard two approaches for driving the combat executive routine were examined. The following section describes and compares these two approaches.

The first alternative shown in Figure 2.34 indicates that each man in this situation has a clock time, initial values of which are selected to be different based upon user input. The model selects the man with the smallest clock time and decides how much time is to be spent observing in an intelligence routine, and computes this amount of time (t'_1 in the figure). Then movement and fire controller models decide if the man will move or fire. If he is to fire, for example, the fire controller model decides at whom he will fire and computes the firing time (t'_2 in the figure). If communications are to occur the time required for communications are also computed. Finally casualty assessments are made. After these calculations are made the clock time for this particular individual examined

Man	Clock Time
Man 1	t_1
Man 2	t_2
. . .	
Man n	t_n

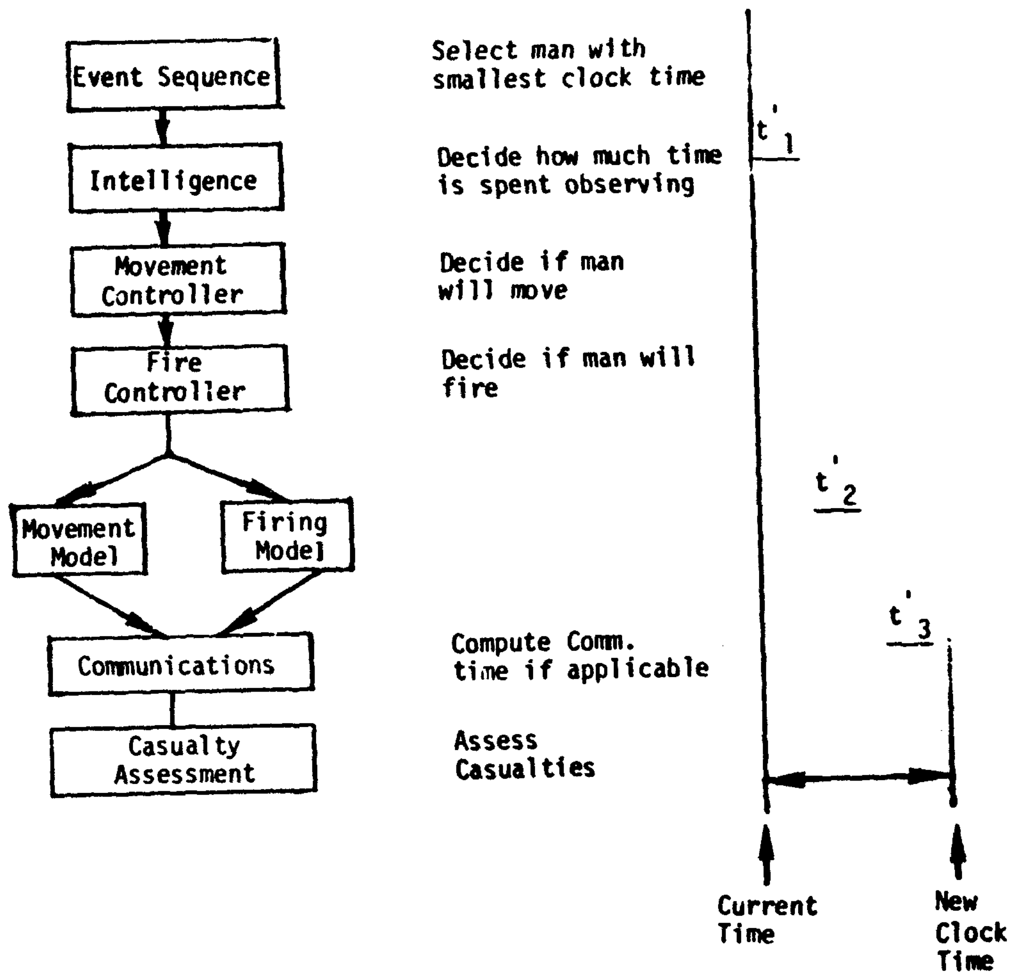


Figure 2.34, Alternative 1 to the Combat Executive

is advanced by the amount $t'_1 + t'_2 + t'_3$ and he is given a new clock time. The model then scans the list of men and clock times, picks out the minimum, and repeats the procedure. Thus, in alternative one, each man is individually cycled through functions that he is required to perform during combat and time is advanced in the fashion described above. This is the approach that is used in models such as DYNTACS and ASARS.

An alternative to this approach is presented in Figure 2.35. Here, instead of individually selecting each man and having a clock time associated with each man, only one clock time exists in the model. The event times in this case are movement, detection, casualty, EFS burst, and internal message reception. The executive routine computes the movement and detection event times for each individual for both the attacker and defender, and the casualty times of each individual for both the attacker and defender. It then scans this list of times together with any scheduled arrival of EFS and any scheduled reception of a message between maneuver units. It then selects the minimum time, and defines the corresponding event as the event which occurs in this particular segment of the model. Figure 2.35, for example, illustrates what would happen if the event were movement. In this case, all moving individuals would be moved an appropriate amount of ammunition, the clock time and the status of each man would be updated, and calculations would be repeated. Thus, instead of cycling through each man, this particular method examines the next event to occur for all men, advances the clock time based upon the minimum of these times, and updates the attributes of each man to what they would be at this time.

A comparison of these two approaches is shown in Figure 2.36 and here, three attributes were defined: running time, event accuracy, and capability to handle cumulative interactions. The comparison indicates that alternative one probably has a faster running time in most cases. However, arguments that alternative two could be faster are also possible to evolve. As far as event accuracy is concerned, alternative one could possibly neglect events which occur to other individuals during a given loop through the logic. The reason for this can be seen through a further examination of Figure 2.34 which shows that an individual could possibly become a casualty during the advance of his clock time. Thus, unless a time step variable is set to adjust the advance of

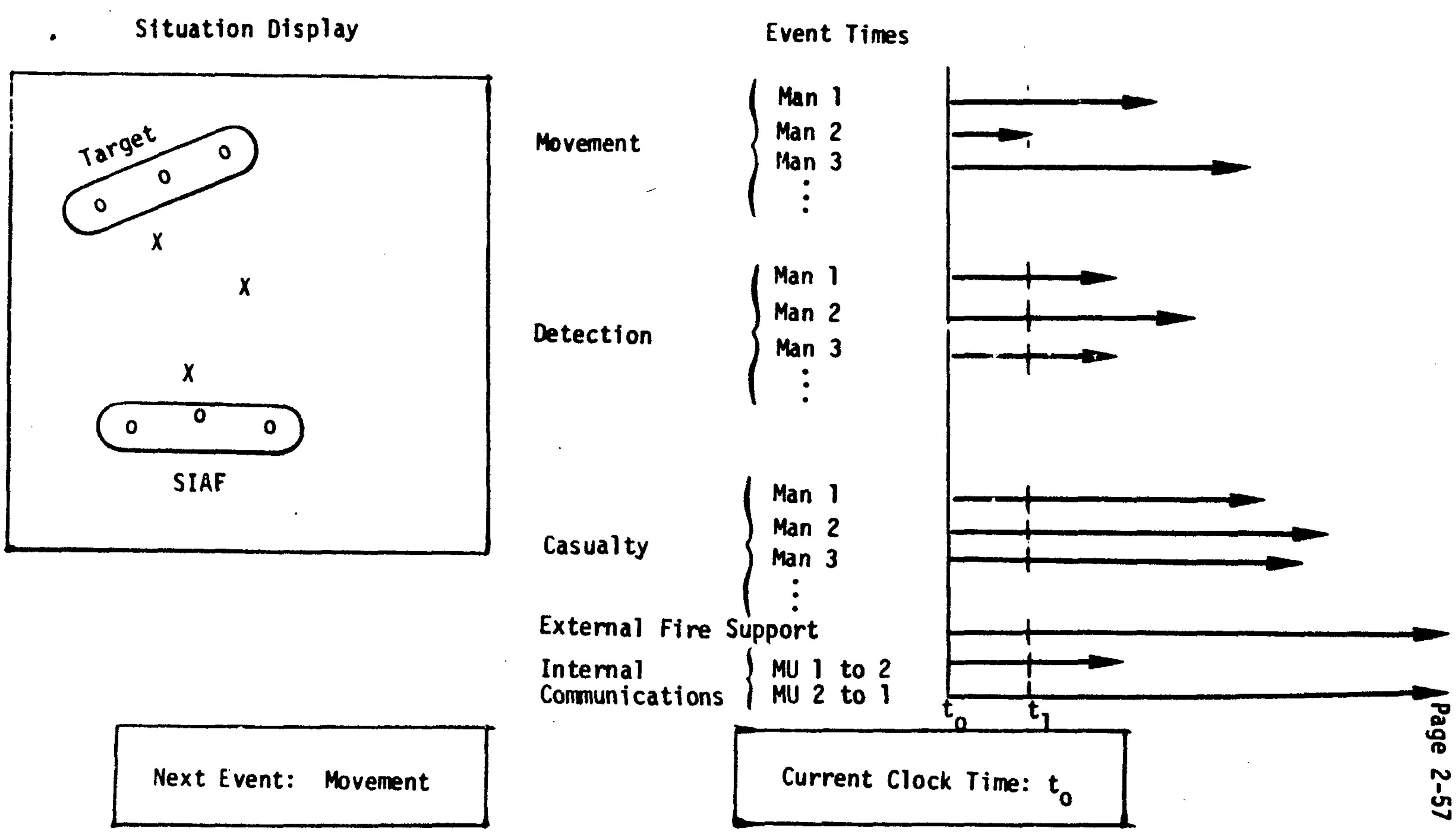


Figure 2.35, Alternative 2 to the Combat Executive (Sheet 1)

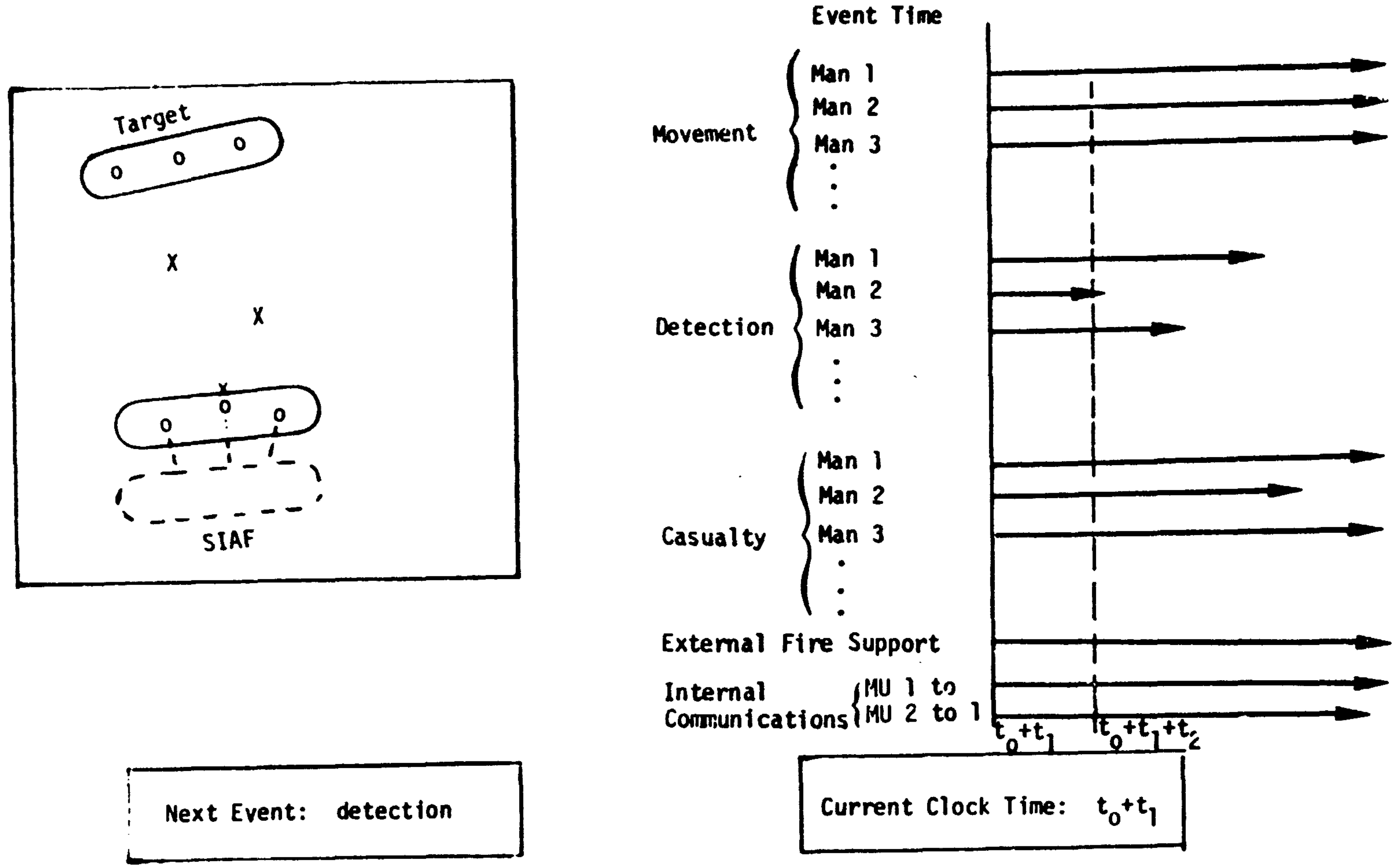


Figure 2.35, Alternative 2 to the Combat Executive (Sheet 2)

Attribute	Alternative 1	Alternative 2. SIAF Technique
Running time	Faster running time in most cases	Will normally run longer but could run faster than Alt. 1
Event Accuracy	Could neglect events which occur to other individuals during a given loop through the logic	Such events are not neglected since everyone is updated during each advance of the clock
Capacity to handle cumulative interaction	Suppression only considers one man firing at one and neglects simultaneous firing	Suppression includes the effect of many individuals firing at one (cumulative P_K table)

Figure 2.36, Comparison of Executive Alternatives

the clock, these types of events, which would tend to bias the results, could occur. With alternative two, such events are not neglected since the time of the first event for all individuals is first calculated and time is advanced in a fashion previously described. With respect to cumulative effects, alternative one neglects the fact that the suppression of an individual may be greater because three individuals may be firing at him rather than just one. Alternative two, on the other hand, can include these types of cumulative effects. As far as implementation goes, it is not clear that alternative one is superior to alternative two. Different logic is required for both alternatives, and a comparison is very difficult to make. Based upon the manner in which the reconnaissance model currently runs and an examination of these alternatives, alternative two was selected as the technique to be used for the SIAF combat model.

In summary, two executive routines are provided with the SIAF model. The first is the reconnaissance executive which operates in the manner described in Section 2.3. Once the detection and identification occurs the decision logic determines whether a combat action will occur. If a combat is to occur then the combat executive described above simulates this part of the mission. Once a combat mission is concluded and a decision is made to return to the reconnaissance operation, the reconnaissance executive routine described in Section 2.3 takes over and continues driving the model.

2.5.3 Data Structure and Manipulation

The SIAF combat model consists of a series of subroutines and an executive routine. The executive routine advances time in the manner previously described and calls individual subroutines to make various calculations. Interactions are considered and modeled by the subroutines which essentially update the attribute list of the target and SIAF shown in Figure 2.37. For example, ATT(1,1,1) is the fire team number of the first man in the attacker patrol. ATT(3,2,2) contains a value of the number of rounds remaining for man number 2 in the defender unit. The attribute matrix is a 25 x 20 x 2 matrix, and the attributes of each individual are changed by various subroutines depending upon the situation. For example, should movement occur then the current X and Y coordinates, attributes 7 and 8, of each individual involved in the movement are updated by the appropriate routine. Should a patrol member assume a different posture, then the height of the patrol member is

ATT(X,Y,Z)

Z is the Patrol Identifier

1: Attacker
2: Defender

Y is the Patrol Member

1
2
3
.
.
.
20

X is the Attribute of the Patrol Member

1: Team Number
2: Weapon Number
3: Current Ammunition Supply (Rounds)
4: Casualty Status
5: Firing Status
6: Current Suppression State
7: Current x Coordinate (Meters)
8: Current y Coordinate (Meters)
9: Next x Coordinate (Meters)
10: Next y Coordinate (Meters
11: Height (Meters)
12: Width (Meters)
13: Current Posture
14: Moving Element
15: Maneuver Unit to Which the Element Belongs
16: Number of Rounds Remaining in Magazine
17: Function in Patrol
18: Movement Rate of Each Individual
19: Individual's Assignment
20: Initial Ammunition Supply
21: Weapon Type
22: Position in Fire Team
23: Secondary Weapon Number
24: Hand Grenade Supply
25: Signal Grenade Supply

Figure 2-27. Attributes of Attack and Defender adjusted, attribute No. 11. Should his movement status change, for example, should he be in a suppression state where movement is not allowed, then the movement status attribute is changed. Attribute changes by one routine in turn effect other routines. For example, should the movement status change, the firing status would probably be different to allow the advancing unit to start moving again. Hence, the interactions between routines are essentially communicated to each of the routines through the attribute matrix. Naturally this is an oversimplification of the exact details of the model and is intended to be an overview to aid in understanding the details presented in Volumes V and VI.

2.5.4 Calculation of Movement Event Times

As previously described in Section 2.5.2 five events are defined in the executive: movement times, detection times,casualty times, communication arrival times, and EFS burst event times. This section describes the calculation of movement event times. Figure 2.36 illustrates this calculation and shows the SIAF team in a line formation moving from one objective point to the next objective point which in this case is the point generated by a dynamic route subroutine. The model starts by computing the objective point for each individual based upon its formation of the unit. For a line formation the objective points would be as shown in the figure. If the formation were a "V" or a wedge then subroutine FORMST would compute the appropriate objective points for each individual and load these values into the ATT matrix. Specifically, these values would be located in ATT 9 and 10, the next movement coordinates. Next, based upon the present location of each individual, this subroutine calculates segment lengths for each individual. As shown in the figure, the segment lengths for each individual could be different and the path each individual takes could be over different terrain; hence, the movement rate model described previously in the reconnaissance section is called and the movement rate of each individual over each segment is calculated. Next these movement rates are modified by the current suppression state which is stored in the ATT matrix. Finally, the segment lengths are divided by movement rates to compute the time at which each individual would reach its next objective point. Then the minimum of all these times is calculated and stored in a variable called STIME.

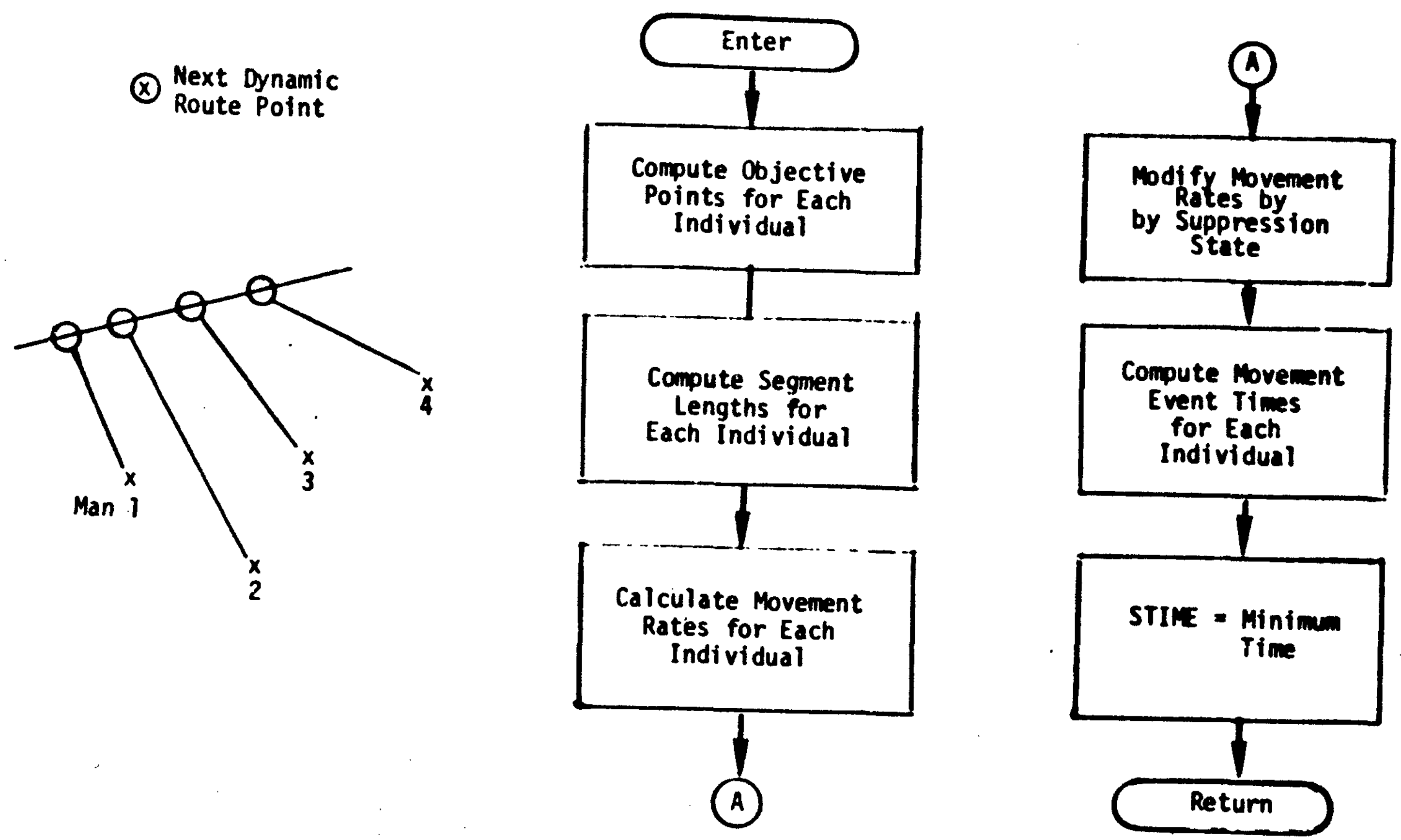


Figure 2.38, Calculation of Movement Event Times

2.5.5 Calculation of Detection Event Times

The previous section described how movement event times are calculated. In this section the calculation of detection event times is described and illustrated in Figure 2.39. First a specific SIAF and target individual are selected. Here detection times are based upon individual detections on individuals, that is, if there are 20 members in a SIAF patrol and 20 members in a target then there are 400 calculations made. After a SIAF individual and target individual are selected the terrain routines are entered and calculations made to determine if line-of-sight exists. If line-of-sight does not exist a no-detection verdict is entered. If line-of-sight does exist and the target is firing then the target is declared detected and time of detection is stored in the array DTIME as shown in the figure. Here the value of DTIME is the current time plus the reaction time which is the time it takes the individual to react to the detection and either change his posture, firing option, movement rate, or change another of his attributes based upon this detection. As shown in the figure, if line-of-sight exists but the target is not firing then a visual detection subroutine is entered to calculate the visual detection time TT. This routine is similar to the routine used in the reconnaissance model described in Volume III. Based upon this calculation the matrix DTIME is again loaded. Finally, the DTIME plus a maximum time are compared with the current time to allow for considering the fact that an individual might have detected another individual 5 seconds ago and the detection may still be valid. As shown in the figure the variable MDET is set equal to TRUE or FALSE which indicates whether the detection did or did not occur. The model proceeds in this fashion until all individuals in the SIAF patrol and all individuals in the target have been examined for detection.

2.5.6 Calculation of Casualty Event Times

Figure 2.40 describes this calculation which starts with computing the assigned area of responsibility of each individual. From this information the next calculation essentially determines a figure of merit and determines firing assignments which will maximize this figure of merit. Thus, this calculation determines the optimum strategy for the

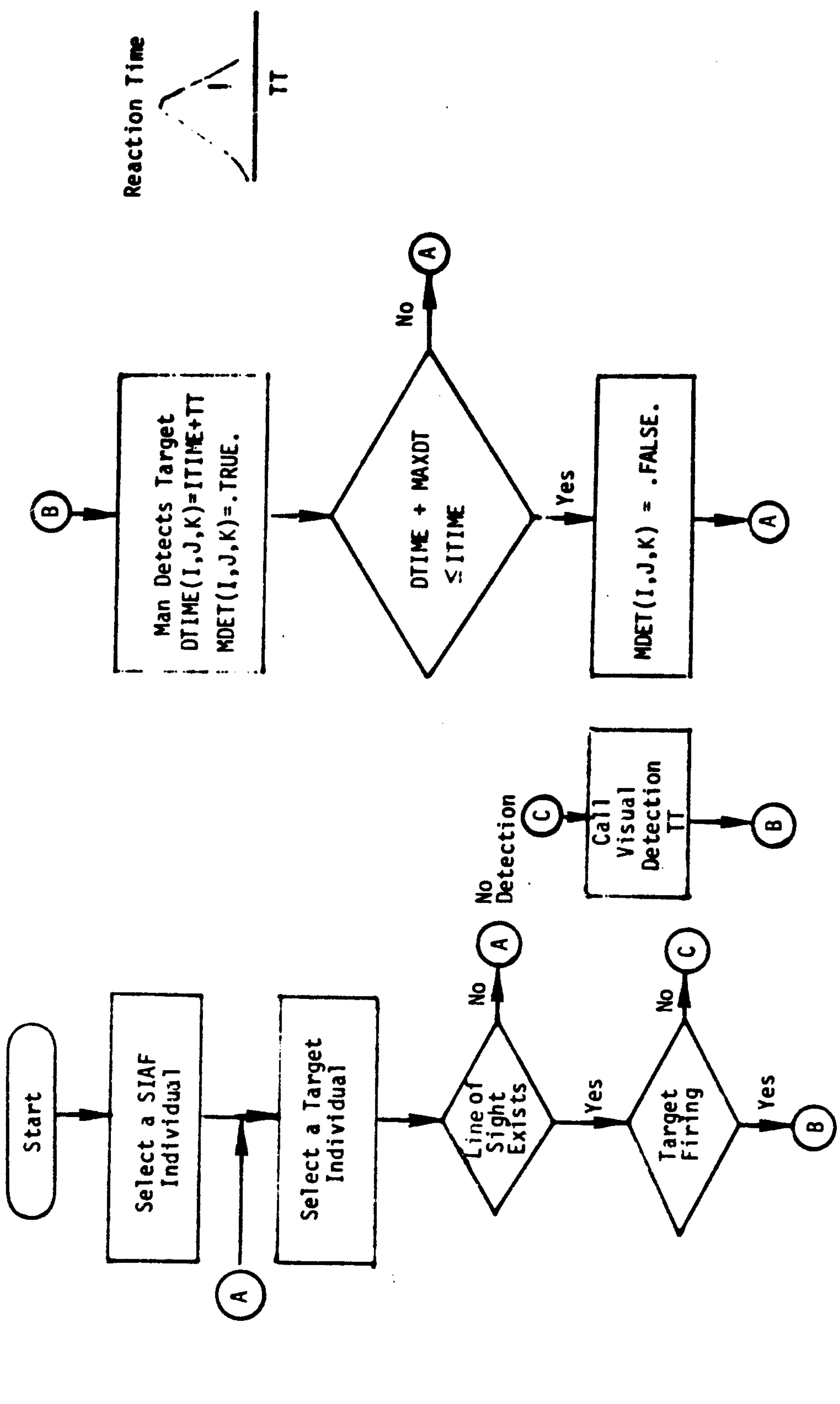


Figure 2.39, Calculation of Detection Events

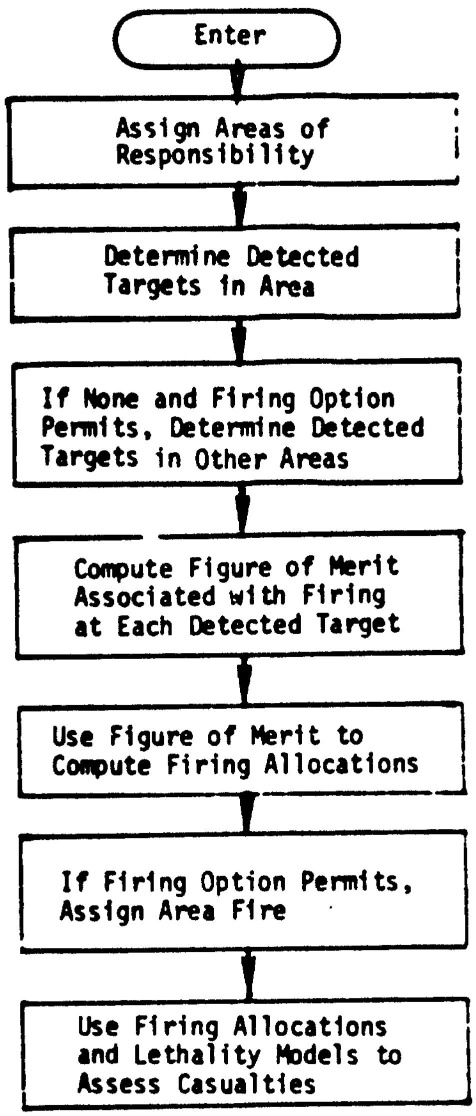


Figure 2.40, Calculation of Firing Events

target and SIAF patrol to use in firing. Based upon this optimum strategy, firing allocation and lethality models are entered to compute casualty times.

2.5.7 Calculation of Internal Communication Event Times

One of the events considered is the reception of a communication from another maneuver unit within the patrol. This would occur after deployment when units are divided into moving maneuver units and a base of fire. In this case it may be necessary to communicate decisions such as break contact, change deployment points, or exchange roles between the moving units and the base of fire. The latter two would be in response to a reaction of the target such as a change in its route or deployment. Several options are available to provide communications. These are by visual hand signals, aural commands, radio, smoke grenades and by sending a messenger. For each type of message, the model has a preference order for attempting communication. These are dependent on the tactical situation. The internal communications routines, called by IC, determine whether or not the communication will be successfully received and interpreted, and they determine the delay time until the message can be implemented. The delay time becomes an event time because the result affects further progress of the combat, including firing, detection and movement status.

2.5.8 Calculation of External Fire Support Event Times

The fifth event considered is an External Fire Support (EFS) event. This is defined as the arrival of a burst, either a volley of artillery or the weapons dropped in a single pass of a close air support aircraft. EFS is a scheduled event but its execution depends on the tactical situation. It is used preparatory to an attack mission. Upon identification of the target, the aimpoint is communicated and a schedule of arrivals is determined. If the target has not counterdetected the SIAF, then the arrivals are scheduled such that they are finished at the same time that the target reaches the minimum safe distance from the target. If this is the case, but the target subsequently counterdetects the SIAF, an immediate open fire command is sent and the schedule of arrivals is adjusted

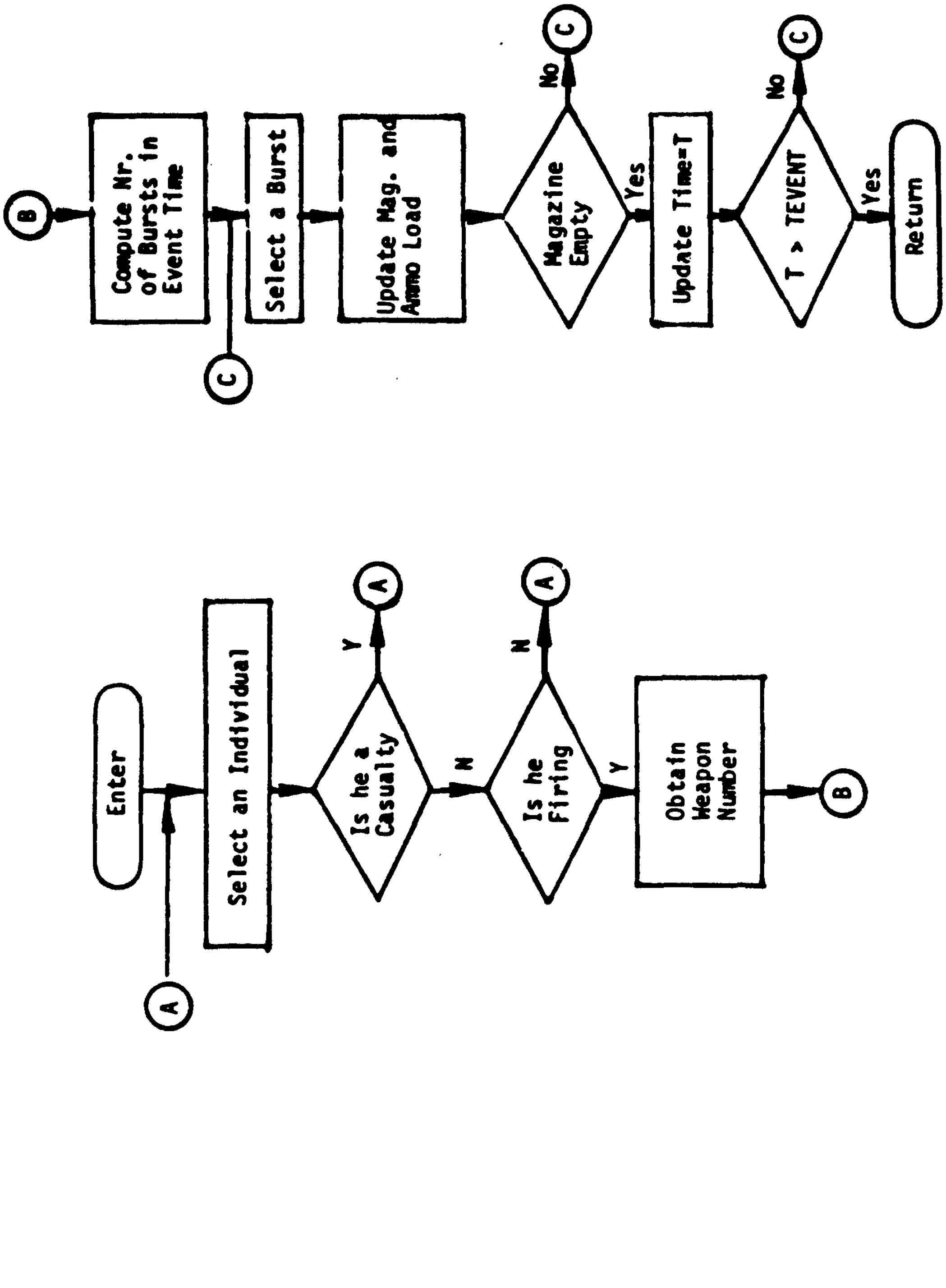


Figure 2.41. Ammunition Update Subroutine (AMMOUP)

to start after a delay due to communications and time of flight. If the target has counterdetected the SIAF at the time of the original request, the delay time also includes time to make aiming calculations and to aim the weapons.

If external fire support is the next event, then Subroutine EFS1 is entered to compute the casualties due to each bomb or shell. This is done by considering aim point errors due to the inability of the SIAF to exactly determine the grid coordinates of the target. This includes both navigation errors and target location estimation errors. Also considered is the ballistic dispersion error. Once the aimpoint is determined (stochastically), the distance of each individual is determined and compared to the lethality data for the weapon. The attribute table is updated to account for any casualties.

Once these times are calculated the next event to occur be it movement, detection, casualty, EFS, or internal communication can be computed. If, for example, it is a movement event then the individuals are moved by updating the ATT matrix. If the next event is a detection event the corresponding logic is entered which will modify the movement rates and firing options based upon these detections. If, on the other hand, the next event was a casualty event then the appropriate element in the ATT matrix are updated to indicate that the individual has become a casualty. After these series of calculations are made the ammunition update, weapon substitution, break contact, and withdrawal routines are entered as appropriate. These routines are described in the next sections.

2.5.9 Ammunition Update

The purpose of this subroutine is to update the ammunition of each individual based upon the current elapsed time and the firing scheme. This routine is described in Figure 2.41 which shows that the first calculation is to select an individual. Next, the question is asked, "is he a casualty?" If so, his ammunition is not updated since he could not have been firing. Hence, another individual is selected and the calculations proceed. If he is not a casualty and if he is firing then his weapon number is obtained from the ATT matrix and the number of bursts in the current event time are computed for this particular weapon and particular

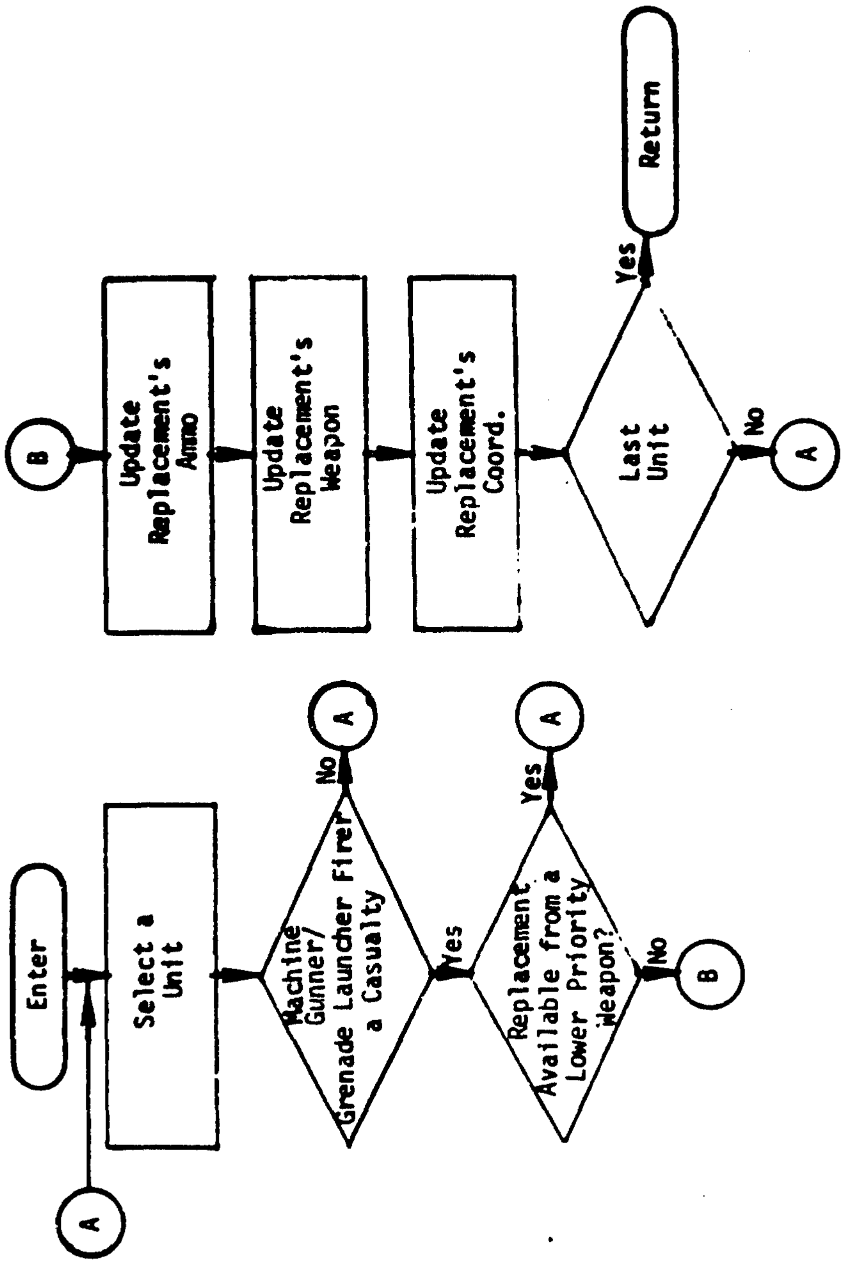


Figure 2.42. Weapon Substitution Subroutine (WSUBS)

Table 2-1, Firing Options

	Firing Options				
	0	1	2	3	4
Fire at detected targets in area of responsibility		X	X	X	X
If none, fire at any detected targets				X	X
If none, conduct area fire into area of responsibility			X		X
Don't fire	X	X		X	

Table 2-2, Firing Options for the Base of Fire and the Maneuver Unit

Base of Fire

SS_{BF} \ SS_{MU}	0	1	2	3	4	5	6
0	1	1	1	1	4	2	2
1	1	1	1	1	4	2	2
2	1	1	1	1	4	2	2
3	1	1	1	1	4	2	2
4	1	1	1	1	4	2	2
5	2	2	2	2	2	2	2
6	2	2	2	2	2	2	2

SS_{BF} = Suppression State for the Base of Fire
SS_{MU} = Suppression State for the Maneuver Unit

Maneuver Unit

SS_{MU}	0	1	2	3	4	5	6
Firing Option	0	0	0	0	2	2	2

firing rate of the individual. It could turn out that during the event time the magazine of the weapon became empty. Hence, the next series of calculations determines whether this occurred. If the magazine does become empty reloading time is entered into the calculation and modifies the number of rounds that the individual expended during the last event. If the magazine did not become empty, then number of rounds are computed based upon the event time and firing rate of the weapon. These calculations are done for each individual and the subroutine returns when all individuals have been examined.

2.5.10 Weapon Substitution

If an individual becomes a casualty (major wound or death) in a particular event, it could turn out that the patrol operations plan is to have another individual take over his weapon. This normally occurs in a case of team weapons like grenade launchers, and machine guns. If the machine gunner is hit a patrol member who fires a rifle or grenade launcher will take over his weapon. An attempt to replace him with a rifleman is made first. If the man who is hit fires a grenade launcher an attempt is made to replace him with a rifleman only. Subroutine WSUBS provides the logic implementing this strategy. Figure 2.42 illustrates the calculations made. First, a unit is selected and here the assumption is that intra-unit weapon substitution is not allowed. That is, weapon substitution is only allowed within a particular unit. After a unit is selected the question is asked if the gunner who is a casualty fires a machine gun or a grenade launcher. If not, another unit is selected and this unit selection process continues until the number of units in a patrol and target are exhausted. If the patrol member under consideration is a casualty and is either a machine gunner or fires a grenade launcher and an appropriate replacement can be found then the ammunition of the replacement is updated, his weapon is switched and his next movement coordinates are changed. These calculations continue until all units have been examined for weapon substitution. (Note: If the user does not desire to play weapon substitution, this subroutine can be bypassed by appropriately adjusting the input variables. This is described further in Volume VI, Subroutine WSUBS.)

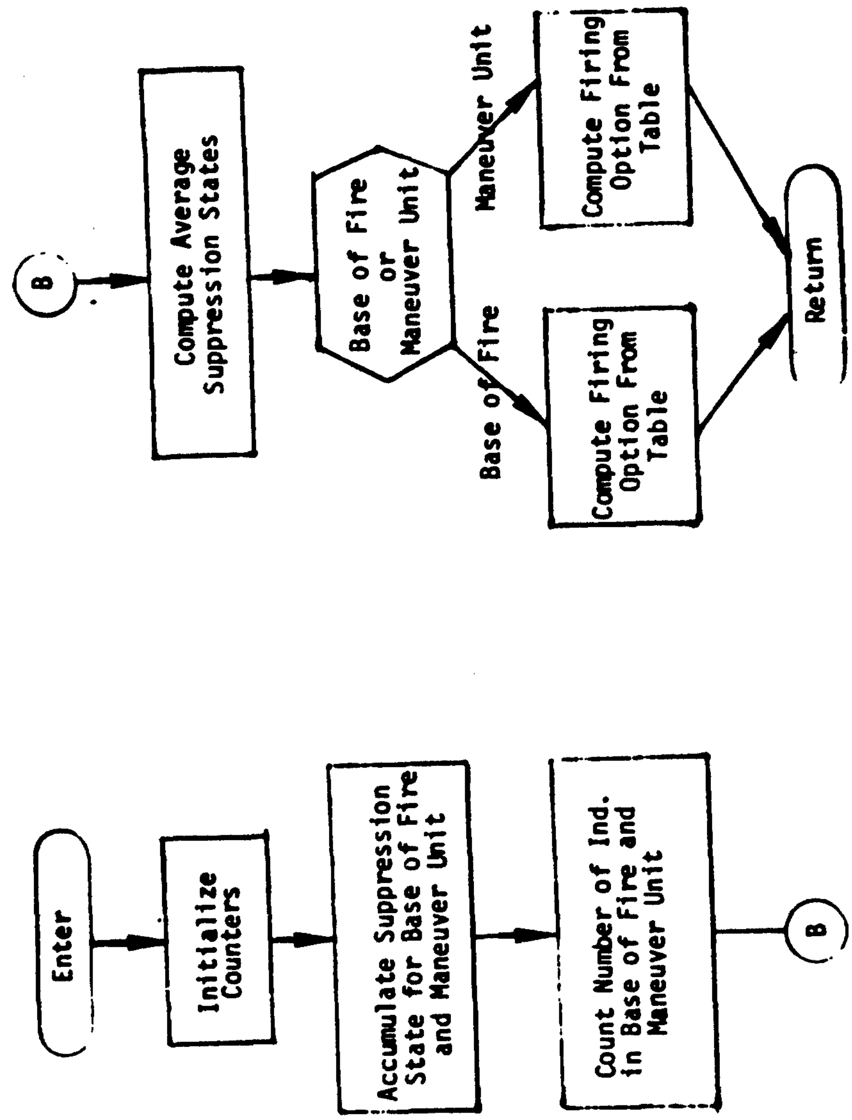


Figure 2.43. Firing Option Subroutine (FIREOP)

Table 2-3, Logic for Breaking Contact

Break Variable	Definition	Criteria
Firepower	$FP = \frac{\text{Firepower of Target}}{\text{Firepower of SIAF}}$	Break if $FP > FP_{Max}$
Casualty Fraction	$CF = \frac{\text{SIAF Casualties}}{\text{SIAF Force Size}}$	Break if $CF > CF_{Ma}$
Time	T = Elapsed time of the firefight	Break if $T > T_{lim}$
Loss of Key Personnel	L_i = 1 if the PL is hit L_i = 2 if the PL and APL are hit	Break if $L_i = j$ (j = 1 or 2)
SIAF - Target Range	R = Minimum Distance Between SIAF and Target	Break if $R < R_{lim}$
Ammunition	A = Average Number of Rounds Remaining (per troop)	Break if $A < A_{lim}$

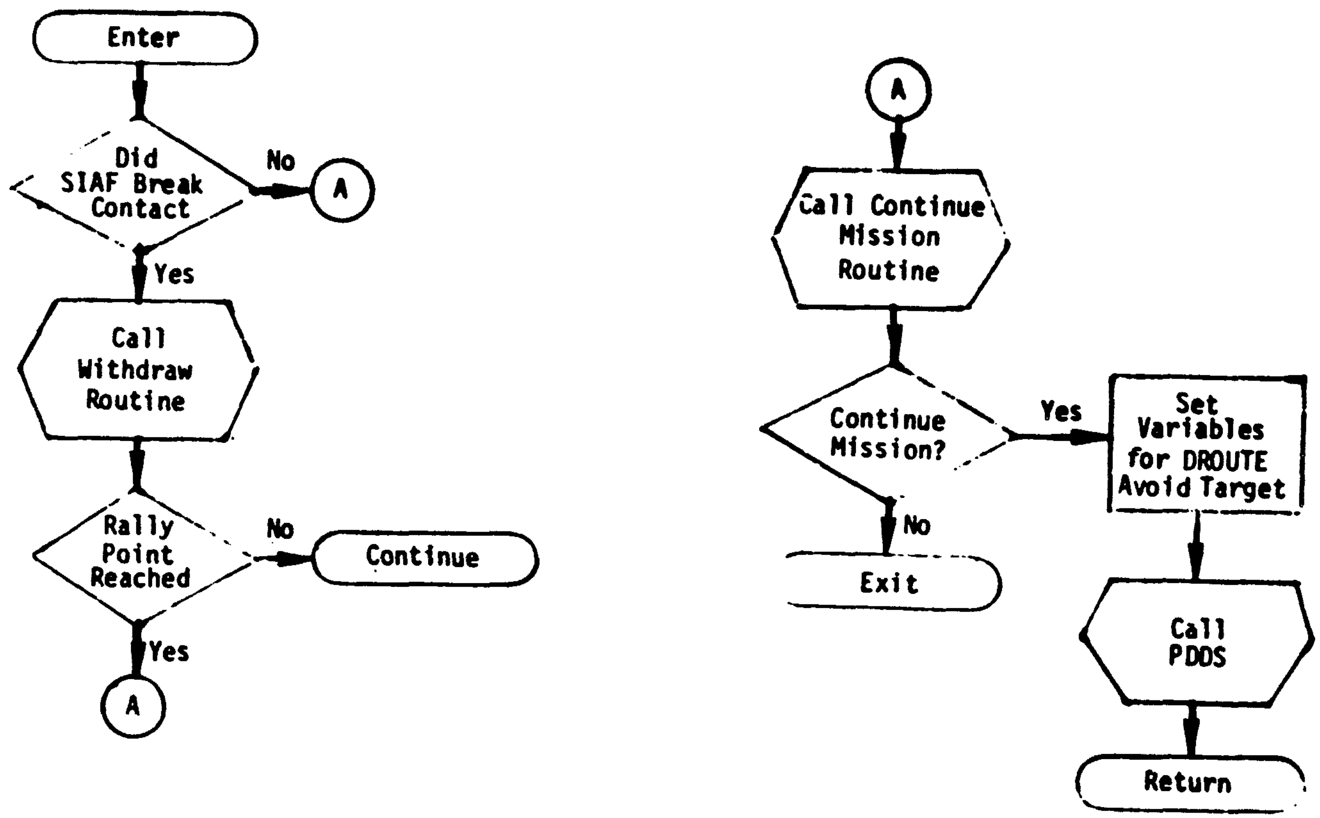
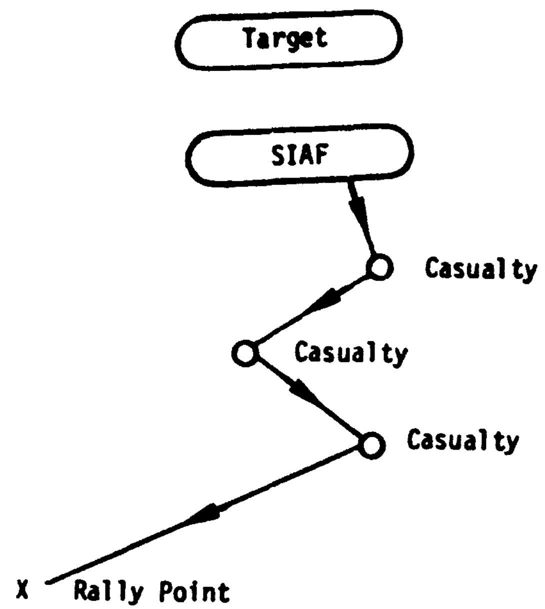


Figure 2.44, Logic For Continuing Reconnaissance After Combat

2.5.11 Firing Options

This particular section describes and presents an overview of how firing options are changed dynamically throughout the conduct of the simulation. Table 2-1 shows the firing options considered in the model. For example, Firing Option 0 is simply "don't fire". Firing Option 1 says, "fire if targets are in your area of responsibility. If none, then don't fire". Option 2 says "fire if detected targets are in area of responsibility. If none, then conduct area fire in area of responsibility." Options 3 and 4 are similar and can be examined by studying Table 2-1. Table 2-2 shows the firing options of both the base of fire and maneuver unit and here the numbers correspond to the options previously described in Table 2-1. For the base of fire, the firing option is a function of their own suppression state and the suppression state of the maneuver unit since their mission is to support the advance of the maneuver unit. The firing options of the maneuver unit on the other hand is a function of their own suppression state only. As an example, Table 2-2 shows that if the maneuver unit in suppression state 0 through 3 their firing option is 0, that is "don't fire". If they are in suppression state 4, 5, or 6, however, their firing option is firing option 2 which states fire at detected targets in area of responsibility. Hence, the firing options can be changed for the base of fire and the maneuver unit by user input data depending upon which particular strategy the user wishes to simulate.

Figure 2.43 shows how this logic is implemented in subroutine FIREOP. When the subroutine is entered counters are initialized and the suppression state for all individuals in the base of fire and maneuver unit is accumulated. Next the number of individuals in the base of fire and maneuver units are counted and the average suppression state of each of these units is computed. Table 2-2 is entered and the appropriate firing option computed by means f table look-up. In this fashion the firing options of both the base of fire and maneuver unit are dynamically adjusted throughout the execution of the combat mission.



- Assume SIAF Breaks Contact
- The Dynamic Route Routine Generates the Exact Path Through the Points Shown

Figure 2.45, Illustration of Withdrawal Model

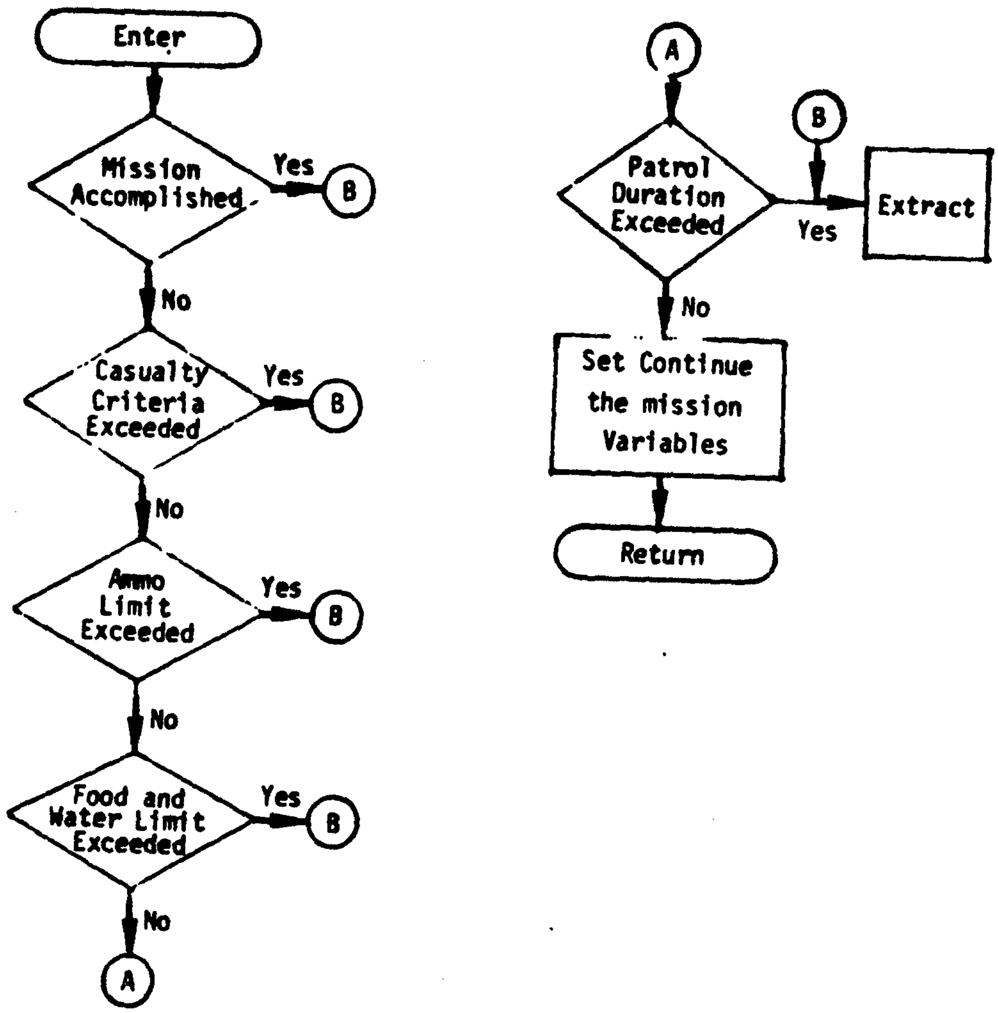


Figure 2.46, Continue The Mission Subroutine

This firer also has the option of firing his normally assigned weapon or throwing a handgrenade. Dependent upon the figure of merit calculated for both his normally assigned weapon and a handgrenade, for the situation that the firer under consideration is in, a decision is made as to which weapon to utilize. The handgrenade is basically used at short ranges under high suppression.

2.5.12 Mines

A SIAF patrol has the capability of Claymore mine ambush. Figure 2.46A depicts a typical mine field deployment. The user specifies a Claymore mine ambush intent by inputting the required inputs, and upon the enemy patrol reaching the most lethal point in the field (middlemost) the mines are detonated. The cumulative probability of kill of all mines in the field upon each target element is computed and the cumulative probability is Monte Carloed for each target individually to determine if the target suffered a minor wound (hit), major wound, or death. Figure 2-46-B shows how this logic is implemented in Subroutine MINES.

2.5.13 Break Contract

In each loop of the simulation, logic for breaking contact is entered if a break contact event is to occur and if so, a determination is made as to which side breaks contact. The break variables described in Table 2-3 are fire power, casualty fraction, time, loss of key personnel, SIAF-target range and ammunition. The criteria for breaking contact are adjusted by means of user input for both the SIAF patrol and for the target. For example, if the user wishes to implement a strategy whereby the SIAF patrol breaks contact after their ammunition reaches 30% of the initial load they implement this strategy by appropriately adjusting the ammunition limit variable shown in the table. The other criteria shown in the table are used in a similar manner. The break contact logic implements a break contact decision if any of the criteria are satisfied.

2.5.14 Withdraw

Figures 2.44 through 2.46 describe how we model a situation where SIAF returns to its reconnaissance mission after the combat operation has been completed. As seen from Figure 2.44, this routine is entered once the proper break contact variable has been set. The first question asked

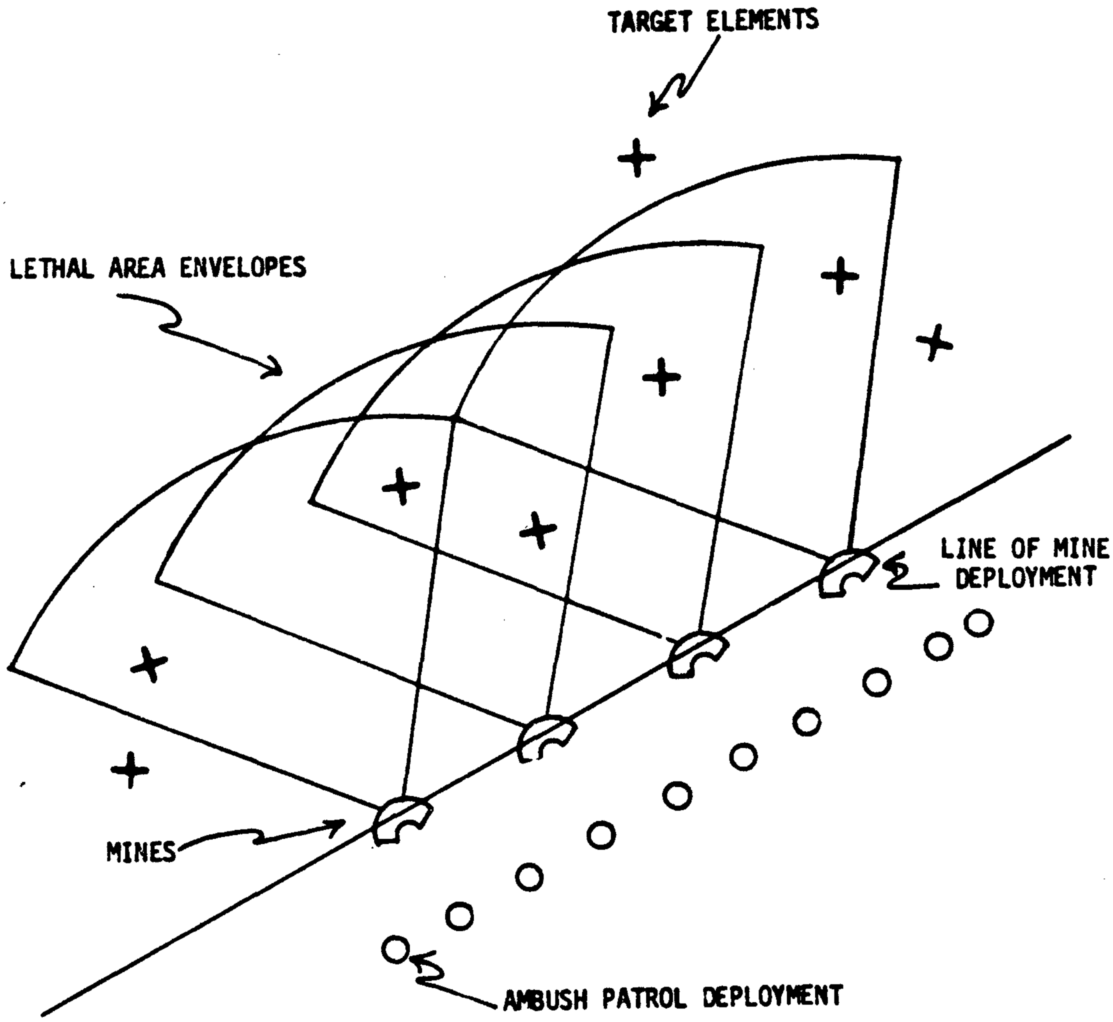


Figure 2.46A Typical Minefield Deployment

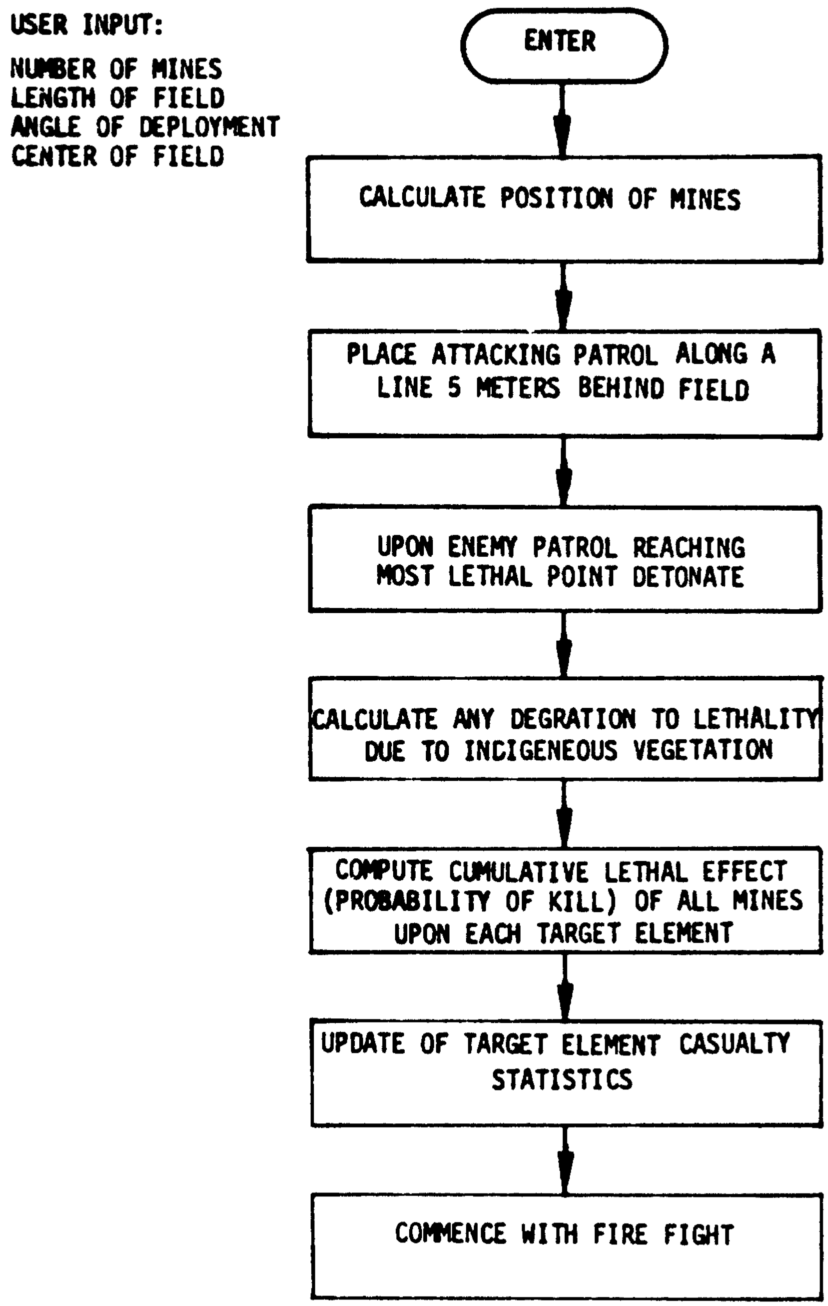


Figure 2.46B, Logic Diagram (MINES)

is, "did SIAF break contact?". If not, then no withdrawal is required for the SIAF unit and the continue-the-mission subroutine described in Figure 2-46 is entered. If SIAF did decide to break contact, then a withdrawal routine is entered. This withdrawal routine calculates the major withdrawal objective points for the patrol. Next, the withdrawal is simulated until the rally point is reached. Once the rally point is reached, the continue-the-mission decision subroutine is entered and if the decision is to continue the mission, then dynamic route variables are set up to avoid the target and get the patrol back to the planned route.

Figure 2.45 illustrates the withdrawal model which forces the patrol to pass through points where a casualty has occurred to the rally point. As indicated in Figure 2.45 the dynamic route subroutine is called to generate the exact route through the casualty locations to the rally point.

2.5.15 Continue the Mission

Once the rally point is reached, the continue-the-mission subroutine shown in Figure 2.46 simulates the patrol leader's decision to extract or go back to the planned route. This decision is based upon the variables shown which are mission objective, casualty criteria, ammunition limits, food and water limits, and patrol duration limits. By adjusting these limits which are user input values, the user can select the criteria he wishes to use in simulating the decision to continue the mission or extract. If a continue-the-mission decision is reached, dynamic route variables are set and subroutine PDDS (see Volume III) is called to generate the route back to the planned path. If the decision is to extract then the model terminates and variables are initiated for the next replication.

2.5.16 Summary of Attacker and Defender Options

Prior to a detection occurring, the SIAF Reconnaissance Model simultates the SIAF mission as discussed in Section 2.4. Once a detection and identification is made (either by SIAF or by the target), the party making the detection and identification becomes the attacker and the other party becomes the defender.

As discussed in Section 2.5.1, the attacker will select one of five options, viz, 1) EES only, 2) ambush, 3) move with stealth to attack, 4) deploy for ambush with mines, 5) no combat. Meanwhile, the defender, having not yet detected, continues to move along his preplanned route. If the attacker selects options 2 or 3, a deployment point is computed and the dynamic route routine generates the attacker's route between hi- present position and the deployment point. If the defender detec.. the attacker before the attacker initiates the firefight, then the defender initiates the firefight or selects an alternative course of action to protect its position.

Once the firefight commences, the defender remains stationary unless he decides to break contact. If the target decides to break contact, the engagement is considered complete and SIAF decides whether to continue its mission. However, if SIAF decides to break contact, the withdrawal is simulated until the rally point is reached, at which point SIAF decides whether to continue its mission, in which case the SIAF Reconnaissance Model is again employed to simulate the remainder of the mission.

2.5.17 Summary of Model Capacities

This section summarizes the current capacities of the model. A summary of computer requirements is given in Sections 7.1 and 7.2 of this volume.

- Maximum number of men on each side = 20
- Maximum number of different weapons = 20
- Maximum number of different grenade launches = 10
- Maximum grid of terrain elevation points = 1366
- Maximum number of targets = 20
- Maximum number of preplanned route points for each target = 20
- Maximum number of preplanned SIAF route points = 100
- Maximum number of helicopter landing points = 5
- Maximum number of weather changes = 100
- Maximum length of simulated patrol = 10 days

3.0 MODEL INPUT

The model input data consists of users inputs, data base, and elevation data. The elevation data is taken directly from digital TOPOCOM tapes from the Defense Mapping Agency. When a particular area of operations is desired, a set of subroutines is used to generate a file of elevation data which can be permanently stored. This file can then be accessed at the start of each run as long as the area of operations remains the same. This file contains elevation data at the maximum resolution (or minimum separation). The model then reads from this file to obtain data for the required resolution. The maximum elevation points at any one time is 8196.

The remaining data inputs are read via NAMELIST card input. In general, the namelist card input has been organized into categories of data base (NAML1), user input (NAML2), target oriented user inputs, (NAML3), and combat oriented user inputs (NAML4). Table 3.1 contains a complete list and definition of all of the required input variables. This table is organized by first presenting user inputs, (those variables specific to a situation) and then presenting the data base. (Variables whose values are unlikely to change from run to run). Within these categories the data is organized by categories according to the use of the variables. For example, all of the required inputs to describe the targets are found together.

The variables in the data base are further described by default values which are current best estimates. These need only be changed if better data become available.

Table 3.2 contains a cross reference to Table 3.1. Here all variables from the namelists are presented in alphabetical order with the sheet number of the corresponding location in Table 3.1. It is felt that this method of presentation allows the user to better understand the meaning of a variable because he is able to see its definition in the context of other variables with which it is associated.

USER INPUT

SET UP

JSTART	Starting point within run if RESTRT feature is used (See Volume III, Section 10.4)	
JSTOP	Termination point within run if STOP feature is to be used for later RESTRT.	
NCOPY	Number of copies of summary output desired	
MAXCAS	Number of cases	
MAXREP	Number of replications	
ICOMBF	Bypass combat flag = 0 reconnaissance only = 1 combat model included	
IX1, IX2	Initial Random numbers (see Subroutine MAIN).	

TERRAIN

THEATA	Angle between the X axis SIAF computer coordinate system and military grids	degrees
VH	X coordinate of origin of SIAF computer coordinate system in the military grid system	4-digit military grid
VK	Y coordinate of origin of SIAF computer coordinate system in the military grid system	4-digit military grid

Table 3-1, Namelist Inputs (Sheet 1)

TERRAIN (Continued)

COMRES	Combat resolution for elevation array (Distance between grid lines)	meters (12.7)
RECRES	Reconnaissance resolution for elevation array (Distance between grid lines)	meters (50.8)
RESMAX	Maximum resolution available for elevation array	meters (12.7)
IXMAT	Number of scan lines in input Z matrix (output from MAPGEN) (See Vol. III, Section 10.5)	-
IYMAT	Number of elevation points per scan line	
IDOMST	Dominant soil type	
DOMMT	Dominant class of micro-relief	
DOMV	Dominant class of vegetation	
NOB	Total number of linear obstacles	
NRVP	Total number of vegetation polygons	
NRMT	Total number of micro-relief polygons	
NRST	Total number of soil polygons	
LNR1	The integer number designating the first linear obstacle	
VEG1	The integer number designating the first vegetation polygon	
SOIL1	The integer number designating the first micro-relief polygon	

Table 3-1, Namelist Inputs (Sheet 2)

TERRAIN (Continued)

MICR1	The integer number designating the first soil polygon
IOB(L)	Linear obstacle type; for L=1,2,3,...NOB where IOB(L) = 1 if linear obstacle L is a river 2 if linear obstacle L is a stream 3 if linear obstacle L is a ravine 4 if linear obstacle L is a dike 5 if linear obstacle L is a canal 6 if linear obstacle L is a cliff 7 if linear obstacle L is a road 8 if linear obstacle L is a trail 9 if linear obstacle L is a lake or reservoir
ITRC(L)	Geometry of L^{th} polygon, where 1 if L^{th} polygon is a triangle 2 if L^{th} polygon is a rectangle 3 if L^{th} polygon is a circle for L=1,2,3,..., NRVP+NRMP+NRSOIL
(XOB(I,L), YOB(I,L))	Coordinates of start point of segment I of obstacle L, for L=1,2,...,NOB, and I-1,2,... (NCO(L)+1) or coordinates describing the geometry of the L^{th} polygon
NCO(L)	Number of line segments comprising linear obstacle L, for L=1,2,3,...NOB
ICL(L)	Class of the L^{th} polygon, for L=1,2,...NRVP+NRMP+NRSOIL

Table 3-1, Namelist Inputs (Sheet 3)

	NAVIGATION DEVICES
PPLS	Portable Position Location System. If such a device is carried by SIAF, PPLS=1, if not carried by SIAF, set PPLS=0.
TBUR	Set TBUR=0 if it is impracticable to use PPLS or if sufficient time is not available. TBUR=1 if sufficient time is available only for a "quick" navigation fix. (2 min. after aircraft arrival, CEP=150.) TBUR=2 if sufficient time (15 min.) is available for an accurate navigational fix (CEP= 60 meters).
SCALE	Map Scale
SPEC	Special Case. Allows override of HumRRO SIAF navigation specs. Input revised limit on standard deviation of distance between actual SIAF location and believed SIAF location. (HumRRO nav. specs. are used if SPEC is input as zero.)

Table 3-1, Namelist Inputs (Sheet 4)

SIAF INPUTS

	DESCRIPTION	
SC(1)	Average height of a SIAF element	- meters
SC(2)	Average width of a SIAF element	- meters
SC(4)	Number of men in the SIAF patrol	
SC(5)	Average visual reflectivity of a SIAF element	
SC(6)	Hearing threshold for a SIAF member	- dB
IFS	0 if a vegetation class dependent formation is to be used for SIAF 1 if specific formation number 1 is to be used for SIAF 2 if specific formation number 2 is to be used for SIAF 5 if specific formation number 5 is to be used for SIAF (See FORMATIONS)	For Reconnaissance (See DETECT)

OPERATIONS PLAN

XBASE	X coordinate of base.	- 4-digit military grid
YBASE	Y coordinate of base	- 4-digit military grid
ITZERO	Time mission starts from base.	- days, hrs, min, sec.

Table 3-1, Namelist Inputs (Sheet 5)

SIAF INPUTS (Continued)

ITMAX	Limiting value on patrol time duration (used as temporary checkout input)	- days, hrs, min, sec.
	INSERTION	
MODE	Insertion vehicle description (1 = helo, 2 = truck, 3 = boat, 4 = fixed wing).	
TDEBK(MODE)	Average time to debark, for M = insertion travel mode.	- days, hrs, min, sec.
VELM(MODE)	Average velocity of the insertion travel mode over the terrain from base to insertion point.	- meters/sec
TPREP	Time necessary to complete prep firing (i.e., time enemy has to move toward primary landing zone).	- seconds
NLZ	Number of landing zones	
XLZ(I)	X coordinate of the I^{th} landing zone.	- 4-digit military grid
YLZ(I)	Y coordinate of the I^{th} landing zone	- 4-digit military grid
RLZ(IZ)	Radius of landing zone IZ	- meters
NDECOY	Number of alternate landing zones (sequentially numbered) that are used for deceptive landings in addition to the actual landing zone attempt at the primary site. This dilutes the enemy in the area of actual landing. This number must be less than or equal to (NLZ-1).	

Table 3-1, Namelist Inputs (Sheet 6)

SIAF INPUTS (Continued)

ISEN	0 if LZ sensors are not used before landing attempt 1 if LZ sensors are used before landing attempt	
ISENLZ	Number of LZ's seeded with sensors (seeding proceeds sequentially starting with the primary LZ)	
HLZ	Time before landing that sensors are monitored.	- seconds
NSENS	Number of sensors in each LZ (each individual LZ has the same number of sensors)	
ENRNG	Range within which the enemy may engage the SIAF upon attempting insertion	- meters
	ROUTE	
NPLAN(IZ)	Number of coordinate points for the planned route for insertion IZ	
XPLAN(IP,IZ)	X axis of the IP^{th} checkpoint of the planned route when the insertion is made at point IZ.	- 4-digit military grid
YPLAN(IP,IZ)	Y axis of the IP^{th} checkpoint of the planned route when the insertion is made at point IZ.	- 4-digit military grid
ITARIV(IP,IZ)	Planned arrival time at checkpoint IP when insertion is made at point IZ (equals zero if this time is not pertinent).	- days, hrs, min, sec.
ITSTAY(IP,IZ)	Mission elapsed time to remain at non-movement point of IP^{th} checkpoint for insertion point IZ.	- days, hrs, min, sec.

Table 3-1, Namelist Inputs (Sheet 7)

SIAF INPUTS (Continued)

ISTAY(IP,IZ)	0 if route checkpoint IP for insertion point IZ is not a non-movement point 1 if route checkpoint IP for insertion point IZ is a non-movement point	
ITMOV(IP,IZ)	Planned departure time from checkpoint IP for insertion point IZ.	- days, hrs, min, sec.
	TARGET INPUTS	
NTAR	Total number of targets	
NFIX	Number of targets located specifically by user. (Others located randomly)	
ITST(IT)	Time when target IT is created in the model.	- days, hrs, min, sec.
ITSTOP(IT)	Time when target IT is eliminated from the model.	- days, hrs, min, sec.
IDET(IT)	1 if target IT is to be considered on an element-to-element basis 0 otherwise	
	MOVEMENT	
IMV(IT)	1 target IT is fixed 2 target IT moves at random 3 target IT moves according to a time and checkpoint plan	

Table 3-1, Namelist Inputs (Sheet 8)

TARGET INPUTS (Continued)

Movement (Cont'd.)

For IMV = 2 or 3 supply =

FRCMVD(IT)	Fraction of the time target IT is moving during the day
FRCMVN(IT)	Fraction of the time target IT is moving during the night
RANMAX(IT)	Maximum range target IT can travel. (Random only) - meters
TVEL(IT)	Velocity of the IT^{th} target. (0 if not a manned target) - meters/sec.

IF IMV = 3 also add

NMP(IT)	Number of movement periods for target IT.	
ITIMS(IL,IT)	The time that target IT initiates movement period IL.	- days, hrs, min, sec.
GOALTX(IL,IT)	The X coordinate of the goal point for movement period IL of target IT.	4-digit military coordinates
GOALTY(IL,IT)	The Y coordinate of the goal point for movement period IL of target IT.	4-digit military coordinates
TC(1,IT)	The X starting coordinate for the IT^{th} target (0 if random).	4-digit military coordinates
TC(2,IT)	The Y starting coordinate for the IT^{th} target (0 if random).	4-digit military coordinates

Table 3-1, Namelist Inputs (Sheet 9)

TARGET INPUTS (Continued)

CHARACTERISTICS

TC(3,IT)	The average height of an element of target IT.	- meters
TC(4,IT)	The average width of an element of target IT.	- meters
TC(5,IT)	The number of fire teams making up target IT.	
TC(6,IT)	The number of elements making up target IT.	
TC(7,IT)	The average visual reflectivity of an element of target IT.	
TC(8, IT)	The average 1.06 micron reflectivity of an element of target IT (for laser designation).	
TC(9,IT	The hearing threshold for a member of target IT.	- dB

FORMATION

IFT(IT)	0 if a vegetation class dependent formation is to be used 1 if a specific formation for target IT is to be used (e.g., a fixed set of buildings)	For Reconnaissance (See DETECT)
FORMT(I,J,IT)	The locations within a target for a special formation of each of the J elements for target IT	For Reconnaissance (See DETECT)

Table 3-1, Namelist Inputs (Sheet 10)

TARGET INPUTS (Continued)

Formation (Cont'd)

Where:	I = 1 is the X location of element J relative to the J = 1 element I = 2 is the Y location of element J relative to the J = 1 element (only used if IFT(IT) = 1)	For Reconnaissance (See UETECT)

SOUND TRACK

NSTP(IT)	Number of special sound track periods of target IT	
ISSOFF(IK,IT)	The time when the IKth sound period stops operating for target IT	- days, hrs, min, sec.
ISSON(IK,IT)	The time when the IFth sound period starts to operate for target IT	- days, hrs, min, sec.
SOUNDT(IK,IT)	Sound level for IKth sound period for target IT.	- dB

Table 3-1, Namelist Inputs (Sheet 11)

TARGET INPUTS (Continued)

DETECTION

RCMAX(IT)	The range between a target IT and SIAF which describes the distance beyond which detailed detection computations are not desired.	- meters
RCMIN(IT)	The range between a target IT and SIAF that always requires detailed detection computations without first checking feasibility. (See TARGEL)	- meters

POST DETECTION

KREC(IT)	0 if target IT is to be eliminated upon detection 1 if SIAF should proceed toward target IT in order to identify the target given that it cannot be identified at detection 2 if SIAF should call external fire support against target IT after advancing for identification 3 if SIAF should avoid target IT upon first detection of target IT. (See PDDS)	

Table 3-1. Namelist Inputs (Sheet 12)

TARGET INPUTS (Continued)

EXTERNAL FIRE SUPPORT (This Section For EFS Only Attack)

IFSUP(IT)	0 no external fire support available 1 artillery support available - Also used for combat 2 air support available
	Artillery
IFADJ(IT)	0 if fire without adjustment 1 if fire with adjustment
ITACT(IT)	1 if target digs in in-place 2 if target expands circularly (if IFADJ(IT) = 1) 3 if target moves to cover
	Close Air Support
IAMG(IT)	1 if air/ground machine guns are used 0 if air/ground machine guns are not used
ICBOM(IT)	1 if cluster bombs are used 0 if CBU's are not used
IGBOM(IT)	1 if general purpose bombs are used 0 if general purpose bombs are not used
IFAR(IT)	1 if folding fin A/C rockets are used 0 if FFAR's are not used

Table 3-1, Namelist Inputs (Sheet 13)

TARGET INPUTS (Continued)

	If Using Cluster Bombs	
FMCB1(IT)	Lethal area of CBU bomblet versus first pass personnel posture	- square
FMCB2(IT)	Lethal area of CBU bomblet versus second and subsequent pass personnel posture	- square
NCB(IT)	Number of ordnance delivering passes, CBU	
	If Using General Purpose Bombs	
FMGPB(IT)	Mean area effectiveness (GP) - personnel posture	
	If Using Rockets	
FMA1(IT)	Lethal area of rockets versus second and subsequent passes personnel posture	- square meters
FMA2(IT)	Lethal area of rockets versus second and subsequent passes personnel posture	- square meters
	If Using Machine Guns	
NGF(IT)	Number of rounds of machine gun fire	
VAX(IT)	Personnel vulnerable area to MG projectiles.	- square meters

Table 3-1, Namelist Inputs (Sheet 14)

WEATHER INFORMATION

TSR	Time of sunrise	days, hrs, min, sec
TSS	Time of sunset	days, hrs, min, sec
NWCL(I,1)	Time at which weather class changes	days, hrs, min, sec
NWCL(I,2)	New weather class commencing at time NWCL(I,1)	-
WDAY(I,J)	Daily weather information	
	I: Day of the patrol.	
	J: 1 = time of moonrise	hrs, min
	2 = time of moonset	hrs, min
	3 = type of moon	
	Type 0 = New Moon	
	Type 1 = 1/4 Moon	
	Type 2 = 1/2 Moon	
	Type 3 = Full moon	
	4 = Maximum temperature	°F
	5 = Minimum temperature	°F
	6 = Maximum relative humidity	%
	7 = Minimum relative humidity	%
	8 = Minimum wind velocity	kts
	9 = Average wind velocity	kts
	10 = Maximum wind velocity	kts
	11 - Direction wind is coming from	Compass bearing o - 360°

Table 3-1, Namelist Inputs (Sheet 15)

COMBAT INPUTS

HUMAN

XMU	Mean human reaction time to detection	Seconds
SSIG	Standard deviation of human reaction time to detections	Seconds
UNKCON	Factor to compute area of uncertainty of target position as a function of the elapsed time since the target was last seen.	
VELNOM (I,K)	Nominal velocity, moving normally I = 1, or moving at top speed I = 2, where K = 1 for attackers, K - 2 for defenders.	Meters/Seconds
FHCR	Fraction of height below which subject is said to be not standing	
FHPR	Fraction of height below which subject is said to be prone.	
XMAXDT	Elapsed time from last detection after which target position becomes unknown.	Seconds
MAXDT	Maximum time after which previous detections lose their value	Seconds

FIRING

DELTA	Increment by which firing allocations are varied in the point fire allocation model (See FALØC)	
AIMMX (K)	Contains maximum aiming time; K = 1 attacker, K - 2 defender	Seconds
FTAPB (K)	Contains fraction of time between bursts spent aiming; K - 1 attacker, K - 2 defender	Seconds
DTEFS	Maximum probable delay of EFS after EFS is called	Seconds
HFR	Height above terrain cutoff for firing	Meters

Table 3-1, Namelist Inputs (Sheet 16)

Firing (Cont'd)		
DF(I,J)	Firing rate degradation factor when the fraction of ammunition remaining is of index I; J - 1 for point-fire weapons, J - 2 for area-fire weapons	
	FORMATIONS (For Combat Only; See FORMST)	
IPERM(J,M)	Contains the positions of a fire team. J indicates the fire team number and M indicates the particular permutation of fire team positions within their maneuver unit. (M = 1, 2, 3, 4, or 5).	
IFORFT (J)	The formation type to be used by the individual within a fire team. Examples: = 1 column, = 2 wedge, = 3 vee, = 5 echelon right, - 6 echelong left; where J, - 1 for stealth, J = 2 for fire and movement, J = 3 for assult, J = 4 for pursuit, J = 5 for withdrawal, J = 6 for stopped.	Meters
IFORMT(J)	The formation type for fire teams within maneuver units (same as for IFORFT).	
FORFTX (K,J)	The relative X location of the Kth position within fire team formation J	
FORFTY (K,J)	The relative Y location of the Kth position within fire team formation J	
FORMUX(I,J)	The relative X location of the Ith fire team in maneuver unit formation J	
FORMUY(I,J)	The relative Y location of the Ith fire team in maneuver unit formation J	
FORSFX(J)	The relative spacing in the X direction of the patrol element from the fire team leader of fire team formation type J	

Table 3-1, Namelist Inputs (Sheet 17)

Formations (Cont'd)		
FORSFY(J)	The relative spacing in the Y direction of the patrol element from the fire team leader of fire team formation type J	
FORSMX(J)	The relative spacing in the X direction of the fire team in position from the leader of the maneuver unit in formation	
FORSMY(J)	The relative spacing in the Y direction of the fire team in position from the leader of the maneuver unit in formation type J	
	FIRING ALLOCATION	
COLMIN(K)	Contains minimum fraction of fire power directed against each detected target; K = 1 defender, K - 2 attacker	
WPWT(I,J)	Contains weapon weighting factor for firing allocation J = 1 - attacker applies to defender's weapons 2 - defender applies to attacker's weapons I = 1 - simi-automatic weapon 2 - automatic weapon 3 - grenade launcher	
ARSMN(K)	Contains minimum length of each man's area of responsibility; K = 1 attacker, K - 2 defender	Meters
ARSPI(K)	Contains fractional overlap of each man's area of responsibility; 1 attacker, 2 defender	
FDGFAC(K)	Contains lateral distance on each side of right-most and left-most targets for defending total area of responsibility; K = 1 defender, K - 2 attacker	

Table 3-1, Namelist Inputs (Sheet 18)

DEPLOYMENT CRITERIA (See DLOGIC)

RAMB	Ambush range between deployment point and engagement point	Meters
RAMIN	Minimum admissible value of RA (see subroutine DLOG5)	Meters
RATT	Attack range between deployment point and engagement point	Meters
REFS	Minimum admissible distance between the subject patrol and object patrol for calling EFS.	Meters
ROBS	Maximum admissible distance between the subject patrol and the engagement point to use detailed terrain information (See DLOG7)	Meters
RSP	Approximate distance desired between trial deployment points	Meters
RZ	Maximum admissible ratio of line-of-sight cut-off distance to range to observed target for adequate cover due to line-of-sight obstruction	
IDIREC	1 - SIAF to be the subject patrol 2 - target to be the subject patrol In case of standoff only.	
IPURSU(J)	= 0 if the maneuver unit is not to pursue the defender in the withdrawal mode past the last attacker objective point (presently not used).	
GSAPRR	Approximate spacing desired between rows and between columns of predeployment movement area array. (See DLOG8)	Meters
NSECT	Number of angular increments (through pi radians) subtended by the circular array of trial deployment points about a stationary object patrol	

Table 3-1, Namelist Inputs (Sheet 19)

Deployment Criteria (Cont'd)

CADM	Minimum admissible value of ADM, where ADM is the average merit value of trial points set in predeployment movement area ($0 \leq CADM \leq 1$). (See DLOGIC)	
FRAMB	Minimum admissible force ratio for ambush	
FRATT	Minimum admissible force ratio for attack	
GMAX	Maximum admissible slope from deployment point to engagement point for engagement	
CC1 CC2 CC3	Percentage thresholds, to be used jointly, with PP1, ... , PP5, for determining adequate cover, concealment, and observation (see subroutine CCO).	
CLASS(J,K)	0 if micro-relief Class J and vegetation Class K are deemed jointly admissible for a deployment point (See DLOG7). 1 if micro-relief Class J and vegetation Class K are deemed joint conditionally admissible 2 if micro-relief Class J and vegetation Class K are deemed joint inadmissible	
DTDAMB	Minimum deployment time required for ambush	Seconds
DTDATT	Minimum deployment time required for attack	Seconds
DTENGM	Maximum admissible time for object patrol to move to engagement point	Seconds
DTPURM	Maximum admissible time for subject patrol to move to deployment point.	Seconds

Table 3-1, Namelist Inputs (Sheet 20)

Deployment Criteria (Cont'd)

PP1 PP2 PP3 PP4 PP5	Probability thresholds, to be used jointly with CC2, CC3, for determining adequate cover, concealment and observation (see subroutine CCO).
Q1 Q2 Q3	Coefficients, non-negative and summing to 1, used to determine the merit value of a point in the movement area (See subroutine CCO).
	FIRING OPTIONS (See FIREOP)
FOTB(I,J,K)	Firing options for the base of fire where I - the average suppression state of the base of fire, J - the average suppression state of the unit they are supporting, and K - 1 for attackers, K - 2 for defenders.
FOTM(J,K)	Firing options for the unit being supported by the base of fire where J is the average suppression state of the unit and K - 1 for attackers, K - 2 for defenders
	SUPPRESSION
DSUST (J,K)	Defines suppression state J as a function of P_{HIT} per minute; K - 1 defender, K - 2 attacker (See SUPN)
SUFAC(I,J)	Contains degradation factors J each suppression state (I); J - 1 firing rate; J - 2 aiming accuracy; J = 3 moving; J = 4 hand grenades
	WITHDRAWAL
NSECTR	Number of angular increments (through a half arc of 60^0) between middle trial point and extreme trial point (use to select a rally point).(See RPT)

Table 3-1, Namelist Inputs (Sheet 21)

Withdrawal (Cont'd)

DWDR	Radius of circular array of trial points for withdrawing to rally point
CARFR	Maximum allowable value of the ratio: $\frac{\text{number of casualties carried}}{\text{number of members carrying}}$
C1	Maximum admissible ratio of current food per man to initial food for extraction
C2	Maximum admissible ratio of current water per man to initial water per man for extraction
LDAYS	Minimum admissible number of days elapsed for extraction
	DEFENDER REACTION (See Subroutine REACT)
KDEFOP	Defender option index (after detecting attacker) 1 Withdraw at top speed 2 Deploy in place 3 Start firing in place 4 Ignore detection 5 Rotate formation and stop 6 Deploy with stealth to new point

Table 3-1, Namelist Inputs (Sheet 22)

ATTRIBUTES

XATT(I.J,K)

Personnel attributes I for each man J, K = 1 for attackers
K = IT + 1 for defenders, where IT is the target number 1-4

I: is the attribute of the Patrol Member

1 Team number
2 Weapon number (See WTS in Weapon Supply DATA BASE)
3 Current ammunition supply (rounds)
4 Casualty status: 0 = not a casualty
   1 = minor wound
   2 = major wound
   3 = dead
5 Firing status: 0 = not firing
   1 = area fire
   2 = point fire
6 Current suppression state
7 Current X coordinate (meters)
8 Current Y coordinate (meters)
9 Next X coordinate (meters)
10 Next Y coordinate (meters)
11 Height (meters)
12 Width (meters)
13 Current posture: 1 = standing
   2 = crouching
   3 = prone
14 Moving Status (0 = stopped, 1 = moving normally, 2 = moving at top speed)
15 Maneuver unit to which the element belongs
16 Number of rounds remaining in magazine
17 Function in Patrol: 1 = Patrol Leader
   2 = Asst. Patro Leader
   3 = Machine Gunner
   4 = Grenade Launcher
   5 = Rifleman
18 Movement rate of each individual

Table 3-1, Namelist Inputs (Sheet 23)

Attributes (Cont'd)		
	19	Individual's assignment: 1 = if in base of fire 2 = if in maneuver unit
	20	Initial ammunition supply
	21	Weapon type: 1 = point fire 2 = area fire
	22	Position in fire team
	23	Secondary Weapon Carried: 13 = Hand Grenade 0 = None
	24	Hand Grenade Supply
	25	Smoke Grenade Supply
YATT(I,J,K)		Maneuver unit attributes I for each maneuver unit J, K = 1 for attackers, K = IT + 1 for defenders, where IT is the target number 1-4
		I: 1 = Movement type, loads MOVTYP 2 = Number of fire teams in the maneuver unit 3 = Index M used to specify which of the particular permutation used to assign fire teams to their positions within their maneuver unit 4 = Number of patrol member acting as leader of the maneuver unit. Loads KPEN 5 = Manuever Unit assigment, Loads IBF 1 = base of fire 0 = moving

Table 3-1, Namelist Inputs (Sheet 24)

ATTRIBUTES (Continued)

ZATT(I,K)

Attacker defender attribute I, K = 1 for SIM, K = IT + 1 for target IT, where IT is the target number 1-4

I:
1 = Number of maneuver units in the patrol
2 = Patrol mission. Loads MISS
3 = Availability of external fire support to patrol;
    0 = not available
    1 = available. Loads EFSA
4 = Patrol member number of patrol leader. Loads NPL
5 = Patrol member number of assistant patrol leader. Loads NAPL
6 = Relative weight factor assigned to semi-automatic weapons in defining firepower for the attacking patrol. Loads SCEMI(1)
7 = Relative weight factor assigned to semi-automatic weapons in defining firepower for the defending patrol. Loads CSEMI(2)
8 = Relative weight factor assigned to automatic weapons in defining firepower for the attacking patrol. Loads CAUTO(1)
9 = Relative weight factor assigned to automatic weapons in defining firepower for the defending patrol. Loads CAUTO(2)
10 = Relative weight factor assigned to grenades in defining firepower for the attacking patrol. Loads CGREN(1)
11 = Relative weight factor assigned to grenades in defining firepower for the defending patrol. Loads CGREN(2)

12 = Firepower ratio which if exceeded will result in a break contact decision for defenders. Loads FPMAX(1)

13 = Firepower ratio which if exceeded will result in a break contact decision for attackers. Loads FPMAX(2)

Table 3-1, Namelist Inputs (Sheet 25)

ATTRIBUTES (CONTINUED)

14 = Maximum number of rounds per man which will result in a break contact decision for attacking patrol. Loads RLIM (1)

15 = Maximum number of rounds per man which will result in a break contract decision for defending patrol. Loads RLIM (2)

16 = Casualty fraction which it exceeded will result in a break contact decision for attacking patrol. Loads CFMAX(1).

17 = Casualty fraction which if exceeded will result in a break contact decision for defending patrol. Loads CFMAX(2).

18 = Value of the loss of key personnel (see definition of L(K)) which will result in a break contact decision for attackers. Load LKP(1)

19 = Value of the loss of key personnel (see definition of L(K)) which will result in a break contact decision for defenders. Load LKP(2)

20 = Elapsed engagement time which will result in a break contact decision for attacking patrol. Loads (TLIM(1)

21 = Elapsed engagement time which will result in a break contact decision for defending patrol. Loads TLIM(2)

22 = Range between units which will result in a break by defending patrol. Loads DISTL

23 = Orientation angle of patrol configuration if stationary, as required by subroutine FORMST

Table 3-1, Namelist Inputs (Sheet 26)

WEAPON

XLAAW(I,J)	Contains lethal areas for grenade Type J
	I = 1 Lethal area for minor wound - target position 1 = standing
	2 Lethal area for minor wound - target position 2 = crouching
	3 Lethal area for minor wound - target position 3 = prone
	4 Lethal area for major wound - target position 1 = standing
	5 Lethal area for major wound - target position 2 = crouching
	6 Lethal area for major wound - target position 3 = prone
	7 Lethal area for death wound - target position 1 = standing
	8 Lethal area for death wound - target position 2 = crouching
	9 Lethal area for death wound - target position 3 = prone

Table 3-1, Namelist Inputs (Sheet 27)

WEAPONS (Continued)

WCHAR(I,J) — Weapon characteristics I for each weapon number J.

1	Maximum range (meters)
2	Minimum range (meters)
3	Rounds per trigger pull - point fire
4	Actual firing rate - point fire (trigger pulls/min)
5	Rounds per trigger pull - area fire
6	Actual firing rate-area fire (trigger pulls/min)
7	P given hit indicator (or value)
8	Air error indicator
9	$\sigma X1$ (mils) used if aim error indicator is zero
10	$\sigma Y1$ (mils)
11	$\sigma X2$ (mils)
12	$\sigma Y2$ (mils)
13	$\mu X3$ (mils)
14	$\mu Y3$ (mils)
15	$\sigma X3$ (mils)
16	$\sigma Y3$ (mils)
17	Distance between aimpoints - area fire (meters)
18	Maximum number of aimpoints in area of responsibility - area fire
19	Minimum number of aimpoints in area of responsibility - area fire
20	Vertical aimpoint above ground level for area fire (meters)
21	Lethal area indicator (= 0 except for grenades)
22	Weapon type for area assignment (1 = semi-automatic, 2 = automatic, 3 = grenades)
23	Weapon type for firing allocating weight factors (1 = semi-automatic, 2 = automatic, 3 = grenades
24	Weapon magazine capacity (rounds)
25	Loading time (Seconds)

Table 3-1, Namelist Inputs (Sheet 28)

MINES

NBR	=	Number of mines deployed by Subject Patrol
LGTH	=	Length of mine field (meters)
XCENT YCENT	=	Coordinates of the centroid of the mine field deployment line segment. (line along which mines are deployed). (Map Coordinates)
TAK	=	Angle that the mine field deployment lines makes with the X-axis. Positive counterclockwise
XLAAW (I,LAIC)	=	Lethal area for mines. See table XLAAW, Volume IV
LAIC	=	Lethal area indication for mines. Points to appropriate lethal area column for mines in table XLAAW
XENGA YENGA	=	Coordinates of engagement point (Map Coordinates)

EXTERNAL FIRE SUPPORT (For Combat Model)

T1	=	The time to make a request for EFS plus aiming calculation time, and time for flight of the shells
T2	=	The time to communicate open fire request plus the time of the flight of the shells given that attack has been previously planned
T3	=	The time delay between each volley of shells
SAFDIS	=	The safe-distance radius between the SIAF and target for an EFS attack

Table 3-1, Namelist Inputs (Sheet 29)

External Fire Support (Cont'd)

NVOLLEY	= The total number of volleys in the EFS attack
SIGMDIS	= The error due to ballistic dispersion expressed as the standard deviation.
JARTL	= Variable whose value (1, 2, 3, 4, 5, 6) specifies which type of artillery or air support is used: 1 = 4.2 inch mortar 2 = 155 MM Howitzer 3 = 105 MM Howitzer 4 = 175 MM Gun 5 = 8 inch Howitzer 6 = Air support
MAEE (Z,J)	Lethal radius of selected ammo against Posture (Z) for kill level J J=1 death, J=2 major wound, J=3 minor wound.
NSUPP	= Suppression state assigned to enemy patrol after completion of the first volley of EFS

DATA BASE
SET UP

Symbol	Definition	Units	Default Value
IPOS	Total number of different personnel postures in set		
SEGMIN	Minimum segment length for which a segment is considered negligibly small	meters	0.1
DSTEP	The maximum step size to be used in a mini-segment. The highest velocity moving feasible target will define the time step size to use for detailed	meters	10.

Table 3-1, Namelist Inputs (Sheet 30)

Data Base Set Up (Cont'd)

Symbol	Definition	Units	Default Value
	detection to assure, at most, a step size of DSTEP for any target or for SIAF (the value must be >0)		
MAXDIS	Maximum distance patrol can move in any event time	Meters	
	FORMATION (Reconnaissance Only)		
FORMS(I,J,IFS)	The location within a SIAF patrol for each of the elements J for each type of special formation IFS (used by Subroutine DETECT when man-to-man detection is desired) where: I = 1 is the X location of element J relative to the J = 1 element I - 2 is the Y location of element J relative to the J = 1 element		meters
	HUMAN MAINTENANCE		
BSAREA	Body surface area	square ft	20.
CONCAP	Convective capacity content	BTU/lb^{o}F	0.0735
CPRAT (L)	Energy expenditure rate for type L check point (rest, recon, sleep, etc. - subroutine HUMAN)	meters	See Subroutine HUMAN

Taole 3-1, Namelist Inputs (Sheet 31)

Human Maintenance (Cont'd)

SIGFFR	Heat transfer constant: $\sigma * F_{ae} * f_r$ where σ = Stephen-Boltzman constant F_{ae} = Shape emissivity factor fr = Radiation area factor	$\frac{BTU/ft^2}{hr\ (^oR)^4}$	0.1103×10^8
RHOH	Air density	lbs/cu ft	0.075
P	Barometric pressure	mm Hg	760.
To	Base film temperature, absolute	F	536.
Po	Standard pressure	mm Hg	760.
RPE	Vapor resistance, air	in. of air	0.24
RPG	Vapor resistance, garments	in. of air	0.50
XMMAX	Maximum SIAF personnel energy expenditure rate(BTU/hr)		

Table 3-1, Namelist Inputs (Sheet 32)

HUMAN MAINTENANCE (cont.)

Symbol	Definition	Units	Default Value
FWRAT(L)	Food consumption energy expenditure rate for type L checkpoint (rest, recon, sleep, etc. - see Subroutine HUMAN).	BTU/hr	See Subroutine LOGIS
LAMDAE	Heat of vaporization	BTU/lb	1080.
STS	Skin temperature	°F	95.
PS	Vapor Pressure at skin	in. Hg	42.
	TERRAIN		
SL1	Limiting value on terrain surface quadratic coefficient - a value close to zero indicates the terrain surface is approximately linear		5×10^4
SL2	Limiting value of slope differences		0.05
DMT(I,K)	Density of micro-relief feature of type K (positive undulations, negative undulations, boulders) in micro-relief class I (I=1,...,5).	number/acre	See Subroutine MICROT
RHOI(II,U)	Density of vegetation features type U (1=grass, 2=brush, 3-tree trunk, 4-tree crown) in vegetation class II.	number/acre	See Subroutine VEGCO[illegible]
RMAX(II,U)	Range at which a target has unity probability of being completely concealed by vegetation features of type U in class II.	meters	See NAMELIST

Table 3-1, Namelist Inputs (Sheet 33)

TERRAIN (Cont.)

Symbol	Definition	Units	Default Value
RMTMAX(I,L)	Range at which a target has unity probability of being completely concealed by micro-relief features of type L (1=positive undulations, 2=negative undulations, 3-boulders) in micrc-relief class I (see Subroutine MICROT).	meters	See Subroutine MICROT
W(I,U)	Width of vegetation features of type U (1-grass, 2=brush, 3=tree trunks, 4=tree crowns) in vegetation class I (see Subroutine VEGCON).	meters	See Subroutine VEGCON
WMT(L,K)	Width of micro-relief feature of type K (1=positive undulations, 2=negative undulations, 3-boulders) in micro-relief class L (see Subroutine MICROT)	meters	See Subroutine MITFEA
DSW11	Water depth in vegetation class 13 - sparse swamp.	meters	1.0
DSW12	Water depth in vegetation class 14 - dense swamp.	meters	1.0
DRICE	Water depth in vegetation class 16 - rice field	meters	0.3
H(I,U)	Height above surface of vegetation features (1=grass, 2=brush, 3=tree trunks, 4=crowns of trees) for vegetation class I (I=1,...,16).	meters	See Subroutine VEGCON

Table 3-1, Namelist Inputs (Sheet 34)

TERRAIN (cont.)

Symbol	Definition	Units	Default Value
HB(J)	Height of obstacle of type J for J= 1,...,9 (see Subroutine TERCON).	meters	See Subroutine TERCON
HMT(I,K)	Height of a micro-relief feature of type K (positive undulations, negative undulations, boulders) in micro-relief class I (I=1,...,5).	meters	See Subroutine MICROT
AØXMAX	The maximum X coordinate at the boundary of the area of operations.	meters	7200.
AØYMAX	The maximum Y coordinate at the boundary of the area of operations.	meters	2400.
REF(II,J)	The effective background reflectance for vegetation class II where 1 is with a downward look angle 2 is with a nearly parallel look angle 3 is with an upward look angle		See Subroutine VISUAL
XLP(II)	The fractional light penetration of vegetation class II		See Light Penetration Subroutine (Volume II, Section 3.2)
VEGC(3,II)	The formation type for moving in the vegetation class II (1-file; 2-column; 3-diamond) (Reconnaissance Only)	meters	See DETECT
VEGC(1,II)	The formation spacing parameter for the vegetation class II (Reconnaissance Only)	meters	See DETECT

Table 3-1, Namelist Inputs (Sheet 35)

NAVIGATION (See NAV Subroutine)

Symbol	Definition	Units	Default Value
SGMTAB	Sigma, Map Terrain Association, Best. For the area of SIAF operation this value represents the standard deviation of the best (minimum) distances within which SIAF can determine its location at any point on its route (except a check-point) by Map Terrain Association, provided that visibility and light level are adequate (i.e., ALL = ALLB, VISM = VISMB).	meters	50.
SGMTAW	Sigma, Map Terrain Association, Worst, Anologous to SGMTAB, but for poor visibility (VISM = VISMW, ALL = ALLW). This term represents the limit on position location by map terrain association.	meters	200.
VISMB	Meteorological Visibility, Best. Visibility (VISM) at which the surrounding terrain features can be seen and identified in sufficient detail to allow the SIAF location to be determined (by Map Terrain Association) to approximately the distance given by the one sigma value of SGMTAB.	meters	13.
VISMW	Meteorological Visibility, Worst. Similar to VISMB described above, but for the "worst" visibility. If VISM = VISMW then SGMTA = SGMTAW. If VISM < VISMW then SIAF location cannot be determined by Map Terrain Association.	meters	300.

Table 3-1, Namelist Inputs (Sheet 36)

NAVIGATION (cont.)

Symbol	Definition	Units	Default Value
ALLW	The "worst" value of Ambient Light Level (ALL) for Map Terrain Association. If ALL > ALLW then SIAF location cannot be determined by Map Terrain Association.	ft lamberts	4×10^3
ITACOS	Average time necessary to get an air craft on-site if PPLS is to be used	seconds	900.
ALLB	The "best" value of Ambient Light Level (ALL) for map-terrain-association (i.e., that value of ALL at which SIAF location can be determined to approximately SGMTAB provided that visibility is good). If ALL > ALLB then it is assumed that ALL > ALLB.	ft lamberts	5×10^3
PMC	Point-on-map Error (Constant Component). Error assicated with putting the believed SIAF location on the map as a point (25 meters suggested for 1:50,000 map; other map scales are automatically converted internally).	meters	25.
PMR	Point-on-map Error (component that increases with range traveled). (25 meters for 1:50,000 map; other values converted internally).	meters	25.
RC	Range Error Constant. Average error associated with estimating range traveled (by pace count), expressed as % of distance traveled since last checkpoint.		4.

Table 3-1, Namelist Inputs (Sheet 37)

NAVIGATION (cont.)

Symbol	Definition	Units	Default Value
RCTAR	Range Error Constant Target Estimate. Average error (σ) associated with visual estimation of the range to a sighted target, expressed as % of estimated range.		10.
BE	Base Error. (σ_{BE}). Average distance between SIAF location and exact center of checkpoint location when SIAF believes it is at checkpoint.	meters	25.
AA	Average compass reading error (assume more than one compass reading is taken for mission leg).	degrees	1.85
AEQ	Effect of special equipment on estimating average compass reading error.	degrees	0.
ATTAR	Angle error, target estimate. Average compass reading error of bearing to target.	degrees	4.
GR	Grid Reading Error. Introduced by translating the point on the map into eight-digit grid readings (25 meters for 1:50,000 map; other values converted).	meters	25.
ATER	Effect of terrain on estimating average compass reading error.	degrees	0.

Table 3-1, Namelist Inputs (Sheet 38)

NAVIGATION (cont).

Symbol	Definition	Units	Default Value
RTER	Effect of terrain on estimating range traveled.		0.
REQ	Effect of special equipment on estimating range traveled.		0.
ITDRPM	Average time for SIAF to determine its position by dead reckoning, put point on map, and read eight digit grid coordinates.	seconds	60.
ITNMTA	Average time necessary to attempt position location by map-terrain association with good light and visibility, given general area by dead reckoning.	seconds	120.
ITNTAR	Average time necessary to estimate range and bearing of target visually detected.	seconds	30.
ITPLSA	Average time for an accurate (CEP = 60 meters) navigational fix by PPLS once A/C is on site.	seconds	120.
ITPLSQ	Average time for a "quick" navigational fix (CEP = 150 meters) by PPLS once A/C is on site.	seconds	900.
	MOVEMENT RATE		
VTYP	Typical SIAF movement rate. (See Subroutine MVRATE)		.3 meters per second
TMR(I,J)	Movement rates for night (J=1) and day (J=2) over terrain slopes satisfying for various slope values I	km/hr	See Subroutine MVRATE

Table 3-1, Namelist Inputs (Sheet 39)

MOVEMENT RATE (Cont'd)

Symbol	Definition	Units	Default Value
TMR(I,3)	Slope limits defining movement rate as a step function		See Subroutine MVRATE
VEGF(I)	Movement rate degradation factor for vegetation class I (I = 1,...,16).		See Subroutine MVRATE
SOILF(I,J)	Movement rate degradation factor for soil type J (see Subroutine SOIL), for wet conditions (I=1) and dry conditions (I=2).		See Subroutine MVRATE
ALIM(I,J)	Night and day limits of ambient light level for a movement rate degradation (lower limit I=1, upper limit I=2, night J=1, day J=2).	ft lamberts	See Subroutine MVRATE
ALLF(I,J)	Movement rate degradation factor for night (J=1) and day (J=2) for various values (I=1,2,3; see Subroutine MVRATE) of ambient light level.		See Subroutine MVRATE
VEGC(2,II)	The speed adjustment factor for the vegetation class II (integer). (Used by target Only)		See MOVET

Table 3-1, Namelist Inputs (Sheet 40)

Movement Rate (Cont'd)

WDC	Weighting factor associated with detection for critical movement problem
WDM	Weighting factor associated with detection for marginal movement problem
WTC	Weighting factor associated with time for critical movement problem
WTM	Weighting factor associated with time for marginal movement problem

AURAL DETECTION

Symbol	Definition	Units	Default Value
ATTEN(J)	The attenuation coefficient for sound passing through solid growth of feature type J. This will be modified by growth density in the subroutine (1=grass, (2=brush, 3=tree trunk, 4=tree crown).	dB/meter	See Subroutine AURAL
VEGC(4,II)	The background noise level for vegetation class II in the daytime.	dB	See Subroutine AURAL
VEGC(5,II)	The background noise for vegetation class II in the nighttime.	dB	See Subroutine AURAL
VEGC(6,II)	The noise generated by one man moving in vegetation class II.	dB	See Subroutine AURAL
VEGC(7,II)	The noise generated by one man not MOVING IN VEGETATION class II.	dB	See Subroutine AURAL
VEGC(8,II)	The incremental wind background noise for vegetation class II.	dB/knot	See Subroutine AURAL

Table 3-1, Namelist Inputs (Sheet 41)

DETECTION (See Subroutine DETECT)

Symbol	Definition	Units	Default Value
ANGID	Angular subtense required for identification of a target	minutes of arc	12.
CRECOG	Contrast ratio required for recognition of a target.		1.
DBACK	Distance behind target considered for background calculations.	meters	50.
TDMIN	Time interval in which detections can be considered simultaneous.	seconds	
WR	Fractional target width required to be visible for target recognition.		0.5
SECT (I,IND,1)	Sector of scan for the case of both patrols moving or both patrols stopped, where I=1 for the angular left bound for the sector of responsibility for the current sector index IND (IND=1,2,3,4), and I=2 is the angular right bound.		See DETECT
SECT (I,IND,2)	Sector of scan for the case of stationary observer and moving target where I and IND are as above. This variable is an adjustment to the scan sector due to peripheral vision being able to pick up targets at a much wider angle from forward than is nominal for a fixed target (see Subroutine DETECT).		See DETECT

Table 3-1, Namelist Inputs (Sheet 42)

DETECTION (See Subroutine DETECT)

Symbol	Definition	Units	Default Value
ANGID	Angular subtense required for identification of a target	minutes of arc	12.
CRECOG	Contrast ratio required for recognition of a target.		1.
DBACK	Distance behind target considered for background calculations.	meters	50.
TDMIN	Time interval in which detections can be considered simultaneous.	seconds	
WR	Fractional target width required to be visible for target recognition.		0.5
SECT (I,IND,1)	Sector of scan for the case of both patrols moving or both patrols stopped, where I=1 for the angular left bound for the sector of responsibility for the current sector index IND (IND=1,2,3,4), and I=2 is the angular right bound.		See DETECT
SECT (I,IND,2)	Sector of scan for the case of stationary observer and moving target where I and IND are as above. This variable is an adjustment to the scan sector due to peripheral vision being able to pick up targets at a much wider angle from forward than is nominal for a fixed target (see Subroutine DETECT).		See DETECT

Table 3-1, Namelist Inputs (Sheet 42)

Detection (Cont'd)

Symbol	Definition	Units	Default Value
ISECT(J)	Sector of primary surveillance responsibility for member J of a patrol (forward sector=1, left side=2, right side=3, rear sect-r=4).		1, 2, 3, 4, 1, 2
	WEATHER		
IDTIM	Time interval preceeding current time during which rain is considered to cause a current wet soil condition	hours	1.0
VISLUM(I,1)	Meteorological visibility at sea level for weather class I (see Subroutine WETHR).	meters	See Subroutine WETHR
VISLUM(I,J)	Illumination of the sky for weather class I, where J=2 for daylight; J=3 for sunrise; 4: sunset; 5: night, no moon; 6: night, quarter moon: 7: night, half moon; 8: night, full moon.	ft lamberts	See Subroutine WETHER

Table 3-1, Namelist Inputs (Sheet 43)

SUPPLY

AMWTAB(K)	Weight of ammunition for type K weapon	lbs/round
	K WEAPON	
	1. M-14(SA6)	.080
	2. M-14A1	.080
	3. M-60MG	.080
	4. M-16(SA)	.040
	5. M-16(A)	.040
	6. Stoner MG	.040
	7. M-79 GL	.600
	8. XM-148 RGL	.600
	9. AK-47	.070
	101 AK-47(A)	.070
	11. RPD Lt. MG	.070
	12. SGM Hvy. MG	.070
	13. M26 A1	1.0
	14. M18 A1	3.5
	15. Stoner MG 1:14	.040
	16. AAI SPIW(SA)	.029
	17. AAISPIW(A)	.029
	18. AAI SPIW MG	.033
	19. 17. with 11.2 Gr Flechette	.032
	20. 0.17 Cal(A)	.037

Table 3-1, Namelist Inputs (Sheet 44)

FOOD SUPPLY

PEQUIP	Total weight of patrol equipment carried	pounds
EQUIP	Initial weight of equipment carried per man	pounds
H20	Initial amount of water carried per man	pounds
RH20	Total weight of resupply water	pounds
FOOD	Initial amount of food carried per man	pounds
RFOOD	Total weight of resupply food	pounds

WEAPON SUPPLY

SAMU(K)	Number of rounds of ammo carried by SIAF for weapon type K.	
RAMU(K)	Total number of resupply ammo rounds for weapon type K.	
RMINES	Number of resupply mines.	
NMINES	Total number of mines carried by SIAF	
RHANDG	Number of resupply hand grenades.	
NHANDG	Total number of hand grenades carried by SIAF	
NSWT	Number of SIAF weapon types	
WTS(K)	K^{th} SIAF weapon type	

Table 3-1, Namelist Inputs (Sheet 45)

<u>WEAPON SUPPLY</u> (cont.)

1 - M-14(SA6)
2 - M-14A1
3 - M-60MG
4 - M-16(SA)
5 - M-16(A)
6 - Stoner MG
7 - M-79 GL
8 - XM-148 RGL
9 - AK-47
10 - AK-47(A)
11 - RPD Lt. MG
12 - SGM Hvy. MG
13 - M26 A1
14 - M18 A1
15 - Stoner MG 1:14
16 - AAI SPIW(SA)
17 - AAISPIW(A)
18 - AAI SPIW MG
19 - 17. with 11.2 Gr Flechette
20 - 0.17 Cal(A)

Table 3-1, Namelist Inputs (Sheet 46)

COMMUNICATION

TUSE	Average external communication message duration	minutes
XDBINS	Sound level increase during attempt of external communication	dB
ICPER	Length of communications period	hours
FREQ	Transmitter frequency of the patrol radio	-
PT	Transmitter output power	mw
TPOWR	Transmission power requirements	amps
RPOWR	Reception power requirements	amps
RNF	Receiver noise figure	dB
BETA	Receiver bandwidth	Kilocycles
BLIFE	Battery life for single radio (assuming a 9:1 ratio of receiving time to transmitting time)	Hours
NBAT	Number of batteries carried per radio.	
NRAD	Total number of radios carried by SIAF	

Table 3-1, Namelist Inputs (Sheet 47)

DYNAMIC ROUTE (See Subroutine DROUTE)

IDELA IDELB IDELC IDELD IDELE	0 if point A,B,C,D, or E is to be deleted 1 if point A,B,C,D, or E is not deleted	
RAVOID	Radial distance from XAVOID, YAVOID with which all grid points are to be deleted (enter 0 if no such position).	meters
XAVOID	X coordinate of position for deletion of grid points	
YAVOID	Y coordinate of position for deletion of grid points	
RAVODD	Radial distance from XAVODD, YAVODD within which all grid points are to be deleted (enter 0 if no such position - second position).	meters
XAVODD	X coordinate of second position for deletion of grid points	
YAVODD	Y coordinate of second position for deletion of grid points	
GSAPRX	Approximate desired grid points spacing	meters
GSAPXX	Approximate desired spacing for second stage grid (LFLOBJ = 1, I GRID = 1)	meters

Table 3-1, Namelist Inputs (Sheet 48)

Dynamic Route (Cont'd)

DSA	First significant range from enemy position XPPT, YPPT; enter only if DYWT (9,MI) ≠ 0	-
DSAA	First significant range from position XPPTT, YPPTT; enter only if DYWT (8,MI) ≠ 0	-
DMOR	Second significant range from enemy position XPPT, YPPT, enter only if DYWT (9,MI) ≠ 0	-
DMORR	Second significant range from position XPPTT, YPPTT; enter only if DYWT (8,MI) ≠ 0	-
RFSAA	Risk factor associated with DSAA.	-
RFMOR	Risk factor associated with DMOR	-
RFMORR	Risk or benefit factor associated with DMORR	-
RFSA	Risk factor associated with DSA	-
NPAR	Number of parameters considered in the determination of path utility	9
DYWT(IPAR,MI)	Weight Factors for Assumed Missions; relative importance of parameter IPAR MI: Mission Situation 1 = Reconnaissance - detect and identify suspected enemy but avoid encounter 2 = Reconnaissance - avoid enemy and proceed as fast as possible 3 = Combat - avoid detection and identification by the enemy	

Table 3-1, Namelist Inputs (Sheet 49)

Dynamic Route (Cont'd)

IPAR:
- 1 = Movement Time
- 2 = SIAF Detects Enemy
- 3 = SIAF identifies enemy
- 4 = Enemy detects SIAF
- 5 = Enemy identifies SIAF
- 6 = SIAF cover
- 7 = SIAF Concealment
- 8 = Distance from Enemy (2)**
- 9 = Distance from Enemy (1)**

** The enemy locations can be used; however, the ninth parameter calculation refers to the same enemy position as the calculation of detection, identification, cover, and concealment.

CBDYWT (IPAR,ICB) The weight associated with parameter IPAR while movement type ICB is in progress (Same definition as DYWT above; used for combat)

Table 3-1, Namelist Inputs (Sheet 50)

EXTERNAL FIRE SUPPORT (for EFS Only Mission)

JNF	Total number of firings	
AIRC	1 - If FFAR's are helicopter launched 0 - If FFAR's are fixed wing aircraft launched	
IPREP	0 Don't use prep fire 1 Use LZ prep fire (prep fire assumed only on the primary LZ)	
PL	CBU bomblet pattern length	meters
PW	CBU bomblet pattern width	meters
MLANGL	Mean launch angle of MG firing	degrees
MLRANG	Mean launch range of MG firing	meters
LANGLE	Launch angle of FFAR salvo	degrees
LRANGE	Launch range of FFAR salvo	meters
MAE(i)	Lethal area of selected ammo versus personnel in posture (i)	square meters
F(i,j)	Fraction of personnel in posture (i) for each firing	
TB1STR	System delay time before first round or volley is delivered after fire request	sec
TBRNDS	System delay time between subsequent rounds/volleys	sec

Table 3-1, Namelist Inputs (Sheet 51)

EXTERNAL FIRE SUPPORT (cont.)

NN(J)	Number of rounds in each firing	
NROP	Number of ordnance delivery passes, GP	
NRS1P	Number of rockets launched - first pass	
NRS2P	Number of rockets launched - second and subsequent passes	
NCB1P	Number of CBU bomblets delivered, first pass	
NCB2P	Number of CBU bomblets delivered, second and all subsequent passes	
NGPB	Number of GP bombs delivered	
RPA	Artillery range probable error(also used for combat)	meters
RPECBU	CBU delivery error - range	meters
RPEGPB	GP delivery error - range	meters
DPE	Artillery deflection probable error(also used for combat)	meters
DPECBU	CBU delivery error - deflection	meters
DPEGPB	GP delivery error - deflection	meters

Table 3-1, Namelist Inputs (Sheet 52)

Table 3.2, Alphabetical Cross Reference for Namelist Input Variables

Variable	Table 3.1 Sheet No.	Variable	Table 3.1 Sheet No.	Variable	Table 3.1 Sheet No.
AA	38	CONCAP	31	ENRNG	7
AEQ	38	CPRAT	31	EQUIP	45
AIMMX	16	CRECOG	42	F	51
AIRC	51	C1	22	FDGFAC	18
ALIM	40	C2	22	FHCR	16
ALLB	37	DBACK	42	FHPR	16
ALLF	40	DELTA	16	FMA1	14
ALLW	37	DF	17	FMA2	14
AMWTAB	44	DMOR	49	FMCB1	14
ANGID	42	DMORR	49	FMCB2	14
ARSMN	18	DMT	33	FMGPB	14
ARSPI	18	DOMMT	2	FOOD	45
AOXMAX	35	DOMV	2	FORFTX	17
AOYMAX	35	DPE	52	FORFTY	17
ATER	38	DPECBU	52	FORMS	31
ATTAR	38	DPEGPB	52	FORMT	10
ATTEN	41	DRICE	34	FORMUX	17
BE	38	DSA	49	FORMUY	17
BETA	47	DSAA	49	FORSFX	17
BLIFE	47	DSTEP	30	FORSFY	18
BSAREA	31	DSUST	21	FORSMX	18
CADM	20	DSW11	34	FORSMY	18
CARFP	22	DSW12	34	FOTB	21
CBDYWT	50	DTDAMB	20	FOTM	21
CC1	20	DTDATT	20	FRAMB	20
CC2	20	DTEFS	16	FRATT	20
CC3	20	DTENGM	20	FRCMVD	9
CLASS	20	DTPURM	20	FRCMVN	9
COLMIN	18	DWDR	22	FREQ	47
COMRES	2	DYWT	49	FTAPB	16

Table 3.2, Alphabetical Cross Reference for Namelist Input Variables (cont.)

Variable	Table 3.1 Sheet No.	Variable	Table 3.1 Sheet No.	Variable	Table 3.1 Sheet No.
FWRAT	33	IFORMT	17	ITSTOP	8
GMAX	20	IFS	5	ITZERO	5
GOALTX	9	IFSUP	13	IXMAT	2
GOALTY	9	IFT	10	IX1	1
GR	38	IGBOM	13	IX2	1
GSAPRR	19	IMV	8	IYMAT	2
GSAPRX	48	IOB	3	JARTL	30
GSAPXX	48	IPERM	17	JNF	51
H	34	IPOS	30	JSTART	1
HB	35	IPREP	51	JSTOP	1
HFR	16	IPURSU	19	KDEFOP	22
HMT	35	ISECT	43	KREC	12
HLZ	7	ISEN	7	LAMDAE	33
H2O	45	ISENLZ	7	LANGLE	51
IAMG	13	ISSOFF	11	LDAYS	22
ICBOM	13	ISSON	11	LGTH	29
ICL	3	ISTAY	8	LNR1	2
ICOMBF	1	ITACOS	37	LRANGE	51
ICPER	47	ITACT	13	MAE	51
IDELA	48	ITARIV	7	MAEE	30
IDELB	48	ITDRPM	39	MAXCAS	1
IDELC	48	ITIMS	9	MAXDIS	31
IDELD	48	ITMAX	6	MAXDT	16
IDELE	48	ITMOV	8	MAXREP	1
IDET	8	ITNMTA	39	MICR1	3
IDTIM	43	ITNTAR	39	MLANGL	51
IDIREC	19	ITPLSA	39	MLRANG	51
IDOMST	2	ITPLSQ	39	MODE	6
IFADJ	13	ITRC	3	NBAT	47
IFAR	13	ITST	8	NBR	29
IFORFT	17	ITSTAY	7	NCB	14

Table 3.2, Alphabetical Cross Reference for Namelist Input Variables (cont.)

Variable	Sheet 3.1 Sheet No.	Variable	Table 3.1 Sheet No.	Variable	Table 3.1 Sheet No.
NCB1P	52	NWCL	15	REF	35
NCB2P	52	P	32	REFS	19
NCO	3	PEQUIP	45	REQ	39
NCOPY	1	PL	51	RESMAX	2
NDECOY	6	PMC	37	RFMOR	49
NFIX	8	PMR	37	RFMORR	49
NGF	14	PO	32	RFOOD	45
NGPB	52	PPLS	4	RFSA	49
NHANDG	45	PP1	21	RFSAA	49
NLZ	6	PP2	21	RHANDG	45
NMINES	45	PP3	21	RHOH	32
NMP	9	PP4	21	RHOI	33
NN	52	PP5	21	RH2O	45
NOB	2	PS	33	RLZ	6
NPAR	48	PT	47	RMAX	33
NPLAN	7	PW	51	RMINES	45
NRAD	47	Q1	21	RMTMAX	34
NRMT	2	Q2	21	RNF	47
NROP	52	Q3	21	ROBS	19
NRST	2	RAMB	19	RPA	52
NRS1P	52	RAMU	45	RPE	32
NRS2P	52	RAMIN	19	RPECBU	52
NRVP	2	RANMAX	9	RPEGPB	52
NSECT	19	RATT	19	RPG	32
NSECTR	21	RAVODD	48	RPOWR	47
NSENS	7	RAVOID	48	RSP	19
NSTP	11	RC	37	RTER	39
NSUPP	30	RCTAR	38	RZ	19
NSWT	45	RCMAX	12	SAFDIS	29
NTAR	8	RCMIN	12	SAMU	45
NVOLLEY	30	RECRES	2	SC	5

Table 3.2, Alphabetical Cross Reference for Namelist input Variables (cont.)

Variable	Table 3.1 Sheet No.	Variable	Table 3.1 Sheet No.	Variable	Table 3.1 Sheet No.
SCALE	4	T0	32	XBASE	5
SECT	42	T1	29	XCENT	29
SEGMIN	30	T2	29	XDBINS	47
SGMTAB	36	T3	29	XENGA	29
SGMTAW	36	UNKCON	16	XLAAW	27
SIGFFR	32	VAX	14	XLP	35
SIGMDIS	30	VEGC	35,40,41	XLZ	6
SL1	33	VEGF	40	XMAXDT	16
SL2	33	VEG1	2	XMMAX	32
SOILF	40	VELM	6	XMU	16
SOIL1	2	VELNOM	16	XOB	3
SOUNDT	11	VH	1	XPLAN	7
SPEC	4	VISLUM	43	YATT	24
SSIG	16	VISMB	36	YAVODD	48
STS	33	VISMW	36	YAVOID	48
SUFAC	21	VK	1	YBASE	5
TAK	29	VTYP	39	YCENT	29
TBRNDS	51	W	34	YENGA	29
TBUR	4	WCHAR	28	YLZ	6
TB1STR	51	WDAY	15	YOB	3
TC	9	WDC	41	YPLAN	7
TDEBK	6	WDM	41	ZATT	25
TDMIN	42	WMT	34		
THEATA	1	WPWT	18		
TMR	39	WR	42		
TPOWR	47	WTC	41		
TPREP	6	WTM	41		
TSR	15	WTS	45		
TSS	15	XATT	23		
TUSE	47	XAVODD	48		
TVEL	9	XAVOID	48		

4.0 MODEL OUTPUTS

4.1 RECONNAISSANCE MODEL OUTPUTS

The reconnaissance model output variables are defined in Table 4-1, and are listed according to the order in which they appear in the model output format. The method used to calculate these variables is described in subroutines SISTAT and SIWRT of Volume IV.

4.2 COMBAT MODEL OUTPUTS

The combat model output variables are defined in Table 4-2. In the model, these variables are printed out during each even time thus giving the user a time history of the events which took place during the combat operation.

Table 4-1, Model Output Variables (Sheet 1)

Symbol	Definition	Units
IVOR(IT,1)	The number of visual detections of target IT by SIAF.	
SDETSR(IT,1)	The visual detection success ratio of target IT by SIAF.	
SSTVDR(IT,1)	The mean visual detection range of target IT by SIAF.	meters
SSSTVD(IT,1)	The standard deviation of the visual detection range of target IT by SIAF.	meters
SISTVD(IT,1)	Mean time of detection of target IT by SIAF.	days,hrs,min
SSISTV(IT,1)	Standard deviation of the time of detection of target IT by SIAF.	days,hrs,min
IAOR(IT)	Number of aural detection cues associated with the visual detection of target IT.	
IIVOR(IT,1)	Number of identifications of target IT by SIAF.	
SIDSR(IT,1)	Identification success ratio of target IT by SIAF.	
SSTRR(IT,1)	Mean identification range of target IT by SIAF.	meters
SSSTRR(IT,1)	Standard deviation of the identification range of target IT by SIAF.	meters
SISTRT(IT,1)	Mean time of identification of target IT by SIAF	days,hrs,min
SSISTR(IT,1)	Standard deviation of the time of identification of target IT by SIAF.	days,hrs,min
IIAOR(IT,1)	Number of aural detections of target IT by SIAF.	

Table 4-1, Model Output Variables (Sheet 2)

Symbol	Definition	Units
SAURSR(IT,1)	Aural detection success ratio of target IT by SIAF.	
SSTADR(IT,1)	Mean aural detection range of target IT by SIAF.	meters
SSSTAD(IT,1)	Standard deviation of the aural detection range of target IT by SIAF.	meters
SISTAD(IT,1)	Mean time of an aural detection of target IT by SIAF.	days,hrs,min
SSISTA(IT,1)	Standard deviation of the time of an aural detection of target IT by SIAF.	days,hrs,min
SCEPTA(IT)	The mean target location CEP of target IT.	meters
SSCEPT(IT)	Standard deviation of the target location CEP of target IT.	meters
IVOR(IT,2)	The number of visual detections of SIAF by target IT.	
SDETSR(IT,2)	Visual detection success ratio of SIAF by target IT.	
SSTVDR(IT,2)	Mean visual detection range of SIAF by target IT.	meters
SSSTVD(IT,2)	Standard deviation of the visual detection range of SIAF by target IT.	meters
SISTVD(IT,2)	Mean time of detection of SIAF by target IT.	days,hrs,min
SSISTV(IT,2)	Standard deviation of the time of detection of SIAF by target IT.	
IIVOR(IT,2)	Number of identifications of SIAF by target IT.	

Table 4-1, Model Output Variables (Sheet 3)

Symbol	Definition	Units
SIDSR(IT,2)	Identification success ratio of SIAF by target IT.	
SSTRR(IT,2)	Mean identification range of SIAF by target IT.	meters
SSSTRR(IT,2)	Standard deviation of the identification range of SIAF by target IT.	meters
SISTRT(IT,2)	Mean time of identification of SIAF by target IT.	days,hrs,min
SSISTR(IT,2)	Standard deviation of the time of identification of SIAF by target IT.	days,hrs,min
IIAOR(IT,2)	Number of aural detections of SIAF by target IT.	
SAURSR(IT,2)	Aural detection success ratio of SIAF by target IT.	
SSTADR(IT,2)	Mean aural detection range of SIAF by target IT.	meters
SSSTAD(IT,2)	Standard deviation of the aural detection range of SIAF by target IT.	meters
SISTAD(IT,2)	Mean time of an aural detection of SIAF by target IT.	days,hrs,min
SSISTA(IT,2)	Standard deviation of the time of an aural detection of SIAF by target IT.	days,hrs,min
SLOSR(IT,1)	Percent of the time target IT is not detected by SIAF due to a relief intercept.	
SLOSV(IT,1)	Percent of the time target IT is not detected by SIAF due to a vegetation intercept.	

Table 4-1, Model Output Variables (Sheet 4)

Symbol	Definition	Units
SLOSD(IT,1)	Percent of the time target IT is not detected by SIAF due to insufficient range or light.	
SLOST(IT,1)	Percent of the time target IT is not detected by SIAF due to insufficient time.	
SLOSR(IT,2)	Percent of the time SIAF is not detected by target IT due to a relief intercept.	
SLOSV(IT,2)	Percent of the time SIAF is not detected by target IT due to a vegetation intercept.	
SLOSD(IT,2)	Percent of the time SIAF is not detected by target IT due to insufficient range or light.	
SLOST(IT,2)	Percent of the time SIAF is not detected by target IT due to insufficient time.	
SMVEL	Mean movement rate of the SIAF patrol.	km/hr
SSVEL	Standard deviation of the movement rate of the SIAF patrol.	km/hr
STIME	Mean patrol duration.	days,hrs,min
SSITIM	Standard deviation of the patrol duration.	days,hrs,min
SPATDI	Mean distance traveled by the SIAF patrol.	km
SSPATD	Standard deviation of the distance traveled by the SIAF patrol.	km
SVEL(I)	Patrol velocity histogram. This vector consists of 12 elements. In each element, the percent of time the patrol is moving is stored in increments of 0.2 of a kilometer per hour.	

Table 4-1, Model Output Variables (Sheet 5)

Symbol	Definition	Units
SCEPPM	The mean patrol location CEP at checkpoints.	meters
SSDCEP	Standard deviation of the patrol location CEP at checkpoints.	meters
SITNAV	Mean time for the patrol to determine its location.	minutes
SSDIT	Standard deviation of the time for the patrol to determine its location.	minutes
SATTEM	Mean number of communication attempts.	
SSATTE	Standard deviation of the number of communication attempts.	
SSUCRA	Mean communication success ratio of the patrol.	
SSSUCR	Standard deviation of the communication success ratio of the patrol.	
SAPCAD	The percent of the communication power loss due to relief for communication failures.	
SAPCAF	The percent of the communication power loss due to vegetation for communication failures.	
SAPCAS	The percent of the communication power loss due to range for communication failures.	
STTIME	The mean time the communication receiver of the patrol is on.	days,hrs,min
SSTTIM	Standard deviation of the time the communication receiver of the patrol is on.	days,hrs,min
STTUSE	The mean time the transmitter of the patrol communication equipment was on.	days,hrs,min

Table 4-1, Model Output Variables (Sheet 6)

Symbol	Definition	Units
SSTTUS	Standard deviation of the time the transmitter of the patrol communication equipment was on.	days,hrs,min
AMPHR	Ampere hours available at the beginning of the patrol.	amp hrs
SAMPHR	Mean ampere hours used by the communication equipment during the patrol.	amp hrs
SSAMPH	Standard deviation of the ampere hours used by the communication equipment during the patrol.	amp hrs
FOOD	Amount of food carried per patrol member at the beginning of the mission.	lbs/man
H2O	Amount of water carried per patrol member at the beginning of the mission.	lbs/man
XP2	Amount of ammunition carried per patrol member at the beginning of the mission.	lbs/man
XP3	Amount of ordnance other than ammunition carried per patrol member at the beginning of the mission.	lbs/man
SFOODA	Mean amount of food carried by each patrol member at the end of the patrol.	lbs/man
SSFOOD	Standard deviation of the amount of food carried by each patrol member at the end of the patrol.	lbs/man
SH2OA	Mean amount of water carried by each patrol member at the end of the patrol.	lbs/man
SSH2OA	Standard deviation of the amount of water carried by each patrol member at the end of the patrol.	lbs/man

Table 4-1, Model Output Variables (Sheet 7)

Symbol	Definition	Units
SPAK2	Mean amount of ammunition carried by each patrol member at the end of the patrol.	lbs/man
SSPAK2	Standard deviation of the amount of ammunition carried by each patrol member at the end of the patrol.	lbs/man
SPAK3	Mean amount of ordnance other than ammunition carried by each patrol member at the end of the patrol.	lbs/man
SSPAK3	Standard deviation of amount of ordnance other than ammunition carried by each patrol member at the end of the patrol.	lbs/man
SPDEGL	The mean human performance degradation at the end of the patrol.	
SSPDEG	Standard deviation of human performance degradation at the end of the patrol.	
SPDMAX	The mean of the maximum human performance degradation experienced by the patrol during the mission.	
SSPDMA	The standard deviation of the maximum human performance degradation experienced by the patrol during the mission.	
SPDMIN	The mean of the minimum human performance degradation experienced by the patrol during the mission.	
SSPDMI	The standard deviation of the minimum human performance degradation experienced by the patrol during the mission.	
SPDAVG	The mean of the average human performance degradation experienced by the patrol during the mission.	

Table 4-1, Model Output Variables (Sheet 8)

Symbol	Definition	Units
SSPDAV	The standard deviation of the average human performance degradation experienced by the patrol during the mission.	
SSIGEN	The mean of the energy expended per patrol member at the end of the patrol.	BTU
SSIGE	The standard deviation of energy expended per patrol member at the end of the patrol.	BTU
SSGMAX	The mean of the maximum energy expended per patrol member during the mission.	BTU
SSSGMA	The standard deviation of the maximum energy expended per patrol member during the mission.	BTU
SSGMIN	The mean of the minimum energy expended per patrol member during the mission.	BTU
SSGMI	The standard deviation of the minimum energy expended per patrol member during the mission.	BTU
SSGAVG	The mean of the average energy expended per patrol member during the mission.	BTU
SSSGAV	The standard deviation of the average energy expended per patrol member during the mission.	
PDPLOT(I)	A vector in which is stored a time history of human performance degradation for the mission.	

Table 4-1, Model Output Variables (Sheet 9)

Symbol	Definition	Units
HTPLOT(I)	A vector of times associated with the human performance values in PDPLOT.	
JJTIME(I)	A vector in which is stored the arrival time of SIAF at the checkpoints.	
AAALL(I)	The vector in which is stored a time history of the light level.	
KKTIME(I)	A vector of times associated with the light level data.	

Table 4-2, Combat Outputs (Sheet 1)

Symbol	Definition	Units
ATT(1,J,K)	Fire team number of man J; K = 1 for attackers and K = 2 for defenders.	-
ATT(2,J,K)	Weapon number of man J; K = 1 for attackers and K = 2 for defenders.	-
ATT(3,J,K)	Current ammunition supply of man J; K = 1 for attackers and K = 2 for defenders.	rounds
ATT(4,J,K)	Casualty status of man J; K = 1 for attackers and K = 2 for defenders. 0 = not a casualty; 1 = minor wound; 2 = major wound; 3 = dead.	-
ATT(5,J,K)	Firing status of man J; K = 1 for attackers and K = 2 for defenders. 0 = not firing; 1 = area fire; 2 = point fire.	-
ATT(6,J,K)	Current suppression state of man J; K = 1 for attackers and K = 2 for defenders.	-
ATT(7,J,K)	Current X coordinate of man J; K = 1 for attackers and K = 2 for defenders.	meters
ATT(8,J,K)	Current Y coordinate of man J; K = 1 for attackers and K = 2 for defenders.	meters
ATT(9,J,K)	Next X coordinate of man J; K = 1 for attackers and K = 2 for defenders.	meters
ATT(10,J,K)	Next Y coordinate of man J; K = 1 for attackers and K = 2 for defenders.	meters
ATT(11,J,K)	Height of man J; K = 1 for attackers and K = 2 for defenders.	meters
ATT(12,J,K)	Width of man J; K = 1 for attackers and K = 2 for defenders	meters

Table 4-2, Combat Outputs (Sheet 2)

Symbol	Definition	Units
ATT(13,J,K)	Current posture of man J; K = 1 for attackers and K = 2 for defenders.	meters
ATT(14,J,K)	Moving status of man J; K = 1 for attackers and K = 2 for defenders. 0 = stopped; 1 = moving normally; 2 = moving at top speed.	
ATT(15,J,K)	Maneuver unit of man J; K = 1 for attackers and K = 2 for defenders.	
ATT(16,J,K)	Number of rounds remaining in magazine of the weapon of man J; K = 1 for attackers and K = 2 for defenders.	
ATT(17,J,K)	Function of man J in the patrol; K = 1 for attackers and K = 2 for defenders. 1 = patrol leader; 2 = assistant patrol leader; 3 = machine gunner; 4 = grenadier; 5 = rifleman.	
ATT(18,J,K)	Movement rate of man J; K = 1 for attackers and K = 2 for defenders.	meters/ seconds
ATT(19,J,K)	Man J's maneuver unit; K = 1 for attackers and K = 2 for defenders.	
ATT(20,J,K)	Initial ammunition supply of man J; K = 1 for attackers and K = 2 for defenders.	
ATT(21,J,K)	Man J's weapon type; K = 1 for attackers and K = 2 for defenders. 1 = point fire; 2 = area fire.	
ATT(22,J,K)	Position of man J in fire team; K = 1 for attackers and K = 2 for defenders.	
ATT(23,J,K)	Weapon number of secondary weapon carried by man J; K = 1 for attackers and K = 2 for defenders. 0 = none; 13 = hand grenade.	
ATT(24,J,K)	Supply of hand grenades for man J; K = 1 for attackers and K = 2 for defenders.	
ATT(25,J,K)	Supply of signal grenades carried by man J; K = 1 for attackers and K = 2 for defenders.	

Table 4-2, Combat Outputs (Sheet 3)

Symbol	Definition	Units
ALPHA(J)	Orientation angle SIAF member J moves to the next point during the current time event.	radians
TIMCAS	Time of the next casualty event.	seconds
TIMDET(K)	Time of the next detection event, K = 1 for attackers, K = 2 for defenders.	seconds
IBRK(K)	0 if patrol K does not break contact; 1 if patrol K breaks contact. K = 1 for attackers and K = 2 for defenders.	
IBVAR(J,K)	K = 1 for attackers and K = 2 for defenders. J = 1,2,...,6 (defined below).	
IBVAR(1,K)	0 if the decision is to continue the fire fight; 1 if the decision is to break contact due to lack of adequate firepower.	
IBVAR(2,K)	0 if the decision is to continue the fire fight; 1 if the decision is to break contact due to lack of adequate ammunition.	
IBVAR(3,K)	0 if the decision is to continue the fire fight; 1 if the decision is to break contact due to the high casualty fraction.	
IBVAR(4,K)	0 if the decision is to continue the fire fight; 1 if the decision is to break contact due to the loss of key personnel.	
IBVAR(5,K)	0 if the decision is to continue the fire fight; 1 if the decision is to break contact due to excessive elapsed time of the fire fight.	
IBVAR(6,K)	0 if the decision is to continue the fire fight; 1 if the decision is to break contact due to the excessively close range of the fire fight.	
IBVAR(6,1)	IBVAR(6,1) is always zero.	

Table 4-2, Combat Outputs (Sheet 4)

Symbol	Definition	Units
IEXTR(1)	= 0 Continue. = 1 Extract: all targets have been recognized.	
IEXTR(2)	= 0 Continue. = 1 Extract: lack of adequate firepower.	
IEXTR(3)	= 0 Continue. = 1 Extract: lack of adequate ammunition.	
IEXTR(4)	= 0 Continue. = 1 Extract: high casualty fraction.	
IEXTR(5)	= 0 Continue. = 1 Extract: inadequate food.	
IEXTR(6)	= 0 Continue = 1 Extract: inadequate water.	
IEXTR(7)	= 0 Continue. = 1 Extract: time duration exceeded.	
INDCAS	Side that sustains next casualty.	
JEXTR	= 0 Continue the mission. = 1 Extract.	
JGO	= 0 Combat decision is to avoid engagement. = 1 To conduct an EFS operation. = 2 Decision is to ambush. = 3 Decision is to attack. = 4 Decision is to deploy Claymore mines for ambush.	

Table 4-2, Combat Outputs (Sheet 5)

Symbol	Definition	Units
JSP	= 1 if SIAF is the subject patrol (attackers). = 2 if the target is the subject patrol.	
STIME	Time to the next movement event.	seconds
NTYPC	Type of casualty sustained.	
NUMCAS	Number of the man sustaining the next casualty.	
SLENG(J)	Length traveled by SIAF man J during the current time event.	
TIMEFF	Elapsed time of the fight.	seconds
XYBRK	X-Y coordinates of the break point.	meters
XYDEPL	X-Y coordinates of the deployment point.	meters
XYENG	X-Y coordinates of the engagement point.	meters
XYRALY	X-Y coordinates of the rally point.	meters

Table 4-2, Combat Outputs (Sheet 6)

Symbol	Definition	Units
EFSTIME(L)	Time vector containing times of scheduled arrivals of external fire support burst events.	seconds
AIMPTXY	X-Y coordinates of external fire support bursts.	meters
XYMINES(M)	X-Y coordinates of the deployment of the M^{th} mine in a Claymore minefield.	meters
TMINES	Time until target arrives in Claymore minefield.	seconds
TAKOP	Target's direction of movement.	radians
ICOMFT	1 if firing is being condicted; 0 before and after firing	
MOVINF(IUN)	Movement information flag maneuver unit IUN. 0 = if a new check point is needed. 1 = if the current check point is still in effect.	
IGA(IUN)	Current check point for maneuver unit IUN.	
NGA(IUN)	Total check points for maneuver unit IUN until the next objective point.	
XYGA(I,IUN)	X-Y coordinates of check point I for maneuver unit IUN	meters
INRPA(IUN)		
IMPA(IUN)	Current objective point for maneuver unit IUN.	

Table 4-2, Combat Outputs (Sheet 7)

Symbol	Definition	Units
NARP(IUN)	Total number of objective points for maneuver unit IUN.	
XYARP(N,IUN)	X-Y coordinates of N^{th} objective point for maneuver unit IUN.	meters
KKK	Maneuver unit that last arrived at a check point.	

5.0 SUBROUTINES

The SIAF model subroutines are presented in Table 5-1 and a brief summary of their function is presented in Table 5-2. The elevation data handling subroutines are presented in Table 5-3. This information is provided as an overview of the SIAF model subroutines. Details concerning the purpose, description, inputs, outputs, flow chart, and programming information are presented in Volumes II, III, V, and VI.

Table 5-1, SIAF Models and Associated Subroutines (Sheet 1)

TERRAIN (RECON)

LOSVEG
VEGCON
MICSOL
MITFEA
MITLOS
MITCON
ELEV
SLOPE
LINOBS
TERCON

WEATHER

WETHR

SUPPLY MAINTENANCE

LOGIS

TARGET

TARMOV
TARGEN
MOVET

ANCILLARY AND DATA HANDLING

MAIN
CASEIN
REPIN
RESTART

MOVEMENT

INSERT
SEGGEN
TMDRVR
MVRATE
DROUTE

NAVIGATION

NAV

SURVEILLANCE/ DETECTION

TARGEL
AURAL
STRACK
VISUAL
DETECT

SUPPLY MAINTENANCE

LOGIS

HUMAN MAINTENANCE

HUMAN

COMMUNICATIONS

EXCOM
IC
ICGRE
ICMSG
ICLOS
ICRAD
ICAUR

COMMAND AND CONTROL

PDDS

ELEVATION DATA HANDLING

MAPGEN
CONVERT
ROTATE
CMREAD
REREAD

Table 5-1, SIAF Models and Associated Subroutines (Sheet 2)

DECISION LOGIC	OPTIMIZATION LOGIC	FIRE CONTROL/LETHALITY	COMBAT FUNCTIONS AND C[2]
MISGEN	OLOGIC	KILL	CMAIN
CCO	OLOG4	LGTH	MOVPLN
DLOGIC	OLOG6	ARAS	MOVDRV
DLOG1	OLOG7	PKBRP	FORMST
DLOG2	OLOG8	FALOC	POSTURE
DLOG3	OLOG9	PTPTPK	DTBCFR
DLOG4	OLOG10	ARPTPK	FIRATE
DLOG5		ARPTI	AMMOUP
DLOG6	**TERRAIN (COMBAT)**	SI	FIREOP
DLOG7	DETERR	PKH	WSUBS
DLOG8	PCOVER	SUPH	BREAK
DLOG9	PCONCL	NEXTC	RPT
DLOG10	PEQTN		WDR
DLOG11	EFCAS	**ETERNAL FIRE SUPPORT**	CONMIS
		EFS	REPT
		EFS1	REACT
		EFSTIM	CREACT
			MINES
			FIRINT
			EFSMIN

Table 5-2, SIAF Subroutines and Their Function (Sheet 1)

TERRAIN

LOSVEG	-	Computes line-of-sight limit due to vegetation and relief
VEGCON	-	Computes vegetation concealment
MITFEA	-	Determines if a target is on a micro-relief feature
MITLOS	-	Computes line-of-sight limit due to micro-relief
MITCON	-	Computes micro-relief concealment
ELEV	-	Calculates elevation of a particular terrain coordinate
SLOPE	-	Calculates slope between two points in the AO
LINOBS	-	Determines if there is an obstacle, or vegetation, micro-relief, or soil polygons between two points
TERCON	-	Integrates terrain subroutines into one package
MICSOL	-	Determines micro-relief, vegetation, and soil type about a particular terrain coordinate

WEATHER

WETHR	-	Computes ambient light level, meteorological visibility, temperature, humidity, wind velocity, and rain/no rain verdict

TARGET

TARMOV	-	Moves targets during the insertion operation
TARGEN	-	Places targets on the map
MOVET	-	Moves targets in accordance with the scenario during non-insertion operations

Table 5-2, SIAF Subroutines and Their Function (Sheet 2)

ANCILLARY AND DATA HANDLING

MAIN	-	Provides logic to drive the SIAF model
CASEIN	-	Converts military coordinates to computer coordinates and converts all times to seconds
REPIN	-	Initializes subroutine variables to proper values at the start of a new replication
RESTART	-	Provides for model execution to start and stop at preset points

MOVEMENT

INSERT	-	Simulates an insertion operation
SEGGEN	-	Generates SIAF movement segment
TMDRVR	-	Computes time interval for driving the model if the segment length is zero
MVRATE	-	Computes nominal patrol velocity and actual velocity based upon mission and time constraints
DROUTE	-	Computes check points for dynamic movement

NAVIGATION

NAV	-	Computes patrol location CEP and target location CEP if detection(s) have occurred

Table 5-2, SIAF Subroutines and Their Function (Sheet 3)

SURVEILLANCE/DETECTION

TARGEL	-	Eliminates infeasible targets from detection calculations
AURAL	-	Determines aural detection verdict
STRACK	-	Simulates special sound effects such as truck tailgate noise
VISUAL	-	Determines visual detection verdict
DETECT	-	Integrates detection subroutines into one package

EXTERNAL FIRE SUPPORT (EFS)

EFS	-	Computes results of external fire support when EFS only mode is used
EFS1	-	Simulates the effects of external fire support in combat mode
EFSTIM	-	Computes the event times for external fire support bursts
EFCAS	-	Determines which members sustained casualities from external fire support

SUPPLY MAINTENANCE

LOGIS	-	Updates available patrol food, water, and ammunition

HUMAN MAINTENANCE

HUMAN	-	Computes required food and water depending upon work performed and computes human performance degradation due to fatigue, body water loss, and body heat storage

Table 5-2, SIAF Subroutines and Their Function (Sheet 4)

OPTIMIZATION LOGIC

- OLOGIC - Provides an optimum array of objective points for attacking maneuver unit routes for ambush or attack
- OLOG4 - Assigns the nominal attack configuration based upon the tactical situation and patrol mission
- OLOG6 - Determines whether the observed patrol configuration is linear or perimeter and - in case of linear - the axes of maximum and minimum dispersion of position
- OLOG7 - Sets an array of trial points over which to search for an optimum deployment point for the case in which the defenders are moving to within engagement range
- OLOG8 - Sets an array of trial points over which to search for an optimum deployment point for the case in which the defenders are moving and the attackers must move to within engagement range of the line of movement of the defenders
- OLOG9 - Sets an array of trial points over which to serach for an optimum deployment point for the case in which the defenders are stationary
- OLOG10 - Selects an optimum deployment point from an array of trial points set by OLOG7, 8, or 9

COMMUNICATIONS

- EXCOM - Calculates external communications statistics and updates battery supply
- IC - Integrates the fire IC subroutines and decides whether internal communications is available between maneuver units
- ICGRE - Checks and updates the maneuver leaders supply of signal grenades
- ICMSG - Selects a messenger

Table 5-2, SIAF Subroutines and Their Function (Sheet 5)

COMMUNICATIONS (cont.)

ICLOS - Determines whether line-of-sight exists between two maneuver unit leaders
ICRAD - Determines whether two maneuver units can communicate using radios
ICAUR - Determines whether a receiver can detect an aural message

COMMAND AND CONTROL

PDDS - Determines detection verdict(s) from the possible detection possibilities

Table 5-2, SIAF Subroutines and Their Function (Sheet 6)

TERRAIN (COMBAT)

DETERR - Determines whether the line of sight from the observer to the observed is obstructed by macro-relief, and if it is not, computes probabilities of cover and concealment (head to head, head to foot, foot to head, and foot to foot).

PCOVER - Computes the probabilities of no cover and of complete cover for observer-target and target-observer.

PCONCL - Computes the probabilities of no concealment and of complete concealment for observer-target and target-observer.

PEQTN - Computes the probabilities of complete obstruction of observer and target and the probabilities of no obstruction of observer and target.

DECISION LOGIC

MISGEN - Coordinates combat initialization and combat execution.

CCO - Evaluates cover, concealment, and observation of an observer's position with respect to the observed's position.

DLOGIC - Simulates engagement-avoid decision and defines General Combat.

DLOG1 - Reads detection and identification statistics and specifies two patrols--one to be a potential attacker and the other a potential defender.

DLOG2 - Determines whether a patrol is sufficiently remote from an enemy patrol to call for external fire support.

DLOG3 - Determines whether the latest possible deployment time would occur before sunrise or the earliest after sunset.

DLOG4 - Determines whether the relative movement of the two patrols would allow adequate time for the attacking patrol to move to deployment and then to deploy. Determines all reachable deployment points.

DLOG5 - Searches for the nearest admissible deployment point for the case of a moving enemy patrol where the enemy patrol's line of movement is not within engagement range of the attacking patrol.

Table 5-2, SIAF Subroutines and Their Function (Sheet 7)

DECISION LOGIC (Cont'd)

DLOG6	- Searches for the nearest admissible deployment point for the case of a moving enemy patrol where the enemy patrol's line of movement is within engagement range of the attacking patrol
DLOG7	- Tests a trial deployment point for terrain admissibility
DLOG8	- Tests a pre-deployment movement area for sufficient protectiveness
DLOG9	- Evaluates protectiveness for movement at a trial point in an array over a pre-deployment movement area
DLOG10	- Searches for the nearest admissible deployment point for the case of a stationary enemy patrol
DLOG11	- Computes the SIAF velocity vector for SIAF on either a planned route or a dynamic route for the case in which SIAF is a potential defender

FIRE CONTROL/LETHALITY

KILL	- Controls the operation of the remaining fire control/lethality subroutines
LETH	- Allocates point fire weapons, assigns area fire as appropriate, assigns hand grenades as appropriate
ARAS	- Computes the area of responsibility for each firer and computes which targets are in each area of responsibility
PKBRP	- Computes a figure of merit for alternative firing strategies
FALOC	- Computes the optimum point fire allocations for all firers in the point fire mode
NEXTC	- Computes casualty data for the next attacker and defender casualty
PTPTPK	- Computes kill probability for each firer using a rifle or machine gun
ARPTPK	- Computes kill probability for each firer using a grenade launcher
S1	- Computes the total single shot delivery error for each weapon type
PKH	- Computes the probability of kill given a hit
SUPN	- Computes individual supporession states

Table 5-2, SIAF Subroutines and Their Function (Sheet 8)

COMBAT FUNCTIONS AND C^2

CMAIN	- Provides logic to drive the combat model.
MOVPLN	- Generates dynamic route points between unit movement objective points.
MOVDRV	- Computes movement rates and movement event times.
FORMST	- Computes coordinates of individuals for various formations.
POSTURE	- Computes the posture of each individual.
FIRATE	- Computes firing rate of each individual based upon the ammunition remaining.
AMMOUP	- Updates ammunition in the magazine and total ammunition remaining for each individual.
FIREOP	- Computes the firing option of each unit based upon the current suppression state of the unit.
WSUBS	- Provides logic for weapon substitution.
BREAK	- Provides logic for breaking contact.
RPT	- Computes withdrawal points for defending unit.
WDR	- Computes withdrawal points for attacking unit.
CONMIS	- Computes a continue the mission decision for SIAF after the combat operation has been completed.
REACT	- Provides six defender reaction options after detection but before fire-fight
CREACT	- Permits attacking unit to revise its plan before attack is initiated
MINES	- Provides for a Claymore Mine ambush
FIRIHT	- Initiates fire-fight between an attacking and a defending unit
EFSMIN	- Updates the EFS event times

Table 5-3. SIAF Elevation Data Handing (Sheet 1)

ELEVATION DATA HANDLING

CONVERT	-	Produces FORTRAN - compatible tapes from Defense Mapping Agency (TOPOCOM) Digital Topographic Tapes
MAPGEN	-	Selects and/or thins terrain elevation data for the area of operation
ROTATES	-	Provides for rotation and change of interval distance between elevation points at a map area output from MAPGEN
CMREAD	-	Loads a selected section of the available map area into computer memory
REREAD	-	Condenses the input area elevations in computer memory

6.0 SAMPLE CASE

Sections 6.1 through 6.4 describe a test case which illustrates the use of the reconnaissance model while Sections 6.5 and 6.6 present a combat model test case.

As part of the SIAF program, a model verification plan was developed and a test using actual patrols was conducted. Concurrent with the test, the SIAF System Model was exercised for the purpose of simulating this test and providing data for comparison purposes. This section presents a sample case based upon the test scenario. Included is a qualitative description of the test, a description of the model input data consisting of terrain, weather, the SIAF operations plan, and the enemy situation, and a description of the outputs of the model.

6.1 QUALITATIVE DESCRIPTION OF THE TEST PROGRAM

The field test was conducted at the Hunter Liggett Military Reservation located near King City, California, a facility of the Combat Developments Command Experimentation Command headquartered at Fort Ord, California (Monterey). The test exercise was conducted in a relatively rugged and remote valley which is also a part of Los Padres National Forest. Figure 6.1 is a photograph of a map of the area of operations which represents a geographic area of approximately 17 square kilometers. The patrol mission-scenario (including an aggressor scenario) was developed by the test conductor employing inputs from the test team members. The mission was basically one of reconnaissance which consisted of surveillance of a road suspected of being an enemy supply route, by a SIAF patrol moving primarily at night along the high ground on one side of the valley. Combat was not entered or simulated and live ammunition was not carried.

As shown by Figure 6.1, the distance between the projected insertion and extraction points is approximately 6-1/4 kilometers; however, the route between checkpoints and projected patrol bases is not a straight line nor did the patrols follow a simple point-to-point route. The actual route traveled by each patrol was approximately 9 kilometers long.

Each patrol spent two days in an objective area near the center of the route. This area contained several OP's and bases among which the patrol moved. Aggressor activity existed in the area, some of which was along the roads. For experimental purposes, this area was instrumented to determine exact positions and ranges of detection between the SIAF patrols and the aggressor.

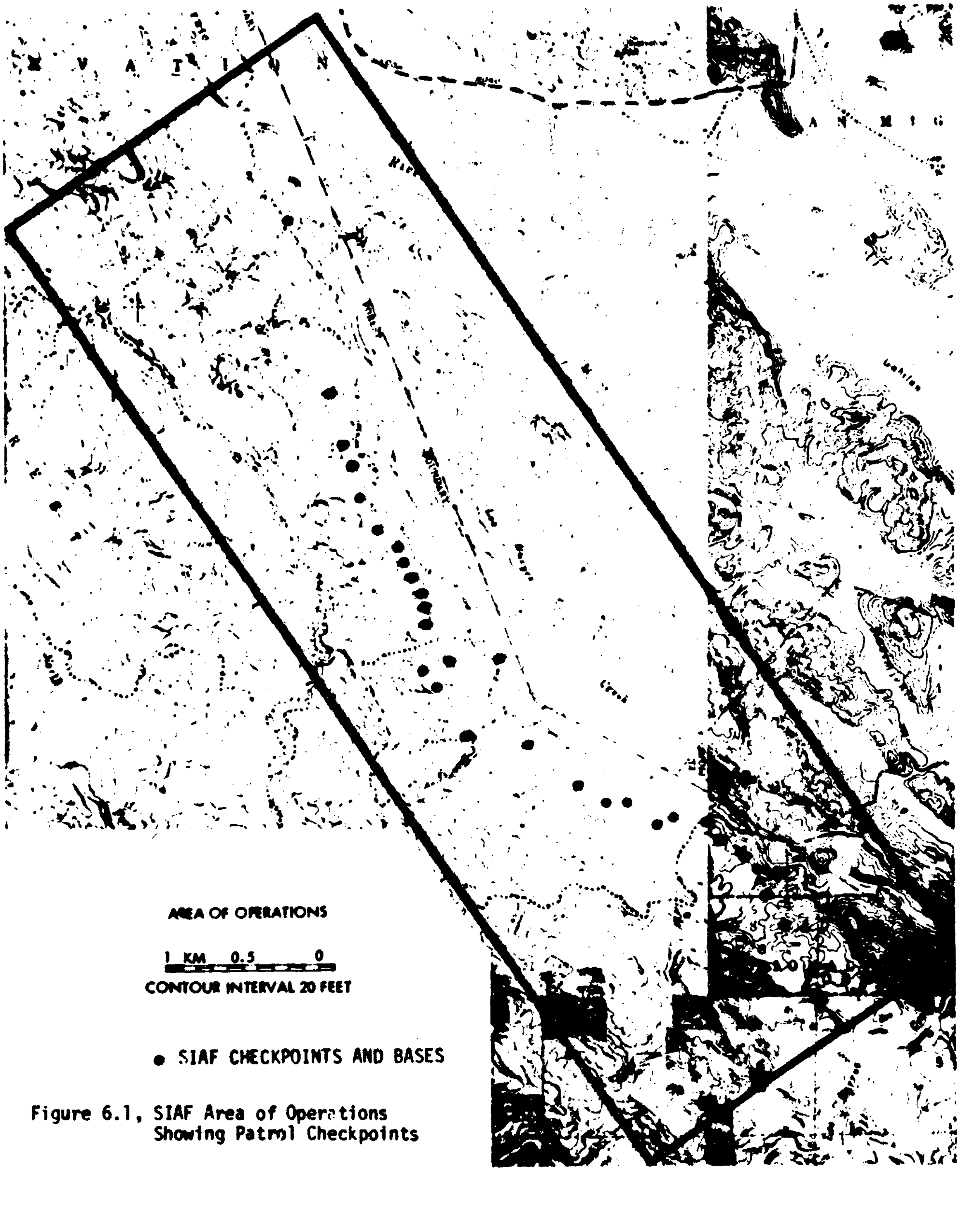


Figure 6.1, SIAF Area of Operations
Showing Patrol Checkpoints

The 5 1/2 day mission was performed by each of 20 patrol teams provided by the 3 participating services:

Army Special Forces	10 teams
U. S. Marine Corps	5 teams
U. S. Navy Seals	5 teams

Each six-man SIAF patrol team was given the same mission, checkpoints, and basing areas, and was exposed to the same aggressor scenario. Patrols moved primarily at night. During the day the patrols established bases from which they monitored the primary road or conducted related reconnaissance and surveillance activities. The sample case described herein (referenced as scenario 1) treats only the first of these patrol missions.

6.2 GENERATION OF BINARY TAPE 8

As described in Section 3.0, Binary Tape 8 is generated from card input. Because of the requirement to duplicate the test situation as closely as possible, detailed terrain and vegetation data were first gathered. This section describes that task.

As previously described in Section 2 4.1, the terrain resolution study for the Hunter Liggett area indicated a substantial increase in accuracy with 50-meter resolution as compared with that obtained for 100-meter resolution. Since the objective of the Hunter Liggett test was to validate the SIAF model, it was considered necessary to use 50-meter resolution. Since the only available digitized data were 100-meter resolution, a decision was made to input the elevation data for the area of operations shown in Figure 6.1 by hand. For this purpose, the map shown in Figure 6.1 was enlarged and a 50-meter grid was overlayed on the map. Then elevation data associated with each corner point of the grid were recorded on computer input sheets. The resulting 7,105 points took approximately two weeks to record. A namelist printout of these resulting data is shown in Figure 6.2. These data, which were used to generate Binary Tape 8, are in feet since the map used for this purpose (Reference 3) contained elevation information in these units. Data were subsequently converted to meters in the computer program.

It should be pointed out that Army digitized terrain tapes of various areas of the world exist. These tapes obviate the necessity of inputting

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 1)

FILE - ZVINP

```
$INPUT,
        [illegible]=5C,  [illegible].
 [illegible]*1,
  [illegible]*1, [illegible], 7*1, 7, 10*1,
  [illegible]*1, 2*6, 6*1, 2*7, 10*1,
  2[illegible]*1, 2*6, 6*1, 2*7, 10*1,
  2[illegible]*1, 6, 7*1, 2*7, 10*1,
  2[illegible]*1, 6, 7*1, 2*7, 10*1,
  3[illegible]*1, 3*7, 9*1,
  24*1, 2*7, 4*1, 2*3, 4*1, 6*7, 8*1,
  24*1, 2*7, 4*1, 3*3, 1, 3*5, 4*7, 7*1,
  24*1, 2*7, 4*1, 4*3, 3*5, 2*7, 9*1,
  24*1, 2*7, 4*1, 5*3, 2*5, 7, 10*1,
  24*1, 2*7, 5*1, 4*3, 2*1, 7, 10*1,
  24*1, 2*7, 6*1, 2*5, 2*1, 2*6, 10*1,
  25*1, 7, 9*1, 3*6, 10*1,
  25*1, 7, 9*1, 3*6, 3*1, 3*5, 4*1,
  35*1, 2*6, 2*1, 5*5, 4*1,
  26*1, 2*5, 6*1, 5, 1, 5*5, 5*1,
  24*1, 5*5, 7*1, 5, 1, 5*5, 5*1,
  22*1, 14*5, 1, 5*5, 6*1,
  21*1, 15*5, 1, 4*5, 7*1,
  20*1, 16*5, 1, 2*5, 9*1,
  20*1, 16*5, 1, 5, 10*1,
  19*1, 7, 16*5, 12*1,
  17*1, 3*7, 16*5, 2*1, 2*5, 6*1,
  16*1, 5*7, 6*5, 10*1, 3*5, 6*1,
  15*1, 6*7, 6*5, 4*1, 4*5, 2*1, 3*5, 8*1,
  14*1, 6*7, 2*1, 5*5, 4*1, 9*5, 8*1,
  13*1, 6*7, 3*1, 5*5, 4*1, 4*5, 1, 4*5, 8*1,
  10*1, 9*7, 4*1, 5*5, 4*1, 9*5, 8*1,
  7*1, 10*7, 6*1, 5*5, 2*1, 5*5, 1, 4*5, 8*1,
  24*1, 9*5, 2*1, 5*5, 8*1,
  26*1, 6*5, 3*1, 5*5, 8*1,
  19*1, 2*7, 7*1, 3*5, 4*1, 5*5, 8*1,
  19*1, 3*7, 5*1, 2*7, 6*1, 5*5, 8*1,
  18*1, 4*7, 4*1, 7, 3, 7, 6*1, 4*5, 9*1,
  16*1, 4*7, 3*1, 2*7, 1, 5, 1, 5, 3*1, 6*5, 8*1,
  18*1, 4*7, 4*1, 2*7, 1, 5, 2*3, 5, 2*1, 5*5, 9*1,
  18*1, 3*7, 4*1, 7, 1, 2*5, 2*3, 5, 2*1, 5*5, 9*1,
  18*1, 2*7, 3, 2*7, 1, 5, 7, 2*1, 5, 3, 5, 3*1, 5*5, 9*1,
  19*1,  *7, 4, 7, 1, 5, 7, 5, 5, 7*1, 2*5, 1, 2*5, 9*1,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 2)

```
[illegible]*1, [illegible], [illegible], 1, 7, [illegible], 4*1, [illegible], 1, 2*5, [illegible]*1,
11*1, [illegible], [illegible], 7, 5, 1, 7, [illegible], [illegible], [illegible], 1, 2*5, [illegible]*1,
[illegible]*1, 5*5, [illegible], 2*7, [illegible], [illegible], [illegible], 2*1, [illegible], 9*1,
7*1, 6*5, 7*1, 5, 7, 1, 3*5, 1, [illegible], 3*1, 5*5, 10*1,
[illegible]*1, 7*5, 7*1, 2*7, 2*1, 5, 1, [illegible], 3*1, 5*5, 13*1,
6*1, 6*5, 7*1, 2*5, 7, 1, 5, 2*1, 4*5, 4*1, 2*5, 12*1,
6*1, 6*5, 5*1, 3*5, [illegible], 7, 1, 5, 1, 4*5, 19*1,
[illegible]*1, 7*5, 4*1, 3*5, [illegible], 1, 5, [illegible], 1, 4*5, 19*1,
[illegible]*1, 5*5, 4*1, 2*5, 1, 7, 3*5, 1, 3*5, 20*1,
5*1, 5*5, 3*1, 2*5, 1, 7, 1, 4*5, 22*1,
1[illegible]*1, 3*5, 2*1, 3*5, [illegible], 1, 5*5, 21*1,
12*1, 4*5, 1, 1, 5, 5, 1, 1, 5*5, 21*1,
5*1, 5*6, 2*1, 3*5, 1, 2*3, 2*6, 5, 1, 6*5, 20*1,
4*1, 7*6, 2*1, 3, 3*3, 5, 9, 6,  1, 4*5, 1, 3*5, 19*1,
3*1, 8*6, 5*1, 3, 3*1, 4*5, 1, 3*5, 20*1,
2*1, 14*6, 4*1, 3*5, 1, 4*5, 4*1, 4*5, 12*1,
6*1, 10*6, 4*1, 5, 1, 2*5, 1, 2*5, 21*1,
6*1, 10*6, 2*1, 5, 1, 5, 1, 5, 1, 2*5, 1, 3*5, 18*1,
6*1, 6*6, 3*1, 6, 6*1, 5, 1, 5, 1, 5, 5*1, 2*5, 14*1,
6*1, 6*6, 4*1, 6, 1, 5, 1, 2*5, 4*1, 2*5, 3*1, 3*5, 14*1,
6*1, 6, 1, 6, 1, 6, 1, 4*1, 5, 2*1, 2*1, 3*5, 2*1, 3*5, 14*1,
6*1, 1, 4*9, 5,  1, 5, 1, 3, 6, 5, 1, 5, 1, 5, 5, 1, 2*1, 3*5, 15*1,
6*1, 3*9, 2*1, 6, 5*1, 5, 1, 2*5, 1, 5, 2*1, 4*5, 16*1,
6*1, 6*1, 1, 5, 1, 5, 2*1, 5, 1, 4*5, 2*1, 3*5, 2*1, 2*5, 15*1,
6*1, 1, 4*9, 1, 1, 3, 1, 6, 1, 5, 1, 2*5, 1, 2*5, 4*1, 5, 2*1, 3*5, 14*1,
6*1, 4*9, 1, 6, 5, 1, 2*6, 3*5, 1, 5, 1, 2*5, 7*1, 3*5, 14*1,
6*1, 9, 4*7, 6, 1, 5, 1, 5, 6, 5, 1, 2*5, 1, 5, 3*1, 5, 4*1, 2*5, 15*1,
7*1, 3*3, 2*1, 9, 2*1, 2*5, 1, 5, 1, 5, 4*1, 2*5, 21*1,
6*1, 4*3, 3*9, 1, 2*5, 1, 5, 3*1, 5, 2*1, 2*5, 22*1,
6*1, 2*3, 4*9, 4*1, 5, 1, 2*5, 1, 5, 1, 5, 5, 23*1,
6*1, 2*9, 1, 9, 4*1, 7, 5, 6*1, 2*5, 7*1, 5, 16*1,
6*1, 8*1, 2*7, 4*1, 5, 1, 5, 1, 7*1, 5, 16*1,
14*1, 2*7, 1, 5, 6*1, 1, 5*1, 2*5, 16*1,
14*1, 3*7, 1, 3, 3*1, 5, 1, 5, 5*1, 2*5, 16*1,
14*1, 3*7, 5, 3*1, 5, 2*1, 5, 5*1, 2*5, 16*1,
15*1, 2*7, 5, 1, 5, 3*1, 5, 5, 5*1, 2*5, 16*1,
        10*1, 2*7, 4*1, 7, 5*1, 2*5, 6*1, 2*5, 16*1,
10*1, 2*7, 2*7, 16*1, 2*5, 16*1,
11*1, 7, 2*7, 3*1, 2*5, 11*1, 2*5, 16*1,
12*1, 3*7, 1, 3*5, 2*1, 2*5, 7*1, 2*5, 16*1,
12*1, 4*1, 2*5, 3*1, 2*5, 5*1, 4*5, 16*1,
12*1, 4*6, 4*5, 1, 2*5, 6, 4*1, 4*5, 16*1,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 3)

```
[illegible] 17*1,
[illegible] 3*5, [illegible]
[illegible] 17*1,
[illegible] 17*1,
[illegible] 17*1,
[illegible] 17*1,
[illegible] 2*5, [illegible] 3*5, 17*1,
[illegible] 3*5, 17*1,
[illegible] 17*1,
13*1, 6*5, 3*1, [illegible] 4*1, [illegible] 17*1,
13*1, 9, 2*5, 7*1, 5, 4*1, 3*5, 17*1,
12*1, 4*9, 7*1, [illegible] 3*5, 17*1,
12*1, 4*9, 1, 5, [illegible] 3*1, [illegible] 17*1,
12*1, 3*9, 1, 2*5, [illegible] 4*1, 2*5, 17*1,
[illegible] 17*1,
[illegible] 5*1, [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] 16*1,
[illegible] 3*5, [illegible]
[illegible] 5*1, [illegible]
[illegible] 3*5, [illegible]
[illegible] 15*1,
[illegible]
[illegible] 14*1,
[illegible] 2*5, [illegible] 14*1,
20*1, 5*1, 6, 3*10, 2*1, 4*5, 14*1,
[illegible] 4*1, [illegible] 14*1,
20*1, [illegible] 14*1,
20*1, 1, 4*6, 10, 3*5, 1, 5, 2*1, [illegible] 14*1,
20*1, 3*6, 2*1, 2*5, 1, 3*5, 14*1,
20*1, 4*6, 3*1, 3, 2*5, 2*1, 5, 15*1,
20*1, 3*6, 2*3, 4*3, 15*1,
25*1, 5, 4*7, 18*1,
24*1, 6*9, 1, 5, 1, 2*6, 13*1,
23*1, 7*9, 1, 5, 1, 2*6, 13*1,
23*1, 4*9, 3*10, 1, 5, 1, 6, 14*1,
23*1, 3*9, 4*10, 1, 5, 16*1,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 4)

```
 24*1, 2*3, 2*10, 2*9, 1, 3, 9, [illegible]*1, [illegible], 1[illegible]*1,
 24*1, 2*3, 2*10, [illegible], 1, 3, [illegible], [illegible]*1, [illegible], 1[illegible]*1,
 24*1, 2*3, 2*10, [illegible], 1, 3, 9, 1, [illegible], 1[illegible]*1,
 24*1, [illegible], 2*1, 9, 1, [illegible], 11*1,
 24*1, 6*3, 1, 2*3, 15*1,
 24*1, 6*3, 1, 2*3, 15*1,
 25*1, 4*3, 9, 1, 2*3, 15*1,
 25*1, 5*9, 15*1,
 26*1, 4*9, 15*1,
 26*1, 4*9, 15*1,
 26*1, 4*9, 15*1,
 240*1,
$
$INPUTZ
 Z=1300, 1350, 1450, 1590, 1650, 1670, 1630, 1600, 1550, 1720,
  1710, [illegible], 1580, [illegible], 1440, 1420, 1420, 1410, 1400, 1520,
  1590, [illegible], 1500, [illegible], [illegible], [illegible], 1350, 1270, 1200, 1230,
  1270, 1220, 1200, [illegible], 1230, 1230, 1205, 1210, 1200, 1220,
  [illegible], [illegible], 1350, [illegible], 1400, 1400, 1300, 1300, 1240,
  [illegible], 1400, [illegible], [illegible], [illegible], [illegible], [illegible], 1740, 1700, 1705,
  [illegible], [illegible], 1510, [illegible], [illegible], [illegible], [illegible], 1480, 1550, 1640,
  [illegible], [illegible], [illegible], [illegible], 1450, [illegible], 1570, 1280, 1270, 1310,
  [illegible], [illegible], 1220, [illegible], [illegible], [illegible], [illegible], 1210, 1220, 1250,
  [illegible], 1320, 1340, [illegible], 1440, 1340, 1280, 1180, 1140,
  [illegible], 1400, 1520, [illegible], 1750, 1740, 1700, 1740, 1710, 1700,
  1590, 1570, 1530, [illegible], [illegible], [illegible], 1440, 1480, 1550, 1630,
  1500, 1540, 1450, [illegible], 1430, 1410, 1370, 1280, 1270, 1320,
  1300, 1220, 1200, [illegible], [illegible], 1210, 1200, 1220, 1240, 1260,
  1240, 1320, 1330, 1400, 1420, 1340, 1260, 1200, 1150,
  1300, 1440, 1560, 1700, 1520, 1760, 1700, 1570, 1560, 1630,
  1570, 1530, 1510, 1530, 1460, 1440, 1540, 1610, 1650, 1600,
  1550, 1490, 1470, 1470, 1430, 1430, 1330, 1320, 1330, 1300,
  1220, 1210, 1220, 1200, 1210, 1220, 1240, 1240, 1260, 1280,
  1320, 1400, 1500, 1440, 1340, 1240, 1170, 1120, 1100,
  1350, 1450, 1550, 1650, 1800, 1760, 1700, 1680, 1630, 1640,
  1610, 1580, 1560, 1540, 1520, 1440, 1500, 1560, 1630, 1640,
  1600, 1540, 1500, 1470, 1430, 1420, 1380, 1370, 1340, 1300,
  1260, 1210, 1240, 1230, 1220, 1220, 1220, 1230, 1270, 1300,
  1360, 1460, 1540, 1440, 1340, 1200, 1160, 1120, 1100,
  1300, 1460, 1560, 1700, 1600, 1760, 1720, 1680, 1650, 1650,
  1660, 1630, 1600, 1590, 1520, 1500, 1500, 1540, 1600, 1630,
  1570, 1500, 1470, 1460, 1450, 1440, 1420, 1360, 1360, 1340,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 5)

```
[illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], 1340,
[illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], 1120, 1130,
[illegible], [illegible], 1500, [illegible], [illegible], [illegible], [illegible], 1540, 1540, 1600,
[illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], 1510, 1570, 1600,
1560, [illegible], 1430, 2*1410,         [illegible], [illegible], 1570, 1340, 1300,
1240, 1300, 1250, 4*1240,                                   1260, 1300, 1360,
1430, 1440, 1400, [illegible], 1320, [illegible], [illegible], 1120, 1100,
1400, 1500, 1650, [illegible], [illegible], [illegible], [illegible], 1720, 1740, 1730,
1720, 1680, 1650, [illegible], 1540, [illegible], 1460, 1520, 1590, 1580,
1550, 1500, 1430, [illegible], [illegible], [illegible], [illegible], 1320, 1300, 1270,
1270, 1250, 1245, 4*1240,                                   1270, 1330, 1400,
1430, 1420, 1360, 2*1300,         1230, 1120, 2*1100,
1500, 1560, 1600, 1500, 1800, 1780, 1730, 1670, 1660, 1680,
1670, 1680, 1630, [illegible], [illegible], [illegible], 1430, 1530, 1540, 1570,
1530, 1500, 1420, 1370, 1350, 1340, 1330, 1290, 1240, 1240,
1250, 4*1240,                            1245, 1240, 1290, 1340, 1420,
1460, 1390, 1310, 1230, 1230, 1130, 3*1100,
1550, 1630, 1740, 1540, 1810, 1700, 1710, 1660, 1650, 1660,
1640, 1620, 1600, 1590, 1550, 1430, 1420, 1500, 1520, 1560,
1500, 1450, 1400, 1350, 1330, 1320, 1310, 1260, 2*1240,
2*1240,     3*1250,            1245,  1240,       1270, 1330, 1430,
1420, 1340, 1260, 1210, 1170, 1160, 2*1100,       1130,
1620, 1700, 1770, 1530, 1800, 1750, 1540, 1670, 1660, 1670,
1620, 1530, 1560, 1550, 1510, 1470, 1410, 1490, 1530, 1560,
1500, 1430, 1380, 1360, 1320, 1330, 1310, 1260, 2*1250,
2*1240,       1250, 1260, 1250, 1230, 1240, 1270, 1300, 1360,
1300, 1300, 1200, 1180, 1150, 1130, 2*1100,       1130,
1780, 1740, 1700, 1740, 1760, 1750, 1720, 1670, 1670, 1640,
1610, 1620, 1560, 1520, 1500, 1450, 1400, 1470, 1520, 1520,
1490, 1430, 1400, 1375, 1350, 1330, 1300, 1250, 2*1250,
1255, 1260, 1270, 2*1260,         1255, 1260, 1260, 1250, 1300,
1300, 1240, 1130, 1150, 1100, 1120, 2*1100,       1120,
1600, 1720, 1690, 1710, 1790, 1770, 1710, 1650, 1620, 1600,
1530, 1600, 1550, 1470, 1450, 1420, 1400, 1450, 1520, 1500,
1440, 1410, 1400, 1350, 1300, 1340, 1300, 1260, 2*1240,
1245, 1260, 1255, 1260, 1250, 1240, 1220, 1240, 1210, 1290,
1300, 1200, 1140, 1140, 1170, 1130, 2*1100,       1140,
1700, 1620, 1600, 1580, 1560, 1590, 1570, 1550, 1490, 1500,
1520, 1540, 1500, 1430, 1430, 1380, 1400, 1460, 1520, 1500,
1450, 1400, 1360, 1340, 1360, 1320, 1270, 1260, 1240, 1250,
1240, 1250, 1245, 1240, 1220, 1230, 1210, 1220, 1180, 1260,
1290, 1190, 1140, 1140, 1110, 1120, 2*1100,       1180,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 6)

```
1700, [illegible], [illegible], [illegible], [illegible], [illegible],     2*1440,     1440,
1440, [illegible], 1450, 1410, [illegible], [illegible], [illegible], 1440, 1500, 1450,
1440, 1400, 1380, [illegible], 1430, [illegible], [illegible], 1250, 1240, 1245,
[illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], 1150, 2*1200,
1150, 1150, 3*1100,                 1130, 1150, 1220,
1730, [illegible], 1740, 1700, 1590, 1600, 1530, 1550, 1560, 1500,
1470, [illegible], 2*1420,          1350, 1380, 1350, 1440, 1400, 1400,
1450, 1400, 1420, 1420, 1350, 1370, 1250, 1240, 3*1220,
1230, 1220, 1260, 1250, 1230, 1240, 1190, 1140, 5*1100,
1120, 1150, 1160, 1230, 1270,
1700, 1750, 1730, 1650, 1600, 1590, 1540, 1600, 1560, 1530,
1520, 1470, 1460, 1460, 1350, 1340, 1370, 1430, 1440, 1450,
1460, 1440, 1400, 1350, 1320, 1370, 1270, 1260, 1205, 1200,
1215, 1220, 1230, 1240, 1240, 1230, 1220, 1190, 1140, 5*1100,
1140, 1160, 1170, 1190, 1250,
1720, 1700, 1740, 1700, 1600, 1560, 1600, 1620, 1590, 1530,
1510, 1500, 1520, 1450, 1390, 1330, 1350, 1420, 1470, 1460,
1430, 1400, 1450, 1400, 1400, 1300, 1300, 1250, 1200, 1200,
1210, 1220, 1220, 1240, 2*1220,     1210, 1170, 6*1100,
1120, 1150, 1175, 1220, 1260,
1600, 1600, 1750, 1700, 1580, 1520, 1600, 1620, 1590, 1540,
1550, 1540, 1490, 1450, 1330, 1320, 1350, 1430, 1460, 1430,
1380, 1340, 1320, 1340, 1320, 1280, 1270, 1220, 1200, 2*1200,
1205, 1215, 1220, 1230, 1200, 1140, 1130, 1100, 1120, 1130,
2*1120,     1100, 1130, 1150, 1160, 1240, 1260,
1740, 1600, 1660, 1640, 1620, 1600, 1600, 1600, 1580, 1600,
1540, 1495, 1425, 1380, 1330, 1360, 1400, 1400, 1390, 1360,
1300, 1300, 1300, 1265, 1260, 1200, 1210, 1220, 1215, 1210,
1200, 1205, 1200, 1200, 1200, 1200, 1140, 1100, 1100, 1110,
1160, 1160, 1150, 1110, 1130, 1160, 1180, 1240, 1240,
1900, 1850, 1800, 1750, 1700, 1650, 1600, 1630, 1620, 1575,
1600, 1540, 1490, 1430, 1370, 1300, 1360, 1420, 1440, 1380,
1320, 1300, 1320, 1300, 1270, 1250, 1210, 1135, 1180, 1185,
1190, 1200, 1200, 1200, 1200, 1220, 1200, 1140, 1100, 1110,
1160, 1160, 1160, 1110, 1130, 1160, 1180, 1240, 1250,
1740, 1680, 1660, 1640, 1620, 1600, 1580, 1620, 3*1610,
1540, 1480, 1470, 1420, 1320, 1280, 1340, 1400, 1380,
1300, 1260, 1265, 1240, 1250, 1220, 6*1180,      1200,
1200, 1190, 1170, 1150, 1120, 1120, 1120,
1230, 1240, 1200, 1140, 1150, 1130, 1200, 2*1240,
1800, 1750, 1700, 1650, 1600, 1650, 1600, 1640, 1650, 1630,
1580, 1540, 1560, 1500, 1420, 1360, 1340, 1300, 1300, 1320,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 7)

```
1200, 1230, 1210, 1200, 1190, 1180, 1180, 1180, 1180, 1160,
1170, 1170, 1150, 1170, 1150, 1110, 4*1100,
1160, 1210, 1170, 1150, 1170, 1190, 1250, 1300, 1200,
1800, 1750, 1700, 1600, 1650, 1640, 1650, 1790, 1810, 1640,
1560, 1560, 1550, 1500, 1440, 1420, 1360, 1330, 1240, 1230,
1220, 1240, 1200, 1200, 1200, 1200, 1195, 1190, 1185, 1180,
1180, 1160, 1150, 1130, 1160, 1150, 1120, 1100, 1100, 1150,
1250, 1240, 1160, 1180, 1200, 1210, 1300, 1300, 1260,
1800, 1700, 1600, 1620, 1630, 1620, 1650, 1700, 1710, 1620,
1560, 1560, 1580, 1500, 1460, 1460, 1410, 1350, 1320, 1260,
1260, 1200, 1240, 1250, 1210, 1200, 1200, 1200, 1200, 1190,
1185, 1185, 2* 1180, 1140, 2* 1100, 1120, 1170, 1210,
1200, 1180, 1190, 1200, 1220, 1260, 1360, 1310, 1240,
1700, 1600, 1680, 1700, 1710, 1680, 1700, 1750, 1680, 1620,
1550, 1550, 1560, 1520, 1500, 1460, 1430, 1400, 1340, 1280,
1200, 1270, 1280, 1240, 1200, 1200, 1200, 1200, 1200, 1200,
1195, 1190, 1185, 1180, 1130, 1100, 1140, 1160, 1180, 1180,
1200, 1200, 1200, 1220, 1300, 1340, 1340, 1310, 1240,
1600, 1650, 1700, 1740, 1740, 1740, 1730, 1720, 1680, 1620,
1590, 1535, 1510, 1470, 1460, 1420, 1400, 1360, 1310, 1260,
1220, 1300, 1250, 1210, 1200, 1200, 1200, 1200, 1200, 1195,
1190, 1190, 1185, 1180, 1140, 1100, 1130, 1160, 1180, 1160,
1200, 1200, 1200, 1260, 1310, 1380, 1350, 1300, 1240,
1600, 1650, 1710, 1780, 1780, 1730, 1760, 1700, 1680, 1620,
1600, 1580, 1530, 1450, 1420, 1400, 1360, 1320, 1260, 1220,
1280, 1300, 1220, 1210, 1200, 1200, 1200, 1200, 1200, 1200,
2*1180, 1170, 1160, 1150, 1110, 1120, 1140, 1140, 1160,
1230, 1210, 1210, 1250, 1350, 1400, 1300, 1250, 1200,
1710, 1720, 1700, 1740, 1780, 1800, 1780, 1720, 1690, 1630,
1580, 1560, 1500, 1470, 1430, 1420, 1370, 1330, 1320, 1270,
1280, 1230, 1200, 1200, 1200, 1200, 1200, 1195, 1180, 1180,
2*1180, 1170, 1160, 1150,1130, 1100, 1160, 1200, 1170,
1190, 1200, 1240, 1230, 1360, 1400, 1330, 1260, 1200,
1760, 1760, 1730, 1800, 1800, 1840, 1740, 1720, 1700, 1640,
1570, 1530, 1500, 1470, 1430, 1420, 1360, 1390, 1340, 1280,
1250, 1230, 1220, 1180, 1170, 1200, 1200, 1200, 1200, 1200,
1190, 1180, 1170, 1170, 1160, 1125, 1100, 1170, 1220, 1180,
      1200, 1230, 1270, 1320, 1400, 1400, 1350, 1300, 1200,
1800, 1800, 1800, 1840, 1860, 1800, 1720, 1700, 1650, 1600,
1560, 1520, 1520, 1460, 1420, 1400, 1400, 1400, 1320, 1280,
1230, 1220, 1210, 1180, 1160, 1180, 1180, 1180, 1190, 1200,
1190, 1180, 1170, 1150, 1130, 1110, 1110, 1170, 1190, 1190,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation(V) Data (Sheet 8)

```
1230, 1240, 1300, 1340, 1400, 1380, 1320, 1300, 1230,
1540, 1520, 1820, 1820, 1830, 1780, 1750, 1710, 1660, 1660,
1500, 1520, 1460, 1440, 1430, 1420, 1400, 1360, 1290, 1240,
1210, 1220, 1190, 1180, 1150, 1150, 1170, 1170, 1180, 1180,
1190, 1180, 1160, 1140, 1125, 1130, 1120, 1140, 1160, 1200,
1220, 1260, 1300, 1400, 1420, 1400, 1340, 1280, 1210,
1830, 1810, 1750, 1770, 1740, 1760, 1760, 1700, 1660, 1620,
1580, 1510, 1460, 1430, 1420, 1400, 1410, 1360, 1260, 1230,
1230, 1210, 1170, 1160, 1150, 1160, 1160, 1160, 1170, 1180,
3*1180,           1150, 1120, 1100, 1120, 2*1180,       1210,
1260, 1300, 1360, 1420, 1420, 1400, 1340, 1260, 1210,
1790, 1730, 1700, 1750, 1690, 1740, 1720, 1650, 1610, 1590,
1530, 1500, 1470, 1420, 1410, 1430, 1420, 1340, 1280, 1230,
1210, 1200, 1180, 1150, 1140, 1170, 1160, 1150, 1160, 1170,
2*1180,     1170, 1150, 1120, 1100, 1150, 2*1200,       1220,
1300, 1350, 1400, 1400, 1380, 1400, 1360, 1280, 1240,
1740, 1670, 1650, 1700, 1660, 1670, 1650, 1620, 1560, 1520,
1480, 1460, 1460, 1460, 1470, 1470, 1400, 1330, 1260, 1240,
1200, 1190, 1180, 1150, 1140, 1160, 1160, 1150, 1150, 1150,
1160, 1170, 1160, 1140, 1120, 1110, 1170, 1220, 1210, 1220,
1300, 1360, 1360, 1360, 1370, 1370, 1320, 1300, 1220,
1700, 1650, 1650, 1620, 1630, 1610, 1540, 1520, 1500, 1480,
1490, 1490, 1490, 1450, 1450, 1450, 1400, 1330, 1240, 1210,
3*1200,           1180, 1140, 4*1140,                   1150,
1150, 1150, 1160, 1140, 1120, 1110, 1200, 1250, 1260, 1260,
1340, 1340, 1360, 1360, 1360, 1360, 1340, 1320, 1240,
1680, 1710, 1720, 1640, 1610, 1510, 1540, 1540, 1540, 1510,
1510, 1510, 1500, 1470, 1470, 1490, 1350, 1330, 1230, 1190,
3*1200,           1175, 1150, 4*1140,                   1145,
1140, 1140, 1150, 1140, 1120, 1100, 1200, 1260, 1300, 1360,
1380, 1360, 1360, 1360, 1360, 1360, 1400, 1320, 1240,
1740, 1800, 1720, 1690, 1640, 1600, 1620, 1620, 1580, 1530,
1520, 1540, 1500, 1490, 1470, 1420, 1340, 1280, 1200, 1190,
3*1180,           1200, 1150, 1140, 1160, 1170, 1170, 1140,
2*1140,     1150, 1140, 1120, 1160, 1200, 1300, 1380, 1380,
1360, 1360, 1360, 1340, 1340, 1340, 1340, 1300, 1220,
1830, 1840, 1800, 1740, 1700, 1660, 1660, 1640, 1600, 1550,
1520, 1520, 1520, 1510, 1500, 1420, 1350, 1320, 1230, 1220,
1200, 2*1160,     1180, 1150, 1140, 2*1180,       1160, 1150,
1120, 1130, 1140, 1120, 1120, 1240, 1300, 1360, 1400, 1380,
1360, 1380, 1360, 1360, 1380, 1380, 1340, 1300, 1200,
1850, 1900, 1860, 1840, 1800, 1740, 1720, 1700, 1620, 1570,
```

Figure 6.2. Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 9)

```
1530, 1540, 1520, 1480, 1460, 1390, 1320, 1260, 1210, 1200,
1160, 1150, 1160, 1140, 1140, 1150, 1180, 1140, 1130, 4*1120,
                  1130, 1140, 1250, 1350, 1400, 1480, 1380,
1360, 1330, 1340, 1340, 1320, 1330, 1320, 1260, 1200,
1860, 1900, 1920, 1880, 1830, 1780, 1730, 1710, 1640, 1580,
1520, 1530, 1480, 1450, 1420, 1360, 1310, 1260, 1200, 1180,
1170, 1190, 1220, 1200, 1140, 1160, 1150, 1140, 1130, 1120,
1150, 1150, 1140, 1140, 1170, 1210, 1300, 1400, 1400, 1390,
1380, 1360, 1360, 1360, 1330, 1310, 1300, 1260, 1220,
1920, 1920, 1920, 1880, 1830, 1730, 1710, 1680, 1630, 1570,
1520, 1480, 1450, 1400, 1370, 1330, 1280, 1220, 1180, 1180,
1170, 1180, 1160, 1150, 1160, 1200, 1150, 1140, 1140, 1150,
1160, 1140, 1140, 1160, 1180, 1230, 1330, 1400, 1380, 1380,
1380, 1400, 1360, 1340, 1320, 1310, 1260, 1240, 1240,
1960, 1940, 1920, 1910, 1870, 1810, 1750, 1700, 1640, 1600,
1580, 1520, 1450, 1410, 1360, 1300, 1260, 1230, 1220, 1200,
2*1200,     1180, 1160, 1160, 1200, 1150, 1140, 1140, 1150,
1160, 1160, 1160, 1170, 1180, 1200, 1240, 1340, 1380, 1380,
1360, 1400, 1400, 1400, 1300, 1290, 1290, 1270, 1260,
1980, 1920, 1880, 1850, 1800, 1760, 1690, 1620, 1560, 1530,
1490, 1430, 1400, 1340, 1260, 1215, 1200, 1250, 1250, 1250,
1270, 1180, 1180, 1160, 1160, 1170, 1140, 1140, 1140, 1140,
1140, 1160, 1180, 1200, 1240, 1360, 1380, 1390, 1400, 1400,
1400, 1400, 1320, 1280, 1280, 1260, 1260, 1260, 1260,
1980, 1920, 1870, 1815, 1770, 1760, 1730, 1630, 1560, 1510,
1440, 1400, 1360, 1300, 1230, 1210, 1200, 1250, 1250, 1250,
1190, 1160, 1160, 1170, 1160, 1160, 1140, 1140, 1140, 1150,
1140, 1160, 1180, 1230, 1230, 1250, 1400, 1420, 1400, 1400,
1420, 1400, 1380, 1340, 1290, 1240, 1200, 1200, 1240,
1930, 1880, 1840, 1790, 1740, 1680, 1660, 1620, 1550, 1490,
1430, 1350, 1320, 1270, 1230, 1220, 1210, 1250, 1250, 1250,
1160, 1180, 1160, 1160, 1160, 1140, 1140, 1140, 1140, 1150,
1160, 1170, 1190, 1230, 1260, 1330, 1420, 1420, 1400, 1400,
1400, 1400, 1400, 1360, 1300, 1300, 1230, 1180, 1200,
1900, 1850, 1810, 1750, 1700, 1650, 1620, 1570, 1540, 1480,
1400, 1340, 1300, 1240, 1240, 1220, 1200, 1230, 1250, 1160,
1170, 1200, 1190, 1160, 1160, 1140, 1150, 1140, 1140, 1140,
1160, 1170, 1180, 1200, 1280, 1350, 1440, 1440, 1420, 1400,
1400, 1400, 1400, 1400, 1320, 1300, 1220, 1180, 1180,
1900, 1830, 1780, 1730, 1680, 1620, 1580, 1540, 1470, 1430,
1360, 1320, 1270, 1260, 1200, 1200, 1200, 1170, 1180, 1180,
1200, 1200, 1180, 1160, 1150, 1140, 1140, 1140, 1140, 1140,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 10)

```
1140, 1160, 1180, 1210, 1300, 1350, 1450, 1450, 1400, 1380,
1380, 1400, 1400, 1360, 1300, 1220, 1170, 1150, 1150,
1880, 1840, 1800, 1720, 1670, 1620, 1600, 1520, 1460, 1400,
1350, 1280, 1230, 1230, 1210, 1190, 1180, 1180, 1190, 1200,
1200, 1190, 1160, 1150, 1150, 1160, 1140, 1140, 1140, 1140,
1150, 1160, 1190, 1220, 1300, 1360, 1420, 1440, 1410, 1370,
1360, 1400, 1400, 1400, 1400, 1300, 1300, 1280, 1260,
1860, 1780, 1760, 1720, 1680, 1630, 1550, 1510, 1450, 1400,
1360, 1320, 1300, 1200, 1200, 1200, 1200, 1180, 1220, 1220,
1180, 1180, 1160, 1150, 1140, 1140, 1140, 1140, 1140, 1140,
1140, 1160, 1180, 1220, 1300, 1360, 1400, 1400, 1380, 1360,
1360, 1380, 1400, 1400, 1400, 1300, 1260, 1220, 1270,
1840, 1780, 1720, 1670, 1650, 1600, 1540, 1480, 1440, 1380,
1390, 1360, 1320, 1260, 1200, 1200, 1200, 1240, 1280, 1260,
1210, 1130, 1160, 1160, 1140, 1140, 1140, 1140, 1140, 1140,
1140, 1160, 1180, 1200, 1300, 1350, 1380, 1360, 1360, 1340,
1350, 1360, 1400, 1400, 1400, 1320, 1300, 1220, 1170,
1780, 1780, 1720, 1640, 1600, 1570, 1530, 1500, 1440, 1410,
1400, 1360, 1340, 1270, 1200, 1200, 1180, 1200, 1220, 1230,
1180, 1200, 1160, 1140, 1160, 1160, 1160, 1160, 1150, 1140,
1140, 1160, 1180, 1200, 1300, 1340, 1390, 1380, 1340, 1320,
1340, 1360, 1380, 1400, 1380, 1300, 1250, 1200, 1160,
1710, 1780, 1730, 1650, 1600, 1570, 1520, 1490, 1430, 1400,
1380, 1360, 1320, 1280, 1240, 1200, 1200, 1240, 1220, 1240,
1210, 1160, 1160, 1140, 1160, 1160, 1140, 1140, 1140, 1140,
1140, 1140, 1180, 1220, 1280, 1350, 1380, 1360, 1340, 1320,
1350, 1370, 1400, 1400, 1400, 1310, 1240, 1200, 1140,
1680, 1720, 1740, 1660, 1600, 1560, 1500, 1460, 1400, 1390,
1400, 1400, 1370, 1340, 1290, 1230, 1200, 1240, 1240, 1240,
1220, 1160, 1160, 1170, 1160, 1160, 1160, 1160, 1160, 1160,
1160, 1160, 1200, 1230, 1300, 1320, 1350, 1360, 1320, 1300,
1320, 1340, 1360, 1400, 1360, 1300, 1230, 1200, 1120,
1720, 1700, 1660, 1640, 1600, 1540, 1480, 1440, 1400, 1420,
1440, 1400, 1380, 1370, 1290, 1220, 1200, 1230, 1260, 1260,
1220, 1170, 1190, 1200, 1160, 1160, 1160, 1160, 1160, 1160,
1160, 1180, 1200, 1240, 1280, 1320, 1360, 1340, 1300, 1300,
1320, 1340, 1360, 1400, 1300, 1250, 1180, 1150, 1100,
1680, 1700, 1660, 1600, 1560, 1500, 1450, 1430, 1420, 1440,
1460, 1420, 1370, 1350, 1290, 1240, 1200, 1240, 1260, 1240,
1220, 1210, 1180, 1200, 1180, 1180, 1160, 1160, 1160, 1160,
1170, 1180, 1200, 1230, 1280, 1340, 1340, 1320, 1300, 1310,
1320, 1340, 1360, 1400, 1300, 1240, 1180, 1140, 1100,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 11)

1650,	1650,	1620,	[illegible]	1560,	1570,	1470,	1450,	1440,	1440,
1450,	1440,	1380,	1360,	1230,	1240,	1220,	1250,	1260,	1220,
1200,	1200,	1160,	1130,	1180,	1130,	1160,	1170,	1180,	1140,
1150,	1150,	1200,	1240,	1260,	1300,	1270,	1250,	1260,	1300,
1320,	1330,	1340,	1360,	1320,	1250,	1130,	1160,	1100,	
1520,	1610,	1560,	1510,	1500,	1460,	1400,	1410,	1430,	1420,
1440,	1420,	1360,	1320,	1230,	1260,	1240,	1260,	1260,	1230,
1200,	1200,	1160,	1200,	1190,	1230,	1170,	1170,	1180,	1180,
1180,	1160,	1160,	1200,	1220,	1230,	1210,	1240,	1250,	1280,
1280,	1260,	1260,	1220,	1300,	1250,	1170,	1100,	1100,	
1600,	1550,	1500,	1450,	1400,	1360,	1360,	1350,	1360,	1360,
1380,	1360,	1340,	1280,	1280,	1240,	1240,	1250,	1260,	1230,
1200,	1200,	1210,	1200,	1200,	1190,	1175,	1170,	1165,	1160,
1155,	1170,	1160,	1230,	1220,	1200,	1240,	1280,	1260,	1270,
1320,	1300,	1340,	1310,	1260,	1150,	1130,	1080,	1080,	
1500,	1450,	1400,	1400,	1400,	1450,	1380,	1420,	1400,	1350,
1300,	1300,	1310,	1280,	1260,	1260,	1260,	1240,	1230,	1240,
1250,	1210,	1220,	1210,	1200,	1150,	1180,	1170,	1160,	1160,
1160,	1175,	1160,	1170,	1180,	1210,	1250,	1300,	1300,	1280,
1300,	1360,	1330,	1300,	1200,	1150,	1100,	1080,	1120,	
1500,	1450,	1400,	1440,	1500,	1470,	1410,	1460,	1460,	1440,
1390,	1320,	1300,	1260,	1270,	1300,	1250,	1240,	1240,	1240,
1250,	1220,	1200,	1180,	1200,	1185,	1175,	1180,	1160,	1160,
1160,	1185,	1200,	1210,	1200,	1250,	1260,	1280,	1310,	1300,
1300,	1340,	1300,	1280,	1200,	1130,	1080,	1090,	1120,	
1560,	1540,	1560,	1510,	1550,	1550,	1470,	1440,	1510,	1460,
1400,	1370,	1320,	1290,	1280,	1270,	1240,	1230,	1220,	1220,
1260,	1220,	1205,	1180,	1190,	1175,	1170,	1160,	1160,	1175,
1175,	1160,	1200,	1230,	1200,	1260,	1300,	1310,	1315,	1325,
1300,	1330,	1320,	1260,	1190,	1140,	1080,	1060,	1120,	
1550,	1580,	1570,	1580,	1610,	1600,	1530,	1470,	1520,	1470,
1440,	1380,	1320,	1280,	1260,	1260,	1240,	1240,	1220,	1210,
1220,	1220,	1200,	1150,	1175,	1170,	1160,	1160,	1160,	1180,
1200,	1200,	1240,	1260,	1220,	1240,	1280,	1320,	1340,	1340,
1300,	1320,	1320,	1260,	1210,	1170,	1110,	1130,	1120,	
1640,	1660,	1650,	1660,	1640,	1630,	1580,	1520,	1530,	1500,
1430,	1370,	1320,	1280,	1280,	1270,	1240,	1240,	1220,	1200,
1200,	1210,	1210,	1180,	3*1160,			1170,	1180,	1200,
1210,	1270,	1320,	1300,	1300,	1240,	1320,	1320,	1360,	1350,
1300,	1320,	1330,	1260,	1210,	1160,	1130,	1115,	1120,	
1600,	1670,	1740,	1770,	1720,	1660,	1620,	1600,	1540,	1470,
1380,	1320,	1300,	1280,	1280,	1280,	1260,	1250,	1220,	1200,

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 12)

```
1200, 1150, 1150, 1150, 1170, 1165, 1160, 1160, 1180, 1200,
1210, 1240, 1400, 1400, 1320, 1250, 1340, 1320, 1330, 1360,
1320, 1340, 1330, 1300, 1210, 1170, 1150, 1120, 1130,
1620, 1660, 1710, 1720, 1740, 1710, 1690, 1630, 1540, 1460,
1400, 1390, 1320, 1290, 1260, 1270, 1250, 1240, 1220, 1200,
1220, 1200, 1210, 1200, 1190, 1170, 1160, 1160, 1185, 1200,
1225, 1300, 1400, 1390, 1330, 1320, 1340, 1350, 1375, 1350,
1340, 1330, 1300, 1270, 1240, 1190, 1160, 1140, 1110,
1640, 1710, 1760, 1920, 1760, 1740, 1700, 1610, 1550, 1460,
1440, 1400, 1330, 1260, 1270, 1240, 1250, 1220, 1215, 1210,
1230, 1240, 1240, 1210, 1190, 1150, 1170, 1160, 1195, 1195,
1220, 1300, 1400, 1330, 1350, 1330, 1370, 1380, 1400, 1380,
1360, 1380, 1360, 1340, 1230, 1210, 1170, 1140, 1150,
1600, 1700, 1780, 1620, 1730, 1740, 1650, 1600, 1540,
1510, 1450, 1380, 1330, 2*1300,     1260, 1260, 1230, 1220, 1240,
1260, 1240, 1220, 1200, 1200, 1190, 1175, 1160, 1180, 1195,
1225, 1300, 1400, 1400, 1350, 1350, 1380, 1430, 1430, 1390,
1380, 1380, 1340, 1310, 1250, 1200, 1150, 1140, 1170,
1620, 1680, 1740, 1820, 1760, 1700, 1620, 1570, 1520, 1470,
1400, 1380, 1350, 1330, 1230, 1285, 1255, 1230, 1220, 1250,
1265, 1230, 1215, 1210, 1205, 2*1200,     2*1180,     1200,
1240, 1330, 1430, 1410, 1360, 1380, 1450, 1460, 1440, 1405,
1370, 1370, 1320, 1280, 1220, 1190, 1140, 1150, 1200,
1620, 1710, 1780, 1830, 1780, 1720, 1640, 1580, 1525, 1500,
1490, 1420, 1360, 1320, 1310, 1370, 1250, 1230, 1230, 1260,
1260, 1220, 1220, 1215, 1210, 1205, 1190, 1180, 1200, 1215,
1250, 1340, 1420, 1350, 1340, 1380, 1450, 1510, 1450, 1390,
1325, 1340, 1300, 1340, 1275, 1225, 1160, 1180, 1240,
1600, 1650, 1750, 1840, 1840, 1740, 1660, 1640, 1600, 1570,
1510, 1360, 1350, 1330, 2*1320,     1270, 2*1240,     1260,
1240, 1230, 1220, 1215, 1215, 1220, 1200, 1180, 1205, 1220,
1245, 1320, 1340, 1290, 1340, 1380, 1450, 1520, 1430, 1360,
1310, 1325, 1280, 1330, 1280, 1220, 1160, 1200, 1240,
1600, 1620, 1720, 1790, 1850, 1770, 1730, 1660, 1580, 1510,
1450, 1420, 1365, 1330, 1320, 1300, 2*1260,     1265, 1250,
1240, 1230, 1225, 2*1220,     1240, 1200, 1180, 1200, 1215,
1235, 1300, 1325, 1280, 1340, 1410, 1490, 1520, 1400, 1350,
1300, 1310, 1340, 1310, 1250, 1210, 1160, 1200, 1260,
1700, 1630, 1670, 1760, 1350, 1770, 1690, 1640, 1580, 1500,
1460, 1430, 1390, 1350, 1320, 1290, 1270, 1250, 1260, 1250,
1240, 1230, 1230, 1225, 1220, 2*1200,     1240, 1200, 1215,
1230, 1260, 1260, 1300, 1375, 1425, 1500, 1490, 1400, 1340,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 13)

```
1300, 1260, 1220, 1240, 1220, 1200, 1160, 1220, 1220,
1800, 1700, 1660, 1750, 1650, 1780, 1730, 1660, 1600, 2*1550,
1500, 1440, 1370, 1340, 1250, 1260, 1270, 1280, 1260,
1240, 1250, 1240, 1225, 3*1200,             1230, 1230, 1240,
1220, 1250, 1300, 1330, 1360, 1420, 1450, 1440, 1400, 1340,
1315, 1290, 1230, 1210, 1200, 1160, 1170, 1195, 1180,
1750, 1740, 1660, 1750, 1550, 1510, 1700, 1660, 1640, 1620,
1560, 1500, 1400, 1350, 1330, 1320, 1300, 1280, 1290, 1275,
1220, 1230, 1235, 3*1200,             1220, 1230, 1250, 1205,
1240, 1265, 1340, 2*1380,       1395, 1420, 1440, 1390, 1330,
1300, 1270, 1220, 1180, 1160, 1130, 3*1100,
1800, 2*1700,       1760, 1360, 1820, 1740, 1700, 1660, 1600,
1520, 1470, 1450, 1400, 1350, 1340, 1310, 2*1300,       1275,
1240, 1250, 1225, 1200, 1205, 1200, 1245, 1240, 1260, 1250,
1240, 1290, 1340, 1370, 1410, 1440, 1420, 1420, 1380, 1310,
1270, 1230, 1170, 1130, 1120, 4*1100,
1800, 1780, 1720, 1800, 1860, 1830, 1700, 1760, 1720, 1600,
1560, 1520, 1460, 1390, 1400, 1370, 1300, 1270, 1265, 1260,
1240, 1220, 1230, 1220, 1225, 1200, 1230, 1270, 1270, 1290,
1240, 1270, 2*1300,       1360, 1410, 1360, 1380, 1360, 1280,
1220, 1170, 1140, 1120, 3*1100,             1120, 1140,
1900, 1850, 2*1800,       1900, 1820, 1750, 1720, 1670, 1620,
1560, 1510, 1440, 1400, 1430, 1380, 1330, 1295, 1280, 1260,
3*1240,             1235, 1245, 1210, 1250, 1290, 1310, 1360,
1280, 1270, 2*1300,       1330, 1350, 1330, 1340, 1340, 1290,
2*1200,       1150, 1160, 1110, 1100, 1120, 2*1150,
1900, 1800, 1740, 1820, 2*1900,       1820, 1750, 1700, 1640,
1600, 1540, 1460, 1420, 1460, 1420, 1360, 1300, 2*1260,
3*1240,             1250, 1270, 1220, 1260, 1280, 1350, 1390,
1300, 1280, 1320, 2*1300,       1340, 1300, 1320, 1300, 1240,
1210, 1210, 1190, 1180, 1150, 1100, 1130, 1180, 1160,
1900, 2000, 3*1900,             1920, 1820, 1740, 1660, 1620,
1580, 1550, 1510, 1470, 1480, 1430, 1390, 1330, 1280, 1270,
2*1250,       1260, 1290, 1300, 1230, 1240, 1300, 1370, 1410,
1340, 1280, 1300, 1300, 1290, 1300, 1290, 1320, 1300, 1250,
1240, 3*1220,             1130, 1130, 1160, 1200, 1190,
2000, 1950, 2000, 2000, 1950, 1900, 1850, 1750, 1680, 1680,
1660, 1600, 1540, 1500, 1480, 1450, 1400, 1370, 2*1300,
1260, 1270, 1270, 1290, 1300, 1240, 1260, 1320, 1380, 1380,
1310, 1260, 5*1280,                         1300, 1330, 1320,
1300, 2*1260,       1240, 1190, 1120, 1140, 2*1100,
4*2100,                         2050, 1950, 1850, 1800, 1760, 1720,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 14)

```
1700, 1600, 1560, 1520, 1450, 1400, 1430, 1380, 1340, 1295,
1270, 1285, 1250, 1270, 1260, 1240, 1300, 1370, 1400, 1350,
1300, 2*1300,       1320, 1250, 2*1280,       1330, 1360, 1410,
1380, 1350, 1320, 1250, 1220, 1120, 1160, 1180, 1200,
2200, 2*2300,       2250, 2100, 1960, 1900, 1900, 1840, 1780,
1700, 1650, 1600, 1570, 1520, 1450, 1400, 1400, 1360, 1310,
1290, 1290, 1300, 1260, 1250, 1270, 1320, 1390, 1410, 1340,
1260, 1300, 1340, 1340, 1300, 1280, 1290, 1300, 1350, 1420,
1420, 1400, 1360, 1320, 1240, 1120, 1160, 2*1200,
2100, 2150, 2200, 2150, 2050, 2000, 1960, 1950, 1900, 1800,
1750, 1700, 1700, 1630, 1540, 1500, 1460, 1410, 1360, 1340,
1325, 1300, 1290, 1250, 1240, 1270, 1330, 1400, 1440, 1370,
1290, 1300, 1350, 1360, 1310, 1280, 1300, 1320, 1350, 1420,
1460, 1430, 1380, 1330, 1240, 1140, 1140, 1210, 1230,
2100, 2140, 2160, 2210, 2150, 2100, 2020, 2000, 1950, 1900,
1850, 1800, 1740, 1640, 1540, 1500, 1460, 1440, 1390, 1350,
1330, 1310, 1270, 1260, 1240, 1270, 1330, 1420, 1450, 1370,
1290, 1290, 1350, 1380, 1350, 1290, 1320, 1360, 1350, 1400,
1480, 1450, 1400, 1350, 1230, 1180, 1120, 1200, 1250,
2100, 2150, 2200, 2220, 2150, 2100, 2100, 2000, 2000, 1900,
1820, 1750, 1670, 1620, 1550, 1520, 1500, 1400, 1370, 1350,
1330, 1320, 1300, 1270, 1240, 1270, 1330, 1400, 1460, 1370,
1320, 1260, 1330, 1390, 1360, 1300, 1320, 1370, 2*1400,
1460, 1500, 1460, 1400, 1300, 1220, 1160, 1120, 1210,
2050, 2100, 2150, 2200, 2230, 2200, 2150, 2120, 2060, 1960,
1670, 1780, 1730, 1640, 1580, 1570, 1550, 1460, 1390, 1340,
1330, 1340, 1310, 1310, 1240, 1270, 1330, 1400, 1480, 1400,
1350, 1260, 1320, 1370, 1370, 1300, 1350, 1380, 1430, 1470,
1450, 1500, 1500, 1450, 1380, 1250, 1160, 1120, 1180,
2050, 2100, 2150, 3*2200,             2180, 2150, 2100, 2000,
1900, 1800, 1700, 1670, 1630, 1610, 1600, 1510, 1420, 1360,
1335, 1330, 1335, 1320, 1260, 1250, 1320, 1400, 1500, 1430,
1350, 1280, 1300, 1350, 1370, 1350, 1380, 1400, 1420, 1490,
1480, 1490, 2*1500,       1400, 1300, 1160, 1160, 1200,
2050, 3*2100,             3*2150,             2120, 2100, 1980,
1900, 1850, 1800, 1740, 1630, 1550, 1560, 1520, 1430, 1360,
1340, 1340, 1330, 1310, 1260, 1260, 1320, 1400, 1500, 1440,
1360, 1290, 1290, 1350, 1400, 1370, 1390, 1440, 1440, 1520,
1480, 1450, 1520, 1500, 1450, 1280, 1140, 1150, 1220,
2080, 2040, 2040, 2080, 2120, 2100, 2120, 2100, 2060, 2000,
1950, 1890, 1810, 1700, 1600, 1550, 1490, 1460, 1400, 1380,
1350, 1300, 1280, 1280, 1270, 1260, 1330, 1410, 1480, 1450,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 15)

```
1330, 1250, 1320, 1370, 1430, 1410, 1420, 1450, 1460, 1520,
1510, 1420, 1460, 1480, 1340, 1250, 1130, 1160, 1230,
2060, 2000, 2020, 2050, 2080, 2100, 2030, 2*2100,       2040,
1970, 1900, 1750, 1710, 1650, 1550, 1480, 1450, 1420, 1395,
1340, 1320, 1330, 1320, 1290, 1260, 1340, 1420, 1480, 1460,
1360, 1300, 1340, 1400, 1460, 1450, 1480, 1470, 1500, 1510,
1520, 1410, 1400, 1440, 1340, 1220, 1120, 1160, 1220,
2050, 2000, 2020, 2070, 2160, 2100, 2020, 2030, 2070, 2000,
1950, 1900, 1600, 1700, 1630, 1560, 1530, 1460, 1420, 1390,
1350, 1330, 1330, 1350, 1300, 1250, 1340, 1400, 1480, 1460,
1360, 1300, 1360, 1420, 1500, 1500, 1520, 1480, 1540, 1530,
1500, 1400, 1320, 1350, 1300, 1200, 1120, 1140, 1200,
2020, 2000, 2010, 2050, 2120, 2100, 2000, 2030, 2050, 1980,
1930, 1850, 1750, 1670, 1640, 1610, 1550, 1480, 1420, 1400,
1390, 1350, 1360, 1370, 1330, 1260, 1330, 1400, 1500, 1460,
1370, 1300, 1340, 1420, 1500, 1510, 1540, 1510, 1540, 1520,
1460, 1390, 1320, 1260, 1230, 1180, 1120, 1140, 1220,
2040, 2000, 2030, 2020, 2080, 2050, 2010, 2060, 2050, 1970,
1900, 1820, 1740, 1660, 1630, 1600, 1540, 1480, 1430, 1390,
1380, 1380, 1370, 1380, 1300, 1260, 1330, 1420, 1460, 1450,
1370, 1300, 1340, 1420, 1470, 1460, 1500, 1500, 1500, 1510,
1450, 1380, 1300, 1250, 1200, 1130, 1120, 1150, 1200,
2040, 1970, 1960, 1980, 2020, 1960, 2000, 2080, 2000, 1930,
1850, 1760, 1700, 1690, 1660, 1620, 1550, 1500, 1440, 1400,
1390, 1360, 1380, 1390, 1310, 1250, 1350, 1420, 1470, 1420,
1360, 1320, 1340, 1330, 1420, 1440, 1460, 1500, 1450, 1430,
1390, 1380, 1290, 1220, 1170, 1120, 1130, 1150, 1200,
2040, 1960, 1960, 1980, 1960, 2*2000,       2080, 1990, 1930,
1870, 1820, 1800, 1730, 1660, 1600, 1570, 1500, 1450, 1410,
1400, 1380, 1390, 1380, 1320, 1270, 1350, 1420, 1480, 1420,
1380, 1330, 1320, 1390, 1440, 1470, 2*1500,       1450, 1400,
1350, 1320, 1300, 1250, 1200, 1130, 1140, 1160, 1160,
1970, 1960, 1940, 1940, 1960, 2000, 2010, 2070, 2080, 1980,
1920, 1880, 1790, 1720, 1680, 1650, 1600, 1520, 1440, 1430,
1410, 1400, 1410, 1350, 1320, 1270, 1330, 1420, 2*1500,
1410, 1340, 1320, 1380, 1420, 1440, 2*1500,       1460, 1420,
1400, 1370, 1340, 1290, 1220, 1160, 1160, 1220, 1220,
1940, 1960, 1960, 1980, 2000, 1980, 2020, 2060, 2100, 2050,
2000, 1920, 1840, 1780, 1730, 1660, 1620, 1500, 1450, 1425,
1420, 1425, 1420, 1380, 1310, 1280, 1350, 1410, 1490, 1500,
1430, 1360, 1330, 1370, 1430, 1490, 1480, 1490, 1480, 1420,
1380, 1320, 1300, 1280, 1220, 1120, 1200, 1280, 1300,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 16)

```
3*2000,                 1960, 2020, 2030, 2030, 2040, 2110, 2040,
1970, 1900, 1870, 1820, 1700, 1610, 1540, 1500, 1460, 1440,
1450, 1450, 1360, 1340, 1230, 1250, 1340, 1400, 1420, 1400,
1420, 1360, 1340, 1360, 1450, 1460, 1530, 1500, 1480, 1420,
1370, 1300, 1260, 1220, 1170, 1140, 1210, 1270, 1330,
2000, 2060, 2040, 2010, 2000, 2040, 2010, 2080, 2160, 2060,
1980, 1900, 1830, 1760, 1670, 1640, 1630, 1540, 1480, 1460,
1500, 1460, 1380, 1330, 1300, 2*1300,      1340, 1380, 1380,
1400, 1360, 1340, 1380, 1480, 1530, 1520, 1480, 1470, 1410,
1350, 1250, 1250, 1210, 1140, 1170, 1210, 1270, 1320,
2040, 2060, 2060, 2020, 2000, 2050, 2020, 2100, 2140, 2070,
2000, 1920, 1850, 1800, 1750, 1580, 1610, 1550, 1530, 1480,
1500, 1450, 1380, 1330, 1330, 1350, 1280, 1290, 1330, 1340,
1400, 1350, 1330, 1370, 1470, 1520, 1540, 1500, 1440, 1410,
1370, 1300, 1260, 1220, 1150, 1170, 1230, 1270, 1320,
2100, 2060, 2080, 2050, 2010, 2070, 2050, 2070, 2160, 2100,
2030, 1930, 1860, 1800, 1740, 1660, 1560, 1520, 1500, 1450,
1420, 1390, 1350, 1320, 1360, 1380, 1320, 2*1300,      1340,
1400, 1360, 1340, 1380, 1480, 1510, 1560, 1510, 1450, 1400,
1350, 1300, 1260, 1210, 1150, 1140, 1180, 1230, 1280,
2060, 2100, 2110, 2050, 2010, 2050, 2100, 2050, 2130, 2100,
1990, 1930, 1860, 1790, 1690, 1640, 1570, 1520, 1450, 1440,
1400, 1360, 1360, 1340, 1380, 1420, 1380, 2*1300,      1380,
1420, 1360, 1340, 1400, 1500, 1530, 1550, 1550, 1520, 1420,
1350, 1300, 1250, 1200, 1160, 1140, 1140, 1180, 1230,
2100, 2120, 2130, 2050, 2030, 2030, 2090, 2070, 2100, 2120,
2000, 1930, 1870, 1800, 1730, 1650, 1580, 1540, 1510, 1520,
1450, 1400, 1400, 1380, 2*1400,      1350, 1300, 1340, 1400,
1440, 1380, 1350, 1400, 1500, 1580, 1600, 1600, 1500, 1400,
1320, 1270, 1220, 1200, 1150, 2*1150,      1140, 1200,
2150, 2120, 2120, 2080, 2050, 2050, 2070, 2100, 2100, 2120,
2040, 1960, 1900, 1800, 1730, 1660, 1590, 1560, 1570, 1540,
1470, 1430, 1450, 1420, 1370, 1320, 1360, 1310, 1340, 1400,
1490, 1400, 1350, 1400, 1500, 1500, 1600, 1600, 1520, 1440,
1350, 1320, 1260, 1210, 1190, 1190, 1180, 1140, 1160,
2160, 2140, 2160, 2120, 2070, 2080, 2050, 2100, 2100, 2120,
2070, 1960, 1900, 1800, 1740, 1680, 1600, 1540, 1540, 1560,
1500, 1420, 1420, 1410, 1360, 1360, 1340, 1320, 1350, 1420,
1500, 1450, 1360, 1380, 1450, 1500, 1570, 1600, 1520, 1460,
1400, 1360, 1300, 1270, 1230, 1230, 1170, 1140, 1180,
2160, 2170, 2160, 2140, 2110, 2080, 2060, 2060, 2100, 2130,
2070, 1970, 1900, 1800, 1730, 1680, 1600, 1540, 1500, 1520,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 17)

```
1490, 1420, 1400, 1380, 1370, 1360, 1340, 1340, 1360, 1420,
1500, 1460, 1360, 1300, 1430, 1490, 1570, 1560, 1500, 1430,
1370, 1350, 1320, 1300, 1300, 1220, 1120, 1160, 1180,
2080, 2130, 2140, 2160, 2163, 2120, 2370, 2080, 2090, 2130,
2020, 1950, 1880, 1770, 1670, 1640, 1600, 1550, 1500, 1460,
1435, 1410, 1370, 1363, 1390, 1360, 1340, 1340, 1550, 1400,
1500, 1450, 1360, 1550, 1440, 1500, 1600, 1560, 1480, 1420,
1420, 1390, 1340, 1230, 1230, 1160, 1150, 2*1200,
2080, 2100, 2140, 2150, 2200, 2120, 2100, 2120, 2120, 2120,
2000, 1900, 1800, 1750, 1600, 1530, 1530, 2*1500,       1450,
1420, 2*1400,       2*1440,       1360, 1350, 1360, 1360, 1380,
1460, 1460, 1380, 1380, 1440, 1500, 1600, 1580, 1500, 1440,
1430, 1400, 1340, 1300, 1180, 1140, 1170, 1220, 1200,
2080, 2100, 2120, 2140, 2180, 2140, 2120, 2160, 2170, 2100,
2000, 1900, 1800, 1700, 1650, 1600, 1590, 1550, 1480, 1430,
1420, 1430, 1430, 1430, 1440, 1360, 1370, 1360, 1360, 1370,
1430, 1430, 1390, 1580, 1410, 1470, 1580, 1580, 1500, 1400,
1370, 1340, 1300, 1240, 1180, 1120, 1180, 1240, 1260,
2020, 2030, 2060, 3*2100,             2110, 2160, 2170, 2070,
1970, 1870, 1780, 1710, 1680, 1640, 1540, 1620, 1520, 1470,
1450, 1420, 1400, 1393, 1370, 1360, 1390, 1400, 1370, 1370,
1430, 1460, 1400, 1380, 1400, 1440, 1540, 1580, 1500, 1400,
1340, 1320, 1300, 1260, 1220, 1140, 1170, 1230, 1300,
2080, 2100, 2*2080,       2*2100, 2110, 2120, 2130, 2100, 2000,
1900, 1820, 1760, 1700, 1700, 1680, 1640, 1540, 1500, 1460,
1420, 1380, 1360, 1380, 1350, 1400, 1410, 1380, 1370, 1440,
1500, 1410, 1380, 1390, 1430, 1500, 1600, 1500, 1400,
1330, 1260, 1280, 1260, 1180, 1140, 1160, 1200, 1250,
2020, 2050, 2100, 2130, 2130, 2120, 2100, 2110, 2140, 2000,
2020, 1920, 1840, 1760, 1770, 1760, 1720, 1660, 1570, 1540,
1500, 1420, 1380, 1400, 1410, 2*1420,       1410, 1380, 1370,
1440, 1520, 1440, 1400, 1400, 1370, 1390, 1470, 1500, 1400,
1320, 1260, 1240, 1200, 1160, 1150, 1140, 1180, 1220,
2060, 2060, 2100, 2130, 2130, 2120, 2110, 2120, 2130, 2070,
2000, 1900, 1840, 1820, 1800, 1760, 1720, 1650, 1560, 1560,
1500, 2*1400,       1420, 2*1440,       1430, 1420, 1370, 1380,
1440, 1500, 1450, 1410, 1400, 1430, 1490, 1550, 1500, 1400,
1300, 1250, 1200, 1200, 1170, 1150, 1140, 1160, 1190,
2100, 2140, 2160, 2200, 2180, 2130, 2110, 2120, 2140, 2060,
1980, 1920, 1670, 1830, 2*1800,       1700, 1600, 1500, 1540,
1500, 1400, 1420, 1440, 1460, 1480, 1460, 1420, 1380, 1350,
1400, 1500, 1460, 1430, 1410, 1420, 1480, 1520, 1500, 1380,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 18)

```
1300, 1250, 1260, 1220, 1190, 1150, 1140, 1160, 1180,
2100, 2150, 2200, 2240, 2130, 2*2140,       2120, 2080, 2020,
1980, 1920, 1900, 1830, 1840, 1750, 1670, 1600, 1530, 1470,
1440, 1420, 1430, 1400, 1500, 1520, 1500, 1450, 1330, 1340,
1370, 1450, 1500, 1450, 1410, 1420, 1460, 1530, 1480, 1380,
1350, 1330, 1280, 1220, 1180, 1160, 1150, 1150, 1160,
2130, 2150, 2160, 2240, 2230, 2160, 2140, 2120, 2060, 2000,
1950, 1920, 1940, 1900, 1760, 1710, 1620, 1580, 1520, 1460,
1500, 1480, 1400, 1500, 1540, 1550, 1510, 1460, 1390, 1340,
1350, 1400, 1480, 1460, 1420, 1420, 1450, 1500, 1500, 1430,
1400, 1350, 1320, 1260, 2*1200,       1160, 1160, 1150,
2150, 4*2200,                   2160, 2120, 2080, 2060, 2010,
1960, 1970, 1940, 1850, 1780, 1740, 1700, 1600, 1540, 1500,
1550, 1540, 1530, 1540, 1580, 1560, 1500, 1430, 1380, 1330,
1340, 1370, 1440, 1480, 1440, 1420, 1440, 1490, 1520, 1440,
1420, 1400, 1360, 1300, 1240, 1230, 1220, 1170, 1150,
2190, 2220, 2240, 2200, 2160, 3*2120,             2070, 2010,
2010, 2010, 1970, 1820, 1900, 1740, 1680, 1600, 1530, 1570,
1620, 1600, 1580, 1580, 1530, 1520, 1500, 1440, 1370, 1330,
1328, 1340, 1410, 1470, 1440, 2*1440,       1475, 1500, 1460,
1480, 1460, 1420, 1340, 1300, 1280, 1260, 1220, 1170,
2200, 2150, 2200, 2150, 2125, 2100, 2060, 2060, 2050, 2000,
2050, 2020, 1950, 1800, 1750, 1680, 1620, 1600, 1610, 1650,
1680, 1610, 1575, 1540, 1480, 1460, 1440, 1380, 1350, 1340,
1300, 1320, 1400, 1480, 1460, 1460, 1450, 1480, 1540, 1480,
1440, 1430, 1410, 2*1400,       1350, 1300, 1250, 1190,
2100, 2120, 2*2100,       2160, 2240, 2220, 2150, 2080, 2040,
2040, 1920, 1880, 1480, 1830, 1750, 3*1650,             1700,
1660, 1580, 1560, 1540, 1510, 1420, 2*1400,       1360, 1290,
1290, 1320, 1390, 1480, 3*1480,             1530, 1600, 1530,
1500, 1440, 1450, 1440, 1400, 1300, 1280, 1230, 1200,
2050, 2*2050,       2070, 2140, 2200, 2260, 2200, 2120, 2080,
2020, 1920, 1830, 1780, 1800, 1700, 1650, 1680, 1660, 1640,
1600, 1550, 1500, 4*1450,                   1440, 1410, 1350, 1280,
1300, 1370, 1460, 1520, 1560, 1530, 1590, 1610, 1550,
1480, 1480, 1500, 1420, 1350, 1320, 1290, 2*1250,
3*2000,             2040, 2090, 2160, 2220, 2180, 2100, 2030,
1980, 1870, 1820, 1720, 1700, 1640, 1630, 1650, 1600, 1570,
1460, 1470, 1500, 1570, 1540, 1480, 1510, 1480, 1420, 1360,
1280, 1320, 1400, 1470, 1530, 1580, 1610, 1620, 1620, 1560,
1520, 1500, 1500, 1450, 1420, 1370, 1300, 1290, 1250,
3*2000,             2040, 2080, 2150, 2200, 2150, 2050, 1950,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 19)

```
1700, 1650, 1790, 1700, 1620, [illegible], 1580, 1560, 2*1580,
2*1530,       1640, 1620, 1590, [illegible], 1550, 1430, 1430, 1350,
1265, 1290, 1380, 1440, 1500, 1500, 1600, 1620, 2*1600,
1560, 1540, 1510, 1450, 1380, 1340, 2*1300,       1200,
3*2120,             2150, 2100, 2170, 2220, 2140, 2050, 1980,
1380, 1810, 1770, 1680, 1630, 1600, 1620, 1600, 1630, 1660,
4*1660,                   1640, 2*1600,       1520, 1410, 1330,
1275, 1260, 1340, 1420, 1450, 1540, 1560, 1530, 1450, 1550,
2*1550,       1500, 1420, 1340, 1270, 1260, 1240, 1170,
3*2150,             2*2100,       2200, 2240, 2140, 2040, 1960,
1880, 1820, 1770, 1750, 1650, 1620, 1640, 1660, 1680, 1720,
2*1720,       1740, 1720, 1680, 1630, 1580, 1510, 1420, 1340,
1280, 1250, 1330, 1380, 1380, 1460, 1500, 1400, 1480, 1550,
1480, 1520, 1450, 1380, 1320, 1260, 1200, 1180, 1160,
2*2150,       2100, 2150, 2160, 2260, 2220, 2100, 2040, 1960,
1890, 1840, 1810, 1770, 1680, 1620, 1690, 1700, 1730, 1750,
3*1800,             1750, 1680, 1600, 1550, 1490, 1400, 1340,
1280, 1240, 2*1300,       1350, 1430, 1400, 1440, 1470, 1420,
1440, 1460, 1400, 1330, 1230, 1240, 1180, 1160, 1140,
2*2100,       2140, 2200, 2230, 2260, 2220, 2100, 2020, 1960,
1940, 1870, 1800, 1770, 1720, 1680, 1700, 1760, 1780, 1800,
1820, 1840, 1815, 1753, 1670, 1600, 1520, 1460, 1400, 1330,
1300, 1240, 1240, 1290, 1360, 1420, 1380, 1300, 1300, 1370,
2*1400,       1330, 1260, 1240, 1220, 1200, 1160, 1140,
3*2140,             2220, 2*2260,       2180, 2100, 2020, 1970,
1980, 1900, 1860, 1820, 1810, 1780, 1700, 1790, 2*1840,
1880, 1840, 1800, 1720, 1600, 1570, 1520, 1470, 1400, 1340,
1290, 1260, 1240, 1290, 2*1320,       1350, 1280, 1300, 1330,
1340, 1340, 1320, 2*1260,       1230, 1190, 1160, 1140,
3*2160,             2210, 2240, 2260, 2160, 2060, 2000, 1960,
1900, 1880, 1850, 1830, 1810, 1740, 1780, 1840, 1900, 1900, 1870,
1820, 1770, 1700, 1640, 1620, 1540, 1460, 1380, 1330, 1295,
1260, 1220, 1270, 1300, 1240, 1260, 1240, 2*1260,
1280, 3*1300,             1240, 1180, 1160, 1170, 1170,
4*2200,                   2260, 2200, 2160, 2050, 1980, 1940,
1940, 1900, 1840, 3*1800,             1860, 1900, 1940, 1900,
2*1800,       1760, 1690, 1580, 1500, 1440, 1400, 1360, 1300,
1280, 1265, 1240, 4*1200,                   3*1220,
1260, 3*1300,             1200, 1180, 1160, 2*1170,
4*2240,                   2280, 2220, 2100, 2040, 2000, 2000,
2000, 1950, 1860, 1860, 1920, 2*1900,       1960, 1940, 1880,
1760, 1460, 2*1700,       1600, 1530, 1450, 1400, 1380, 1340,
```

Figure 6.2, Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 20)

```
1300, 1295, 1280, 1250, 1240, 1220, 3*1200,                 1220,
1230, 1240, 1250, 1270, 1180, 3*1160,                   1160,
5*2200,                       2240, 2140, 2060, 2*2080,
2030, 1900, 2*1900,      2*1920,      2000, 1970, 1900, 1800,
1750, 1600, 1600, 1560, 1550, 1520, 1440, 1400, 1360, 1340,
1305, 1290, 1300, 1260, 1250, 2*1240,      3*1200,
3*1200,            1180, 1160, 4*1160,
2150, 3*2100,            2200, 2250, 2150, 2*2100,      2150,
2050, 1970, 1930, 1960, 3*2020,            1980, 1920, 1840,
1600, 1650, 1610, 1550, 1500, 1460, 1420, 1380, 1360, 1320,
1300, 1275, 1275, 1300, 1280, 1260, 4*1200,
3*1180,            5*1160,                        1180,
2*2100,      2*2200,      2*2300,      2250, 2180, 2*2160,
2060, 2000, 1970, 1980, 2000, 2080, 2030, 1950, 1900, 1850,
1600, 1700, 1640, 1560, 1500, 1460, 1410, 1360, 1320, 1310,
1270, 1260, 1270, 1340, 1300, 1240, 4*1200,
3*1220,            1200, 3*1180,            2*1160,
2120, 2150, 2200, 2250, 2*2300,      2150, 3*2150,
2100, 2050, 2*2000,      2*2050,      2000, 1900, 1830, 1760,
1700, 1650, 1630, 1560, 2*1500,      1420, 1390, 1340, 1295,
1290, 1260, 1260, 1250, 1300, 1250, 1200, 1220, 1220, 1230,
1250, 2*1280,      1200, 3*1180,            2*1160,
3*2200,            2250, 2*2200,      2*2150,      2*2100,
2100, 2080, 2060, 2040, 2060, 2020, 1980, 1900, 1850, 1800,
1700, 1620, 1530, 1500, 1530, 1500, 1380, 1320, 2*1280,
1270, 1240, 1230, 2*1240,      2*1200,      3*1240,
1280, 1320, 1260, 1190, 5*1170,
2100, 2150, 4*2200,                  2120, 2*2080,      2060,
2050, 2080, 2060, 2020, 2000, 1950, 1980, 1900, 1840, 1820,
1750, 1630, 1550, 1460, 1440, 1470, 1370, 1310, 1270, 1250,
1240, 1220, 1210, 1205, 2*1200,      1230, 1250, 1260, 1300,
2*1300,      1220, 1280, 5*1160,
6*2100,                              2120, 2060, 2*2040,
2020, 2040, 2020, 2000, 1950, 1900, 1940, 1900, 1820, 1780,
1720, 1640, 1550, 1490, 2*1400,      1380, 1330, 1300, 1265,
1235, 4*1200,                  1240, 1260, 1280, 2*1300,
1300, 1240, 1200, 6*1180,
2200, 2150, 2200, 2240, 2200, 2150, 2100, 2020, 2000, 2*1980,
2*2000,      1920, 3*1870,            2*1820,      1760,
1700, 1630, 1550, 1480, 1420, 1400, 1340, 1300, 1280, 1260,
1220, 3*1200,            1220, 1260, 3*1300,           1260,
1240, 3*1160,            5*1160,
```

Figure 6.2. Namelist Printout of Sample Case Elevation (Z) and Vegetation (V) Data (Sheet 21)

```
3*2200,           2150, 2*2100,       2050, 2020, 2000, 1980,
1950, 1660, 1940, 1920, 2*1800,       3*1780,             1770,
1700, 1610, 1520, 2*1460,       1420, 1330, 2*1260,       1240,
4*1220,                   1250, 1330, 2*1320,       1250, 1200,
1200, 1160, 1170, 1170, 1180, 1160, 1170, 1160, 1180,
2200, 2180, 2160, 2140, 2130, 2060, 3*2040,             2020,
1960, 1900, 2*1830,       1600, 2*1750,       1700, 2*1780,
1660, 1600, 1520, 2*1440,       1400, 1300, 1240, 1230, 1220,
1220, 1220, 1230, 1220, 1230, 2*1340,       1280, 1220, 1180,
9*1180,
3*2200,           2130, 3*2100,             2060, 2050, 2020,
2000, 1920, 1840, 1780, 1750, 3*1700,             1760, 1750,
1660, 1560, 1480, 3*1410,             1300, 1240, 3*1220,
      1240, 1240, 1240, 1290, 1350, 1310, 1220, 2*1180,
1180, 2*1160,     2*1180,       1190, 3*1180,
2*2200,     3*2100,             2140, 2*2100,       2080, 2020,
1960, 1900, 1850, 1780, 1700, 1630, 1560, 1660, 1720, 1700,
1650, 1550, 1450, 1390, 1350, 1340, 1280, 1240, 2*1240,
3*1240,           1260, 1275, 1300, 1220, 3*1180,
3*1160,           2*1180,     2*1300,     2*1180,
2200, 2150, 2*2100,     3*2150,             2100, 2080, 2000,
1950, 1880, 1820, 1730, 1710, 1690, 1680, 1640, 1680, 1650,
1600, 1510, 1410, 1340, 1310, 1270, 2*1240,       1260, 1260,
1240, 1250, 1260, 1215, 1225, 1200, 4*1180,
4*1180,                 3*1200,             2*1180,
$
```

terrain data by hand as was done for this sample case,and normal use of the model for various SIAF studies would probably not require as extensive an effort as was undertaken for this project.

As with relief, considerably more effort than normally required was taken to input vegetation data since the objective of the simulation was to duplicate as best as possible the test situation. As described in Section 2.4.1, a vegetation survey of the Hunter Liggett area was conducted for the purpose of obtaining input data for this simulation. During this survey, aerial photographs of the area were obtained, a ground survey was conducted, and the vegetation in the area was categorized according to the classification scheme shown in Figure 2.7. From this information, the vegetation data for the 50-meter grid square resolution were recorded on computer input sheets. The last part of Figure 6.2 shows namelist printout of these data from which Tape 8 was generated. Because of the difficulties of correlating the aerial photograph with the map, this exercise took approximately three weeks; however, normal use of the model would require a far less extensive effort. In fact, with the aid of the namelist input the vegetation of the entire area could be input with one card if the user desired to specify a constant vegetation class for the area.

6.3 USER INPUT AND DATA BASE

Values corresponding to the variables of Tables 3-1 and 3-2 are presented in Figure 6.3. The data base in NAML1 consists of the first three pages of this Figure. The user inputs with the exception of the target data are in NAML2 which starts on the third page of Figure 6.3, while the target data (NAML3) starts on the seventh page of Figure 6.3. The user input for the sample case has been organized alphabetically so there is a one-to-one correspondence between this sample case and the inputs described in Section 3.0.

In order to exercise the dynamic route and external fire support options of the model, this sample case was organized as follows: For targets 1 and 2, the decision rule used was for SIAF to move toward these targets i an attempt to identify them. Once targets were identified, external fire support was to be called on the targets. For targets 3 and 4, the decision rule was to avoid these targets, if detected, by moving around them. For

```
&NAMEL1
 AA      = 1.85,
 AEJ     = 0.,
 ALIM    = .00001,  0.001,  10.,  100.,
 ALLB    = 5000.,
 ALLF    = .75,  2*1.,  0.75,  2*1.,
 ALLW    = .0004,
 AMR     = 0.1,
 ANGID   = 12.,
 AUXMAX  =  2400.,
 AUYMAX  =  7200.,
 AMWTAB  =  3*0.08,  3*0.04,  2*0.0,  4*0.07,  3*0.04,  2*0.029,
            0.033, 0.032, 2*0.037,
 ATER    = 0.,
 ATTAR   = 4.,
 ATTEN   = 0.03,  0.09,  0.15,  0.12,
 BE      = 25.,
 BSAREA  =  20.,
 CUNCAP  =  0.0735,
 CPRAT   =-1700., -700., 600., -1200., -550., -50., -600.,
 CRECOG  =  1.,
 DBACK   =150.,
 DMT     = 0., 25., 75., 25., 2*0., 25., 75., 5*0., 1000., 600.,
 DRICE   = 0.3,
 DSTEP   =20.,
 DSW11   = 1.,
 DSW12   = 1.,
 DYWT=-1.,1.,3.,3*-1.,1.,0.,0.,-1.,0.,0.,-2.,-2.,1.,1.,11*0.,
 FWRAT   =300., 500., 600., 430., 450., 550., 467.,
 GR      = 25.,
 H       = 0., 1., 1.5, 3., 8*0., 0.5, 2*0., 0.7,
           4*0., 3., 2*1., 0., 2.5, 3*3., 2*2., 4., 0.,
           4*0., 2., 3., 5., 9., 1., 7.5, 11., 14., 0., 3., 2*0.,
           4*0., 10., 12., 15., 20., 15., 18., 24., 30., 0., 5., 2*0.,
 HB      = -1., -3.5, -4., 1.8, -0.8, 4., 2., 2*0.,
 HMT     = 0., -0.25, 2*-0.5, 2*0., 0.25, 0.5, 5*0., 0.25, 1.,
 IDTIM   = 1,
 ISECT=    1, 2, 3, 4, 1, 2, 3, 1, 4, 1, 2, 1, 3, 1, 2, 3, 4, 1, 2, 3,
 ITACUS  = 900,
 ITURPM  = 60,
 ITNMTA  = 120,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 1)

```
ITNTAR = 30,
ITPLSA = 433,
ITPLSQ = 120,
LAMDAE = 1000.,
NPAR=9,
P       = 760.,
PMC     = 25.,
PMR     = 25.,
PO      = 760.,
PS      = 42.,
RC      = 4.,
RCTAR   = 10.,
REF     = 0.3, 0.3, 0.13, 0.13, 4*0.3, 4*0.09, 0.17, 0.15, 2*0.2,
          2*0.3, 2*0.13, 3*0.35, 0.3, 4*0.09, 0.17, 0.15, 2*0.2,
          3*1., 2*0.13, 0.04, 0.33, 5*0.02, 1., 0.04, 0.2, 1.,
REQ     = 0.,
RHOH    = 0.075,
RHOI    = 0., 500., 367., 120., 3*0., 18., 2*0., 5.,
          4*0., 165., 250., 500., 0., 1200., 250., 500., 1000., 20., 1000.,
          50., 0., 4*0., 70., 140., 300., 600., 30., 200., 350., 400., 0.,
          100., 2*0., 4*0., 70., 140., 300., 600., 30., 200., 350., 400., 0.,
          100., 2*0.,
RMAX    = 1000., 30., 20., 10., 8*1000., 10., 2*1000., 10.,
          4*1000., 75., 72., 36., 1000., 10., 32., 16., 10., 500., 2*10.,
          21*1000., 75., 30., 12., 10., 120., 18., 10., 10., 1000., 80.,
          2*1000.,
RMTMAX  =       200., 100., 50., 100., 2*200., 100., 50., 5*200., 150., 50.,
RPE     = 0.24,
RPG     = 0.5,
RTER    = 0.,
SECT    = 5.49,0.735,0.785, 2.35, 3.93, 5.49, 2.35, 3.93,
          4.72, 1.57, 0., 2*3.14, 0., 1.57, 4.72,
SEGMIN  =.1,
SGMTAB  = 50.,
SGMTAW  = 230.,
SIGFFR  = 0.0330033001103,
SL1     = 0.0005,
SL2     = 0.05,
SOILF   = .8, .85, .8, .75, .7, .65, .6, .5, .8, 3*1., 4*.9,
STS     = 95.,
TO      = 530.,
TAR     = .1, .25, .5, .75, 1., 1.25, 3*1.5, 1.15, .8, .5, .35,
          .15, .35, 3*.25, .2, .5, 1., 1.5, 2., 2.5, 3*3., 2.3,
          1.6, 1., .7, .3, .1, 3*.5, -1.0, -1.4, -1.2, -1., -.8,
          -.6, -.4, -.2, 0., .2, .4,   .8, 1., 1.2, 1.4, 1.6, 1.8,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 2)

```
VEGC    = 15., 1., 3., 35., 30., 55., 33., 0.5, 10., 0.05, 3., 33., 28.,
          50., 31., 0.5,
          4., 0.7, 3., 31., 20., 57., 32., 0.5, 2., 0.40, 2., 30., 25., 58.,
          33., 0.5,
          5., 0.35, 3., 29., 24., 57., 33., 0.45, 15., 0.80, 3., 28.,
          23., 57., 33., 0.4,
          7.5, 0.7, 2., 27., 22., 57., 32., 0.35, 7.5, 0.65, 2., 25.,
          20., 55., 30., 0.3,
          1., 0.20, 2., 25., 20., 60., 34., 0.2, 2., 0.40, 2., 28.,
          23., 55., 32., 0.3,
          1.5, 0.30, 1., 27., 22., 58., 33., 0.25, 1., 0.2, 1., 25.,
          20., 60., 34., 0.2,
          2., 0.3, 1., 30., 25., 62., 35., 0.5, 1., 0.2, 1., 28., 23.,
          63., 35., 0.4,
          2., .9, 3., 40., 35., 57., 32., 0.4, 10., 0.2, 3., 40.,
          35., 61., 34., 0.5,
VEGP    = 1., .85, .7, .4, .55, .3, .7, .65, .2, .4, .3, .2,
          .3, .2, .9, .2,
VISLUM  = 40000., 15000., 13000., 10000., 2000., 500., 300., 50.,
          10000.,  5000., 1000., 100., 1000., 500., 100., 10.,
          2*40., 10., 1., 10., 5., 1., 0.1, 2*4., 1., 0.1, 1., 0.5, 0.1, 0.01,
          2*0.0001, 0.00008, 0.00002, 0.00008, 0.00005, 0.00002, 0.00001,
          2*0.001, 0.0008, 0.0002, 0.0008, 0.0005, 0.0002, 0.0001,
          2*0.004, 0.003, 0.003, 0.003, 0.002, 0.008, 0.004,
          2*0.01, 0.008, 0.002, 0.008, 0.005, 0.002, 0.001,
VISMJ   = 13.,
VISMA   = 500.,
VIYP=.5,
W       = [illegible], 1., [illegible], 13., 4*0., 2[illegible]., 2[illegible]., 50.,
          4*0., 2., 2*1., 0., 4*2., 1., [illegible], 10., 0.,
          4*0., 3*0.3, 0.45, 0.2, 2*0.3, 0.45, 0., 0.5, 2*0.,
          4*0., 3., 3.5, 4., 4.5, 2*4., 4.5, 5., 0., 2., 2*0.,
WMT     = 0., 5., 4., 5., 2*0., 5., 4., 5*0., 0.5, 1.,
WR      = 0.5,
ALP     = 3*1., 0.95, 0.9, 0.5, 0.15, 0.91, 0.9, 0.5, 0.25, 0.1, 1., 0.75,
          0.95, 1.,
&END

&NAML2
 BETA   = 40.,
 BLIFE  =100.,
 DMUR=0.,
 DMURR=0.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 3)

```
DUMIT  = 1.,
DPE    =10.,
DSA=0.,
DSAA=0.,
EQUIP  = 0.,
ENRNG  = 0.,
F      =1.,
FOOD   =13.47,
FORMS=200*0.,
FORMT=2040*0.,
FREQ   = 50.,
GSAPRX=20.,
GSAPXX=20.,
HLZ=3600.,
H2O    =6.96,
ICPER  = 3600,
IDELA=1,
IDELB=1,
IDELC=1,
IDELD=1,
IDELE=1,
IDUMST = 3,

IFADJ  =1,1,49*0,
IFS=0,
IFSUP  =51*1,
IFT=51*0,
IPJS   =1,
IPREP  = 0,
ISCEN  = 4H  HU, 4HNTER,4H LIU,4HGETT,4H SCE,4HNARI,4HI 2 ,
ISEN   = 0,
ISENLZ=0,
ISTAY  = 0, 5*3, 7, 5*3, 7, 2*3, 31*0, 9, 7, 31*0, 6, 3, 7, 9*3, 6, 20*3, 7, 0,
ISTAY(15,1) = 2*3, ISTAY(49,1) = 2*3, ISTAY(92,1) = 3,
ISTAY(57,1) = 3, ITSTAY(67,1) = 200,
ITALT  =1,3*2,47*1,
ITARIV = 01170000, 2*0, 01220000, 2*0, 02040000, 2*0, 02220000, 2*0, 03050000,
         2*0, 03220000, 03220115, 29*0, 03240000, 04060000, 04220000,
         04220115, 29*0, 04240000, 0, 05060000, 4*0, 06020000, 06060000, 2*0,
         05150000, 0,
ITGRID = 1,
ITMAX  =C4002100,
ITMOV(1,1) = 01170000, 2*0, 01223000, 2*0, 02190000, 2*0, 02220200, 2*0,
             03190000, 2*0, 03220000, 03220115, 29*0, 04040000, 04215000,
             04220000, 04220115, 29*0, 05040000, 0, 05190000, 4*0, 06020200,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 4)

```
DUMIT   = 1.,
DPE     =10.,
DSA=0.,
DSAA=0.,
EQUIP   = 0.,
ERRNG   = 0.,
F       =1.,
FUUD    =13.47,
FURMS=200*0.,
FURMT=2040*0.,
FREQ    = 50.,
GSAPRX=20.,
GSAPXX=20.,
HLZ=3600.,
H2O     =6.96,
ICPER   = 3600,
IDELA=1,
IDELB=1,
IDELC=1,
IDELD=1,
IDELE=1,
IDUMST = 3,

IFADJ   =1,1,49*0,
IFS=0,
IFSUP   =51*1,
IFT=51*0,
IPUS    =1,
IPREP   = 0,
ISCEN   = 4H  HU, 4HNTER,4H LIU,4HGETT,4H SCE,4HNARI,4HU 2 ,
ISEN    = 0,
ISENCZ=0,
ISTAY   = 0, 5*3, 7, 5*3, 7, 2*3, 31*0, 6, 7, 31*0, 6, 3, 7, 5*3, 6, 2*3, 7, 0,
ISTAY(15,1) = 2*3, ISTAY(44,1) = 2*3, ISTAY(92,1) = 3,
ISTAY(67,1) = 3, ITSTAY(67,1) = 200,
ITACT   =1,3*2,47*1,
ITARIV = 01170000, 2*0, 01220000, 2*0, 02040000, 2*0, 02220000, 2*0, 03050000,
         2*0, 03220000, 03220115, 29*0, 03240000, 04060000, 04220000,
         04220115, 29*0, 04240000, 0, 05060000, 4*0, 06020000, 06060000, 2*0,
         05150000, 0,
ITGRID = 1,
ITMAX  =C4002100,
ITMOV(1,1) = 01170000, 2*0, 01223000, 2*0, 02190000, 2*0, 02220200, 2*0,
             03190000, 2*0, 03220000, 03220115, 29*0, 04040000, 04215000,
             04220000, 04220115, 29*0, 05043000, 0, 05190000, 4*0, 06020200,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 4)

```
      [illegible]
 IT[illegible] = [illegible]
 IT[illegible] = 0, [illegible] 2*200, 3100, 400, 16000, 4100,
      [illegible]
 IT[illegible] = [illegible]
 IX1   = 33449[illegible],
 IX2   = 303975447,
 JNF   =1,
 KREC  =2,2,3,3,4*0,
 MAE   =500.,
 MAXCAS = 1,
 MAXREP =1,
 MODE  = 1,
 MOAT  =2,
 NCOPY =1,
 NDECOY = 0,
 NFIX=51,
 NMA[illegible] =3,
 NLZ   = 1,
 NMI[illegible] =3,
 NN    =36,
 NOS   = 0,
 NPLA[illegible]=72,
 NRAD  = 1,
 NRMT  = 0,
 NRST  = 0,
 NSENS=0,
 N[illegible]T = 1,
 NTAR  =51,
 NWCL(1,1) = 011700, 012000, 020030, 020700, 021600, 022000, 030400, 042400,
        050330, 050900, 051000, 052000, 060030, 060900, 061600, 062030,
        070030, 070900, 100000,
 NWCL(1,2) = 2, 1, 5, 1, 2, 1, 3, 1, 5, 1, 2, 1, 5, 1, 2, 1, 2, 1, 1,
 PE[illegible]P =313.40,
 PPLS  = 1.,
 PT    = 1500.,
 RA[illegible]D = 400.,
 RAVODD=0.,
 RAVJ[illegible]D=0.,
 RF[illegible]=.5,
 RF[illegible]=.5,
 RF[illegible] = 0.,
 RFSA=.5,
 RFSAA=.5,
 RH2O  = 0.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 5)

```
RHA..JJ = 1.,
RLZ     =50.,
RHI..L2 = 0.,
RW      = 10.,
RPW     =25.,
RPOWR   = 0.6,
SAMJ    =4*0.,
SC(1)   = 1.7,
SC(2)   = 0.5,
SC(3)   = 1.,
SC(4)   = 6.,
SC(5)   = 0.04,
SC(6)   = 32.,
SCALE   = 5000C.,
SPEC    = 0.,
TBISTR  =60.,
TBRADS  =30.,
TBUR    = 0.,
TOLBK   = 4*0.,
TDMIN   = 10.,
THEATA  = 36.,
TPOWR   = 1.5,
TPREP   = 0.,
TSR     =3554.,
TSS     =1829.,
TUSE    = 0.5,
VELM    =4*100.,
VH      = 5770.,
VK      = 7020.,
NDAY    = 0633., 0716., 376C., 3549., 3940., 1046., 4*1148., 2045., 2159.,
          2510., 2350., 3014., 0110., 4*150., 5*0., 5*1., 73., 79., 69., 63.,
          72., 75., 4*76., 51., 56., 51., 47., 48., 5*52., 98., 97., 98., 85.,
          98., 99., 4*90., 20., 23., 40., 22., 20., 26., 4*24., 10*0., 2., 1.,
          3., 4., 2., 5*1., 3., 5., 12., 15., 8., 5*6., 3*300., 030., 190.,
          5*300.,
WDC     = 0.,
WDM     = C.,
WTC     = 1.,
WTM     = 1.,
WTS     = 4, 3*0.,
XAVGOD=0.,
XAVGID=0.,
XBASE   =5600.,
XDGINS  = 40.,
XLZ     = 5682.4,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 6)

```
 XAMAX   = 6[illegible]0.,
 XPLAN   = 5560.4, 5556.3, 5553.3, 5504., 5555.3, 5805.3, 5790.3, 5771.3,
           5763.1, 5747.4, 5732.7, 5714., 5677.1, 5644.4, 5619.7, 5621.4,
           5623.3, 5624.4, 5625.3, 5627.4, 5625.2, 5631.1, 5632.0, 5636.0,
           5636.2, 5637.2, 5637.5, 5636.3, 5641.4, 5641.3, 5642.8, 2*5645.5,
           5646.3, 5647., 5645.1, 5640.9, 5633.3, 5652.4, 5653.2, 5655.2,
           5655.7, 5656.4, 5658.4, 2*5659.8, 5657.9, 5609.2, 5621.4, 5623.3,
           5624.4, 5625.3, 5627.4, 5625.2, 5631.1, 5632.0, 5636., 5636.2,
           5637.2, 5637.5, 5635.5, 5641.4, 5641.8, 5642.0, 2*5645.5, 5646.3,
           5647., 5648.1, 5645.1, 5650.3, 5652.4, 5653.2, 5655.2, 5655.7,
           5656.4, 5658.9, 2*5659.5, 5657.9, 5613.5, 5611.8, 5606.3, 5601.4,
           5594.3, 5566.4, 5559.9, 5561.0, 5550., 5549.0, 5544., 5500.7,
 XPPTT=0.,
 YAVGDD=0.,
 YAVGID=0.,
 YBASE   =7000.,
 YLL     = 7132.0,
 YPLAN   = 7132.5, 7150.6, 7199.3, 7217., 7224.0, 7220.1, 7252.0, 7254., 7240.6,
           7260., 7270.3, 7271.9, 7299.4, 7303.6, 7333.3, 7354.9, 7358.1,
           7358.2, 7356.8, 7356.1, 7356.6, 7355.2, 7355., 7357.7, 7358.0,
           7358.5, 7357.7, 7357.3, 7356.5, 7355.5, 7355., 7355.9, 7357., 7358.1,
           7358.5, 7356.3, 7357.9, 7358.5, 7358.1, 7358.7, 7358., 7357.1,
           7355.7, 7354.3, 7354.4, 7353.4, 7351.7, 7341.7, 7354.9, 7358.1,
           7358.2, 7356.8, 7356.1, 7356.0, 7355.2, 7355., 7357.7, 7358.6,
           7356.5, 7357.7, 7357.3, 7356.5, 7355.5, 7355., 7355.9, 7357., 7358.1,
           7358.5, 7356.3, 7357.9, 7358.5, 7358.1, 7358.7, 7358., 7357.1,
           7355.7, 7354.0, 7354.4, 7353.4, 7351.7, 7382.2, 7398., 7401.5,
           7410.4, 7415.5, 7425.0, 7444.5, 7454.2, 7460.9, 7489.6, 7530.,
           7641.,
 YPPTT=0.,
&END

&NAML3
 IULT     =51*0,
  TVEL=51*0.,SUUWT=255*0.,MAP=51*0,NSTP=51*0,
INV(1)= 3, KANMAX(1)= 4000., FRLAND(1)= 1., FRCMUN(1)= 1.,
  TVEL(1)=     5.83,  MAP(1)= 14,  IST(1)= 01215204, ISTOP(1)= 01222100,
  ITIMS= 7*01215204, 7*01221503,
  GOALTX(1,1)= 5686., 5735., 5753., 5758., 5772., 5794., 5825., 5794.,
  5772., 5758., 5750., 5735., 5686., 5672.,
  GOALTY(1,1)= 7314., 7294., 7269., 7261., 7245., 7277., 7242., 7277.,
  7245., 7261., 7269., 7294., 7314., 7312.,
  TC(1,1)= 5672., 7312., 2., 5., 1., 1., 100., 3., 32.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 7)

```
 [illegible]                                        SOUNDT(1,1)= 90., 90.,
 [illegible]
 RCMIN(2)= [illegible]  RCMAX(2)= [illegible]
IMV(2)= [illegible] FRCMVN(2)= 1.,
 [illegible]  ITSTUP(2)= 01221500,
 [illegible]
 GOALTX(1,2)= 56[illegible]  GOALTY(1,2)= 7241., 7242.,
 TC(1,2)= 5625., 724[illegible], 1.7, 0.5, 1., 5., 0.04, 0., 32.,
 NSTP(2)= 3, ISSON(1,2)= 01215[illegible], 01220000, 01220500,
 ISSUFF(1,2)= 01220000, 01220[illegible], 01221500,
 SOUNDT(1,2)= 70., 90., 7.,
 RCMIN(2)= 200., RCMAX(2)= [illegible]
IMV(3)= 1, ITST(3)= 01215900, ITSTUP(3)= 01220000,
 TC(1,3)= 5625., 7241., 1.7, 0.1, 0., 2., 20., 0., 100.,
 NSTP(3)= 0, RCMIN(3)= 100., RCMAX(3)= 1000.,
IMV(4)= 3, RANMAX(4)= 4000., FRCAVD(4)= 1., FRCMVN(4)= 1.,
 TVEL(4)= 6.55, NMP(4)= 4, ITST(4)= 02043000, ITSTUP(4)= 02060000,
 ITIMS(1,4)= 02043000, 02050000, 02052000, 02053800,
 GOALTX(1,4)= 5752., 5510., 5750., 5697.,
 GOALTY(1,4)= 7270., 7270., 7270., 7336.,
 TC(1,4)= 5697., 7336., 1.7, 1., 1., 0., 0.04, 0., 32.,
 NSTP(4)= 1, ISSON(1,4)= 02043000, ISSUFF(1,4)= 02060000,
 SOUNDT(1,4)= 70., RCMIN(4)= 200., RCMAX(4)= 1000.,
IMV(5)= 3, RANMAX(5)= 2000., FRCAVD(5)= 1., FRCMVN(5)= 1.,
 TVEL(5)= 5.83, NMP(5)= 6, ITST(5)= 02213704, ITSTUP(5)= 02223930,
 ITIMS(1,5)= 02213704, 02213731, 02213830, 02223630, 02223804, 02223903,
 GOALTX(1,5)= 5686., 5732., 5750., 5705., 5686., 5672.,
 GOALTY(1,5)= 7314., 7294., 7250., 7294., 7314., 7312.,
 TC(1,5)= 5672., 7312., 2., 3., 1., 1., 100., 0., 32.,
 NSTP(5)= 2, ISSON(1,5)= 02213704, 02223630,
 ISSUFF(1,5)= 02214004, 02223930,               SOUNDT(1,5)= 90., 90.,
 RCMAX(5)= 1000., RCMIN(5)= 1000.,
IMV(6)= 1, ITST(6)= 02223600, ITSTUP(6)= 02220630,
 TC(1,6)= 5749., 7264., 60., 5., 0., 1., 1000., 0., 100.,
 NSTP(6)= 1, ISSON(1,6)= 02223600, ISSUFF(1,6)= 02220610,
 SOUNDT(1,6)= 90., RCMIN(6)= 1000., RCMAX(6)= 1000.,
IMV(7)= 3, RANMAX(7)= 2500., FRCAVD(7)= 1., FRCMVN(7)= 1.,
 TVEL(7)= 5.83, NMP(7)= 14, ITST(7)= 03021752, ITSTUP(7)= 03033343,
 ITIMS(1,7)= 03021752, 03021843, 03021914, 03021950, 03022033, 03022040,
 03022106, 03033000, 03033029, 03033055, 03033102, 03033145, 03033221,
 03033252,
 GOALTX(1,7)= 5627., 5637., 5650., 5655., 5653., 5653., 5602., 5650., 5653.,
 5655., 5636., 5637., 5627., 5602.,
 GOALTY(1,7)= 7404., 7384., 7355  7351., 7343., 7329., 7320., 7329., 7343.,
 7351., 7366., 7384., 7404., 7416 ,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 8)

```
TC(1,7)= 5602., 7418., 2., 3., 4. 1., 1.0., 0., 32.,
NSTP(7)= 5,
ISSON(1,7)= 03024750, 03025650, 03023030, 03024400, 03033000,
ISSOFF(1,7)= 03022155, 03023030, 03024400, 03033000, 03033345,
SOUNDT(1,7)= 40., 32., 75., 72., 90.,
RCMIN(7)= 1000., RCMAX(7)= 1300.,
IMV(8)= 1, ITST(8)= 03030000, ITSTUP(8)= 03030100,
TC(1,8)= 5602., 7320., 1.7, 0.1, 0., 2., 20., 0., 100.,
NSTP(8)= 0, RCMIN(8)= 1000., RCMAX(8)= 1300.,
IMV(9)= 3, KANMAX(9)= 500., FRCMVD(9)= 1., FRCMVN(9)= 1.,
TVEL(9)= 0.5, NMP(9)= 2, ITST(9)= 03060000, ITSTUP(9)= 03065000,
ITIMS(1,9)= 03060030, 03063030,
GOALTX(1,9)= 5602., 5530., GOALTY(1,9)= 7348., 7320.,
TC(1,9)= 5680., 7320., 1.7, 0.0, 1., 3., 0.04, 0., 32.,
NSTP(9)= 0, RCMIN(9)= 200., RCMAX(9)= 800.,
IMV(10)= 1, ITST(10)= 03063000, ITSTUP(10)= 03063500,
TC(1,10)= 5650., 7348., 20., 1.5, 1., 1., 0., 0., 100.,
NSTP(10)= 0, RCMIN(10)= 500., RCMAX(10)= 600.,
IMV(11)= 3, KANMAX(11)= 3000., FRCMVD(11)= 1., FRCMVN(11)= 1.,
TVEL(11)= 5.83, NMP(11)= 33, ITST(11)= 03084752, ITSTUP(11)= 03101400,
ITIMS(1,11)= 13*03084752,
03085558, 03100000, 03100016, 9*03100043, 03100624, 03100730,
03100801, 03101130, 03101300,
GOALTX(1,11)= 5627., 5637., 5650., 5655., 5653., 5650., 5662., 5672.,
5680., 5705., 5750., 5758., 5772., 5780., 5772., 5758., 5750., 5705.,
5636., 5672., 5602., 5650., 5653., 5655., 5636., 5637., 5680., 5637.,
5627., 5602., GOALTY(1,11)= 7404., 7384., 7368., 7351., 7343., 7329.,
7320., 7312., 7314., 7294., 7269., 7281., 7285., 7280., 7285., 7281.,
7269., 7294., 7314., 7312., 7320., 7329., 7343., 7351., 7368., 7384.,
7345., 7384., 7404., 7418.,
TC(1,11)= 5602., 7418., 2., 5., 1., 1., 0.05, 0., 32.,
NSTP(11)= 4, ISSON(1,11)= 03084752, 03100000, 03100730, 03101130,
ISSOFF(1,11)= 03085558, 03100730, 03101130, 03101400,
SOUNDT(1,11)= 40., 93., 77., 93., RCMIN(11)= 200., RCMAX(11)= 1500.,
IMV(12)= 3, KANMAX(12)= 1200., FRCMVD(12)= 1., FRCMVN(12)= 1.,
TVEL(12)= 0.83, NMP(12)= 2, ITST(12)= 03085614, ITSTUP(12)= 03100000,
ITIMS(1,12)= 03085700, 03095000,
GOALTX(1,12)= 5730., 5780., GOALTY(1,12)= 7330., 7280.,
TC(1,12)= 5780., 7280., 1.7, 0.5, 1., 4., 0.04, 0., 32.,
NSTP(12)= 5, ISSON(1,12)= 03085700, 03092000, 03092015, 03093000,
03093015, ISSOFF(1,12)= 03092000, 03092015, 03093000, 03093015, 03100000,
SOUNDT(1,12)= 70., 73., 70., 78., 70.,
RCMIN(12)= 600., RCMAX(12)= 1500.,
IMV(13)= 1, ITST(13)= 03094000, ITSTUP(13)= 03094500,
TC(1,13)= 5780., 7330., 1.7, 0.2, 1., 2., 1., 0., 130.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 9)

```
 [illegible]                                  RCMAX(13)= 300.,
IMV(14)= [illegible] RANMAX(14)= [illegible], FRCMVD(14)= 1., FRCMVN(14)= 1.,
 TVEL(14)= [illegible], NMP(14)= 23, ITST(14)= 03154752, ITSTOP(14)= 0316[illegible],
 ITIMS(1,14)= 14*0315[illegible], 0315[illegible], 0315[illegible], 12*03160043,
 GOALTX(1,14)= 5[illegible], [illegible], [illegible], 5655., 5653., 5650., 565[illegible].,
 5672., 5690., 5705., 5750., 5755., 5772., 5750., 5772., 5755., 5750.,
 5705., 5680., 5672., 5662., 5650., 5653., 5655., 5636., 5637., 5627.,
 5602., GOALTY(1,14)= 7404., 7384., 7365., 7351., 7343., 7329., 7320.,
 7312., 7314., 7294., 7259., 7251., 7255., 7280., 7265., 7251., 7269.,
 7294., 7314., 7312., 7321., 7329., 7343., 7351., 7368., 7384., 7404.,
 7415.,TC(1,14)=5602.,7415.,[illegible]5.,1.,1.,0.,05,0.,32.,
 NSTP(14)= 2, ISSON(1,14)= 03154752, 03160300,
 ISSOFF(1,14)= 03150730, 03160910, SOUNOT(1,14)= 90., 90.,
 RCMIN(14)= 200., RCMAX(14)= 1500.,
IMV(15)= 3, RANMAX(15)= 1200., FRCMVD(15)= 1., FRCMVN(15)= 1.,
 TVEL(15)= 0.35, NMP(15)= 2, ITST(15)= 03155514, ITSTOP(15)= 03180000,
 ITIMS(1,15)= 03165700, 03175000, GOALTX(1,15)= 2*5760., GOALTY(1,15)=
 7330., 7285., TC(1,15)= 5750., 7400., 1.7, 0.5, 1., 0., 0.04, 0., 32.,
 NSTP(15)= 5, ISSON(1,15)= 03165700, 03172000, 03172015, 03173000, 03173015,
 ISSOFF(1,15)= 03172000, 03172015, 03173000, 03173015, 03180000,
 SOUNOT(1,15)= 70., 76., 70., 76., 70.,
 RCMIN(15)= 500., RCMAX(15)= 1500.,
IMV(16)= 1, ITST(16)= 03174000, ITSTOP(16)= 03174500,
 TC(1,16)= 5780., 7330., 1.7, 0.2, 1., 2., 1., 0., 100.,
 NSTP(16)= 0, RCMIN(16)= 800., RCMAX(16)= 800.,
IMV(17)= 3, RANMAX(17)= 6000., FRCMVD(17)= 1., FRCMVN(17)= 1.,
 TVEL(17)= 5.83, NMP(17)=12, ITST(17)= 03211439, ITSTOP(17)= 03212449,
 ITIMS(1,17)= 03211439, 03211527, 03211516, 03211657, 03211752, 03211843,
 03212014, 03212045, 03212136, 03212231, 03212312, 03212401,
 GOALTX(1,17)= 5574., 5571., 5590., 5602., 5627., 5637., 5627., 5602.,
 5590., 5571., 5574., 5560., GOALTY(1,17)= 7479., 7456., 7442., 7418.,
 7404., 7384., 7404., 7418., 7442., 7456., 7479., 7495.,
 TC(1,17)= 5560., 7495., 2., 3., 1., 1., 100., 0., 32., NSTP(17)= 3,
 ISSON(1,17)= 03211439, 03211914, 03212014, ISSOFF(1,17)= 03211914, 03212014,
 03212449, SOUNOT(1,17)= 90., 77., 90., RCMIN(17)= 200., RCMAX(17)= 2000.,
IMV(18)= 3, RANMAX(18)= 1000., FRCMVD(18)= 1., FRCMVN(18)= 1.,
 TVEL(18)= 0.667, NMP(18)= 26, ITST(18)= 03211900, ITSTOP(18)=03240000,
 ITIMS(1,18)= 03212200, 12*03215000, 13*03220115,
 GOALTX(1,18)= 5649.8, 5646.6, 5643.9, 5643.1, 5642.2, 5640.2, 5639.8,
 5639.3, 5638.4, 5636.4, 5635.0, 5634.8, 5630.7, 5629.6, 5629.2, 5628.4,
 5627.8, 5626.6, 5625.7, 5622.8, 5622.4, 5621.6, 5620.4, 5619.2, 5616.8,
 5616.2, GOALTY(1,18)= 7364.6, 7364.8, 7364.3, 7367.7, 7367.8, 7367.7,
 7364.6, 7365.2, 7363.8, 7363.6, 7360.2, 7363.3, 7364.2, 7363.8, 7362.5,
 7362.1, 7361.7, 7361.2, 7361.7, 7360.4, 7359.2, 7359.8, 7359.9, 7359.6,
 7358.4, 7355.6,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 10)

```
[illegible] 5.04, 0., 32.,
NSTP(19)= [illegible] KCMIN(19)= [illegible] KCMAX(19)= 400.,
IMV(19)= [illegible] RANMAX(19)= 100., FRCMVD(19)= 1., FRCMVN(19)= 1.,
[illegible] ITSTOP(19)= 04 [illegible]
[illegible]
QUALTX(1,19)= [illegible] 5590., 5571., 5574.,
QUALTY(1,19)= 7456., 746[illegible] 741[illegible] 7414., 7442., 7456., 7473.,
TC(1,19)= 5574., 747[illegible] 100., 0., 32.,
NSTP(19)= 3, ISSON(1,19)= 04001527, 04001830, 04001830,
ISSOFF(1,19)= 04001530, 04001830, 04002100,
SSOUT(1,19)= [illegible] 77., [illegible] KCMIN(19)= 200., KCMAX(19)= 1500.,
IMV(20)= 3, RANMAX(20)= 50., FRCMVD(20)= 1., FRCMVN(20)= 1.,
TVEL(20)= 0.695, NMP(20)=[illegible] ITST(20)= 04034000, ITSTOP(20)= 04014300,
ITIMS(1,20)= 04034000, [illegible] 5*04013000, 04013400,
QUALTX(1,20)= 5635.4, [illegible] 5634.4, 5635.2, 5636.6, 5637.5,
5635.1, [illegible] 5646.5, 5650., 5650.8,
[illegible] 5650.6, [illegible] 5652., 5651.2, 5650.5, 5650.,
QUALTY(1,20)= 7374., [illegible] 7357.3, 7365.9, 7364.4, 7363.9,
7362.9, 7362.3, 7360.7, 7359.8, 7355.5, 7358., 7357.4, 7354.6, 3*7354.,
7353.3, 7351.3, 7349.8, 7344.[illegible] 7342.2, 7339.2, 7337.1, 7320.,
TC(1,20)= 5637., 7384., 1.7, 3.75, 1., 8., 0.04, 0., 32.,
NSTP(20)= 1, ISSON(1,20)= 04005200, ISSOFF(1,20)= 04013000,
SSOUT(1,20)= 70., KCMIN(20)= 200., KCMAX(20)= 400.,
IMV(21)= 3, RANMAX(21)= 100., FRCMVD(21)= 1., FRCMVN(21)= 1.,
TVEL(21)= 0.655, NMP(21)= 1, ITST(21)= 04060000, ITSTOP(21)= 04060600,
ITIMS(1,21)= 04060000, QUALTX(1,21)= 5680., QUALTY(1,21)= 7345.,
TC(1,21)= 5680., 7320., 1.7, 3.5, 1., 16., 0.04, 0., 32.,
NSTP(21)= 0, KCMIN(21)= 200., KCMAX(21)= 400.,
IMV(22)= 1, ITST(22)= 04010000, ITSTOP(22)= 04011100,
TC(1,22)= 550[illegible] 7394., [illegible] 2., 20., 0., 100.,
NSTP(22)= 0, KCMIN(22)= 1000., KCMAX(22)= 1000.,
IMV(23)= 3, RANMAX(23)= 100., FRCMVD(23)= 1., FRCMVN(23)= 1.,
TVEL(23)= 0.667, NMP(23)= 21, ITST(23)= 04030000, ITSTOP(23)= 04032000,
ITIMS(1,23)= 21*04030000, QUALTX(1,23)= 5643.5, 5643.9,
5644.3, 5649.8, 5650.7, 5651.5, 5653.3, 5655., 5656.2, 5656.6, 5657.4,
5655.4, 5660.2, 5661., 5662., 5665.7, 5667.3, 5667.2, 5666.8, 5666.2, 5680.,
QUALTY(1,23)= 7336.2, 7337.8, 7341.8, 7342., 7342.5, 7343.3, 7343.8,
7344.5, 7346.1, 7347.1, 7347.3, 7347.7, 7348.7, 7348.4, 7349.6, 7350.5,
7352.5, 7353.5, 7354.6, 7356., 7325.,
TC(1,23)= 5544.1, 7335.0, 1.7, 3.5, 1., 3., 0.04, 0., 32.,
NSTP(23)= 0, KCMIN(23)= 200., KCMAX(23)= 200.,
IMV(24)= 3, RANMAX(24)= 500., FRCMVD(24)= 1., FRCMVN(24)= 1.,
TVEL(24)= 5.83, NMP(24)= 12, ITST(24)= 04055727, ITSTOP(24)= 04061305,
ITIMS(1,24)= 5*04055727, 04060114, 04060600, 5*04060910,
QUALTX(1,24)= 5571., 5590., 5532., 5527., 5637., 5600., 5637., 5627., 5502.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 11)

```
[illegible] QUALTY(1,24)= 7456., 7442., 7418., 7404., 7384.,
[illegible] 7418., [illegible] 7456., 7479.,
TC(1,24)= [illegible] 7479., 2., [illegible] 1., 2., 10., [illegible] 32.,
[illegible] (1,24)= [illegible] 04050500,
ISSOFF(1,24)= [illegible] 04050500, [illegible]
SOUNDT(1,24)= 90., 77., 90., RCMIN(24)= 200., RCMAX(24)= 1500.,
IMV(25)= 3, NANMAX(25)= 500., FRCMVD(25)= 1., FRCMVN(25)= 1.,
NMP(25)= 10, ITST(25)= 04130200, ITSTOP(25)= 04141547,
IVEL(25)= 5.33, ITIMS(1,25)= 5*04130200., 5*04141000,
QUALTX(1,25)= 5571., 5590., 5602., 5627., 5637., 5627., 5602., 5590., 5571.,
5574., QUALTY(1,25)= 7456., 7442., 7418., 7404., 7384., 7404., 7418., 7442.,
7456., 7479., TC(1,25)= 5574., 7479., 2., 5., 2*1., 0.05, 0., 32.,
NSTP(25)= 2, ISSON(1,25)= 04130200, 04141000, ISSOFF(1,25)= 04130547,
04141547, SOUNDT(1,25)= 2*90., RCMIN(25)= 200., RCMAX(25)= 1500.,
IMV(26)= 3, NANMAX(26)= 100., FRCMVD(26)= 1., FRCMVN(26)= 1.
IVEL(26)= 3.833, NMP(26)= 10, ITST(26)= 04131500, ITSTOP(26)= 04141000,
ITIMS(1,26)= 04131500, 04132600, 2*04133400, 6*04134700,
QUALTX(1,26)= 5537., 2*5520., [illegible] 5602., 5550., 5653., 5655., 5636.,
5637., QUALTY(1,26)= 7384., 7340., 7303., 7303.6, 7320., 7329., 7343.,
7351., 7355., 7384., NSTP(26)= 2, RCMIN(26)= 200., RCMAX(26)= 500.,
TC(1,26)= 5635., 7385., 1.7, .5, 1., 5., .04, 0., 32.,
IMV(27)= 3, NANMAX(27)= 6000., FRCMVD(27)= 1., FRCMVN(27)= 1.,
IVEL(27)= 5.55, NMP(27)= 12, ITST(27)= 04211439, ITSTOP(27)= 04212449,
ITIMS(1,27)= 5*04211439, 6*04212014,
QUALTX(1,27)= 5574., 5571., 5590., 5602., 5627., 5637., 5627., 5602.,
5590., 5571., 5574., 5560., QUALTY(1,27)= 7479., 7456., 7442., 7418.,
7404., 7384., 7404., 7418., 7442., 7456., 7479., 7495., RCMIN(27)= 200.,
TC(1,27)= 5560., 7495., 2., 5., 2*1., 100., 0., 32., RCMAX(27)= 2000.,
NSTP(27)= 3, ISSON(1,27)= 04211439, 04211914, 04212014,
ISSOFF(1,27)=04211914,
04212014, 04212449, SOUNDT(1,27)= 90., 77., 90.,
IMV(28)= 3, NANMAX(28)= 1000., FRCMVD(28)= 1., FRCMVN(28)= 1.,
IVEL(28)= 5.83, NMP(28)= 30, ITST(28)= 04214304, ITSTOP(28)= 05002800,
ITIMS(1,28)= 15*04214304, 10*04221500, 5*05002000,
QUALTX(1,28)= 5550., 5574., 5571., 5590., 5602., 5627., 5637., 5636.,
5555., 5555., 5550., 5602., 5672., 5686., 5750., 5686., 5672.,
5602., 5637., 5653., 5655., 5636., 5637., 5627., 5602., 5590., 5571., 5574.,
5560., 5554., QUALTY(1,28)= 7495., 7479., 7456., 7442., 7418., 7404.,
7384., 7355., 7351., 7343., 7329., 7320., 7312., 7314., 7269., 7314., 7312.,
7320., 7320., 7343., 7351., 7355., 7384., 7404., 7418., 7442., 7456., 7479.,
7495., 7547.,
TC(1,28)= 5554., 7547., 2., 5., 2*1., 100., 0., 32., RCMIN(28)= 200.,
ISSON(1,28)= 04214304, 04221500, 05002000, RCMAX(28)= 1500.,
ISSOFF(1,28)= 04215504, 04222231, 05002800, SOUNDT(1,28)= 3*90., NSTP(28)= 3,
IMV(29)= 3, NANMAX(29)= 1200., FRCMVD(29)= 1., FRCMVN(29)= 1.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 12)

```
 TVEL(29)= 0.667, NMP(29)= 21, ITST(29)= 04211900, ITSTUP(29)= 04223000,
 ITIMS(1,29)= 04212CC , 12*04221500., 13*04220115,
 QUALTX(1,29)= 5649.8, 5646.6, 5643.9, 5643.1, 5642.4, 5640.2, 5639.5,
 5639.3, 5638.7, 5636.4, 5635.5, 5634.2, 5630.7, 5629.6, 5629.2, 5628.4,
 5627.3, 5625.6, 5625.7, 5622.6, 5622.4, 5621.6, 5620.4, 5619.2, 5616.6,
 5615.2, QUALTY(1,29)= 7364.6, 7364.5, 7364.3, 7367.7, 7367.8, 7367.7,
 7364.5, 7363.2, 7363.3, 7363.6, 7366.2, 7363.3, 7364.2, 7363.8, 7362.5,
 7362.1, 7361.7, 7361.2, 7361.7, 7360.4, 7359.2, 7359.8, 7359.9, 7359.6,
 7358.4, 7355.8, NSTP(29)= 0, RCMIN(29)= 200., RCMAX(29)= 400.,
 TC(1,29)= 5637., 7384., 1.7, 0.5, 1., 8., 0.04, 0., 32.,
IHV(30)= 3, RANMAX(30)= 200., FRCMVU(30)= 1., FRCMVN(30)= 1.,
 TVEL(30)= 0.667, NMP(30)= 3, ITST(30)= 04222900, ITSTUP(30)= 04223500,
 ITIMS(1,30)= 3*04222300.,
 QUALTX(1,30)= 5653.6, 5659.8, 5663.4,
 QUALTY(1,30)= 7361., 7360.4, 7357.3,
 NSTP(30)= 0,     RCMIN(30)= 200.,     RCMAX(30)= 400.,
 TC(1,30)= 5651.9, 7362.1, 1.7, 0.5, 1., 8., 0.04, 0., 32.,
IHV(31)= 3, RANMAX(31)= 300., FRCMVU(31)= 1., FRCMVN(31)= 1.,
 TVEL(31)= 0.695, NMP(31)= 26, ITST(31)= 05004000, ITSTUP(31)= 05014300,
 ITIMS(1,31)= 05004000, 16*05004500, 8*05013600, 05013400,
 QUALTX(1,31)= 5635.4, 5635., 2*5634.4, 5635.2, 5636.6, 5637.5, 5638.1,
 5639., 5641.9, 5643., 5645., 5646.3, 5646.3, 5650., 5650.8, 5660.,
 5650.8, 5652.8, 5654.2, 5654.6, 5653., 5652., 5651.2, 5650.5, 5680.,
 QUALTY(1,31)= 7374., 7373.1, 7368.9, 7367.8, 7365.8, 7364.4, 7363.8,
 7362.9, 7362.3, 7360.7, 7359.6, 7358.5, 7358., 7357.4, 7354.6, 3*7354.,
 7353.3, 7351.9, 7349.8, 7344., 7342.2, 7339.2, 7337.1, 7320.,
 TC(1,31)= 5637., 7384., 1.7, 0.75, 1., 8., 0.04, 0., 32.,
 NSTP(31)= 1, ISSON(1,31)= 05005200, ISSOFF(1,31)= 05013000,
 SOURCT(1,31)= 70., RCMIN(31)= 200., RCMAX(31)= 400.,
IHV(32)= 3, RANMAX(32)= 100., FRCMVU(32)= 1., FRCMVN(32)= 1.,
 TVEL(32)= 0.695, NMP(32)= 1, ITST(32)= 05060000, ITSTUP(32)= 05060600,
 ITIMS(1,32)= 05060000, QUALTX(1,32)= 5680., QUALTY(1,32)= 7345.,
 TC(1,32)= 5680., 7320., 1.7, 0.5, 1., 10., 0.04, 0., 32., NSTP(32)= 0,
 RCMIN(32)= 200., RCMAX(32)= 400.,
IHV(33)= 4, ITST(33)= 05011000, ITSTUP(33)= 05011100,
 TC(1,33)= 5500., 7334., 1.7, 0.1, 0., 2., 20., 0., 100.,
 NSTP(33)= 0, RCMIN(33)= 100., RCMAX(33)= 100.,
IHV(34)= 3, RANMAX(34)= 100., FRCMVU(34)= 1., FRCMVN(34)= 1.,
 TVEL(34)= 0.667, NMP(34)= 21, ITST(34)= 05030000, ITSTUP(34)= 05032000,
 ITIMS(1,34)= 21*05030000, QUALTX(1,34)= 5643.5, 5643.9, 5644.8, 5649.8,
 5650.7, 5651.5, 5653.3, 5655., 5656.2, 5656.6, 5657.4, 5658.4, 5660.2,
 5661., 5662., 5663.7, 5667.3, 5667.2, 5666.6, 5666.2, 5680.,
 QUALTY(1,34)= 7336.2, 7337.8, 7341.6, 7342., 7342.5, 7343.3, 7343.9,
 7344.5, 7346.1, 7347.1, 7347.6, 7347.7, 7348.7, 7349.4, 7349.6, 7350.5,
 [illegible] RCMIN(34)= 200., RCMAX(34)= 200.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 13)

```
NSTP(34)= 0, TC(1,34)= 5644., 7355., 1.7, 3.5, 1., 3., 0.04, 0., 32.,
IMV(35)= 3, RANMAX(35)= 500., FRCMVD(35)= 1., FRCMVN(35)= 1.,
 TVEL(35)= 5.83, NMP(35)= 12, ITST(35)= 05055727, ITSTUP(35)= 05C61305,
 ITIMS(1,35)= 5*05055727, 05060114, 05060600, 5*05060910,
 QUALTX(1,35)= 5571., 5590., 5602., 5627., 5637., 5600., 5637., 5627., 5502.,
 559.., 5571., 5574., QUALTY(1,35)= 7495., 7442., 7418., 7404., 7384.,
 7345., 7384., 7404., 7418., 7442., 7456., 7479.,
 TC(1,35)= 5574., 7479., 2., 3., 1., 2., 100., 0., 32., NSTP(35)= 3,
 ISSUN(1,35)= 05055727, 05060114, 05060600, ISSOFF(1,35)= 05060114,
 05060630, 05061305, SOUNDT(1,35)= 90., 77., 90.,
 RCMIN(35)= 200., RCMAX(35)= 1500.,
IMV(36)= 3, RANMAX(36)= 1000., FRCMVD(36)= 1., FRCMVN(36)= 1.,
 TC(1,36)= 5672., 7312., 2., 3., 2*1., 100., 0., 32., NSTP(36)= 2,
 TVEL(36)= 5.83, NMP(36)= 30, ITST(36)= 05212630, ITSTUP(36)= 05225300,
 ITIMS(1,36)= 15*05212630, 15*05223030, QUALTX(1,36)= 5560., 5574.,
 5571., 5590., 5602., 5627., 5637., 5636., 5655., 5653., 5650., 5672., 5686.,
 5705., 5750., 5705., 5686., 5572., 5655., 5653., 5655., 5636., 5637., 5627.,
 5602., 5590., 5571., 5574., 5560., 5542.,
 QUALTY(1,36)= 7495., 7479., 7456., 7442., 7418., 7404., 7384., 7368., 7351.,
 7343., 7329., 7312., 7314., 7294., 7267., 7294., 7314., 7312., 7329., 7343.,
 7351., 7366., 7384., 7404., 7418., 7442., 7456., 7479., 7495., 7597.,
 ISSUN(1,36)= 05212630, 05223530, ISSOFF(1,36)= 05214004, 05225300,
 SOUNDT(1,36)= 2*90., RCMIN(36)= 200., RCMAX(36)= 1500.,
IMV(37)= 1, ITST(37)= 05220600, ITSTUP(37)= 05220630, NSTP(37)= 0,
 TC(1,37)= 5749., 7264., 50., 3., 2*1., 1000., 0., 32.,
 RCMIN(37)= 3000., RCMAX(37)= 3000.,
IMV(38)= 3, RANMAX(38)= 1000., FRCMVD(38)= 1., FRCMVN(38)= 1.,
 TVEL(38)= 5.83, NMP(38)= 12, ITST(38)= 05194000, ITSTUP(38)= 06021127,
 ITIMS(1,38)= 6*05194000, 6*06020500,
 QUALTX(1,38)= 5542., 5559., 5560., 5574., 5571., 5590., 5571., 5574.,
 5560., 5559., 5542., 5509., QUALTY(1,38)= 7597., 7549., 7495., 7479.,
 7456., 7442., 7456., 7479., 7495., 7549., 7597., 7644.,
 TC(1,38)= 5509., 7644., 2., 3., 2*1., 100., 0., 32., NSTP(38)= 2,
 ISSUN(1,38)= 05194000, 06020500, ISSOFF(1,38)= 05194527, 06021127,
 SOUNDT(1,38)= 2*90., RCMIN(38)= 200., RCMAX(38)= 1500.,
IMV(39)= 3, RANMAX(39)= 500., FRCMVD(39)= 1., FRCMVN(39)= 1.,
 TVEL(39)= 0.5, NMP(39)= 2, ITST(39)= 05195000, ITSTUP(39)= 06020000,
 ITIMS(1,39)= 05195000, 06015000,
 QUALTX(1,39)= 5534., 5592., QUALTY(1,39)= 7440., 7439.,
 TC(1,39)= 5592., 7439., 1.7, 3.5, 1., 5., 0.04, 0., 32.,
 NSTP(39)= 1, ISSUN(1,39)= 05195000, ISSOFF(1,39)= 06020000,
 SOUNDT(1,39)= 75., RCMIN(39)= 200., RCMAX(39)= 400.,
IMV(40)= 1, ITST(40)= 05204500, ITSTUP(40)= 06014500,
 TC(1,40)= 5584., 7440., 1.5, 0.25, 2*1., 1000., 0., 100.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 14)

```
IMV(41)= 1, ITST(41)= 00204000, ITSTOP(41)= 00210500,
  TC(1,41)= 5554., 7442., 0., 12., 24., 130., 0., 100.,
  NSTP(41)= 0, RCMIN(41)= 200., RCMAX(41)= 1000.,
IMV(42)= 3, KANMAX(42)= 1200., FRCMVU(42)= 1., FRCMVN(42)= 1.,
  TVEL(42)= 5.83, NMP(42)= 23, ITST(42)= 00021900, ITSTOP(42)= 00034200,
  ITIMS(1,42)= 14*00021300, 14*00033000,
  QUALTX(1,42)= 5542., 5559., 5560., 5574., 5571., 5590., 5602., 5627.,
  5637., 5636., 5655., 5653., 5650., 5652., 5650., 5653., 5655., 5636.,
  5637., 5627., 5602., 5590., 5571., 5574., 5560., 5559., 5542., 5509.,
  QUALTY(1,42)= 7597., 7544., 7495., 7479., 7456., 7442., 7418., 7404.,
  7384., 7368., 7351., 7343., 7329., 7320., 7329., 7343., 7351., 7368.,
  7384., 7404., 7418., 7442., 7456., 7479., 7495., 7549., 7597., 7644.,
  TC(1,42)= 5539., 7644., 2., 3., 2*1., 100., 0., 32.,
  NSTP(42)= 2, ISSON(1,42)= 00021000, 00033000, ISSOFF(1,42)= 00022230,
  00034230, SOGHOT(1,42)= 24., RCMIN(42)= 200., RCMAX(42)= 1500.,
IMV(43)= 3, KANMAX(43)= 1200., FRCMVU(43)= 1., FRCMVN(43)= 1.,
  TVEL(43)= 5.83, NMP(43)= 33, ITST(43)= 00034000, ITSTOP(43)= 00101900,
  ITIMS(1,43)= 14*00034000, 5*00100000, 14*00100011,
  QUALTX(1,43)= 5542., 5559., 5560., 5574., 5571., 5590., 5602., 5627.,
  5637., 5636., 5655., 5653., 5650., 5652., 5650., 5653., 5655., 5636., 5637.,
  5660., 5637., 5627., 5602., 5590., 5571., 5574., 5560., 5559., 5542., 5509.,
  QUALTY(1,43)= 7597., 7544., 7495., 7479., 7456., 7442., 7418., 7404.,
  7384., 7368., 7351., 7343., 7329., 7320., 7329., 7343., 7351., 7368., 7384.,
  7345., 7384., 7404., 7418., 7442., 7456., 7479., 7495., 7544., 7597., 7644.,
  TC(1,43)= 5509., 7644., 2., 3., 2*1., 0.05, 0., 32.,
  NSTP(43)= 4, SOGHOT(1,43)= 96., 96., 77., 96.,
  ISSON(1,43)=    00034000, 00100435, 06100711, 06100811,
  ISSOFF(1,43)=   00035135, 00100711, 06100811, 06101800,
  RCMIN(43)= 200., RCMAX(43)= 150...,
IMV(44)= 1, ITST(44)= 00150000, ITSTOP(44)= 00200300,
  TC(1,44)= 5422., 7505., 1., 0.5, 0., 1., 130., 0., 100.,
  NSTP(44)= 0, RCMIN(44)= 200., RCMAX(44)= 1500.,
IMV(45)= 3, KANMAX(45)= 1000., FRCMVU(45)= 1., FRCMVN(45)= 1.,
  TVEL(45)= 5.83, NMP(45)= 13, ITST(45)= 00104000, ITSTOP(45)= 00105600,
  ITIMS(1,45)= 9*00104000, 9*00104700, QUALTX(1,45)= 5542., 5559., 5560.,
  5574., 5571., 5590., 5602., 5627., 5637., 5627., 5602., 5590., 5571., 5574.,
  5560., 5559., 5542., 5509., QUALTY(1,45)= 7597., 7544., 7495., 7479., 7456.,
  7442., 7418., 7404., 7384., 7404., 7418., 7442., 7456., 7479., 7495., 7544.,
  7597., 7644., TC(1,45)= 5509., 7644., 2., 3., 2*1., 0.05, 0., 32.,
  NSTP(45)= 2, ISSON(1,45)= 00104000, 00104700, ISSOFF(1,45)= 00104914,
  00105630, SOGHOT(1,45)= 24., RCMIN(45)= 200., RCMAX(45)= 1000.,
IMV(46)= 3, KANMAX(46)= 1000., FRCMVU(46)= 1., FRCMVN(46)= 1., TVEL(46)= 5.8,
  NMP(46)= 16, ITST(46)= 00211000, ITSTOP(46)= 00212900, NSTP(46)= 3,
  ITIMS(1,46)= 9*00211000, 9*00212000, QUALTX(1,46)= 5542., 5559., 5560.,
  5574., 5571., 5590., 5602., 5627., 5637., 5627., 5602., 5590., 5571., 5574.,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 15)

```
[illegible] QUALTY(1,46)= 7597., 7544., 7495., 7474., 7495.,
[illegible] 7544., 7495., 7474., 7495., 7544.,
[illegible] 7544., 2., 3., 2*1., 100., 0., 32.,
[illegible] ISSUFF(1,46)= [illegible], [illegible],
[illegible] RCMIN(46)= 200., RCMAX(46)= 150 .,
IAV(47)= [illegible] FRCMVD(47)= 1., FRCMVN(47)= 1., TVEL(47)= 5.4,
NMP(47)= [illegible] IIST(47)= [illegible], IISTOP(47)= 07002630, NSTP(47)= 3,
IITASI(1,47)= [illegible], QUALTX(1,47)= 5542., 5554., 5580.,
5574., 5571., 5574., 5580., 5580., 5582., 5580., 5571., 5574., 5580., 5599.,
5542., 5554., QUALTY(1,47)= 7597., 7544., 7495., 7479., 7450., 7442., 7415.,
7410., 7415., 7442., 7450., 7479., 7495., 7544., 7597., 7544.,
TC(1,47)= 5554., 7544., 2., 3., 2*1., 1000., 0., 32., ISSUN(1,47)= 07001300,
07001300, 07001630, ISSUFF(1,47)= 07001600, 07001630, 07002630,
SOUNDT(1,47)= 90., 77., 90., RCMIN(47)= 2000., RCMAX(47)= 1500.,
IAV(48)= 3, RANMAX(48)= 1000., FRCMVD(48)= 1., FRCMVN(48)= 1., TVEL(48)= 5.4,
NMP(48)= [illegible], IIST(48)= 07055200, IISTOP(48)= 07061800, NSTP(48)= 3,
IITASI(1,48)= [illegible], QUALTX(1,48)= 5542., 5559., 5560.,
5574., 5571., 5580., 5582., 5587., 5637., 5580., 5637., 5627., 5602., 5592.,
5574., 5574., 5580., 5559., 5542., 5559., QUALTY(1,48)= 7597., 7549., 7495.,
7479., 7450., 7442., 7418., 7404., 7384., 7365., 7384., 7404., 7418., 7442.,
7450., 7479., 7495., 7549., 7597., 7644., ISSUN(1,48)= 07055200, 07060500,
07060500, TC(1,48)= 5507., 7544., 2., 3., 2*1., 100., 0., 32.,
ISSUFF(1,48)= 07060500, 07060500, 07061800, SOUNDT(1,48)= 90., 77., 90.,
RCMIN(48)= 200., RCMAX(48)= 1300.,
IAV(49)= 3, RANMAX(49)= 500., FRCMVD(49)= 1., FRCMVN(49)= 1.,
TVEL(49)= 5.83, NMP(49)= 2, IIST(49)= 07064030, IISTOP(49)= 07064300,
IITASI(1,49)= 2*07064000, QUALTX(1,49)= 5542., 5550.,
QUALTY(1,49)= 7597., 7580.,        NSTP(49)= 1, ISSUN(1,49)= 07064000,
ISSUFF(1,49)= 07064300, TC(1,49)= 5504., 7544., 2., 3., 2*1., 0.05, 0., 32.,
SOUNDT(1,49)= 90., RCMIN(49)= 2000., RCMAX(49)= 1200.,
IAV(50)= 3, RANMAX(50)= 200., FRCMVD(50)= 1., FRCMVN(50)= 1.,
TVEL(50)= 5.555, NMP(50)= 20, IIST(50)= 07064300, IISTOP(50)= 07101300,
IITASI(1,50)= 4*07064300, 4*07071300, 4*07074300, 4*07081300, 4*07084300,
4*07091300, 4*07094300,    QUALTX(1,50)= 5542., 5509., 5542., 5550., 5542.,
5509., 5542., 5550., 5542., 5509., 5542., 5550., 5542., 5509., 5542.,
5550., 5542., 5509., 5542., 5550., 5542., 5509., 5542., 5550., 5542.,
5509., 5542., 5550.,
QUALTY(1,50)= 7597., 7644., 7597., 7580., 7597., 7644., 7597., 7580.,
7597., 7644., 7597., 7580., 7597., 7644., 7597., 7580., 7597., 7644., 7597.,
7580., 7597., 7644., 7597., 7580., 7597., 7644., 7597., 7580.,
TC(1,50)= 5550., 7580., 1.7, 0.5, 1., 7., 0.24, 0., 32.,
NSTP(50)= 1,   ISSUN(1,50)= 07064300,   ISSUFF(1,50)= 07101300,
SOUNDT(1,50)= 90.,  RCMIN(50)= 200.,    RCMAX(50)= 1000.,
IAV(51)= 3, RANMAX(51)= 200., FRCMVD(51)= 1., FRCMVN(51)= 1.,
TVEL(51)= 5.555, NMP(51)= 20, IIST(51)= 07064300, IISTOP(51)= 07101300,
```

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 16)

[illegible]

Figure 6.3, Namelist Printout of Sample Case User Input (Sheet 17)

targets 5 through 51, no dynamic movement was used. Instead, once detected, these targets were removed from the simulation and subsequent identification was not attempted.

6.4 MODEL OUTPUTS

The outputs of the model consist of detail and summary printout. Detail printout presented in Figure 6.4 begins with some target transformations and then shows the X and Y coordinates of the SIAF location, the target currently being considered under the dynamic route option, and the current time in seconds. The second page of Figure 6.4, for example, indicates that IDTAR equals zero. Thus, there are no targets currently being considered for the dynamic route option at the simulation time shown. The third page of Figure 6.4 indicates that the dynamic route option was taken by the patrol at the time shown. Subsequent printout reveals that the patrol was moving toward the first target in an attempt to identify it. Finally, the fifth page of Figure 6.4 shows the result of an external fire support mission which was called on target number 2 and later on target number 1. This detail printout continues and presents a time history of a portion of the operation by showing when a dynamic route is used, the results of the external fire support missions, and the location of the patrol throughout the entire mission.

Summary printout of the simulation of the mission for all 51 targets is presented in Figure 6.5. Table 6-1 presents a brief description of these targets. For this summary printout, the dynamic route option described above was not used; hence, KREC(IT) was set equal to zero for all targets.

Included in Figure 6.5 are statistics pertaining to visual detection, target identification, aural detection, target location, movement, navigation, communications, supply maintenance, and human maintenance. As an example of the correlation of these results with the physical situation, Figures 6.6 and 6.7 are presented. Figure 6.6 shows the first six targets in the vicinity of the star cluster turn while Figure 6.7 shows the time line diagram associated with these targets.

A study of these Figures and Page 1 of the output data of Figure 6.5 reveals that for 5 replications, targets 1 through 3 were never visually detected by SIAF while targets 4 through 6 were always detected. Page 37 of the output reveals that the reasons for no detection on target 1 were primarily due to vegetation while targets 2 and 3 were always masked by relief. The aural detection statistics of Page 10 of Figure 6.5 indicate that targets 1, 2, and 5 were always detected by SIAF while target 4 (8 personnel) was not. Aural detection of targets 3 and 6 was not feasible.

With respect to detections of SIAF. Page 19 of Figure 6.5 indicates that target 4 (8 personnel) visually detected SIAF once in 5 replications while Page 28 reveals no aural detections of SIAF by the enemy.

TC1,TC2	[illegible]	[illegible]
TC1,TC2	1749.55261[illegible]	1472.7[illegible]125
TC1,TC2	175[illegible]	1455.[illegible]125
TC1,TC2	1197.714[illegible]	[illegible]
TC1,TC2	423.5391[illegible]25	2938.35937500
TC1,TC2	1264.34375000	2097.43750000
TC1,TC2	933.28125000	4237.37109375
TC1,TC2	889.66015625	5561.85937500
TC1,TC2	1035.28125000	2955.05859375
TC1,TC2	1038.05859375	3530.14062500
TC1,TC2	460.28125000	4237.37109375
TC1,TC2	1609.18750000	2044.66796875
TC1,TC2	1903.07812500	2449.17578125
TC1,TC2	480.28125000	4207.37109375
TC1,TC2	1609.18750000	2044.66796875
TC1,TC2	1903.07812500	2449.17578125
TC1,TC2	1095.05593750	5077.11968750
TC1,TC2	1063.56984375	3726.57812500
TC1,TC2	1112.30078125	4865.44921875
TC1,TC2	1063.58984375	3726.57812500
TC1,TC2	1035.28125000	2955.05859375
TC1,TC2	1073.32421875	3343.67968750
TC1,TC2	836.50390625	3293.27734375
TC1,TC2	1112.30078125	4865.44921875
TC1,TC2	1112.30078125	4865.44921875
TC1,TC2	1053.28515625	3743.42187500
TC1,TC2	1095.08593750	5077.17968750
TC1,TC2	1402.39843750	5517.92968750
TC1,TC2	1063.58984375	3726.57812500
TC1,TC2	1055.37890625	3461.81250000
TC1,TC2	1063.58984375	3726.57812500
TC1,TC2	1035.28125000	2955.05859375
TC1,TC2	1073.32421875	3343.67968750
TC1,TC2	836.50390625	3293.27734375
TC1,TC2	1112.30078125	4865.44921875
TC1,TC2	923.53515625	2938.35937500
TC1,TC2	1264.34375000	2097.43750000
TC1,TC2	1556.26953125	6532.38671875
TC1,TC2	1022.81250000	[illegible]
TC1,TC2	935.[illegible]875[illegible]	4441.15625[illegible]
TC1,TC2	[illegible].96875[illegible]	4441.15625[illegible]
TC1,TC2	1555.28906250	6532.38671875
TC1,TC2	1556.26953125	6532.38671875
TC1,TC2	5[illegible].65234375	6516.44140625

Figure 6.4, Detailed Computer Output (Sheet 1)

TC1,TC2	[illegible]	[illegible]			
TC1,TC2	1556.289[illegible]	[illegible]71675			
TC1,TC2	1556.284[illegible]	[illegible]4557167[illegible]			
TC1,TC2	[illegible]	[illegible]			
TC1,TC2	[illegible]	[illegible]			
TC1,TC2	1511.[illegible]75125	[illegible]62[illegible]9375			
TC1,TC2	1511.[illegible]7812[illegible]	[illegible]6210[illegible]75			
XSTAF,YSTAF,IDTAR,ITIME		1530.641	300.000	0	147743
XSTAF,YSTAF,IDTAR,ITIME		15[illegible]	323.717	0	147747
XSTAF,YSTAF,IDTAR,ITIME		161[illegible]	35[illegible]	0	147[illegible]50
XSTAF,YSTAF,IDTAR,ITIME		1624.96[illegible]	[illegible]	0	147950
XSTAF,YSTAF,IDTAR,ITIME		1644.[illegible]51	[illegible]	0	1480[illegible]
XSTAF,YSTAF,IDTAR,ITIME		165[illegible]	451.137	0	148056
XSTAF,YSTAF,IDTAR,ITIME		1669.142	500.000	0	148211
XSTAF,YSTAF,IDTAR,ITIME		1693.753	550.000	0	148341
XSTAF,YSTAF,IDTAR,ITIME		1700.000	573.675	0	148398
XSTAF,YSTAF,IDTAR,ITIME		[illegible]	600.000	0	148441
XSTAF,YSTAF,IDTAR,ITIME		1727.875	650.000	0	148554
XSTAF,YSTAF,IDTAR,ITIME		1747.536	700.000	0	148667
XSTAF,YSTAF,IDTAR,ITIME		1750.000	700.154	0	148681
XSTAF,YSTAF,IDTAR,ITIME		1767.140	750.000	0	148780
XSTAF,YSTAF,IDTAR,ITIME		1775.637	771.044	0	148829
XSTAF,YSTAF,IDTAR,ITIME		1775.033	771.045	0	148866
XSTAF,YSTAF,IDTAR,ITIME		1775.030	771.045	0	148956
XSTAF,YSTAF,IDTAR,ITIME		1766.645	800.000	0	149005
XSTAF,YSTAF,IDTAR,ITIME		1751.594	853.003	0	149162
XSTAF,YSTAF,IDTAR,ITIME		1750.000	894.406	0	149[illegible]
XSTAF,YSTAF,IDTAR,ITIME		1735.570	900.000	0	149211
XSTAF,YSTAF,IDTAR,ITIME		1720.500	950.000	0	149321
XSTAF,YSTAF,IDTAR,ITIME		1712.520	974.333	0	149363
XSTAF,YSTAF,IDTAR,ITIME		1712.620	974.336	0	149444
XSTAF,YSTAF,IDTAR,ITIME		1712.520	974.336	0	149504
XSTAF,YSTAF,IDTAR,ITIME		1702.796	1000.000	0	149555
XSTAF,YSTAF,IDTAR,ITIME		1700.[illegible]	1007.137	0	149572
XSTAF,YSTAF,IDTAR,ITIME		16[illegible].035	1050.000	0	149650
XSTAF,YSTAF,IDTAR,ITIME		1663.725	110[illegible]	0	149753
XSTAF,YSTAF,IDTAR,ITIME		1650.[illegible]	1135.164	0	149835
XSTAF,YSTAF,IDTAR,ITIME		1644.[illegible]	115[illegible]	0	149906
XSTAF,YSTAF,IDTAR,ITIME		1624.675	[illegible]	0	149961
XSTAF,YSTAF,IDTAR,ITIME		1600.145	1200.[illegible]	0	150111
XSTAF,YSTAF,IDTAR,ITIME		[illegible]	1203.172	0	150140
XSTAF,YSTAF,IDTAR,ITIME		1594.503	1275.303	0	150161
XSTAF,YSTAF,IDTAR,ITIME		1594.603	1275.303	0	150302
XSTAF,YSTAF,IDTAR,ITIME		15[illegible]	1276.355	0	15[illegible]923
XSTAF,YSTAF,IDTAR,ITIME		15[illegible]	[illegible]27[illegible].401	0	151[illegible]

Figure 6.4, Detailed Computer Output (Sheet 2)

XSIAF,YSIAF,IOTAR,ITIME	[illegible]	1275.303		151[illegible]
XSIAF,YSIAF,IOTAR,ITIME	[illegible]	1275.303	[illegible]	152003
XSIAF,YSIAF,IOTAR,ITIME	1534.303	1275.303	[illegible]	152454
XSIAF,YSIAF,IOTAR,ITIME	[illegible]	1275.303	[illegible]	152763
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303	[illegible]	153066
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303	[illegible]	153367
XSIAF,YSIAF,IOTAR,ITIME	1534.845	1275.303	[illegible]	153656
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303	[illegible]	153969
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303		154270
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303		154571
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303		1548[illegible]1
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303		1549[illegible]
XSIAF,YSIAF,IOTAR,ITIME	1534.843	1275.303		155165
XSIAF,YSIAF,IOTAR,ITIME	1534.303	1275.303		155464
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303		155765
XSIAF,YSIAF,IOTAR,ITIME	1534.303	1275.303	[illegible]	155066
XSIAF,YSIAF,IOTAR,ITIME	1534.843	1275.303	[illegible]	155367
XSIAF,YSIAF,IOTAR,ITIME	1534.843	1275.303	[illegible]	155608
XSIAF,YSIAF,IOTAR,ITIME	1534.840	1275.303	6	153401
XSIAF,YSIAF,IOTAR,ITIME	1534.843	1275.303	6	155522
XSIAF,YSIAF,IOTAR,ITIME	1534.303	1275.303	[illegible]	163343
XSIAF,YSIAF,IOTAR,ITIME	1534.380	1275.303	[illegible]	162091
XSIAF,YSIAF,IOTAR,ITIME	1534.845	1275.303	[illegible]	162122
XSIAF,YSIAF,IOTAR,ITIME	1534.380	1275.303	[illegible]	163923
XSIAF,YSIAF,IOTAR,ITIME	1534.845	1275.303	3	165125
XSIAF,YSIAF,IOTAR,ITIME	1534.843	1275.303	[illegible]	165156
XSIAF,YSIAF,IOTAR,ITIME	1534.303	1275.303	3	165178
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303	[illegible]	1652[illegible]7
XSIAF,YSIAF,IOTAR,ITIME	1534.8[illegible]	1275.303	[illegible]	165312
XSIAF,YSIAF,IOTAR,ITIME	1534.[illegible]	1275.303	[illegible]	165337
XSIAF,YSIAF,IOTAR,ITIME	1534.303	1275.303	[illegible]	165378
XSIAF,YSIAF,IOTAR,ITIME	1534.843	1275.303	[illegible]	165439
XDY,YDY	1599.997033	1275.303291		
XDY,YDY	1602.339[illegible]	[illegible]		
XDY,YDY	1610.[illegible]	[illegible]		
XDY,YDY	1618.[illegible]	[illegible]		
XDY,YDY	1625.770[illegible]	[illegible]		
XDY,YDY	1634.70271	1505.2257[illegible]		
XDY,YDY	1600.[illegible]	1572.514[illegible]		
XDY,YDY	[illegible]	[illegible]		
XDY,YDY	171[illegible]	[illegible]		
XDY,YDY	1720.624[illegible]	[illegible]		
XDY,YDY	1761.50[illegible]	[illegible].159[illegible]		
XDY,YDY	1752.197[illegible]	165[illegible]031		
XDY,YDY	1762.1[illegible]	[illegible]92[illegible]		

Figure 6.4, Detailed Computer Output (Sheet 3)

XDY,YDY	[illegible]	[illegible]			
XDY,YDY	[illegible]	[illegible]			
XDY,YDY	[illegible]	[illegible]			
XDY,YDY	[illegible]	[illegible]			
XDY,YDY	1713.2????	[illegible]			
XDY,YDY	1735.01??	[illegible]			
IDY,NIDY	1	13			
XS1AF,YS1AF	1594.340	127?.?53			
XS1AF,YS1AF,IDTAF,IIIIC		1577.??	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		1599.763	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	[illegible]	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		1613.6?1	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	[illegible]	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	1	1?5731
XS1AF,YS1AF,IDTAF,IIIIC		1623.731	[illegible]	1	1?5743
XS1AF,YS1AF,IDTAF,IIIIC		1636.762	1363.???	1	105834
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	1366.101	1	105865
XS1AF,YS1AF,IDTAF,IIIIC		1633.737	[illegible]	1	1?5961
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	1372.015	1	105957
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	1	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		1711.?72	[illegible]	[illegible]	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		[illegible]	[illegible]	[illegible]	[illegible]
XS1AF,YS1AF,IDTAF,IIIIC		1723.???	[illegible]	1	[illegible]

Figure 6.4, Detailed Computer Output (Sheet 4)

```
REPLICATION NUMBER                                            1
TARGET NUMBER                                                 2
ELAPSED TIME OF ENGAGEMENT                              120.000
NUMBER OF CASUALTIES INFLICTED BY ARTILLERY               3.065
NUMBER OF CASUALTIES INFLICTED BY COBS                    0.0
NUMBER OF CASUALTIES INFLICTED BY OF OC105                0.0
NUMBER OF CASUALTIES INFLICTED BY FFARS                   0.0
NUMBER OF CASUALTIES INFLICTED BY MGS                     0.0
XSTAF,YSTAF,IOTAR,ITIME      1734.135     1460.000    1     100227
XSTAF,YSTAF,IOTAR,ITIME      1735.223     1463.773    1     100236
```

Figure 6.4, Detailed Computer Output (Sheet 5)

```
                REPLICATION NUMBER                                    1
                TARGET NUMBER                                         1
                ELAPSED TIME OF ENGAGEMENT                      330.000
                NUMBER OF CASUALTIES INFLICTED BY ARTILLERY       0.750
                NUMBER OF CASUALTIES INFLICTED BY CBUS            0.0
                NUMBER OF CASUALTIES INFLICTED BY GP BOMBS        0.0
                NUMBER OF CASUALTIES INFLICTED BY FFARS           0.0
                NUMBER OF CASUALTIES INFLICTED BY MGS             0.0
XDYN,YDYN      1730.223367    1400.772447
XDYN,YDYN      1725.303394    1375.573211
XDYN,YDYN      1701.403754    1355.737542
XDYN,YDYN      1693.916554    1403.153353
XDYN,YDYN      1680.424072    1420.082351
XDYN,YDYN      1675.931641    1438.909277
XDYN,YDYN      1671.439209    1455.410203
XDYN,YDYN      1663.940533    1472.823430
XDYN,YDYN      1655.454102    1490.233469
XDYN,YDYN      1643.901070    1507.037095
XDYN,YDYN      1641.469238    1525.344922
XDYN,YDYN      1633.976807    1542.451304
XDYN,YDYN      1626.484131    1559.559131
XDYN,YDYN      1616.931699    1577.260113
XDYN,YDYN      1611.499268    1594.073349
XDYN,YDYN      1604.006592    1612.060322
XDYN,YDYN      1596.514434    1629.487549
XDYN,YDYN      1589.021729    1646.894531
XDYN,YDYN      1561.529297    1664.301753
XDYN,YDYN      1591.444092    1689.231172
XDYN,YDYN      1601.359131    1714.131074
IDY,NIDY          1   21
XSIAF,YSIAF   1730.223   1400.773
XSIAF,YSIAF,ICTAR,ITIME           1735.916        1400.000      1     100240
XSIAF,YSIAF,IDTAR,ITIME           1726.339        1375.373      1     100336
XSIAF,YSIAF,IDTAR,ITIME           1701.439        1365.730      1     100453
XSIAF,YSIAF,IDTAR,ITIME           1700.000        1389.301      1     100469
XSIAF,YSIAF,IDTAR,ITIME           1693.272        1400.000      1     100528
XSIAF,YSIAF,IDTAR,ITIME           1693.917        1403.195      1     100540
XSIAF,YSIAF,IDTAR,ITIME           1685.424        1420.002      1     100634
XSIAF,YSIAF,ICTAR,ITIME           1678.932        1433.307      1     100732
XSIAF,YSIAF,ICTAR,ITIME           1673.771        1450.000      1     100797
XSIAF,YSIAF,ILTAR,ITIME           1671.439        1455.410      1     100820
XSIAF,YSIAF,ILTAR,ITIME           1665.917        1472.323      1     100892
XSIAF,YSIAF,IDTAR,ITIME           1656.454        1490.230      1     100954
XSIAF,YSIAF,ILTAR,ITIME           1652.249        1500.000      1     107005
XSIAF,YSIAF,ILTAR,ITIME           1650.002        1505.225      1     107021
XSIAF,YSIAF,IDTAR,ITIME
```

Figure 6.4, Detailed Computer Output (Sheet 6)

[illegible]		[illegible]	1	[illegible]
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	[illegible]	1	[illegible]
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	1542.452	1	[illegible]
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	[illegible]	1	[illegible]
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	[illegible]	1	167265
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	[illegible]	1	167359
XSIAF,YSIAF,IDTAR,ITIME	1611.499	1594.673	1	167453
XSIAF,YSIAF,IDTAR,ITIME	1609.255	[illegible]	1	167482
XSIAF,YSIAF,IDTAR,ITIME	1604.037	[illegible]	1	167547
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	1621.339	1	167597
XSIAF,YSIAF,IDTAR,ITIME	1595.514	1629.457	1	167631
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	1640.394	1	167703
XSIAF,YSIAF,IDTAR,ITIME	1537.635	1650.000	1	167716
XSIAF,YSIAF,IDTAR,ITIME	1581.529	1664.302	1	167775
XSIAF,YSIAF,IDTAR,ITIME	1591.444	1689.201	1	167877
XSIAF,YSIAF,IDTAR,ITIME	1595.744	1703.000	1	167921
XSIAF,YSIAF,IDTAR,ITIME	1600.000	1713.088	1	167965
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.101	1	167979
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	168010
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	169811
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	171612
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	172601
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	172832
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	174633
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	176401
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	176432
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	178233
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	180001
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	180062
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	181863
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	183601
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	183632
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	185433
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	187201
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	187292
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	189001
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	189302
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	189603
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	189904
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	190205
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	190506
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	190801
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	190884
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	190922
XSIAF,YSIAF,IDTAR,ITIME	1601.359	1714.102	0	191222

Figure 6.4, Detailed Computer Output (Sheet 7)

XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	[illegible]	[illegible]
XSIAF,YSIAF,IDTAN,ITIME	1501.5[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]		[illegible]
XDYN,YDYN	150[illegible]	17[illegible]		
XDYN,YDYN	1563.755[illegible]	1730.47[illegible]		
XDYN,YDYN	1547.3[illegible]	1692.[illegible]71[illegible]		
XDYN,YDYN	[illegible]	[illegible]		
XDYN,YDYN	[illegible]	[illegible]		
XDYN,YDYN	[illegible]	[illegible]		
XDYN,YDYN	[illegible]	[illegible]		
XDYN,YDYN	1412.[illegible]511	163[illegible].[illegible]17[illegible]		
XDYN,YDYN	[illegible]	[illegible]		
XDYN,YDYN	[illegible]	[illegible]		
XDYN,YDYN	[illegible]77[illegible]	[illegible]		
XDYN,YDYN	[illegible]	[illegible]		
XDYN,YDYN	[illegible]	17[illegible]		
XDYN,YDYN	1371.[illegible]	1750.[illegible]		
XDYN,YDYN	1374.[illegible]	17[illegible]		
XDYN,YDYN	1377.[illegible]	179[illegible]		
XDYN,YDYN	[illegible]	[illegible]175		
XDYN,YDYN	[illegible]	[illegible]758545		
XDYN,YDYN	1507.[illegible]	1004.2[illegible]		
IDYN,IDY	1	14		
XSIAF,YSIAF	1501.5[illegible]	1714.1[illegible]		
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	1714.09[illegible]	4	1[illegible]2372
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	17[illegible].470	4	192518
XSIAF,YSIAF,IDTAN,ITIME	15[illegible].412	17[illegible]	4	192657
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	192663
XSIAF,YSIAF,IDTAN,ITIME	1547.[illegible]	[illegible]	4	192695
XSIAF,YSIAF,IDTAN,ITIME	152[illegible]	[illegible]	4	192853
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	192959
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	192936
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	193044
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	193110
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	193152
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	193157
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	[illegible]261
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	193311
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	193330
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	[illegible]
XSIAF,YSIAF,IDTAN,ITIME	[illegible]	[illegible]	4	193477
XSIAF,YSIAF,IDTAN,ITIME	1501.717	[illegible]	4	193507
XSIAF,YSIAF,IDTAN,ITIME	1501.[illegible]	[illegible]	4	193595

Figure 6.4, Detailed Computer Output (Sheet 8)

XSIAF,YSIAF,IDTAR,ITIME	1364.95[illegible]	[illegible]	4	19[illegible]
XSIAF,YSIAF,IDTAR,ITIME	1367.406	17[illegible]	4	193782
XSIAF,YSIAF,IDTAR,ITIME	1368.197	1767.[illegible]	4	193809
XSIAF,YSIAF,IDTAR,ITIME	1371.421	17[illegible]	4	193919
XSIAF,YSIAF,IDTAR,ITIME	1372.663	1753.[illegible]	4	193969
XSIAF,YSIAF,IDTAR,ITIME	1374.655	1765.17[illegible]	4	194048
XSIAF,YSIAF,IDTAR,ITIME	1377.880	1795.706	4	194120
XSIAF,YSIAF,IDTAR,ITIME	1376.301	1806.300	4	194131
XSIAF,YSIAF,IDTAR,ITIME	1381.125	1825.232	4	194193
XSIAF,YSIAF,IDTAR,ITIME	1383.333	[illegible]	4	194254
XSIAF,YSIAF,IDTAR,ITIME	1384.357	1834.755	4	194263
XSIAF,YSIAF,IDTAR,ITIME	1387.5[illegible]	[illegible]	4	194318
XSIAF,YSIAF,IDTAR,ITIME	1357.544	1864.233	0	194401
XSIAF,YSIAF,IDTAR,ITIME	1367.544	1864.2[illegible]	0	194459
XSIAF,YSIAF,IDTAR,ITIME	1353.03[illegible]	1866.42[illegible]	0	194530
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	1364.273	0	194623
XSIAF,YSIAF,IDTAR,ITIME	1257.8[illegible]	1487.905	0	194640
XSIAF,YSIAF,IDTAR,ITIME	1287.862	1384.765	0	194737
XSIAF,YSIAF,IDTAR,ITIME	1287.865	1389.765	0	194767
XSIAF,YSIAF,IDTAR,ITIME	1234.031	1900.700	0	194793
XSIAF,YSIAF,IDTAR,ITIME	1203.346	1952.300	0	194891
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	2000.033	0	195002
XSIAF,YSIAF,IDTAR,ITIME	1253.430	2305.430	0	195017
XSIAF,YSIAF,IDTAR,ITIME	1235.836	2353.330	0	195114
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	195162
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	195253
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	195854
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.438	0	196455
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.483	0	197056
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	197657
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.480	0	198001
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.480	0	198032
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	198633
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.438	0	199234
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.433	0	199835
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.433	0	200436
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.400	0	201037
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.433	0	201601
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.438	0	201662
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.433	0	233463
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.433	0	235201
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.430	0	235232
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.483	0	237033
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.433	0	233831
XSIAF,YSIAF,IDTAR,ITIME	1227.875	74.403	0	238832

Figure 6.4, Detailed Computer Output (Sheet 9)

XSIAF,YSIAF,IDTAR,ITIME	[illegible]	[illegible]		213553
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IDTAR,ITIME	1227.875	[illegible]		[illegible]
XSIAF,YSIAF,IDTAR,ITIME	1227.875	[illegible]		[illegible]
XSIAF,YSIAF,IDTAR,ITIME	1227.875	[illegible]		216011
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488		216612
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	217633
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	218031
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	219722
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	221525
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	223201
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	223202
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	225003
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	225601
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	225832
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	226833
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	230401
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	230432
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	231033
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	231634
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	232235
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	232836
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	233437
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	234031
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	234032
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	234633
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	235234
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	235835
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	236436
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	237037
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	237631
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	237692
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	238293
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	238894
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	239195
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	239496
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	239797
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	240046
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	240399
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	240700
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	241001
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	241201
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	241302
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	241623
XSIAF,YSIAF,IDTAR,ITIME	1227.875	2074.488	0	241924

Figure 6.4, Detailed Computer Output (Sheet 10)

XSIAF,YSIAF,IOTAR,ITIME	1227.875	[illegible]		[illegible]
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	[illegible]
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	242547
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	243128
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	[illegible]
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	244832
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	246033
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	248401
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	249492
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	250233
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	250625
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	250656
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	250652
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	250700
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	250711
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	250752
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433		252031
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	252032
XSIAF,YSIAF,IOTAR,ITIME	1227.875	2074.433	0	252121
XSIAF,YSIAF,IOTAR,ITIME	1219.037	[illegible]	0	252229
XSIAF,YSIAF,IOTAR,ITIME	1209.049	2127.460	0	252361
XSIAF,YSIAF,IOTAR,ITIME	1209.029	2127.541	0	252302
XSIAF,YSIAF,IOTAR,ITIME	1201.392	2155.333	0	252470
XSIAF,YSIAF,IOTAR,ITIME	1233.030	2155.417	0	252494
XSIAF,YSIAF,IOTAR,ITIME	1134.037	2200.000	0	252739
XSIAF,YSIAF,IOTAR,ITIME	1151.400	2244.195	0	252926
XSIAF,YSIAF,IOTAR,ITIME	1101.493	2244.195	0	252951
XSIAF,YSIAF,IOTAR,ITIME	1159.430	2244.135	0	253047
XSIAF,YSIAF,IOTAR,ITIME	1152.775	2253.017	0	253083
XSIAF,YSIAF,IOTAR,ITIME	1150.000	2261.303	0	253172
XSIAF,YSIAF,IOTAR,ITIME	1133.540	2337.333	0	253441
XSIAF,YSIAF,IOTAR,ITIME	1133.530	2334.370	0	253472
XSIAF,YSIAF,IOTAR,ITIME	1353.000	2347.374	0	253772
XSIAF,YSIAF,IOTAR,ITIME	1347.314	2352.333	0	253791
XSIAF,YSIAF,IOTAR,ITIME	1327.013	2367.352		253890
XSIAF,YSIAF,IOTAR,ITIME	1327.013	2367.363	0	253917
XSIAF,YSIAF,IOTAR,ITIME	1317.333	2400.303	0	254156
XSIAF,YSIAF,IOTAR,ITIME	1321.771	2457.300	0	254366
XSIAF,YSIAF,IOTAR,ITIME	1300.330	2453.303	0	254393
XSIAF,YSIAF,IOTAR,ITIME	430.152	[illegible]	0	254743
XSIAF,YSIAF,IOTAR,ITIME	473.012	2553.333	0	254902
XSIAF,YSIAF,IOTAR,ITIME	455.133	[illegible]	0	255377
XSIAF,YSIAF,IOTAR,ITIME	153.300	2710.155	0	255466
SIAF,YSIAF,IOTAR,ITIME	942.413	2643.532	0	255601
XSIAF,YSIAF,IOTAR,ITIME	942.413	[illegible]	0	255751

Figure 6.4, Detailed Computer Output (Sheet 11)

XSIAF,YSIAF,IDTAR,ITIME	334.454	2651.330	0	255804
XSIAF,YSIAF,IDTAR,ITIME	423.875	2700.300	0	255606
XSIAF,YSIAF,IDTAR,ITIME	438.245	2750.330	0	256242
XSIAF,YSIAF,IDTAR,ITIME	400.039	2775.623	0	256420
XSIAF,YSIAF,IDTAR,ITIME	842.716	2800.000	0	256519
XSIAF,YSIAF,IDTAR,ITIME	890.737	2806.449	0	256567
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	256578
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	258379
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	259201
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	259232
XSIAF,YSIAF,IDTAR,ITIME	890.737	2806.449	0	261093
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	262801
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	262832
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	264633
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	266401
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	266522
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267413
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267523
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267562
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267590
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267634
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267649
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267674
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	267675
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	269476
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	273001
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	273061
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	273062
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	273651
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	273692
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	275493
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	275794
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	276095
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	276396
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	276697
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	276998
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	277201
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	277232
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	277533
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	277834
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	278135
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	278436
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	278737
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	279038
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	279339

Figure 6.4, Detailed Computer Output (Sheet 12)

XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	279040
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	279941
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	2[illegible]242
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	280343
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	280831
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	280832
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	280961
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	281591
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	281760
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	282131
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	282198
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	282799
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	282901
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	283501
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	283711
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	283801
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	2844[illegible]1
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	284432
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	285033
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	285634
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	285235
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	285836
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	287437
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	288031
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	288032
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	288833
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	2[illegible]073
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	290923
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	290962
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	290990
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291034
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291049
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291074
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291084
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291375
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291421
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291631
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291632
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	291654
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	29[illegible]655
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	29[illegible]031
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	29[illegible]01
IAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	295201
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	295262
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	297063

Figure 6.4, Detailed Computer Output (Sheet 13)

XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	[illegible]
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	299032
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	300033
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	302431
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449		302492
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	304293
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	306031
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	306032
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	307633
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	309031
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	309632
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	311433
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	313231
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	313232
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	315033
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	315531
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	315922
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	317523
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	318124
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	318725
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319326
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319673
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319723
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319752
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319790
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319834
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319869
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319874
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	319901
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	320175
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	320221
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	320401
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	320432
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	320694
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	321295
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	321896
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	322497
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	323001
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	323101
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	323702
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	324001
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	324032
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	324033
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	325234
XSTAF,YSTAF,IOTAR,ITIME	690.707	2800.449	0	325535

Figure 6.4, Detailed Computer Output (Sheet 14)

XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	325836
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	326137
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	326438
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	326739
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	327040
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	327341
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	327601
XSIAF,YSIAF,IDTAR,ITIME	890.707	2806.449	0	327751
XSIAF,YSIAF,IDTAR,ITIME	850.000	2843.700	0	328018
XSIAF,YSIAF,IDTAR,ITIME	843.225	2850.000	0	328057
XSIAF,YSIAF,IDTAR,ITIME	800.000	2859.046	0	328303
XSIAF,YSIAF,IDTAR,ITIME	755.712	2900.000	0	328360
XSIAF,YSIAF,IDTAR,ITIME	750.000	2935.527	0	328614
XSIAF,YSIAF,IDTAR,ITIME	734.194	2950.000	0	328734
XSIAF,YSIAF,IDTAR,ITIME	700.000	2951.307	0	328899
XSIAF,YSIAF,IDTAR,ITIME	677.555	3000.000	0	329031
XSIAF,YSIAF,IDTAR,ITIME	650.000	3027.229	0	329173
XSIAF,YSIAF,IDTAR,ITIME	626.174	3050.000	0	329312
XSIAF,YSIAF,IDTAR,ITIME	615.436	3056.133	0	329350
XSIAF,YSIAF,IDTAR,ITIME	615.436	3056.133	0	329381
XSIAF,YSIAF,IDTAR,ITIME	615.436	3056.133	0	329471
XSIAF,YSIAF,IDTAR,ITIME	619.349	3100.000	0	329654
XSIAF,YSIAF,IDTAR,ITIME	620.333	3150.000	0	329820
XSIAF,YSIAF,IDTAR,ITIME	621.316	3200.000	0	330036
XSIAF,YSIAF,IDTAR,ITIME	622.293	3250.000	0	330248
XSIAF,YSIAF,IDTAR,ITIME	623.275	3300.000	0	330490
XSIAF,YSIAF,IDTAR,ITIME	624.257	3350.000	0	330732
XSIAF,YSIAF,IDTAR,ITIME	625.239	3400.000	0	330974
XSIAF,YSIAF,IDTAR,ITIME	625.514	3415.073	0	331042
XSIAF,YSIAF,IDTAR,ITIME	625.514	3416.079	0	331103
XSIAF,YSIAF,IDTAR,ITIME	631.316	3424.773	0	331201
XSIAF,YSIAF,IDTAR,ITIME	631.313	3424.773	0	331291
XSIAF,YSIAF,IDTAR,ITIME	650.000	3449.048	0	331412
XSIAF,YSIAF,IDTAR,ITIME	652.862	3450.000	0	331451
XSIAF,YSIAF,IDTAR,ITIME	695.553	3500.000	0	331750
XSIAF,YSIAF,IDTAR,ITIME	700.000	3505.190	0	331776
XSIAF,YSIAF,IDTAR,ITIME	739.203	3550.000	0	332024
XSIAF,YSIAF,IDTAR,ITIME	750.000	3563.745	0	332100
XSIAF,YSIAF,IDTAR,ITIME	766.313	3562.344	0	332236
XSIAF,YSIAF,IDTAR,ITIME	766.313	3562.344	0	332237
XSIAF,YSIAF,IDTAR,ITIME	766.313	3562.344	0	332638
XSIAF,YSIAF,IDTAR,ITIME	766.313	3562.344	0	332861
IAF,YSIAF,IDTAR,ITIME	766.313	3562.344	0	332932
XSIAF,YSIAF,IDTAR,ITIME	766.313	3562.344	0	333060
XSIAF,YSIAF,IDTAR,ITIME	766.313	3562.344	0	333717

Figure 6.4, Detailed Computer Output (Sheet 15)

XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335728
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335768
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335777
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335818
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335865
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335873
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335923
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335940
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335954
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	335962
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	336015
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	336016
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	336121
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	336470
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	337801
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	337847
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	337899
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	337961
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	337977
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338013
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338060
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338072
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338094
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338132
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338181
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338235
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338310
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338401
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338476
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338487
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338521
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338535
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338546
XSIAF,YSIAF,IDTAR,ITIME	706.313	3582.844	0	338551
XSIAF,YSIAF,IDTAR,ITIME	770.031	3587.393	0	338570
XSIAF,YSIAF,IDTAR,ITIME	785.410	3591.138	0	338580
XSIAF,YSIAF,IDTAR,ITIME	788.013	3592.328	0	338583
XSIAF,YSIAF,IDTAR,ITIME	833.633	3597.301	0	338613
XSIAF,YSIAF,IDTAR,ITIME	833.476	3597.563	0	338614
XSIAF,YSIAF,IDTAR,ITIME	836.477	3597.965	0	338705
XSIAF,YSIAF,IDTAR,ITIME	809.933	3594.714	0	338724
XSIAF,YSIAF,IDTAR,ITIME	810.030	3574.394	0	338754
XSIAF,YSIAF,IDTAR,ITIME	821.932	3557.231	0	338788
XSIAF,YSIAF,IDTAR,ITIME	832.320	3556.517	0	338834
XSIAF,YSIAF,IDTAR,ITIME	834.874	3551.366	0	338817

Figure 6.4, Detailed Computer Output (Sheet 16)

XSIAF,YSIAF,IDTAR,ITIME	846.547	3523.266	0	338858
XSIAF,YSIAF,IDTAR,ITIME	850.033	3524.952	0	339006
XSIAF,YSIAF,IDTAR,ITIME	857.515	3527.335	0	339004
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3517.041	0	338954
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3519.079	0	338956
XSIAF,YSIAF,IDTAR,ITIME	927.747	3523.775	0	338972
XSIAF,YSIAF,IDTAR,ITIME	915.312	3514.133	0	338987
XSIAF,YSIAF,IDTAR,ITIME	915.039	3510.963	0	339004
XSIAF,YSIAF,IDTAR,ITIME	921.723	3505.773	0	339021
XSIAF,YSIAF,IDTAR,ITIME	925.023	3500.003	0	339032
XSIAF,YSIAF,IDTAR,ITIME	957.531	3476.240	0	339074
XSIAF,YSIAF,IDTAR,ITIME	934.875	3467.313	0	339092
XSIAF,YSIAF,IDTAR,ITIME	943.027	3457.557	0	339111
XSIAF,YSIAF,IDTAR,ITIME	950.000	3454.722	0	339129
XSIAF,YSIAF,IDTAR,ITIME	944.875	3453.003	0	339155
XSIAF,YSIAF,IDTAR,ITIME	957.179	3449.273	0	339159
XSIAF,YSIAF,IDTAR,ITIME	967.713	3453.333	0	339161
XSIAF,YSIAF,IDTAR,ITIME	973.052	3458.183	0	339178
XSIAF,YSIAF,IDTAR,ITIME	980.551	3462.379	0	339201
XSIAF,YSIAF,IDTAR,ITIME	994.681	3461.533	0	339215
XSIAF,YSIAF,IDTAR,ITIME	1000.000	3455.819	0	339228
XSIAF,YSIAF,IDTAR,ITIME	1002.293	3453.420	0	339234
XSIAF,YSIAF,IDTAR,ITIME	1004.007	3450.000	0	339241
XSIAF,YSIAF,IDTAR,ITIME	1006.420	3445.473	0	339256
XSIAF,YSIAF,IDTAR,ITIME	1021.273	3442.121	0	339276
XSIAF,YSIAF,IDTAR,ITIME	1035.914	3426.912	0	339312
XSIAF,YSIAF,IDTAR,ITIME	1045.926	3420.676	0	339329
XSIAF,YSIAF,IDTAR,ITIME	1050.000	3420.403	0	339341
XSIAF,YSIAF,IDTAR,ITIME	1050.000	3409.262	0	339365
XSIAF,YSIAF,IDTAR,ITIME	1056.629	3402.033	0	339381
XSIAF,YSIAF,IDTAR,ITIME	1056.738	3399.023	0	339383
XSIAF,YSIAF,IDTAR,ITIME	1070.355	3371.844	0	339433
XSIAF,YSIAF,IDTAR,ITIME	1062.948	3361.505	0	339450
XSIAF,YSIAF,IDTAR,ITIME	1074.027	3353.132	0	339467
XSIAF,YSIAF,IDTAR,ITIME	1071.774	3353.002	0	339474
XSIAF,YSIAF,IDTAR,ITIME	1063.148	3345.008	0	339485
XSIAF,YSIAF,IDTAR,ITIME	1050.000	3343.153	0	339574
XSIAF,YSIAF,IDTAR,ITIME	1042.831	3342.418	0	339610
XSIAF,YSIAF,IDTAR,ITIME	1042.831	3342.418	0	339641
XSIAF,YSIAF,IDTAR,ITIME	1042.831	3342.418	0	341442
XSIAF,YSIAF,IDTAR,ITIME	1042.831	3342.418	0	342001
XSIAF,YSIAF,IDTAR,ITIME	1042.831	3342.418	0	342036
XSIAF,YSIAF,IDTAR,ITIME	1042.831	3342.418	0	343833
IAF,YSIAF,IDTAR,ITIME	1042.831	3342.418	0	345001
IAF,YSIAF,IDTAR,ITIME	1042.831	42.418	0	345632

Figure 6.4, Detailed Computer Output (Sheet 17)

XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346528
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346568
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346609
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346656
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346680
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346683
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346711
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346735
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346788
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346829
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	346860
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348001
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348147
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348301
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348318
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348390
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348406
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348436
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348471
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348490
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348509
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348525
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348582
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348609
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348642
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348662
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348674
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348721
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348739
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348756
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	348849
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	349201
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	349242
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	349801
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	349861
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	351002
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	352801
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	352832
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	354633
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	356401
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	356417
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	356432
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	356443
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	356505
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	356581

Figure 6.4, Detailed Computer Output (Sheet 18)

XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	355030
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	355620
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	355654
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	356602
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	356712
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	356729
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	356748
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	356766
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	356797
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	358590
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	360001
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	360091
XSIAF,YSIAF,IDTAR,ITIME	1020.033	3350.000	0	360169
XSIAF,YSIAF,IDTAR,ITIME	1000.000	3361.829	0	360241
XSIAF,YSIAF,IDTAR,ITIME	950.000	3384.506	0	360497
XSIAF,YSIAF,IDTAR,ITIME	915.039	3400.000	0	360656
XSIAF,YSIAF,IDTAR,ITIME	900.000	3407.183	0	360741
XSIAF,YSIAF,IDTAR,ITIME	850.000	3429.861	0	360909
XSIAF,YSIAF,IDTAR,ITIME	805.590	3450.000	0	361227
XSIAF,YSIAF,IDTAR,ITIME	800.000	3452.537	0	361257
XSIAF,YSIAF,IDTAR,ITIME	750.000	3475.215	0	361446
XSIAF,YSIAF,IDTAR,ITIME	700.000	3497.892	0	361696
XSIAF,YSIAF,IDTAR,ITIME	695.352	3500.000	0	361721
XSIAF,YSIAF,IDTAR,ITIME	650.000	3520.570	0	361965
XSIAF,YSIAF,IDTAR,ITIME	600.000	3543.247	0	362198
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.765	0	362245
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	362276
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	362577
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	362878
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	363179
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	363480
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	363601
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	363662
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	363903
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	364204
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	364505
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	364806
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	365167
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	365468
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	365769
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	366076
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	366371
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	366672
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	366973
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	367048

Figure 6.4, Detailed Computer Output (Sheet 19)

XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367056
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367129
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367176
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367200
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367220
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367251
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367266
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367275
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367375
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367561
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367661
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367751
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	367790
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367840
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367887
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367928
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367968
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	367986
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	368587
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	369188
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	369789
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	370390
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	370801
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	370922
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	371523
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.706	0	372124
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	372725
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	373326
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	373927
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	374401
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	374492
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.706	0	376293
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	378001
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	378032
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	379833
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	381601
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.706	0	381722
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	383523
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	385291
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	385292
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	387033
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	388831
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	388832
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	390633
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.700	0	392401

Figure 6.4, Detailed Computer Output (Sheet 20)

XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392462
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392521
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392561
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392602
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392649
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392699
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392738
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	392746
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	393301
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	393328
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	393901
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	394429
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	395031
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	395632
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	396001
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	396340
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	396690
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	396737
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	396778
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	398018
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	398826
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	399029
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	399601
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	399632
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	401433
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	403231
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	403362
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	403923
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	404524
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	405125
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	405726
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	406327
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	406801
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	406832
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	407433
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	408034
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	408635
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	409236
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	409837
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	410401
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	410432
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	411033
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	411634
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	411935
XSIAF,YSIAF,IDTAR,ITIME	590.039	3547.766	0	412238

Figure 6.4, Detailed Computer Output (Sheet 21)

XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	412537
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	412838
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	413139
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	413440
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	413741
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	414001
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	414032
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	414333
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	414634
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	414935
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	415236
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	415537
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	415838
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	417031
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	417062
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	417463
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	421231
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	421232
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422080
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422117
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422157
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422198
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422245
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422295
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422334
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422341
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422355
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422415
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422454
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422504
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422520
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422551
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422592
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422632
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422669
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422690
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	422921
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	423765
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	423678
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	423915
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	423955
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	423996
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	424043
XSIAF,YSIAF,IDTAF,ITIME	590.039	3547.700	0	424093

Figure 6.4, Detailed Computer Output (Sheet 22)

XSIAF,YSIAF,IDTAR,ITIME	533.039	3547.700	0	424180
XSIAF,YSIAF,IDTAR,ITIME	540.033	3547.700	0	424200
XSIAF,YSIAF,IDTAR,ITIME	571.355	3543.030	0	424204
XSIAF,YSIAF,IDTAR,ITIME	570.393	[illegible]	0	424219
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3549.745	0	424236
XSIAF,YSIAF,IDTAR,ITIME	611.200	3550.300	0	424234
XSIAF,YSIAF,IDTAR,ITIME	605.122	3550.700	0	424245
XSIAF,YSIAF,IDTAR,ITIME	607.759	3551.293	0	424253
XSIAF,YSIAF,IDTAR,ITIME	614.253	3552.290	0	424272
XSIAF,YSIAF,IDTAR,ITIME	622.775	3554.159	0	424294
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3554.952	0	424300
XSIAF,YSIAF,IDTAR,ITIME	639.097	3555.555	0	424319
XSIAF,YSIAF,IDTAR,ITIME	643.127	3559.323	0	424364
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3559.570	0	424375
XSIAF,YSIAF,IDTAR,ITIME	655.741	3560.450	0	424350
XSIAF,YSIAF,IDTAR,ITIME	665.347	[illegible]	0	424422
XSIAF,YSIAF,IDTAR,ITIME	670.422	3565.545	0	424450
XSIAF,YSIAF,IDTAR,ITIME	685.010	3566.200	0	424469
XSIAF,YSIAF,IDTAR,ITIME	687.105	3567.390	0	424481
XSIAF,YSIAF,IDTAR,ITIME	694.958	3565.042	0	424503
XSIAF,YSIAF,IDTAR,ITIME	693.315	3568.713	0	424505
XSIAF,YSIAF,IDTAR,ITIME	720.030	3569.540	0	424519
XSIAF,YSIAF,IDTAR,ITIME	728.324	3571.592	0	424545
XSIAF,YSIAF,IDTAR,ITIME	725.391	3574.099	0	424592
XSIAF,YSIAF,IDTAR,ITIME	744.209	3570.450	0	424046
XSIAF,YSIAF,IDTAR,ITIME	755.000	3579.507	0	424663
XSIAF,YSIAF,IDTAR,ITIME	760.312	3582.344	0	424709
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.344	0	424721
XSIAF,YSIAF,IDTAR,ITIME	760.312	3582.844	0	424740
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.544	0	424831
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.344	0	424876
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.344	0	424897
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.344	0	424921
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.344	0	424935
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.344	0	424946
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.344	0	424969
XSIAF,YSIAF,IDTAR,ITIME	760.313	3582.644	0	424981
XSIAF,YSIAF,IDTAR,ITIME	765.777	3585.950	0	424980
XSIAF,YSIAF,IDTAR,ITIME	737.912	3592.152	0	425021
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3597.551	0	425043
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3597.555	0	425044
XSIAF,YSIAF,IDTAR,ITIME	[illegible]	3597.550	0	425165
XSIAF,YSIAF,IDTAR,ITIME	509.938	3591.914	0	425184
XSIAF,YSIAF,IDTAR,ITIME	615.650	3574.074	0	425214
XSIAF,YSIAF,IDTAR,ITIME	621.932	3557.251	0	425248

Figure 6.4, Detailed Computer Output (Sheet 23)

XSIAF,YSIAF,IUTAR,ITIME	831.325	3556.617	0	425264
XSIAF,YSIAF,IUTAR,ITIME	834.874	3555.[illegible]	0	425277
XSIAF,YSIAF,IUTAR,ITIME	846.947	3560.606	0	425318
XSIAF,YSIAF,IUTAR,ITIME	850.[illegible]	3524.702	0	425320
XSIAF,YSIAF,IUTAR,ITIME	857.515	3517.330	0	425344
XSIAF,YSIAF,IUTAR,ITIME	900.60[illegible]	3519.541	0	425414
XSIAF,YSIAF,IUTAR,ITIME	900.932	3519.079	0	425416
XSIAF,YSIAF,IUTAR,ITIME	907.787	3525.773	0	425432
XSIAF,YSIAF,IUTAR,ITIME	915.312	3519.105	0	425449
XSIAF,YSIAF,IUTAR,ITIME	913.05[illegible]	3510.503	0	425464
XSIAF,YSIAF,IUTAR,ITIME	921.753	3505.773	0	425481
XSIAF,YSIAF,IUTAR,ITIME	925.[illegible]	35[illegible]	0	425492
XSIAF,YSIAF,IUTAR,ITIME	937.531	3470.240	0	425534
XSIAF,YSIAF,IUTAR,ITIME	934.875	3467.013	0	425552
XSIAF,YSIAF,IUTAR,ITIME	940.027	3457.557	0	425571
XSIAF,YSIAF,IUTAR,ITIME	935.[illegible]	3454.722	0	425589
XSIAF,YSIAF,IUTAR,ITIME	934.875	345[illegible]	0	425615
XSIAF,YSIAF,IUTAR,ITIME	967.179	3443.270	0	425619
XSIAF,YSIAF,IUTAR,ITIME	967.71[illegible]	3457.[illegible]	0	425621
XSIAF,YSIAF,IUTAR,ITIME	973.652	3455.103	0	425638
XSIAF,YSIAF,IUTAR,ITIME	986.551	3402.379	0	425695
XSIAF,YSIAF,IUTAR,ITIME	980.551	3402.379	0	425701
XSIAF,YSIAF,IUTAR,ITIME	980.551	3402.379	0	425815
XSIAF,YSIAF,IUTAR,ITIME	980.551	3402.379	0	425836
XSIAF,YSIAF,IUTAR,ITIME	986.551	3402.379	0	425861
XSIAF,YSIAF,IUTAR,ITIME	985.551	3402.379	0	425880
XSIAF,YSIAF,IUTAR,ITIME	980.551	3402.379	0	426541
XSIAF,YSIAF,IUTAR,ITIME	980.551	3402.379	0	4265[illegible]1
XSIAF,YSIAF,IUTAR,ITIME	994.001	3401.5[illegible]	0	426631
XSIAF,YSIAF,IUTAR,ITIME	1003.[illegible]	3455.319	0	426664
XSIAF,YSIAF,IUTAR,ITIME	1002.273	3453.405	0	426679
XSIAF,YSIAF,IUTAR,ITIME	1004.067	3453.[illegible]	0	426694
XSIAF,YSIAF,IUTAR,ITIME	1006.420	3445.473	0	426713
XSIAF,YSIAF,IUTAR,ITIME	1010.667	3444.529	0	426724
XSIAF,YSIAF,IUTAR,ITIME	1021.273	3442.121	0	426770
XSIAF,YSIAF,IUTAR,ITIME	1029.255	3430.579	0	426814
XSIAF,YSIAF,IUTAR,ITIME	1035.914	3425.512	0	426850
XSIAF,YSIAF,IUTAR,ITIME	1045.420	3425.070	0	426868
XSIAF,YSIAF,IUTAR,ITIME	1050.[illegible]36	3422.303	0	426915
XSIAF,YSIAF,IUTAR,ITIME	1055.000	3419.20[illegible]	0	426963
XSIAF,YSIAF,IUTAR,ITIME	1056.559	3410.330	0	427029
XSIAF,YSIAF,IUTAR,ITIME	1060.730	3399.923	0	427034
XSIAF,YSIAF,IUTAR,ITIME	1070.355	3371.044	0	427181
XSIAF,YSIAF,IUTAR,ITIME	1069.096	3361.505	0	427231
XSIAF,YSIAF,IUTAR,ITIME	1074.027	3355.132	0	427266

Figure 6.4, Detailed Computer Output (Sheet 24)

XSIAF,YSIAF,IDTAR,ITIME	1071.774	3352.003	0	427267
XSIAF,YSIAF,IDTAR,ITIME	1063.146	3345.003	0	427313
XSIAF,YSIAF,IDTAR,ITIME	1050.020	3345.153	0	427432
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	427437
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.400	0	427466
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	428401
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	428522
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.419	0	433323
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	432001
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	432032
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	433833
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	434401
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434547
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434701
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434718
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	434790
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434836
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434850
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434871
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434890
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434909
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	434925
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	434982
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435039
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435042
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435062
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435074
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435121
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435139
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435156
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435239
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	435601
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	435632
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	436201
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	436261
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	438002
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	439201
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	439232
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	441033
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	442801
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	442817
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	442842
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	442892
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	442905
SIAF,YSIAF,IDTAF,ITIME	1042.801	3342.418	0	442981

Figure 6.4, Detailed Computer Output (Sheet 25)

XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	443000
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	443020
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	443054
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	443082
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	443112
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	443129
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	443148
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	443151
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	444952
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.418	0	446461
XSIAF,YSIAF,IDTAR,ITIME	1042.801	3342.413	0	446581
XSIAF,YSIAF,IDTAR,ITIME	1042.114	3350.000	0	446615
XSIAF,YSIAF,IDTAR,ITIME	1022.395	3400.000	0	446872
XSIAF,YSIAF,IDTAR,ITIME	1004.677	3450.000	0	447129
XSIAF,YSIAF,IDTAR,ITIME	1000.000	3463.197	0	447166
XSIAF,YSIAF,IDTAR,ITIME	986.936	3500.000	0	447352
XSIAF,YSIAF,IDTAR,ITIME	967.240	3550.000	0	447679
XSIAF,YSIAF,IDTAR,ITIME	951.521	3600.000	0	447806
XSIAF,YSIAF,IDTAR,ITIME	950.000	3604.293	0	447889
XSIAF,YSIAF,IDTAR,ITIME	933.833	3650.000	0	448124
XSIAF,YSIAF,IDTAR,ITIME	916.085	3700.000	0	448581
XSIAF,YSIAF,IDTAR,ITIME	900.000	3743.371	0	448615
XSIAF,YSIAF,IDTAR,ITIME	898.507	3750.000	0	448639
XSIAF,YSIAF,IDTAR,ITIME	880.049	3800.000	0	449030
XSIAF,YSIAF,IDTAR,ITIME	862.931	3850.000	0	449093
XSIAF,YSIAF,IDTAR,ITIME	862.803	3850.136	0	449094
XSIAF,YSIAF,IDTAR,ITIME	862.833	3850.137	0	449165
XSIAF,YSIAF,IDTAR,ITIME	862.833	3850.137	0	449215
XSIAF,YSIAF,IDTAR,ITIME	880.877	3900.000	0	449436
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	449475
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	449596
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	449897
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	450031
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	450032
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	450333
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	450634
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	450935
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	451236
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	451537
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	451838
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	452139
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	452440
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	452741
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453042
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453343

Figure 6.4, Detailed Computer Output (Sheet 26)

XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453448
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453488
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453529
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453576
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453580
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453601
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453722
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	453901
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	454562
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	455103
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	455704
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	456305
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	456966
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	457201
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	457322
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	457923
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	458524
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	459125
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	459726
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	460327
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	460801
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	460832
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	462633
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	464401
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	464432
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	465233
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	468001
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	468032
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	469633
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	471601
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	471632
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	473433
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	475201
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	475322
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	477123
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	478801
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	478922
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	480723
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	482401
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	482522
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	484323
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	486001
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	486032
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	487833
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	489601

Figure 6.4, Detailed Computer Output (Sheet 27)

XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	[illegible]
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	49563[illegible]
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	49743[illegible]
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	498034
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	498335
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	498636
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.074	0	498937
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	499238
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	499539
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	499840
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	500141
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	500401
XSIAF,YSIAF,IDTAR,ITIME	883.203	3907.078	0	500581
XSIAF,YSIAF,IDTAR,ITIME	893.772	3953.000	0	500794
XSIAF,YSIAF,IDTAR,ITIME	900.000	3975.290	0	500903
XSIAF,YSIAF,IDTAR,ITIME	906.084	4000.000	0	501026
XSIAF,YSIAF,IDTAR,ITIME	913.058	4045.625	0	501236
XSIAF,YSIAF,IDTAR,ITIME	918.059	4048.625	0	501357
XSIAF,YSIAF,IDTAR,ITIME	918.293	4050.000	0	501363
XSIAF,YSIAF,IDTAR,ITIME	926.835	4099.992	0	501608
XSIAF,YSIAF,IDTAR,ITIME	934.773	4145.457	0	501836
XSIAF,YSIAF,IDTAR,ITIME	934.775	4145.465	0	501927
XSIAF,YSIAF,IDTAR,ITIME	934.775	4145.465	0	501957
XSIAF,YSIAF,IDTAR,ITIME	933.528	4149.995	0	501975
XSIAF,YSIAF,IDTAR,ITIME	915.909	4199.990	0	502198
XSIAF,YSIAF,IDTAR,ITIME	904.935	4231.219	0	502321
XSIAF,YSIAF,IDTAR,ITIME	904.906	4231.227	0	502352
XSIAF,YSIAF,IDTAR,ITIME	904.906	4231.227	0	502442
XSIAF,YSIAF,IDTAR,ITIME	904.007	4247.775	0	502514
XSIAF,YSIAF,IDTAR,ITIME	901.013	4299.932	0	502754
XSIAF,YSIAF,IDTAR,ITIME	901.158	4309.504	0	502801
XSIAF,YSIAF,IDTAR,ITIME	900.182	4329.871	0	502900

...ure 6.4, Detailed Computer Output (Sheet 28)

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
XSIAF,YSIAF,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
XSIAF,YSIAF,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
XSIAF,YSIAF,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	[illegible]	503119
XSIAF,YSIAF,IOTAF,ITIME	595.715	4562.537	0	503127
XSIAF,YSIAF,IOTAF,ITIME	595.715	4562.537	0	503131
XSIAF,YSIAF,IOTAF,ITIME	595.715	4562.537	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	595.715	4562.537	[illegible]	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	595.715	4562.537	[illegible]	503221
XSIAF,YSIAF,IOTAF,ITIME	595.411	4597.954	0	503431
XSIAF,YSIAF,IOTAF,ITIME	595.151	4597.996	0	503414
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	0	503553
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	[illegible]	503631
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	[illegible]	503644
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	4552.117	[illegible]	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	4552.117	[illegible]	504151
XSIAF,YSIAF,IOTAF,ITIME	631.747	4599.996	0	504256
XSIAF,YSIAF,IOTAF,ITIME	877.271	4599.992	0	504511
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.441	0	504562
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	504593
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	505594
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	505701
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	507501
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	507032
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	509141
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	509444
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	511201
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	511252
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	511501
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	511541
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	513552
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	514592
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	513401
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	513412
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	520293
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	522001
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	522032
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	523333
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	524731
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	570.556	4610.445	[illegible]	[illegible]

Figure 6.4, Detailed Computer Output (Sheet 29)

XSIAF,YSIAF,IOTAR,ITIME	876.336	4613.44[illegible]	0	525021
XSIAF,YSIAF,IOTAR,ITIME	876.336	4617.445	0	525722
XSIAF,YSIAF,IOTAR,ITIME	873.472	4645.373	0	525921
XSIAF,YSIAF,IOTAR,ITIME	873.155	4649.932	0	525917
XSIAF,YSIAF,IOTAR,ITIME	872.320	4654.351	0	525942
XSIAF,YSIAF,IOTAR,ITIME	872.136	4662.355	0	525952
XSIAF,YSIAF,IOTAR,ITIME	871.534	4659.900	0	526019
XSIAF,YSIAF,IOTAR,ITIME	873.134	4653.593	0	526112
XSIAF,YSIAF,IOTAR,ITIME	869.195	4697.992	0	526169
XSIAF,YSIAF,IOTAR,ITIME	868.731	4735.191	0	526236
XSIAF,YSIAF,IOTAR,ITIME	867.535	4734.732	0	526237
XSIAF,YSIAF,IOTAR,ITIME	867.119	4735.347	0	526249
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.695	0	526357
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	526357
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	526450
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	526451
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	526202
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	529201
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	529322
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	531123
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	532801
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	532922
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	534723
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	535024
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	535325
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	535626
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	535927
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	536228
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	536401
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	536432
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	536733
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	537034
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	537335
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	537636
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	537937
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	538235
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	538539
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	538840
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	539141
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	539442
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	539743
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	540001
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	540332
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	540633
XSIAF,YSIAF,IOTAR,ITIME	866.191	4737.703	0	541234

Figure 6.4, Detailed Computer Output (Sheet 30)

XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	541[illegible]55
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	542436
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	543[illegible]37
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	543[illegible]1
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	543722
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	544323
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	544924
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	545525
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	545126
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	545727
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	547201
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	547232
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	549[illegible]33
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	549[illegible]1
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	549700
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	549756
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	549561
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	549868
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	553801
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	553832
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	552633
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	5544[illegible]1
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	554492
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	556293
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	556001
XSIAF,YSIAF,IOTAF,ITIME	866.191	4737.703	0	558151
XSIAF,YSIAF,IOTAF,ITIME	871.727	4749.995	0	558177
XSIAF,YSIAF,IOTAF,ITIME	894.150	4799.995	0	558295
XSIAF,YSIAF,IOTAF,ITIME	90[illegible]	4814.350	0	558326
XSIAF,YSIAF,IOTAF,ITIME	916.565	4847.992	0	558403
XSIAF,YSIAF,IOTAF,ITIME	938.994	4897.992	0	558521
XSIAF,YSIAF,IOTAF,ITIME	950.60[illegible]	4924.531	0	558586
XSIAF,YSIAF,IOTAF,ITIME	961.422	4947.995	0	558646
XSIAF,YSIAF,IOTAF,ITIME	977.559	4983.502	0	558734
XSIAF,YSIAF,IOTAF,ITIME	977.646	4985.509	0	558755
XSIAF,YSIAF,IOTAF,ITIME	977.[illegible]	4985.[illegible]	0	558855
XSIAF,YSIAF,IOTAF,ITIME	992.103	4997.990	0	558850
XSIAF,YSIAF,IOTAF,ITIME	998.005	5349.990	0	558999
XSIAF,YSIAF,IOTAF,ITIME	10[illegible]	5055.258	0	559012
XSIAF,YSIAF,IOTAF,ITIME	1013.915	5097.772	0	559099
XSIAF,YSIAF,IOTAF,ITIME	1029.821	5149.992	0	559199
XSIAF,YSIAF,IOTAF,ITIME	1037.[illegible]	5174.[illegible]	0	559263
XSIAF,YSIAF,IOTAF,ITIME	1037.556	5174.343	0	559234
XSIAF,YSIAF,IOTAF,ITIME	1037.566	5174.346	0	559364
XSIAF,YSIAF,IOTAF,ITIME	1047.559	5197.992	0	559455

Figure 6.4, Detailed Computer Output (Sheet 31)

XSIAF,YSIAF,IOTAF,ITI[illegible]	[illegible]	[illegible]		553456
XSIAF,YSIAF,IOTAF,ITI[illegible]	1375.27[illegible]	5247.77[illegible]	.	553575
XSIAF,YSIAF,IOTAF,ITI[illegible]	1376.7[illegible]	[illegible]	.	553694
XSIAF,YSIAF,IOTAF,ITI[illegible]	112[illegible]	526[illegible]	.	553714
XSIAF,YSIAF,IOTAF,ITI[illegible]	112[illegible]	534[illegible]	.	553814
XSIAF,YSIAF,IOTAF,ITI[illegible]	1141.77[illegible]	5397.472	0	553933
XSIAF,YSIAF,IOTAF,ITI[illegible]	1153.[illegible]	5413.225	0	553965
XSIAF,YSIAF,IOTAF,ITI[illegible]	1157.3[illegible]	5443.992	0	557053
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.[illegible]	0	560066
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	560097
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	561031
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	561032
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	563433
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	565231
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	565322
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	567123
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	568821
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	569832
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	570633
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	572401
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	572404
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	572432
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	574235
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	575031
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	576032
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	576033
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	577234
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	577335
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	575401
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	575506
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	575551
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	577152
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	579031
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	579032
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	553233
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	580834
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	581435
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	582036
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	582037
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	583231
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	583232
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	583333
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	584434
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	584735
XSIAF,YSIAF,IOTAF,ITI[illegible]	1169.357	5454.333	0	585036

Figure 6.4, Detailed Computer Output (Sheet 32)

XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	575137
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	580036
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	580459
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	583249
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	583541
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	586031
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	586922
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	587223
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	587524
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	591025
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	590126
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	593427
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	593726
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	593401
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	593432
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	592233
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	594031
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	594032
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	594601
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	594701
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	594735
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	595336
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	597001
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	597532
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	597433
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	601201
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	601232
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	603033
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	604001
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	604922
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	605401
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	605499
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	605533
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	607334
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	608401
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	608432
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	610233
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	612001
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	612032
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	613633
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	615601
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	615632
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	617433
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	619201
XSIAF,YSIAF,IDTAR,ITIME	1169.307	5454.303	0	619232

Figure 6.4, Detailed Computer Output (Sheet 33)

XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		026019
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	5545.564	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	1201.[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	1217.[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	1317.234	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	1333.567	5949.990		027590
XSIAF,YSIAF,IOTAF,ITIME	1353.000	[illegible]	0	[illegible]
XSIAF,YSIAF,IOTAF,ITIME	1390.441	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	1367.333	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	1333.625	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	6199.992		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]
XSIAF,YSIAF,IOTAF,ITIME	[illegible]	[illegible]		[illegible]

Figure 6.4, Detailed Computer Output (Sheet 34)

XSIAF,YSIAF,IDTAR,ITIME	1496.234	6349.772	0	023416
XSIAF,YSIAF,IDTAR,ITIME	1493.175	6373.743	0	023516
XSIAF,YSIAF,IDTAR,ITIME	1499.754	6441.492	0	023610
XSIAF,YSIAF,IDTAR,ITIME	1500.677	6457.733	0	023612
XSIAF,YSIAF,IDTAR,ITIME	1506.333	6449.442	0	023713
XSIAF,YSIAF,IDTAR,ITIME	1531.536	6542.732	0	023801
XSIAF,YSIAF,IDTAR,ITIME	1533.547	6547.737	0	023802
XSIAF,YSIAF,IDTAR,ITIME	1532.947	6547.478	0	024017
XSIAF,YSIAF,IDTAR,ITIME	1536.219	6557.577	0	028037
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.333	0	028505
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.333	0	029501
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.363	0	029502
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.363	0	029583
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.363	0	030001
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.333	0	030032
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.333	0	030033
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.333	0	031234
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.333	0	032035
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.803	0	032436
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.303	0	033037
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.303	0	033001
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.303	0	033032
XSIAF,YSIAF,IDTAR,ITIME	1530.249	6557.303	0	033433
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.303	0	037031
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.303	0	037032
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.303	0	039033
XSIAF,YSIAF,IDTAR,ITIME	1530.219	6557.303	0	040031

Figure 6.4, Detailed Computer Output (Sheet 35)

Figure 6.5. SIAF SURVEILLANCE STATISTICS (PAGE 1)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	1	2	3	4	5	6
NUMBER OF DETECTIONS	0	0	0	5	5	5
DETECTION SUCCESS RATIO	0.0	0.0	0.0	1.000	1.000	1.000
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	172.910	152.475	65.213
STANDARD DEVIATION	0.0	0.0	0.0	0.321	2.338	0.967
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	020517	022237	022206
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL	5	5	0	0	5	0
SENSOR						

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	1	2	3	4	5	6
NUMBER OF IDENTIFICATIONS	0	0	0	0	3	5
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.600	1.000
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	152.079	65.213
STANDARD DEVIATION	0.0	0.0	0.0	0.0	2.195	0.967
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	022237	022206
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5. SIAF SURVEILLANCE STATISTICS (PAGE 2)
HUNTER LIGGETT SCENARIO 1
8 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	7	8	9	10	11	12
NUMBER OF DETECTIONS	0	0	0	5	0	1
DETECTION SUCCESS RATIO	0.0	0.0	0.0	1.000	0.0	0.250
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	515.212	0.0	1038.198
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	033625	000000	030904
STANDARD DEVIATION	000000	000000	000000	000002	000000	000000
DETECTION CUES						
AURAL	5	0	0	0	5	0
SENSOR						

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	7	8	9	10	11	12
NUMBER OF IDENTIFICATIONS	0	0	0	5	0	0
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	1.000	0.0	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	515.212	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	033625	000000	000000
STANDARD DEVIATION	000000	000000	000000	000002	000000	000000

Figure 6.5, SIAF SURVEILLANCE STATISTICS (PAGE 3)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	13	14	15	16	17	18
NUMBER OF DETECTIONS	0	0	3	0	0	4
DETECTION SUCCESS RATIO	0.0	0.0	0.600	0.0	0.0	0.800
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	1039.449	0.0	0.0	41.912
STANDARD DEVIATION	0.0	0.0	0.629	0.0	0.0	0.923
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	031721	000000	000000	032203
STANDARD DEVIATION	000000	000000	000023	000000	000000	000000
DETECTION CUES						
AURAL	0	5	0	0	5	0
SENSOR						

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	13	14	15	16	17	18
NUMBER OF IDENTIFICATIONS	0	0	0	0	0	4
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	1.000
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	41.912
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.923
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	032203
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, SIAF SURVEILLANCE STATISTICS (PAGE 4)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	19	20	21	22	23	24
NUMBER OF DETECTIONS	0	3	0	1	3	1
DETECTION SUCCESS RATIO	0.0	0.600	0.0	0.200	0.600	0.200
DETECTION RANGE (METERS)						
MEAN	0.0	35.446	0.0	31.159	44.018	501.217
STANDARD DEVIATION	0.0	11.659	0.0	0.0	3.151	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	040054	000000	040119	040306	040408
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL						
SENSOR	0	2	0	0	0	0

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	19	20	21	22	23	24
NUMBER OF IDENTIFICATIONS	0	3	0	1	3	0
IDENTIFICATION SUCCESS RATIO	0.0	1.000	0.0	1.000	1.000	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	35.446	0.0	31.159	44.018	0.0
STANDARD DEVIATION	0.0	11.659	0.0	0.0	3.151	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	040354	000000	040119	040306	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5. SIAF SURVEILLANCE STATISTICS (PAGE 5)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	25	26	27	28	29	30
NUMBER OF DETECTIONS	0	1	0	5	1	0
DETECTION SUCCESS RATIO	0.0	0.200	0.0	1.000	0.200	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	153.085	0.0	198.758	45.842	0.0
STANDARD DEVIATION	0.0	0.0	0.0	190.460	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	041336	000000	042213	042204	000000
STANDARD DEVIATION	000000	000000	000000	000011	000000	000000
DETECTION CUES						
AURAL						
SENSOR	0	0	0	4	0	0

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	25	26	27	28	29	30
NUMBER OF IDENTIFICATIONS	0	0	0	3	1	0
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.600	1.000	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	47.908	45.842	0.0
STANDARD DEVIATION	0.0	0.0	0.0	3.313	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	042219	042204	000000
STANDARD DEVIATION	000000	000000	000000	000009	000000	000000

Figure [illegible] [illegible]ILLANCE STATISTICS (PAGE 6)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	31	32	33	34	35	36
NUMBER OF DETECTIONS	5	0	3	5	5	3
DETECTION SUCCESS RATIO	1.000	0.0	0.600	1.000	1.000	0.600
DETECTION RANGE (METERS)						
MEAN	31.555	0.0	31.159	39.950	216.416	253.432
STANDARD DEVIATION	8.772	0.0	0.0	1.813	3.400	55.929
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	050054	000000	050110	050306	050600	052132
STANDARD DEVIATION	000000	000000	000000	000000	000000	000001
DETECTION CUES						
AURAL	4	0	0	0	5	5
SENSOR						

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	31	32	33	34	35	36
NUMBER OF IDENTIFICATIONS	5	0	3	5	2	0
IDENTIFICATION SUCCESS RATIO	1.000	0.0	1.000	1.000	0.400	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	31.555	0.0	31.159	39.950	215.522	0.0
STANDARD DEVIATION	8.772	0.0	0.0	1.813	0.745	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	050054	000000	050110	050306	050600	00000
STANDARD DEVIATION	000000	000000	000000	000000	000000	00000

Figure 6.5. STAF SURVEILLANCE STATISTICS (PAGE 7)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY STAF

TARGET NUMBER	37	38	39	40	41	42
NUMBER OF DETECTIONS	0	6	0	0	0	5
DETECTION SUCCESS RATIO	0.0	0.667	0.0	0.0	0.0	1.000
DETECTION RANGE (METERS)						
MEAN	0.0	136.657	0.0	0.0	0.0	258.208
STANDARD DEVIATION	0.0	0.147	0.0	0.0	0.0	0.999
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	051355	000000	000000	000000	060215
STANDARD DEVIATION	000000	000001	000000	000000	000000	000000
DETECTION CUES						
AURAL	0	0	0	0	0	5
SENSOR						

IDENTIFICATION STATISTICS OF THE TARGETS BY STAF

TARGET NUMBER	37	38	39	40	41	42
NUMBER OF IDENTIFICATIONS	0	0	0	0	0	5
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	1.000
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	258.208
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.999
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	060215
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure [illegible], SIAF SURVEILLANCE STATISTICS (PAGE 8)
HUNTER LIBERTY SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	43	44	45	46	47	48
NUMBER OF DETECTIONS	5	5	5	5	5	5
DETECTION SUCCESS RATIO	1.000	1.000	1.000	1.000	1.000	1.000
DETECTION RANGE (METERS)						
MEAN	256.214	1338.244	334.893	334.967	334.634	335.173
STANDARD DEVIATION	1.374	0.0	0.767	0.758	0.782	0.824
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	060845	061500	061643	062113	070013	070555
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL	5	[illegible]	5	5	5	5
SENSOR						

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	43	44	45	46	47	48
NUMBER OF IDENTIFICATIONS	5	0	0	0	0	0
IDENTIFICATION SUCCESS RATIO	1.000	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	256.214	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	1.374	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	060845	[illegible]	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, SIAF SURVEILLANCE STATISTICS (PAGE 9)
HUNTER LIGGETT SCENARIO 1
6 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	49	50	51
NUMBER OF DETECTIONS	5	5	3
DETECTION SUCCESS RATIO	1.000	1.000	0.600
DETECTION RANGE (METERS)			
MEAN	119.722	736.549	736.568
STANDARD DEVIATION	0.669	0.047	0.017
DETECTION TIME (DAYS,HRS,MINS)			
MEAN	070640	070643	070643
STANDARD DEVIATION	000000	000000	000000
DETECTION CUES			
AURAL	0	0	0
SENSOR			

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	49	50	51
NUMBER OF IDENTIFICATIONS	5	0	0
IDENTIFICATION SUCCESS RATIO	1.000	0.0	0.0
IDENTIFICATION RANGE (METERS)			
MEAN	119.722	0.0	0.0
STANDARD DEVIATION	0.669	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)			
MEAN	070640	000000	000000
STANDARD DEVIATION	000000	000000	000000

Figure 6.8, SIAF SURVEILLANCE STATISTICS (PAGE 10)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	1	2	3	4	5	6
NUMBER OF DETECTIONS	5	5	0	0	5	0
DETECTION SUCCESS RATIO	1.000	1.000	0.0	0.0	1.000	0.0
DETECTION RANGE (METERS)						
MEAN	344.181	240.831	0.0	0.0	311.826	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	012157	012230	000000	000000	022139	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	1	2	3	4	5	6
TARGET LOCATION CEP (METERS)						
MEAN	0.0	0.0	0.0	24.861	21.923	9.376
STANDARD DEVIATION	0.0	0.0	0.0	0.046	0.337	0.010

Figure 6.5, STAF SURVEILLANCE STATISTICS (PAGE 11)
[illegible] SCENARIO 1
6 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY STAF

TARGET NUMBER	7	8	9	10	11	12
NUMBER OF DETECTIONS	5	0	0	0	5	0
DETECTION SUCCESS RATIO	1.000	0.0	0.0	0.0	1.000	0.0
DETECTION RANGE (METERS)						
MEAN	423.070	0.0	0.0	0.0	382.900	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	030221	000000	000000	000000	030851	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	7	8	9	10	11	12
TARGET LOCATION CEP (METERS)						
MEAN	0.0	0.0	0.0	74.077	0.0	149.272
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0

[illegible]

IRAL DETECTION [illegible] TARGETS [illegible]

	13	14	15	16	17	18
TARGET NUMBER	13	14	15	16	17	18
NUMBER OF DETECTIONS	0	5	0	0	5	0
DETECTION SUCCESS RATIO	0.0	1.000	0.0	0.0	1.000	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	382.900	0.0	0.0	330.202	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	031651	000000	000000	032120	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	13	14	15	16	17	18
TARGET LOCATION CEP (METERS)						
MEAN	0.0	0.0	149.452	0.0	0.0	6.026
STANDARD DEVIATION	0.0	0.0	0.090	0.0	0.0	1.283

FIGURE 6.?? STAF SURVEILLANCE STATISTICS (PAGE 13)
HUNTER LIGGETT SCENARIO I
5 REPLICATIONS

AERIAL DETECTION STATISTICS OF THE TARGETS BY STAF

TARGET NUMBER	19	20	21	22	23	24
NUMBER OF DETECTIONS	0	2	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.400	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	27.9[illegible]	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	040054	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	19	20	21	22	23	24
TARGET LOCATION CEP (METERS)						
MEAN	0.0	5.096	0.0	4.48[illegible]	6.329	72.065
STANDARD DEVIATION	0.0	1.533	0.0	0.0	0.453	0.0

SURVEILLANCE STATISTICS (PAGE 15)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	25	26	27	28	29	30
NUMBER OF DETECTIONS	0	0	0	4	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.800	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	446.849	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	8.559	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	042218	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	25	26	27	28	29	30
TARGET LOCATION CEP (METERS)						
MEAN	0.0	22.011	0.0	29.577	6.591	0.0
STANDARD DEVIATION	0.0	0.0	0.0	27.384	0.0	0.0

Figure 6.5, SIAF SURVEILLANCE STATISTICS (PAGE 15)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	31	32	33	34	35	36
NUMBER OF DETECTIONS	4	0	0	0	5	5
DETECTION SUCCESS RATIO	0.800	0.0	0.0	0.0	1.000	1.000
DETECTION RANGE (METERS)						
MEAN	27.909	0.0	0.0	0.0	301.201	263.412
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	050054	000000	000000	000000	050600	052131
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	31	32	33	34	35	36
TARGET LOCATION CEP (METERS)						
MEAN	4.537	0.0	4.480	5.744	31.116	36.438
STANDARD DEVIATION	1.261	0.0	0.0	0.261	0.489	8.041

Figure [illegible] SIAF SURVEILLANCE STATISTICS (PAGE 16)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	37	38	39	40	41	42
NUMBER OF DETECTIONS	0	0	0	0	0	5
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	1.000
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	369.338
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	34.196
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	060215
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	37	38	39	40	41	42
TARGET LOCATION CEP (METERS)						
MEAN	0.0	19.649	0.0	0.0	0.0	37.125
STANDARD DEVIATION	0.0	0.021	0.0	0.0	0.0	0.144

Figure 6.5. SIAF SURVEILLANCE STATISTICS (PAGE 17)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	43	44	45	46	47	48
NUMBER OF DETECTIONS	5	0	5	5	5	5
DETECTION SUCCESS RATIO	1.000	0.0	1.000	1.000	1.000	1.000
DETECTION RANGE (METERS)						
MEAN	374.015	0.0	394.064	466.798	470.139	418.854
STANDARD DEVIATION	22.622	0.0	8.192	41.378	34.697	56.359
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	060845	000000	061643	062112	070012	070554
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	43	44	45	46	47	48
TARGET LOCATION CEP (METERS)						
MEAN	36.810	192.413	48.151	48.161	48.114	48.191
STANDARD DEVIATION	0.198	0.0	0.110	0.115	0.112	0.118

Figure 6.5, SIAF SURVEILLANCE STATISTICS (PAGE 18)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	49	50	51
NUMBER OF DETECTIONS	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0
DETECTION RANGE (METERS)			
MEAN	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)			
MEAN	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	49	50	51
TARGET LOCATION CEP (METERS)			
MEAN	17.214	105.901	105.904
STANDARD DEVIATION	0.096	0.037	0.032

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 19)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	1	2	3	4	5	6
NUMBER OF DETECTIONS	0	0	0	1	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.200	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	172.478	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	020517	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL	0	0	0	0	0	0
SENSOR						

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	1	2	3	4	5	6
NUMBER OF IDENTIFICATIONS	0	0	0	0	0	0
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 5.5, TARGET SURVEILLANCE STATISTICS (PAGE 20)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	7	8	9	10	11	12
NUMBER OF DETECTIONS	0	0	0	0	0	3
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.600
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	1036.898
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	2.447
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	030004
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION-CUES						
AURAL						
SENSOR	0	0	0	0	0	0

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	7	8	9	10	11	12
NUMBER OF IDENTIFICATIONS	0	0	0	0	0	0
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

[illegible] TARGET SURVEILLANCE STATISTICS (PAGE 21)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	13	14	15	16	17	18
NUMBER OF DETECTIONS	0	0	2	0	0	3
DETECTION SUCCESS RATIO	0.0	0.0	0.400	0.0	0.0	0.600
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	1037.702	0.0	0.0	38.502
STANDARD DEVIATION	0.0	0.0	1.049	0.0	0.0	8.201
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	031704	000000	000000	032203
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL						
SENSOR	0	0	0	0	0	0

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	13	14	15	16	17	18
NUMBER OF IDENTIFICATIONS	0	0	0	0	0	3
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	1.000
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	38.502
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	8.201
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	032203
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 22)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	19	20	21	22	23	24
NUMBER OF DETECTIONS	0	3	0	0	2	0
DETECTION SUCCESS RATIO	0.0	0.600	0.0	0.0	0.400	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	40.622	0.0	0.0	38.502	0.0
STANDARD DEVIATION	0.0	9.309	0.0	0.0	0.963	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	040054	000000	000000	040306	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL	0	0	0	0	0	0
SENSOR						

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	19	20	21	22	23	24
NUMBER OF IDENTIFICATIONS	0	4	0	0	2	0
IDENTIFICATION SUCCESS RATIO	0.0	1.333	0.0	0.0	1.000	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	33.466	0.0	0.0	38.502	0.0
STANDARD DEVIATION	0.0	19.349	0.0	0.0	0.963	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	330040	000000	000000	040306	000000
STANDARD DEVIATION	000000	011757	000000	000000	000000	000000

Figure 6-[illegible], TARGET SURVEILLANCE STATISTICS (PAGE 23)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	25	26	27	28	29	30
NUMBER OF DETECTIONS	0	4	0	0	4	0
DETECTION SUCCESS RATIO	0.0	0.800	0.0	0.0	0.800	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	172.107	0.0	0.0	43.600	0.0
STANDARD DEVIATION	0.0	85.050	0.0	0.0	6.904	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	041333	000000	000000	042205	000000
STANDARD DEVIATION	000000	000002	000000	000000	000000	000000
DETECTION CUES						
AURAL	0	0	0	0	0	0
SENSOR						

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	25	25	27	28	29	30
NUMBER OF IDENTIFICATIONS	0	0	0	0	4	0
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	1.000	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	43.600	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	6.904	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	042205	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 24)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	31	32	33	34	35	36
NUMBER OF DETECTIONS	1	0	0	0	0	0
DETECTION SUCCESS RATIO	0.200	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	25.087	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	050054	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL	0	0	0	0	0	0
SENSOR						

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	31	32	33	34	35	36
NUMBER OF IDENTIFICATIONS	1	0	0	0	0	0
IDENTIFICATION SUCCESS RATIO	1.000	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	25.087	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	050054	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 25)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	37	38	39	40	41	42
NUMBER OF DETECTIONS	0	0	0	0	0	1
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.200
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	259.003
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	060215
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL	0	0	0	0	0	0
SENSOR						

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	37	38	39	40	41	42
NUMBER OF IDENTIFICATIONS	0	0	0	0	0	0
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 26)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	43	44	45	46	47	48
NUMBER OF DETECTIONS	3	0	0	0	0	1
DETECTION SUCCESS RATIO	0.600	0.0	0.0	0.0	0.0	0.200
DETECTION RANGE (METERS)						
MEAN	255.577	0.0	0.0	0.0	0.0	335.355
STANDARD DEVIATION	1.525	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	060845	000000	000000	000000	000000	070555
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000
DETECTION CUES						
AURAL						
SENSOR	0	0	0	0	0	0

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	43	44	45	46	47	48
NUMBER OF IDENTIFICATIONS	0	0	0	0	0	0
IDENTIFICATION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE ST. STICS (PAGE 27)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	49	50	51
NUMBER OF DETECTIONS	5	5	5
DETECTION SUCCESS RATIO	1.000	1.000	1.000
DETECTION RANGE (METERS)			
MEAN	119.722	736.548	736.548
STANDARD DEVIATION	0.669	0.047	0.047
DETECTION TIME (DAYS,HRS,MINS)			
MEAN	070640	070643	070643
STANDARD DEVIATION	000000	000000	000000
DETECTION CUES			
AURAL	0	0	0
SENSOR			

IDENTIFICATION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	49	50	51
NUMBER OF IDENTIFICATIONS	5	0	0
IDENTIFICATION SUCCESS RATIO	1.000	0.0	0.0
IDENTIFICATION RANGE (METERS)			
MEAN	119.722	0.0	0.0
STANDARD DEVIATION	0.669	0.0	0.0
IDENTIFICATION TIME (DAYS,HRS,MINS)			
MEAN	070640	000000	000000
STANDARD DEVIATION	000000	000000	000000

Figure 6.5. TARGET SURVEILLANCE STATISTICS (PAGE 23)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF STAF BY THE TARGETS

TARGET NUMBER	1	2	3	4	5	6
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 29)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	7	8	9	10	11	12
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

FIGURE [illegible] TARGET SURVEILLANCE STATISTICS (PAGE 3[illegible])
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	13	14	15	16	17	18
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

FIGURE 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 31)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	19	20	21	22	23	24
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 32)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	25	26	27	28	29	30
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 33)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	31	32	33	34	35	36
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 34)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	37	38	39	40	41	42
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 35)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	43	44	45	46	47	48
NUMBER OF DETECTIONS	0	0	0	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION RANGE (METERS)						
MEAN	0.0	0.0	0.0	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)						
MEAN	000000	000000	000000	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000	000000	000000	000000

Figure 6.5, TARGET SURVEILLANCE STATISTICS (PAGE 35)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

AURAL DETECTION STATISTICS OF SIAF BY THE TARGETS

TARGET NUMBER	49	50	51
NUMBER OF DETECTIONS	0	0	0
DETECTION SUCCESS RATIO	0.0	0.0	0.0
DETECTION RANGE (METERS)			
MEAN	0.0	0.0	0.0
STANDARD DEVIATION	0.0	0.0	0.0
DETECTION TIME (DAYS,HRS,MINS)			
MEAN	000000	000000	000000
STANDARD DEVIATION	000000	000000	000000

FIGURE [illegible] SEAF/TARGET SURVEILLANCE STATISTICS (PAGE 47)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR SEAF (PERCENT)

TARGET NUMBER	1	2	3	4	5	6
MASKING BY RELIEF	9.744	100.000	100.000	16.667	42.942	0.0
MASKING BY VEGETATION	90.256	0.0	0.0	72.917	55.666	0.0
RANGE AND LIGHT LEVEL	0.0	0.0	0.0	7.813	0.0	0.0
INSUFFICIENT TIME	0.0	0.0	0.0	2.604	1.392	0.0

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	1	2	3	4	5	6
MASKING BY RELIEF	9.360	100.000	100.000	16.000	42.520	0.0
MASKING BY VEGETATION	85.700	0.0	0.0	70.000	55.118	0.0
RANGE AND LIGHT LEVEL	3.941	0.0	0.0	10.000	2.362	100.000
INSUFFICIENT TIME	0.0	0.0	0.0	4.000	0.0	0.0

SURVEILLANCE STATISTICS (PAGE 39)
HUNTER LIGGETT SCENARIO 1
REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	7	8	9	10	11	12
MASKING BY RELIEF	19.032	100.000	40.404	0.0	33.384	17.978
MASKING BY VEGETATION	80.968	0.0	59.596	0.0	64.350	65.169
RANGE AND LIGHT LEVEL	0.0	0.0	0.0	0.0	1.007	0.562
INSUFFICIENT TIME	0.0	0.0	0.0	0.0	1.259	16.292

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	7	8	9	10	11	12
MASKING BY RELIEF	19.032	100.000	40.404	0.0	33.384	18.182
MASKING BY VEGETATION	80.968	0.0	59.596	0.0	64.350	65.909
RANGE AND LIGHT LEVEL	0.0	0.0	0.0	100.000	2.266	5.682
INSUFFICIENT TIME	0.0	0.0	0.0	0.0	0.0	10.227

Figure 6.5, SIAF/TARGET SURVEILLANCE STATISTICS (PAGE 39)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	13	14	15	16	17	18
MASKING BY RELIEF	0.0	33.969	14.167	0.0	78.750	61.431
MASKING BY VEGETATION	0.0	63.262	66.667	0.0	21.250	36.392
RANGE AND LIGHT LEVEL	0.0	0.0	2.500	0.0	0.0	1.089
INSUFFICIENT TIME	0.0	2.769	16.667	0.0	0.0	1.089

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	13	14	15	16	17	18
MASKING BY RELIEF	0.0	33.969	14.050	0.0	74.118	61.335
MASKING BY VEGETATION	0.0	63.262	66.116	0.0	20.000	36.335
RANGE AND LIGHT LEVEL	0.0	2.769	4.959	0.0	5.882	1.087
INSUFFICIENT TIME	0.0	0.0	14.876	0.0	0.0	1.242

Figure 6.5, SIAF/TARGET SURVEILLANCE STATISTICS (PAGE 43)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	19	20	21	22	23	24
MASKING BY RELIEF	0.0	52.795	0.0	0.0	90.278	18.576
MASKING BY VEGETATION	100.000	40.373	0.0	0.0	0.0	74.305
RANGE AND LIGHT LEVEL	0.0	0.0	0.0	0.0	0.0	0.0
INSUFFICIENT TIME	0.0	6.832	0.0	100.000	9.722	7.119

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	19	20	21	22	23	24
MASKING BY RELIEF	0.0	53.125	0.0	0.0	89.041	18.556
MASKING BY VEGETATION	90.196	40.625	0.0	0.0	0.0	74.222
RANGE AND LIGHT LEVEL	9.804	3.125	0.0	100.000	0.0	4.111
INSUFFICIENT TIME	0.0	3.125	0.0	0.0	10.959	3.111

Figure 6.5, SIAF/TARGET SURVEILLANCE STATISTICS (PAGE 41)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	25	26	27	28	29	30
MASKING BY RELIEF	23.136	46.154	35.484	37.122	0.0	18.182
MASKING BY VEGETATION	71.722	27.473	59.355	50.204	90.933	18.182
RANGE AND LIGHT LEVEL	0.0	0.0	0.0	0.409	2.332	27.273
INSUFFICIENT TIME	5.141	26.374	5.161	12.265	6.736	36.364

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	25	26	27	28	29	30
MASKING BY RELIEF	23.136	47.727	32.164	32.946	0.0	18.182
MASKING BY VEGETATION	71.722	28.409	53.801	44.557	91.645	18.182
RANGE AND LIGHT LEVEL	4.499	0.0	14.035	22.279	2.350	27.273
INSUFFICIENT TIME	0.643	23.864	0.0	0.218	6.005	36.364

Figure 6.5, SIAF/TARGET SURVEILLANCE STATISTICS (PAGE 42)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	31	32	33	34	35	36
MASKING BY RELIEF	52.147	0.0	0.0	91.549	89.286	11.607
MASKING BY VEGETATION	39.877	0.0	0.0	0.0	7.143	83.482
RANGE AND LIGHT LEVEL	3.067	0.0	0.0	0.0	0.0	0.0
INSUFFICIENT TIME	4.908	0.0	100.000	8.451	3.571	4.911

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	31	32	33	34	35	36
MASKING BY RELIEF	50.595	0.0	0.0	85.526	87.549	11.314
MASKING BY VEGETATION	38.690	0.0	0.0	0.0	7.004	81.375
RANGE AND LIGHT LEVEL	2.976	0.0	100.000	0.0	5.447	7.311
INSUFFICIENT TIME	7.738	0.0	0.0	14.474	0.0	0.0

Figure 6.5, SIAF/TARGET SURVEILLANCE STATISTICS (PAGE 43)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	37	38	39	40	41	42
MASKING BY RELIEF	0.0	9.563	2.489	0.0	100.000	96.278
MASKING BY VEGETATION	100.000	89.617	97.511	100.000	0.0	3.722
RANGE AND LIGHT LEVEL	0.0	0.0	0.0	0.0	0.0	0.0
INSUFFICIENT TIME	0.0	0.820	0.0	0.0	0.0	0.0

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	37	38	39	40	41	42
MASKING BY RELIEF	0.0	9.150	2.489	0.0	100.000	93.046
MASKING BY VEGETATION	100.000	85.752	97.511	100.000	0.0	3.597
RANGE AND LIGHT LEVEL	0.0	5.098	0.0	0.0	0.0	2.398
INSUFFICIENT TIME	0.0	0.0	0.0	0.0	0.0	0.959

Figure 6.5, SIAF/TARGET SURVEILLANCE STATISTICS (PAGE 44)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	43	44	45	46	47	48
MASKING BY RELIEF	96.875	0.0	100.000	100.000	100.000	100.000
MASKING BY VEGETATION	3.125	0.0	0.0	0.0	0.0	0.0
RANGE AND LIGHT LEVEL	0.0	0.0	0.0	0.0	0.0	0.0
INSUFFICIENT TIME	0.0	0.0	0.0	0.0	0.0	0.0

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	43	44	45	46	47	48
MASKING BY RELIEF	96.473	0.0	98.000	98.000	98.000	98.394
MASKING BY VEGETATION	3.112	0.0	0.0	0.0	0.0	0.0
RANGE AND LIGHT LEVEL	0.0	100.000	0.0	2.000	2.000	0.0
INSUFFICIENT TIME	0.415	0.0	2.000	0.0	0.0	1.606

FIGURE 6.5. DIAP/TARGET SURVEILLANCE STATISTICS (PAGE 45)
— [illegible] SCENARIO 1
5 REPLICATIONS

CAUSES OF NO DETECTION FOR DIAP (PERCENT)

TARGET NUMBER	49	50	51
MASKING BY RELIEF	0.0	0.0	0.0
MASKING BY VEGETATION	0.0	0.0	0.0
RANGE AND LIGHT LEVEL	0.0	0.0	83.333
INSUFFICIENT TIME	0.0	0.0	16.667

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	49	50	51
MASKING BY RELIEF	0.0	0.0	0.0
MASKING BY VEGETATION	0.0	0.0	0.0
RANGE AND LIGHT LEVEL	0.0	0.0	0.0
INSUFFICIENT TIME	0.0	0.0	0.0

MOVEMENT STATISTICS (PAGE 46)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

```
MOVEMENT RATE (KM/HR)
     MEAN                                 0.964
     STANDARD DEVIATION                   0.324

PATROL DURATION (DAYS,HRS,MINS)
     MEAN                                071000
     STANDARD DEVIATION                  000000

DISTANCE TRAVELLED (KM)
     MEAN                                 9.022
     STANDARD DEVIATION                   0.000

MOVEMENT RATE HISTOGRAM (KM/HR)

     PERCENT TIME BETWEEN 0.0   - 0.200 KM/HR =  0.004

     PERCENT TIME BETWEEN 0.200 - 0.400 KM/HR =  0.0

     PERCENT TIME BETWEEN 0.400 - 0.600 KM/HR =  0.009

     PERCENT TIME BETWEEN 0.600 - 0.800 KM/HR =  0.318

     PERCENT TIME BETWEEN 0.800 - 1.000 KM/HR =  0.457

     PERCENT TIME BETWEEN 1.000 - 1.200 KM/HR =  0.001

     PERCENT TIME BETWEEN 1.200 - 1.400 KM/HR =  0.038

     PERCENT TIME BETWEEN 1.400 - 1.600 KM/HR =  0.137

     PERCENT TIME BETWEEN 1.600 - 1.800 KM/HR =  0.004

     PERCENT TIME BETWEEN 1.800 - 2.000 KM/HR =  0.030

     PERCENT TIME BETWEEN 2.000 - 2.200 KM/HR =  0.002

     PERCENT TIME BETWEEN 2.200 - 2.400 KM/HR =  0.001
```

Figure 6.5. SIAF NAVIGATION STATISTICS (PAGE 47)
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

PATROL CEP AT CHECKPOINTS (METERS)	
MEAN	31.621
STANDARD DEVIATION	8.442
TIME TO DETERMINE LOCATION (MIN)	
MEAN	0.830
STANDARD DEVIATION	0.0

SIAF INSERTION STATISTICS

INSERTION ATTEMPTS	
NUMBER OF SUCCESSFUL INSERTIONS	
NUMBER OF INSERTIONS AT PRIMARY LZ	
NUMBER OF INSERTIONS AT SEC. LZS	
INSERTION TIME (DAYS,HRS,MINS)	011700

EXTERNAL COMMUNICATIONS

ATTEMPTS	
MEAN	170.000
STANDARD DEVIATION	0.0
COMMUNICATION SUCCESS RATIO	
MEAN	C.827
STANDARD DEVIATION	0.034
AVERAGE POWER LOSSES FOR COMMO FAILURES (PERCENT)	
ATTENUATION DUE TO RELIEF	10.952
ATTENUATION DUE TO VEGETATION	1.019
ATTENUATION DUE TO RANGE	88.037
TOTAL TIME RECIEVING (DAYS,HRS,MINS)	
MEAN	051[illegible]00
STANDARD DEVIATION	000000
TOTAL TIME TRANSMITTING (DAYS,HRS,MINS)	
MEAN	000300
STANDARD DEVIATION	000019
AMPERE HRS AVAILABLE	138.000
AMPERE HRS USED	
MEAN	79.817
STANDARD DEVIATION	C.09[illegible]

[illegible]

SUPPLY MAINTENANCE STATISTICS

	BEGINNING	END
TOTAL WEIGHT CARRIED (LBS/MAN)		
MEAN	65.053	50.519
STANDARD DEVIATION	0.0	0.000
FOOD (LBS/MAN)		
MEAN	6.520	0.0
STANDARD DEVIATION	0.0	0.0
WATER (LBS/MAN)		
MEAN	8.019	0.0
STANDARD DEVIATION	0.0	0.0
AMMO (LBS/MAN)		
MEAN	0.0	0.0
STANDARD DEVIATION	0.0	0.0
OTHER ORDNANCE (LBS/MAN)		
MEAN	2.250	2.250
STANDARD DEVIATION	0.0	0.0

	[illegible]	[illegible]	[illegible]	MIN	[illegible]
[illegible]					
MEAN	[illegible]	[illegible]	[illegible]	0.0	[illegible]
STANDARD DEVIATION	0.0	[illegible]	0.000	0.0	0.000
ENERGY EXPENDED (BTU)					
MEAN	.0	2753.944	4131.193	0.0	1318.590
STANDARD DEVIATION	0.0	1.489	33.000	0.0	6.330

TIME HISTORY OF HUMAN PERFORMANCE DEGRADATION (FIRST REPLICATION ONLY)

TIME	011732	012032	012303	020231	020532	020930
PERF. DEG.	0.000	0.010	0.021	0.011	0.002	0.0
TIME	021231	021531	021831	022132		
PERF. DEG.	0.0	0.0	0.0	0.009		

NUMBER OF SEGMENTS = [illegible]

STAR ARRIVAL TIME AT CHECKPOINTS (DAYS,HRS,MINS)

CHECKPOINT	1	2	3	4	5	6
ARRIVAL TIME	000000	011721	011731	011745	012241	012251
CHECKPOINT	7	8	9	10	11	12
ARRIVAL TIME	012314	021925	021937	021954	022217	022235
CHECKPOINT	13	14	15	16	17	18
ARRIVAL TIME	022324	031439	032009	032030	032203	000000
CHECKPOINT	19	20	21	22	23	24
ARRIVAL TIME	000000	000000	000000	000000	000000	000000
CHECKPOINT	25	26	27	28	29	30
ARRIVAL TIME	000000	000000	000000	000000	000000	000000
CHECKPOINT	31	32	33	34	35	36
ARRIVAL TIME	000000	000000	000000	000000	000000	000000
CHECKPOINT	37	38	39	40	41	42
ARRIVAL TIME	000000	000000	000000	000000	000000	000000
CHECKPOINT	43	44	45	46	47	48
ARRIVAL TIME	000000	000000	000000	000000	032219	040439
CHECKPOINT	49	50	51	52	53	54
ARRIVAL TIME	042204	042207	000000	000000	000000	000000
CHECKPOINT	55	56	57	58	59	60
ARRIVAL TIME	000000	000000	000000	000000	000000	000000
CHECKPOINT	61	62	63	64	65	66
ARRIVAL TIME	000000	000000	000000	000000	000000	000000

[illegible] VALUE-BY STATISTICS (PAGE [illegible])
[illegible] LIGHT SCENARIO [illegible]
[illegible] REPLICATIONS

CHECKPOINT	67	68	69	70	71	72
ARRIVAL TIME	042216	000000	000000	000000	000000	000000
CHECKPOINT	73	74	75	76	77	78
ARRIVAL TIME	000000	000000	000000	000000	000000	000000
CHECKPOINT	79	80	81	82	83	84
ARRIVAL TIME	000000	042246	050447	050453	051914	051924
CHECKPOINT	85	86	87	88	89	90
ARRIVAL TIME	051933	051947	052040	060214	061113	061123
CHECKPOINT	91	92				
ARRIVAL TIME	061137	070643				

LIGHT LEVEL (FT LAMBERTS) AND SAMPLE TIME (DAYS,HRS,MINS)

LIGHT LEVEL	2.89E 02	1.69E 02	6.93E 01	3.83E 01	1.91E-01	1.00E-03
SAMPLE TIME	011721	011731	011745	011800	011900	012000
LIGHT LEVEL	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
SAMPLE TIME	012100	012200	012241	012251	012300	012314
LIGHT LEVEL	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-04	6.92E-04
SAMPLE TIME	020000	020100	020200	020300	020400	020500
LIGHT LEVEL	6.64E 01	1.21E 02	1.00E 03	1.00E 03	1.00E 04	1.00E 04
SAMPLE TIME	020600	020700	020800	020900	021000	021100
LIGHT LEVEL	1.00E 04	1.00E 04	1.00E 04	1.00E 04	1.00E 04	1.72E 03
SAMPLE TIME	021200	021300	021400	021500	021600	021700
LIGHT LEVEL	5.15E 01	9.57E-02	1.02E-03	1.00E-03	1.00E-03	1.00E-03
SAMPLE TIME	021800	021900	021925	021937	021954	022000
LIGHT LEVEL	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
SAMPLE TIME	022100	022200	022217	022236	022300	022323

STATISTICS (PAGE [illegible])
HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

LIGHT LEVEL	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-04	6.92E-04
SAMPLE TIME	030000	030100	030200	030300	030400	030500
LIGHT LEVEL	6.64E 01	1.17E 02	1.00E 03	1.00E 03	1.00E 04	1.00E 04
SAMPLE TIME	030600	030700	030800	030900	031000	031100
LIGHT LEVEL	1.00E 04	1.00E 04	1.00E 04	1.00E 04	1.00E 04	1.20E 03
SAMPLE TIME	031200	031300	031400	031500	031600	031700
LIGHT LEVEL	3.83E 01	9.57E-02	1.00E-03	1.00E-03	1.00E-03	1.00E-03
SAMPLE TIME	031800	031900	031938	032000	032009	032030
LIGHT LEVEL	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
SAMPLE TIME	032100	032200	032203	032219	032300	040000
LIGHT LEVEL	1.00E-03	8.00E-04	8.00E-04	8.00E-05	8.00E-05	5.66E-04
SAMPLE TIME	040100	040200	040300	040400	040439	040500
LIGHT LEVEL	1.65E 01	1.31E 02	1.00E 03	1.00E 03	1.00E 03	1.00E 03
SAMPLE TIME	040600	040700	040800	040900	041000	041100
LIGHT LEVEL	1.00E 03	1.00E 03	1.00E 03	1.00E 03	1.00E 03	3.76E 02
SAMPLE TIME	041200	041300	041400	041500	041600	041700
LIGHT LEVEL	5.94E 00	3.97E-02	5.00E-04	8.00E-04	8.00E-04	8.00E-04
SAMPLE TIME	041800	041900	042000	042100	042200	042204
LIGHT LEVEL	8.00E-04	8.00E-04	8.00E-04	8.00E-04	8.00E-04	8.00E-04
SAMPLE TIME	042207	042216	042246	042300	050000	050100
LIGHT LEVEL	8.00E-04	8.00E-04	8.00E-05	9.73E-05	3.15E-04	1.02E-03
SAMPLE TIME	050200	050300	050400	050447	050453	050500
LIGHT LEVEL	1.65E 01	1.47E 02	1.00E 03	1.00E 03	1.00E 03	1.00E 03
SAMPLE TIME	050600	050700	050800	050900	051000	051100
LIGHT LEVEL	1.00E 03	1.00E 03	1.00E 03	1.00E 03	1.00E 03	3.35E 02
SAMPLE TIME	051200	051300	051400	051500	051600	051700
LIGHT LEVEL	1.06E 01	4.04E-02	7.65E-03	2.63E-03	9.01E-04	8.00E-04
SAMPLE TIME	051800	051900	051914	051924	051933	051947

[illegible]

HUNTER LIGGETT SCENARIO 1
5 REPLICATIONS

LIGHT LEVEL	8.00E-04	8.00E-04	8.00E-04	8.00E-04	8.00E-04	8.00E-04
SAMPLE TIME	052000	052040	052100	052200	052300	060000
LIGHT LEVEL	8.00E-04	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.06E-03
SAMPLE TIME	060100	060200	060214	060300	060400	060500
LIGHT LEVEL	4.70E 01	1.21E 02	1.09E 03	1.00E C3	1.00E 04	1.00E 04
SAMPLE TIME	060600	060700	060800	060900	061000	061100
LIGHT LEVEL	1.00E 04	1.00E 04	1.00E 04	1.00E 04	1.00E 04	1.00E 04
SAMPLE TIME	061113	061123	061137	061200	061300	061400
LIGHT LEVEL	1.00E 04	1.00E 04	1.62E 03	5.15E C1	1.91E-01	1.00E-03
SAMPLE TIME	061500	061600	061700	061800	061900	062000
LIGHT LEVEL	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
SAMPLE TIME	062100	062200	062300	070000	070100	070200
LIGHT LEVEL	1.00E-03	1.00E-03	6.92E-04	7.62E 01	8.58E 01	1.31E 02
SAMPLE TIME	070300	070400	070500	070600	070643	070700
LIGHT LEVEL	1.00E 03	1.00E 03				
SAMPLE TIME	070800	070900				

Table 6-1. Target Number System (Sheet 1)

- WATER CAN EVENT - DAY 01

  1 - TRUCK (ROUND TRIP)
  2 - MEN + WATER CANS
  3 - LIT CIGARETTES

- AMMO CARRIERS - DAY 02

  4 - MEN

- STAR CLUSTER EVENT - DAY 02

  5 - TRUCK (ROUND TRIP)
  6 - FLARE (COLUMN)

- TRUCK/AMMO EVENT - DAY 03

  7 - TRUCK + TAILGATE BANGING
  8 - LIT CIGARETTES

- SMOKE AT SUNRISE EVENT - DAY 03

  9 - MEN
  10 - SMOKE COLUMN

- RADAR ANTENNA DISASSEMBLY - DAY 03

  11 - TRUCK (ROUND TRIP)
  12 - MEN
  13 - CIGARETTE SMOKE (COLUMN)

- RADAR ANTENNA ASSEMBLY - DAY 03

  14 - TRUCK (ROUND TRIP)
  15 - MEN
  16 - CIGARETTE SMOKE (COLUMN)

- SECURITY PATROL (A-LOOPS) - DAY 03

  17 - TRUCK (DELIVERY)
  18 - PATROL THROUGH LOOPS

- NOODLE CARRIERS - DAY 04

  19 - TRUCK (DELIVERY)
  20 - PATROL THROUGH LOOPS (C-TRAIL)
  21 - TWO PATROLS LEAVING AGGRESSOR TENT
  22 - LIT CIGARETTE
  23 - CROW'S NEST PATROL (A74)
  24 - TWO TRUCKS (PICK-UP)

Table 6-1, Target Numbering System (Sheet 2)

- EXOTIC WEAPON EVENTS - DAY 04

  25 - TRUCK (DELIVERY)
  26 - PATROL

- SECURITY PATROL (A-LOOPS) - DAY 04

  27 - TRUCK (DELIVERY)
  29 - PATROL (A-1 TO A-41)
  30 - PATROL (A-49 TO A-62)

- * WATER CAN EVENT - DAY 04

  28 - TRUCK (ROUND TRIP)

- NOODLE CARRIERS - DAY 05

  31 - PATROL (C-LOOPS)
  32 - TWO PATROLS LEAVING AGGRESSOR TENT
  33 - LIT CIGARETTE
  34 - CROW'S NEST PATROL
  35 - TWO TRUCKS (PICK-UP)

- * STAR CLUSTER EVENT - DAY 05

  36 - TRUCK (ROUND TRIP)
  37 - FLARE

- HELIPAD EVENT - DAY 06

  38 - TRUCK (ROUND TRIP)
  39 - MEN
  40 - STROBE LIGHT
  41 - LANDING LIGHTS

- * PASSING TRUCKS - DAY 06

  42 - AMMO TRUCK
  43 - RADAR DISASSEMBLY TRUCK

- LASER EXERCISE - DAY 06

  44 - BEACON

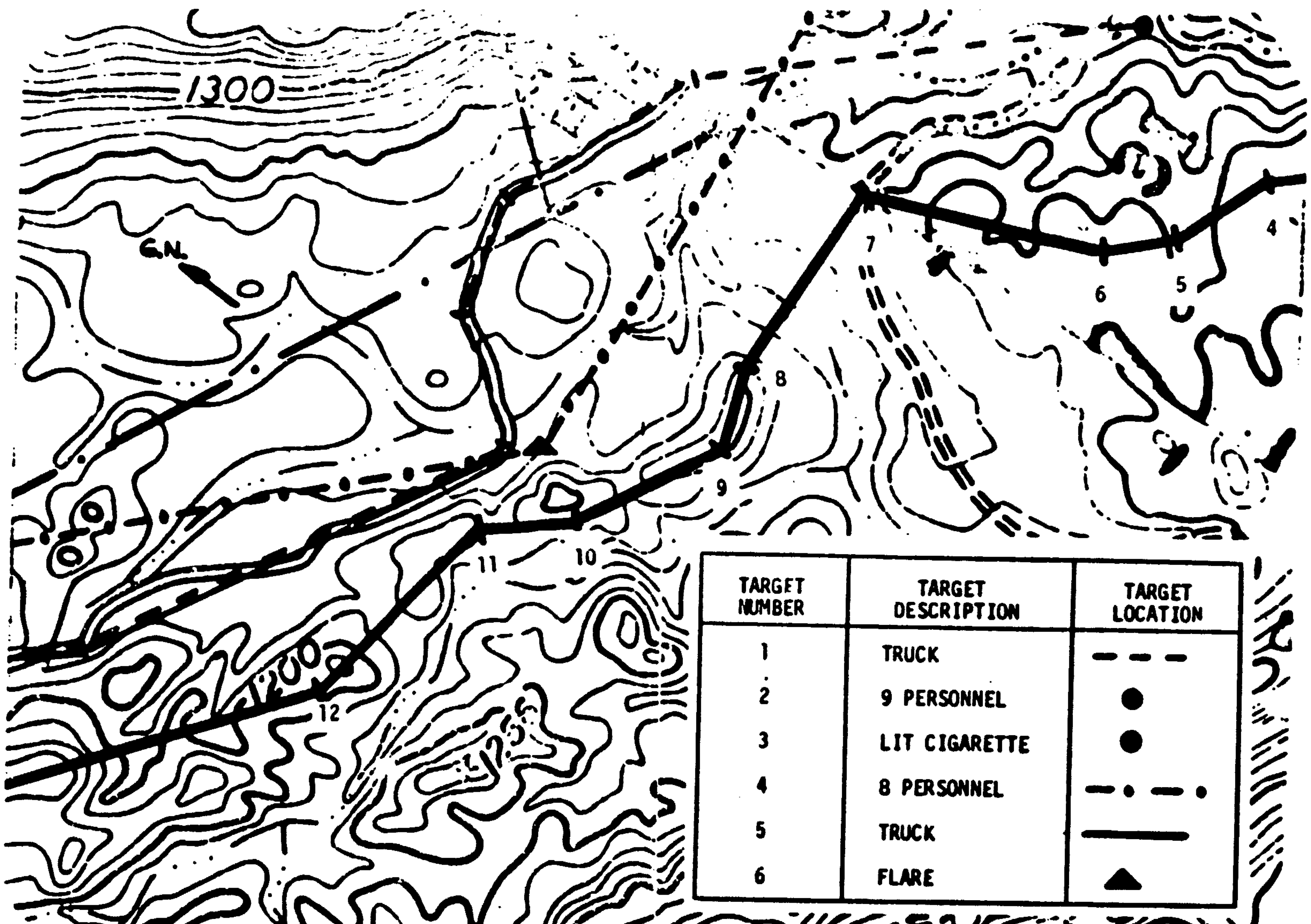
- * PASSING TRUCKS - DAY 06 AND 07

  45 - RADAR ASSEMBLY TRUCK
  46 - LOOP PATROL TRUCK
  47 - NOODLE CARRIER TRUCK
  48 - TWO TRUCKS FOR PICK-UP

- ROAD PATROL EVENT - DAY 07

  49 - TRUCK (ONE-WAY)
  50 - PATROL
  51 - CIGARETTE SMOKE (COLUMN)

* EVENTS PLANNED FOR A SECOND PATROL IN THE TEST, THAT PRESENT DETECTION OPPORTUNITIES FOR THE FIRST PATROL.



TARGET NUMBER	TARGET DESCRIPTION	TARGET LOCATION
1	TRUCK	— — —
2	9 PERSONNEL	●
3	LIT CIGARETTE	●
4	8 PERSONNEL	— • — •
5	TRUCK	———
6	FLARE	▲

Figure 6.6, SIAF and Target Positions in Vicinity of Star Cluster Turn

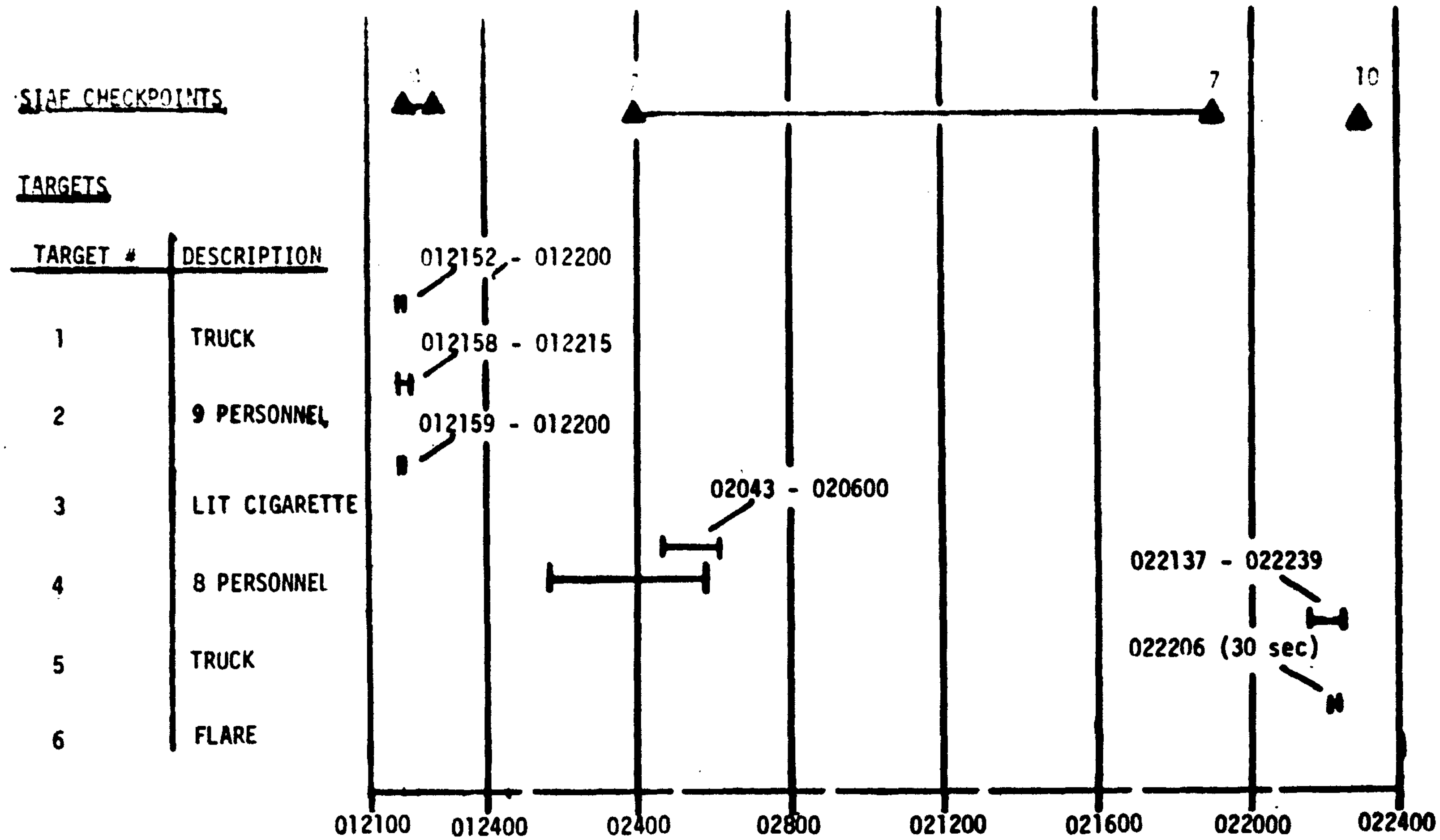


Figure 6.7, Timeline Diagram for Selected Portion of the Scenario

6.5 USER INPUT FOR THE COMBAT MODEL SAMPLE CASE

As an example of the operation of the integrated reconnaissance and combat model including the additions made in the modification contract, the following case is presented. Figure 6.8 shows the namelist input used for this case. The area of operations is taken from the Hunter Liggett Military Reservation. The scenario calls for a SIAF patrol of eight men on an ambush mission. They are moving in the dry El Piojo Creek bed at 0800. The scenario is diagrammed in Figure 6.9. The target starts on the other side of an 80 foot hill approximately 600 meters away. The target is a six-man patrol and is heading on a collision course with the SIAF.

6.6 OUTPUTS FOR THE COMBAT MODEL SAMPLE CASE

The outputs of the model, shown in Figure 6.10, consist of detail and summary printout. The detailed printout begins with the location of the target and of the SIAF. Two lines of printout are generated by the Reconnaissance model at the end of each segment. This gives the positions, a detection verdict, the time, and the reason for no line of sight.

At 17 minutes into the mission, the SIAF detects the target. This is shown by point 1 on Figure 6.9. It is in an area of both vegetation and microrelief. The output then shows the generation of a dynamic route to seek recognition of the target. The grid plot shows the selected grid points for the dynamic route. One minute later, the SIAF identifies the target. The range is 264 meters. This is shown by point 2 on Figure 6.9 for both the SIAF and target. At this point, a dynamic route is generated to return to the original route should that be the decision of the SIAF.

The action selected by the decision logic submodel is to continue to ambush. A preliminary deployment point and engagement point is selected which is the first admissable point. The optimization logic then selects deployment points for both a base of fire and a moving maneuver unit. These are shown by the pair of points labelled number 3 at the edge of the wooded area. The projected engagement point for the target is also shown. The optimization logic also determines an assault point close to the target.

At this point in the simulation, the terrain resolution is shifted from 50.8 meters to 12.7 meters for greater accuracy in the line of sight calculations. The individual attributes are then printed for both patrols at the start of combat. The next computation is the generation of dynamic routes for the attacker maneuver units to the deployment points.

The combat model through its executive routine, CMAIN, then assumes control of the simulation. This is driven by the first occurrence of a detection, arrival at the checkpoint (generated by dynamic route routine), casualty, or 20 seconds if nothing else happens. For other missions, it considers also the arrival of an external fire support burst and the detonation of Claymore mines. For this case, the first few events are individual detections by SIAF members of target members. More detections could be occurring, but only one is printed per patrol at each event interval. Here the locations of the maneuver unit leaders are also printed. The next two events are arrivals at the intermediate dynamic route points. This process continues until both maneuver units have arrived at their deployment points. At this time, they stop. A dynamic route is generated for the moving maneuver unit to get to the assault point, but movement does not begin on this leg for an ambush until the firefight has begun. The model continues to print detection events for the attacker of the defender while the defender is moving to the engagement point.

When the defender arrives at the engagement point, the SIAF opens fire and a casualty event occurs within 2 seconds. As shown in the printout, the casualty is defender number 5 who sustains a minor wound. The next event is another casualty. This time defender 2 sustains a major wound. The elapsed time of the firefight is 3.3 seconds. The attribute tables for both patrols are then printed as they are after either a major wound or death. At this time, the defender decides to withdraw and selects a direction 180^{o} opposite to which it was moving. The break decision was due to the high number of casualties.

At the five second point, defender number 3 is killed. The break decision printout is repeated for information purposes, but no new action is taken. The next eventis a major wound for defender 1 at 6.2 seconds. At 7.8 seconds, defender 6 is killed and at 9.7 seconds, defender 4 is killed. At this point all defenders have been killed or wounded. The SIAF stops firing and the moving maneuver unit reaches the first checkpoint on its assault route.

At 30 seconds, however, the SIAF decides to break due to an elapsed time criterion. A rally point is selected on the opposite side of the hill and the SIAF begins moving. After arriving at the rally point, the patrol decides to continue the reconnaissance mission. The final attributes are printed and control is returned to the Reconnaissance Model. At this time, the elevation data at the 50.8 meter resolution is retrieved. The SIAF then completes its operations plan and is extracted. Summary statistics for the mission are then printed.

6.7 EXAMPLE USING EXTERNAL FIRE SUPPORT

The same case was run using external fire support in preparation for the firefight. The same inputs were used except the mission was changed to attack. The same deployment and engagement points were selected, but this time a volley of artillery shells arrived soon after the request. Figure 6.12 shows the detailed output from there on. First the burst points are printed and then the attributes after the burst. The next event is a casualty inflicted by the SIAF who open fire after the first volley. The next events are arrivals of more volleys of artillery. Again the target decides to break in the opposite direction. The attacker decides to break due to the elapsed time criterion.

6.8 EXAMPLE USING CLAYMORE MINES

For this case, the mission was switched to an ambush using Claymore mines. As shown in Figure 6.13, the mines were deployed just inside the edge of the wooded area. The SIAF was deployed in the woods and was not detected by the target. When the target reached the most vulnerable area with respect to the mines, they were detonated and all of the target personnel were killed. Control then returned to the Reconnaissance model after the withdrawal. The detailed output is shown in Figure 6.14.

```
$NAML1
 AA      = 1.85,
 AEQ     = 0.,
 ALIM    = .00001,  0.001,  10.,  100.,
 ALLB    = 5000.,
 ALLF    = .75,  2*1.,  0.75,  2*1.,
 ALLW    = .0004,
 ANGID   = 12.,
 AOXMAX  =  2400.,
 AOYMAX  =  7200.,
 AMWTAB  =  3*0.08,  3*0.04,  2*0.6,  4*0.07,  1.0,3.5,0.04,2*0.029,
            0.033, 0.032,2* 0.037,
 ATER    = 0.,
 ATTAR   = 4.,
 ATTEN   = 0.03,  0.09,  0.15,  0.12,
 BE      = 25.,
 BSAREA  =  20.,
 COMRES=15.,
 CONCAP  =  0.0735,
 CPRAT   =-1700., -700., 600., -1200., -550., -50., -600.,
 CRFCOG  =  1.,
 DBACK   =150.,
 DMT     = 0., 25., 75., 25., 2*0., 25., 75., 5*0., 1000., 600.,
 DRICE   = 0.3,
 DSTEP   =20.,
 DSW11   = 1.,
 DSW12=1.,
 DYWT=-1.,1.,3.,3*-1.,1.,0.,0.,-1.,0.,0.,-2.,-2.,1.,1.,5*0.,2*-3.,4*1.
 FWRAT   =300., 500., 600., 400., 450., 550., 467.,
 GR      = 25.,
 H       = 0., 1., 1.5, 3., 8*0., 0.5, 2*0., 0.7,
          4*0., 3., 2*1., 0., 2.5, 3*3., 2*2., 4., 0.,
          4*0., 2., 3., 5., 9., 1., 7.5, 11., 14., 0., 3., 2*0.,
          4*0., 10., 12., 15., 20., 15., 18., 24., 30., 0., 5., 2*0.,
 HR      = -1., -0.5, -4., 1.8, -0.8, 4., 2., 2*0.,
 HMT     = 0., -0.25, 2*-0.5, 2*0., 0.25, 0.5, 5*0., 0.25, 1.,
 IDTIM   = 1,
 ISECT(1)=1, 2, 3, 4, 1, 2, 3, 1, 4, 1, 2, 1, 3, 1, 2, 3, 4, 1, 2, 3,
 ITACOS  = 900,
 ITORPM  = 60,
 ITNMTA  = 120,
 ITNTAR  = 30,
```

Figure 6.8, Combat Sample Case Namelist Inputs

```
 ITPLSA = 900,
 ITPLSO = 120,
  IXMAT=350,
 IYMAT=301,
 LAMDAE = 1080.,
 NPAR=9,
 P      = 760.,
 PMC    = 25.,
 PMR    = 25.,
 PO     = 760.,
 PS     = 42.,
 RC     = 4.,
 RCTAR  = 10.,
 RECRES=50.,
 REF    = 0.3, 0.3, 0.13, 0.13, 4*0.3, 4*0.09, 0.17, 0.15, 2*0.2,
          2*0.3, 2*0.13, 3*0.35, 0.3, 4*0.09, 0.17, 0.15, 2*0.2,
          3*1., 2*0.13, 0.04, 0.03, 5*0.02, 1., 0.04, 0.2, 1.,
 REQ    = 0.,
 RESMAX=12.7,
 RHOH   = 0.075,
 RHOI   = 0., 500., 667., 120., 8*0., 18., 2*0., 5.,
          4*0., 135., 250., 500., 0., 1200., 250., 500., 1000., 20.,  1000.,
          50., 0., 4*0., 70., 140., 300., 600., 30., 200., 350., 400., 0.,
          100., 2*0., 4*0., 70., 140., 300., 600., 30., 200., 350., 400., 0.,
          100., 2*0.,
 RMAX   = 1000., 36., 20., 10., 8*1000., 10., 2*1000., 15.,
          4*1000., 75., 72., 36., 1000., 10., 32., 16., 10., 500., 2*10.,
          21*1000., 75., 30., 12., 10., 120., 18., 10., 10., 1000., 80.,
          2*1000.,
 RMTMAX =         200., 100., 50., 100., 2*200., 100., 50., 5*200., 150., 50.,
 RPE    = 0.24,
 RPG    = 0.5,
 RTFR   = 0.,
 SECT   = 5.49,0.785,0.785, 2.35, 3.93, 5.49, 2.35, 3.93,
          4.72,  1.57, 0., 2*3.14, 0., 1.57, 4.72,
 SEGMIN =.1,
 SGMTAB = 50.,
 SGMTAW = 200.,
 SIGFFR = 0.0000000031103,
 SL1    = 0.0005,
 SL2    = 0.05,
 SOILF  = .8, .85, .8, .75, .7, .65, .6, .5, .8, 3*1., 4*.9,
```

```
STS    = 95.,
TO     = 536.,
TMR    = .1, .25, .5, .75, 1., 1.25, 3*1.5, 1.15, .8, .5, .35,
         .15, .05, 3*.25, .2, .5, 1., 1.5, 2., 2.5, 3*3., 2.3,
         1.6, 1., .7, .3, .1, 3*.5, -1.6, -1.4, -1.2, -1., -.8,
         -.6, -.4, -.2, 0., .2, .4, .6, .8, 1., 1.2, 1.4, 1.6, 1.8,
VEGC   = 15., 1., 3., 35., 30., 55., 30., 0.5, 10., 0.85, 3., 33., 28.,
         56., 31., 0.5,
         4., 0.7, 3., 31., 26., 57., 32., 0.5, 2., 0.40, 2., 30., 25., 58.,
         33., 0.5,
         5., 0.85, 3., 29., 24., 59., 33., 0.45, 15., 0.80, 3., 28.,
         23., 59., 33., 0.4,
         7.5, 0.7, 2., 27., 22., 57., 32., 0.35, 7.5, 0.65, 2., 25.,
         20., 55., 30., 0.3,
         1., 0.20, 2., 25., 20., 60., 34., 0.2, 2., 0.40, 2., 28.,
         23., 56., 32., 0.3,
         1.5, 0.30, 1., 27., 22., 58., 33., 0.25, 1., 0.2, 1., 25.,
         20., 60., 34., 0.2,
         2., 0.3, 1., 30., 25., 62., 35., 0.5, 1., 0.2, 1., 28., 23.,
         63., 35., 0.4,
         2., .9, 3., 40., 35., 57., 32., 0.4, 10., 0.2, 3., 40.,
         35., 61., 34., 0.5,
VEGF   = 1., .85, .7, .4, .85, .8, .7, .65, .2, .4, .3, .2,
         .3, .2, .9, .2,
VISLUM = 40000., 15000., 13000., 10000., 2000., 500., 300., 50.,
         10000., 5000., 1000., 100., 1300., 500., 100., 10.,
         2*40., 10., 1., 10., 5., 1., 0.1, 2*4., 1., 0.1, 1., 0.5, 0.1, 0.01,
         2*0.0001, 0.00008, 0.00002, 0.00008, 0.00005, 0.00002, 0.00001,
         2*0.001, 0.0008, 0.0002, 0.0008, 0.0005, 0.0002, 0.0001,
         2*0.004, 0.003, 0.008, 0.003, 0.002, 0.008, 0.004,
         2*0.01, 0.008, 0.002, 0.008, 0.005, 0.002, 0.001,
VISMB  = 13.,
VISMW  = 300.,
VTYP=.3,
W      = 0., 1., 1.5, 10., 8*0., 20., 2*0., 50.,
         4*0., 2., 2*1., 0., 4*2., 1., 2., 10., 0.,
         4*0., 3*0.3, 0.45, 0.2, 2*0.3,0.45, 0., 0.5, 2*0.,
         4*0., 3., 3.5, 4., 4.5, 2*4., 4.5, 5., 0., 2., 2*0.,
WMT    = 0., 5., 4., 5., 2*0., 5., 4., 5*0., 0.5, 1.,
WR     = 0.5,
XLP    = 3*1., 0.95, 0.9, 0.5, 0.15, 0.01, 0.9, 0.5, 0.25, 0.1, I., 0.75,
         0.95, 1.,
```

```
$
$NAML2
 BETA    = 40.,
 BLIFE   =100.,
 DMOR=0.,
 DMORB=0.,
 DOMMT   = 2,
 DOMV  =1,
 DPE     =10.,
 DSA=0.,
 DSAA=0.,
 EQUIP   = 0.,
 ENRNG   = 0.,
 F(1,1) =1.,
 FOOD    =13.47,
 FORMS=200*0.,
 FORMT=800*0.,
 FREQ    = 50.,
 GSAPRX=20.,
 GSAPXX=20.,
 MLZ=3600.,
 H2O     =6.96,
 ICL(1)=5,3,5,
 ICPER   = 3600,
 IDELA=1,
 IDELB=1,
 IDELC=1,
 IDELD=1,
 IDELE=1,
 IDOMST = 3,
 IFADJ   =20*0,
 IFS=0,
 IFSUP   =20*0,
 IFSUP(1)=1,
 IOR=5*0,
 IFT=20*0,
 IPOS    =1,
 IPREP   = 0,
 ISEN    = 0,
 ISFNLZ=0,
 ISTAY(1,1)=3*0,1,
 ITARIV(1,1)=4*0,
```

```
ITACT  =1,3*2,16*1,
ITMAX  =01000000,
ITMOV(1,1) =3*0.01083700,
ITRC(1)=1,2,1
ITSTAV(1,1) =3*0.00002000,
ITZERO = 01080000,
IX1    = 334432395,
IX2    = 363975447,
JSTART=0,
JSTOP=0,
JNF    =1,
LNR1=0,
KREC(1)=3*1,
MAE(1) =600.,
MAXCAS = 1,
MAXREP =1,
MICR1=1,
MODE   = 1,
NBAT   =2,
NCO(1)=3,4,3,
NCOPY  =1,
NDECOY = 0,
NFIX= 1,
NHANDG =0,
NLZ    = 1,
NMINES =0,
NN (1) =36,
NOB    = 0,
NPLAN(1)=7,
NRAD   = 1,
NRMT   = 2,
NRST   = 0,
NRVP=1,
NSENS=0,
NSWT   = 1,
NTAR=1,
NWCL(1,1) = 010800, 012000, 020630, 020900, 021600, 022000, 030400, 042400,
            050630, 050900, 051600, 052000, 060630, 060900, 061600, 062000,
            070630, 070900, 100000,
NWCL(1,2) = 2, 1, 5, 1, 2, 1, 3, 1, 5, 1, 2, 1, 5, 1, 2, 1, 2, 1, 1,
PEQUIP =313.46,
PPLS   = 0.,
```

TRW SYSTEMS

```
PI      = 1300..
RAMU    = 4*0..
RAVODO=0..
RAVOID=0..
RFMOR=.5.
RFMORR=.5.
RFOOD   = 0..
RFSA=.5.
RFSAA=.5.
RH2O    = 0..
[illegible] = 1..
RL2(1)  =50..
RMINES  = 0..
RNF     = 10..
RPA     =25..
RPOWR   = 0.6.
SAMU    =4*0..
SC(1)   = 1.7.
SC(2)   = 0.5.
SC(3)   = 1..
SC(4)   = 8..
SC(5)   = 0.04.
SC(6)   = 32..
SCALE   = 50000..
SOIL1 =0.
SPEC    = 0..
TBISTR =60..
TBRNDS =30..
TBUR    = 0..
TDERK   = 4*0..
TDMIN   = 10..
THEATA=0..
TPOWR   = 1.5.
TPREP   = 0..
TSR     =0554..
TSS     =1829..
TUSE    = 0.5.
VEGI    =3.
VELM    =4*100..
VH      = 6302..
VK      = 7146..
WDAY    = 0638.. [illegible]716.. [illegible]763.. 0849.. 0946.. 1046.. 4*1148.. 2045.. 2159..
```

```
2310., 2350., 0014., 0110., 4*156., 5*0., 5*1., 73., 79., 69., 63.,
72., 75., 4*78., 51., 56., 51., 47., 48., 5*52., 98., 97., 98., 85.,
98., 99., 4*98., 20., 23., 40., 22., 20., 26., 4*24., 10*0., 2., 1.,
3., 4., 2., 5*1., 8., 5., 12., 15., 8., 5*6., 3*300., 030., 190.,
5*360.,
WDC    = 0.,
WDM    = 0.,
WTC    = 1.,
WTM    = 1.,
WTS    = 4, 3*0,
XAVODD=0.,
XAVOID=0.,
XBASE  =6345.,
XLZ(1) = 6455. ,
XDBINS = 40.,
XMMAX  = 6000.,
XOB(1,1)=6419.5,6424.5,6419.5,
XOB(1,2)=6417.,6417.,50.,
XOB(1,3)=6419.5,6424.5,6419.5,
XPLAN(1,1)=6451.,6447.,6427.,6418.6,6427.,6447.,6451.,
YAVODD=0.,
YAVOID=0.,
YBASE  =7240.,
YLZ(1) = 7284.,
YOB(1,1)=7306.,7318.5,7318.5,
YOB(1,2)=7318.5,7321.,
YOB(1,3)=7306.,7318.5,7318.5,
YPLAN(1,1)=7296.,7311.,7319.,7319.0,7319.,7311.,7296.,
$
$NAML3
 IDET   =20*0,
  TVEL=20*0.,SOUNDT=100*0.,NMP=20*0,NSTP=20*0,
IMV(1)= 3, RANMAX(1)= 4000., FRCMVD(1)= 1., FRCMVN(1)= 1.,
  TVEL(1)=     0.3 ,  NMP(1)=  1,  ITST(1)= 01080000, ITSTOP(1)= 02080000,
  ITIMS(1,1)= 01081600,01092000,
  GOALTX(1,1)=6442.,
  GOALTY(1,1)=7341.,
  TC(1,1)=6392.,7301.,1.7,.5,1.,6.,.04,0.,32.,
  NSTP(1)= 1,  ISSON(1,1)= 01080000, 01221500,
  ISSOFF(1,1)= 02080000, 01222100,               SOUNDT(1,1)= 90., 90.,
  RCMIN(1)= 200.,    RCMAX(1)=  1500.,
$
```

```
[illegible]
 CADM   =.4,
 CARFR =.5,
 C1     =.3,
 C2     =.3,
 CC1    =50.,
 CC2    =50.,
 CC3    =50.,
 CLASS =2,2,1,1,1,  2,2,1,1,1,  1,1,1,1,1,  0,0,0,0,0,  0,0,0,0,0,
        0,0,0,0,0,  0,0,0,0,0,  0,0,0,0,0,  0,0,0,0,0,  0,0,0,0,0,
        0,0,0,0,0,  2,2,2,2,2,  2,2,2,2,2,  2,2,2,2,2,  2,2,2,2,2,
        2,2,2,2,2,
 DTDAMB=150.,
 DTDATT=120.,
 DTEFS =300.,
 DTENGM=3600.,
 DTPURM=3600.,
 DWDR  =300.,
 FRAMB =.7,
 FRATT =.9,
 GMAX  =.3,
 GSAPRR=50.,
 IDIREC=1,
 IPERM(1,1)=1,
 LDAYS =4,
 NSECT =6,
 NSECTR=3,
 PP1=.1,
 PP2    =.3,
 PP3    =.3,
 PP4    =.5,
 PP5    =.95,
 Q1     =.33,
 Q2     =.33,
 Q3     =.34,
 RAMB  =100.,
 RAMIN =.6,
 RATT=100.,
 RFFS  =500.,
 RORS  =600.,
 RSP   =10.,
 RZ    =.5,
```

```
CBDYWT=54*0.,CBDYWT(2,1)=1.,CBDYWT(2,2)=1.,CBDYWT(2,3)=2.,
CBDYWT(1,1)=-1.,CBDYWT(1,2)=-1.,CBDYWT(1,3)=-2.,CBDYWT(7,1)=2.,CBDYWT(6,2)=2.,
OF=.1,.2,.3,.4,.5,.6,.7,.8,.9,1.,.1,.2,.3,.4,.5,.6,.7,.8,.9,1.,
FHCR=.7,FHPR=.3,
 FORFTX(1,1)=0.,-1.,1.,-2.,2.,-1.,-2.,-3.,
 FORFTY(1,1)=8*0.,
FORMUX(1,1)=0.,1.,2.,3.,4.,5*0.,FORMU (1,1)=5*0.,0.,1.,2.,3.,4.,
FORSFX(1)=2*5.,FORSFY(1)=2*10.,
FORSMX(1)=2*10.,FORSMY(1)=2*15.,
FOTB=5*1.,2*2.,5*1.,2*2.,5*1.,2*2.,5*1.,2*2.,5*4.,2*2.,14*2.,
      5*1.,2*2.,5*1.,2*2.,5*1.,2*2.,5*1.,2*2.,5*4.,2*2.,14*2.,
FOTM=4*1.,3*2.,4*1.,3*2.,
HFR=.25,
ICOMBF=1,
 IFORFT=6*1,IFORMT=6*1,
IPURSU=5*0,
MAXDIS=25.,
MAXOT=60.,
SSIG=1.,
UNKCON=10.,
VELNUM=.3,.6,.3,.6,
WCHAR=50*0.0,
      600.,0.,10.,15.,10.,30.,2.,3.,2*0.,991.,1.186,-2.089,-.709,1.483,3.371,
                                          1.,20.,3.,0.,0.,2.,2.,20.,5.,
      460.,0.,1.,15.,1.,30.,3.,2.,8*0.,1.,20.,3.,0.,0.,1.,3.,20.,5.,
      460.,0.,3.,15.,3.,30.,3.,2.,2*0.,991.,1.186,-2.089,-.709,1.483,3.371,
                                          1.,20.,3.,0.,0.,1.,1.,20.,5.,
       25*0.0,
      350.,30.,1.,3.,1.,4.,0.,4.,8*0.,5.,20.,3.,1.,1.,3.,3., 1.,5.,
      25*0.0,
      460.,0.,1.,15.,1.,30.,4.,2.,8*0.,1.,20.,3.,0.,0.,1.,1.,20.,5.,
      75*0.0,
       40.,2*0.,6.,0.,6.,14*0.,2.,0.,4.,0.,5.,
       20*0.,3.,4*0.,
      150*0.0,
XATT(1,1,1)=1.,4.,100.,0.,0.,0.,4*0.,2.,5,1.,1.,2.,20.,1.,0.,1.,100.,4.,1.,
 13.,4.,2.,
     1.,4.,100.,0.,0.,0.,4*0.,2.,5,1.,1.,1.,20.,2.,0.,2.,100.,4.,1.,13.,4.,2.,
     1.,4.,100.,0.,0.,0.,4*0.,2.,5,1.,1.,2.,20.,5.,0.,1.,100.,4.,2.,13.,4.,0.,
     1.,5.,100.,0.,0.,0.,4*0.,2.,5,1.,1.,2.,20.,3.,0.,1.,100.,5.,3.,13.,4.,0.,
     1.,7.,  6.,0.,0.,0.,4*0.,2.,5,1.,1.,2.,20.,4.,0.,1.,  6.,7.,4.,13.,4.,0.,
     1.,4.,100.,0.,0.,0.,4*0.,2.,5,1.,1.,2.,20.,5.,0.,1.,100.,3.,5.,13.,4.,0.,
```

```
        1.,4.,100.,0.,0.,0.,4*0.,2.,.5,1.,1.,1.,20.,5.,0.,2.,100.,4.,2.,13.,4.,0.,
        1.,4.,100.,0.,0.,0.,4*0.,2.,.5,1.,1.,1.,20.,5.,0.,2.,100.,4.,3.,13.,4.,0.,
 XATT(1,1,2)=1.,
           9.,100.,0.,0.,0.,4*0.,2.,.5,1.,0.,1.,20.,1.,0.,1.,100.,9.,1.,3*0.,
        1.,9.,100.,0.,0.,0.,4*0.,2.,.5,1.,0.,1.,20.,2.,0.,1.,100.,9.,2.,3*0.,
        1.,9.,100.,0.,0.,0.,4*0.,2.,.5,1.,0.,1.,20.,5.,0.,1.,100.,9.,3.,3*0.,
        1.,9.,100.,0.,0.,0.,4*0.,2.,.5,1.,0.,1.,20.,5.,0.,1.,100.,9.,4.,3*0.,
        1.,9.,100.,0.,0.,0.,4*0.,2.,.5,1.,0.,1.,20.,5.,0.,1.,100.,9.,5.,3*0.,
        1.,9.,100.,0.,0.,0.,4*0.,2.,.5,1.,0.,1.,20.,5.,0.,1.,100.,9.,6.,3*0.,
 XMAXOT=10.,
 XMU=5.,
 YATT=125*1.,
  YATT(4,1,1)=2.,
  YATT(5,1,1)=0.,
 ZATT(1,1)=2.,2.,1.,1.,2.,2*.2,2*.5,2*.3,2*2.,2*10.,2*.3,2*1.,2*30.,30.,2.3,
 7*0.,1.,3.,1.,1.,2.,2*.2,2*.5,2*.3,2*2.,2*10.,2*.3,2*5.,2*400.,30.,2.3,7*0.,
 AIMMX =2*3.,
 ARSMN =2*10.,
 ARSPI =2*0.,
 COLMIN=2*.1,
 DELTA =.05,
 DSUST =.05,.1,.15,.25,.35,.5,.05,.1,.15,.25,.35,.5,
 FDGFAC=2*10.,
 FTAPB =2*.7,
 SUFAC =.95,.85,.7,.9,.25,0.,.95,.80,.7,.5,.25,.7,.95,.85,0.7,.6,.25,0.,
          40.,35.,30.,25.,20.,15.,
  WPWT  =1.,4.,3.,3.,1.,4.,3.,3.,
 XLAAW =49.,36.,25.,36.,25.,16.,25.,16.,9.,
          1135.,616.,314.,707.,381.,201.,381.,201.,113.,
          12050.,6940.,4070.,7850.,4525.,2635.,4525.,2640.,1521.,
          63*0.,
  XENGA=6417.,
  YENGA=7321.,
  TAK  =.6747,
  XCENT =6418.6,
  YCENT =7319.,
  NBR  =3,
  LGTH =30,
  T1=60.,
  T2=40.,
  T3=10.,
  NVOLLEY=5,
```

(4)

```
SAFDIS=15.,
JARTL=1,
MAEE(1)=14.,12.6,11.3,12.6,11.3,9.8,11.3,9.8,8.,
NSUPP=1,
SIGMDIS=15.,
KDEFOP=4,
$
```

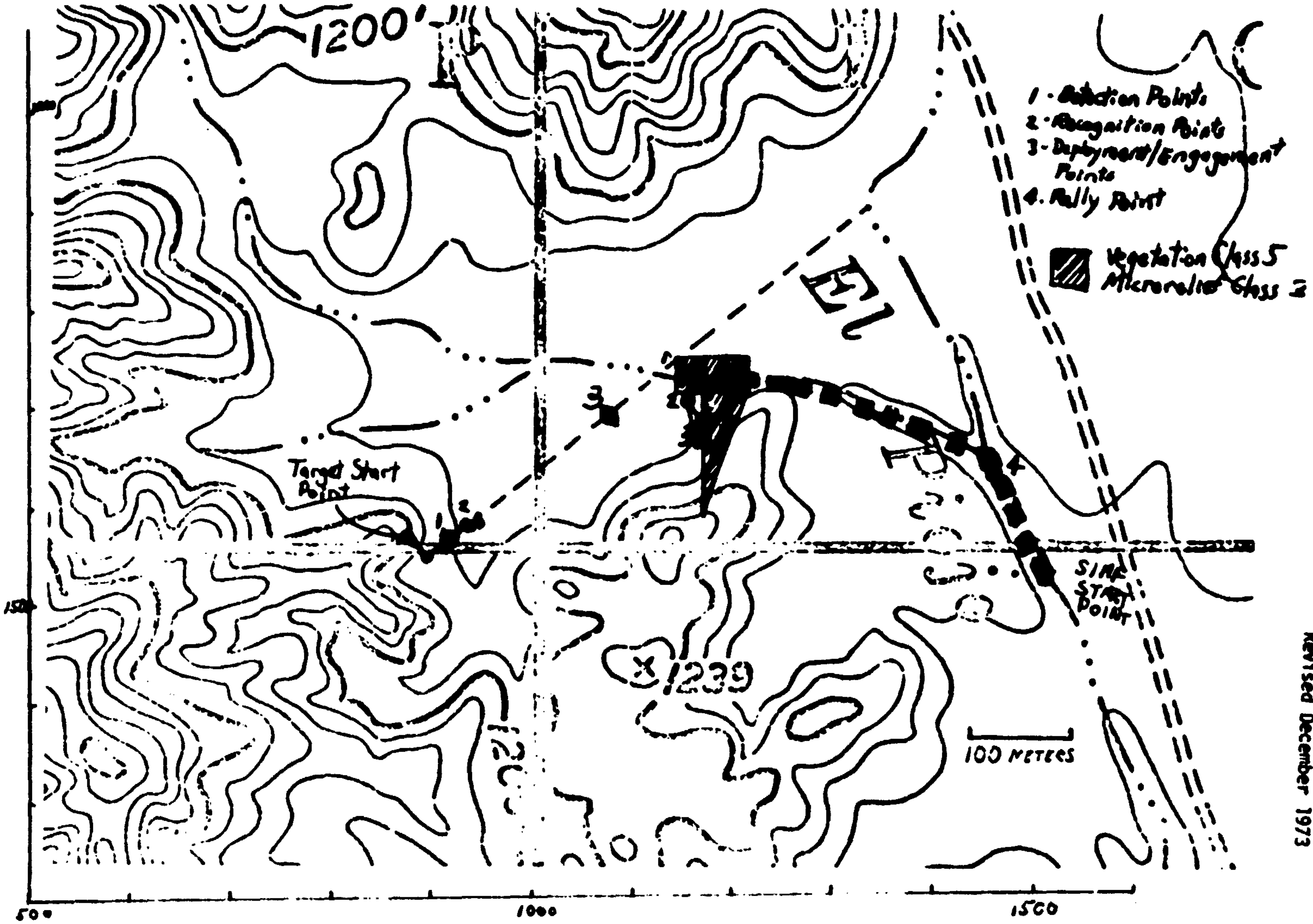


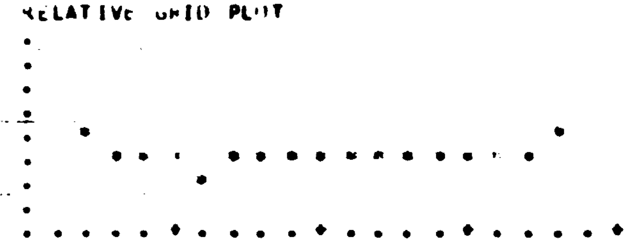
Figure 6.9, Sample Case Diagram

```
STARTING WITH RECONAISSANCE RESOLUTION OF 50.8 METERS

INITIAL TARGET POSITION  FOR TARGET NUMBER   1 : X-  900.00 Y-   1550.00
STAF POSITION:  X- 1483.60 Y- 1524.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-01
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1473.20 Y- 1553.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-02
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1470.05 Y- 1574.80      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-03
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1456.51 Y- 1625.50      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-05
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1450.00 Y- 1650.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-06
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1422.40 Y- 1661.04      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-07
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1384.00 Y- 1676.40      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-09
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1371.60 Y- 1681.36      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-09
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1320.30 Y- 1701.68      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-11
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1270.00 Y- 1722.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-14
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1257.00 Y- 1727.20      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-14
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1250.00 Y- 1730.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-14
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1219.20 Y- 1730.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-16
  XTAR =   900     YTAR = 1550      LOS =  2
STAF POSITION:  X- 1208.36 Y- 1730.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-16
  XTAR =   900     YTAR = 1550      LOS =  3
STAF POSITION:  X- 1168.40 Y- 1730.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-17
  XTAR =   917     YTAR = 1564      LOS =  3
STAF POSITION:  X- 1158.29 Y- 1730.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-08 MINUTES-17
  XTAR =   917     YTAR = 1564      LOS =  1
STAF DETECTS TARGET NO. 1 VISUALLY
```

Figure 6.10, Sample Case Output

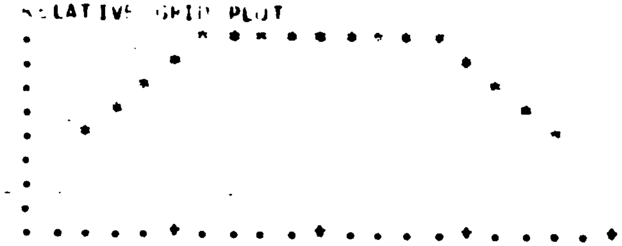
```
TARGET DETECTED   DYNAMIC ROUTE TO SEEK RECOGNITION
X,Y COORDINATES ON EACH MOVEMENT FOR THE LEADER OF THIS MU.
     XDVN        YDVN                      RELATIVE GRID PLOT
   1168.39     1730.00
   1163.08     1703.92
   1147.39     1693.54
   1131.69     1683.16
   1126.39     1657.08
   1100.31     1662.39
   1084.62     1652.00
   1068.93     1641.62
   1053.24     1631.24
   1037.54     1620.85
   1021.85     1610.47
   1006.16     1600.08
    990.47     1589.70
    974.78     1579.31
    959.09     1568.93
    943.39     1558.55
    917.32     1563.85
STATISTICS ON ABOVE DYNAMIC ROUTE
NUMBER OF POINTS IN THE ROUTE :     17
```



```
SIAF POSITION:  X- 1167.82 Y- 1727.20     TARGET DETECTED:   YES     TIME:  DAYS-01 HOURS-08 MINUTES-17
   XTAR =  919      YTAR = 1565      LOS =  1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF POSITION:  X- 1163.08 Y- 1703.92     TARGET DETECTED:   YES     TIME:  DAYS-01 HOURS-08 MINUTES-18
   XTAR =  932      YTAR = 1576      LOS =  1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF RECOGNIZED TARGET NO. 1 AT X- 1163.08 Y- 1703.92 THE RECOGNITION RANGE IS  263.08
```

```
DYNAMIC ROUTE TO RETURN TO NEXT CHECK PT OF ORIGINAL ROUTE IF DESIRED
X,Y COORDINATES ON EACH MOVEMENT FOR THE LEADER OF THIS MU.
   XCYN       YCYN
  1163.08    1703.92
  1165.04    1705.22
  1167.00    1706.52
  1168.96    1707.82
  1170.92    1709.12
  1171.26    1710.75
  1171.59    1712.38
  1171.92    1714.01
  1172.25    1715.64
  1172.58    1717.26
  1172.91    1718.89
  1173.25    1720.52
  1173.58    1722.15
  1172.28    1724.12
  1170.98    1726.08
  1169.68    1728.04
  1168.39    1730.00
STATISTICS ON ABOVE DYNAMIC ROUTE
NUMBER OF POINTS IN THE ROUTE :    17
```

RELATIVE GRID PLOT



```
MISSION IS -- AMBUSH OR AVOID

THE COURSE OF ACTION FOR SIAF TO TAKE :
 SIAF  DECIDES TO CONT. ON TO AMBUSH
SIAF IS TO BE THE SUBJECT  PATROL
DEPLOYMENT POINT   X =    1177.1333       Y =    1702.3624
ENGAGEMENT POINT   X =    1077.6589       Y =    1592.1268
FOR MANEUVER UNIT NUMBER  1, ULOGIC COMPUTES APPROACH PATH
   1164      1173      1090
   1691      1663      1677
FOR MANEUVER UNIT NUMBER  2, ULOGIC COMPUTES APPROACH PATH
   1160      1177
   1716      1682

ENGAGEMENT POINT    1077.66    1592.13
 A 128 BY  64RECTANGLE HAS BEEN FITTED AT X=    228.60Y=   1251.40
RESOLUTION HAS BEEN CHANGED TO COMBAT LEVEL OF   12.7 METERS
```

PATROL MEMBER STATISTICS BEFORE COMBAT

ATTACKER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)	
CURRENT AMMO SUPPLY	100	100	100	100	6	100	100	100	0
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO	
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT	
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0
CURRENT X (METER)	1160.48	1163.89	1163.10	1157.86	1165.72	1155.24	1166.12	1161.65	0.00
CURRENT Y (METER)	1716.14	1691.46	1711.84	1720.43	1707.62	1724.66	1686.99	1695.93	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND	
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	
MANEUVER UNIT	4	1	2	2	2	2	1	1	0
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	20	20	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN	
MOVEMENT RATE(M/SEC)	.41	.41	.41	.41	.41	.41	.41	.41	0.00
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT	
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47			
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0
CASUALTY STATUS	NO	NO	NO	NO	NO	NO			
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT			
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0
CURRENT X (METER)	932.35	929.23	935.47	926.10	938.63	929.23	0.00	0.00	0.00
CURRENT Y (METER)	1575.88	1579.78	1571.97	1583.69	1568.07	1579.78	0.00	0.00	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND			
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL			
MANEUVER UNIT	1	1	1	1	1	1	0	0	0
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN			
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.			
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA			
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE			
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0

```
DYNAMIC ROUTE FOR ATTACKER MU 1
X,Y COORDINATES ON EACH MOVEMENT FOR THE LEADER OF THIS MU.
     XDYN        YDYN
   1163.89     1691.46
   1168.58     1677.16
   1173.28     1662.86
STATISTICS ON ABOVE DYNAMIC ROUTE
NUMBER OF POINTS IN THE ROUTE :       3

DYNAMIC ROUTE FOR ATTACKER MU 2
X,Y COORDINATES ON EACH MOVEMENT FOR THE LEADER OF THIS MU.
     XDYN        YDYN
   1160.48     1715.14
   1168.83     1699.29
   1177.19     1682.44
STATISTICS ON ABOVE DYNAMIC ROUTE
NUMBER OF POINTS IN THE ROUTE :       3
```

```
COMBAT EXECUTION :
      TIME                 POSITION(ATTACKER)        EVENT
DAYS HRS. MIN. SEC.          X          Y

POSITION OF ATTACKER MU 1 X- 1164.79 Y- 1688.72
POSITION OF ATTACKER MU 2 X- 1162.32 Y- 1712.42
POSITION OF DEFENDER MU 1 X-  934.69 Y- 1577.75
  1    8   18   31    1164.79   1688.72   DETECTION    ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 2
POSITION OF ATTACKER MU 1 X- 1165.69 Y- 1685.97
POSITION OF ATTACKER MU 2 X- 1163.61 Y- 1709.83
POSITION OF DEFENDER MU 1 X-  937.03 Y- 1579.63
  1    8   18   41    1165.69   1685.97   DETECTION    ATTACKER MEMBER: 7 DETECTS DEFENDER MEMBER: 1
POSITION OF ATTACKER MU 1 X- 1166.59 Y- 1683.23
POSITION OF ATTACKER MU 2 X- 1164.89 Y- 1707.24
POSITION OF DEFENDER MU 1 X-  939.38 Y- 1581.50
  1    8   18   51    1166.59   1683.23   DETECTION    ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1167.49 Y- 1680.48
POSITION OF ATTACKER MU 2 X- 1166.17 Y- 1704.65
POSITION OF DEFENDER MU 1 X-  941.72 Y- 1583.38
  1    8   19    1    1167.49   1680.48   DETECTION    ATTACKER MEMBER: 8 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1167.96 Y- 1679.05
POSITION OF ATTACKER MU 2 X- 1166.84 Y- 1703.30
POSITION OF DEFENDER MU 1 X-  942.94 Y- 1584.36
  1    8   19    6    1167.95   1679.05   MOVEMENT     ATTACKER MU 1  WILL MOVE 1.51 METERS AT AN ANGLE OF  -71
  1    8   19    6    1166.84   1703.30   MOVEMENT     ATTACKER MU 2  WILL MOVE 1.51 METERS AT AN ANGLE OF  -63
POSITION OF ATTACKER MU 1 X- 1168.57 Y- 1677.19
POSITION OF ATTACKER MU 2 X- 1167.71 Y- 1701.55
POSITION OF DEFENDER MU 1 X-  944.55 Y- 1585.62
  1    8   19   12    1168.57   1677.19   MOVEMENT     ATTACKER MU 1  WILL MOVE 1.96 METERS AT AN ANGLE OF  -71
  1    8   19   12    1167.71   1701.55   MOVEMENT     ATTACKER MU 2  WILL MOVE 1.96 METERS AT AN ANGLE OF  -63
POSITION OF ATTACKER MU 1 X- 1169.47 Y- 1674.44
POSITION OF ATTACKER MU 2 X- 1169.00 Y- 1698.96
POSITION OF DEFENDER MU 1 X-  945.67 Y- 1587.50
  1    8   19   22    1169.47   1674.44   DETECTION    ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER MU 1 X- 1170.38 Y- 1671.70
POSITION OF ATTACKER MU 2 X- 1170.28 Y- 1696.37
```

```
POSITION OF DEFENDER NU 1 X- [illegible].22 Y- [illegible].37
   1    8   19   32     1170.38   1671.70    DETECTION    ATTACKER MEMBER: 6 DETECTS DEFENDER MEMBER: 4
POSITION OF ATTACKER NU 1 X- 1171.28 Y- 1668.95
POSITION OF ATTACKER NU 2 X- 1171.56 Y- 1693.78
POSITION OF DEFENDER NU 1 X-  951.56 Y- 1591.25
   1    8   19   42     1171.28   1668.95    DETECTION    ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 1
POSITION OF ATTACKER NU 1 X- 1172.18 Y- 1666.21
POSITION OF ATTACKER NU 2 X- 1172.85 Y- 1691.20
POSITION OF DEFENDER NU 1 X-  953.90 Y- 1593.12
   1    8   19   52     1172.18   1666.21    DETECTION    ATTACKER MEMBER: 7 DETECTS DEFENDER MEMBER: 4
POSITION OF ATTACKER NU 1 X- 1173.08 Y- 1663.47
POSITION OF ATTACKER NU 2 X- 1174.13 Y- 1688.61
POSITION OF DEFENDER NU 1 X-  956.24 Y- 1594.99
   1    8   20    2     1173.08   1663.47    DETECTION    ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER NU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER NU 2 X- 1174.20 Y- 1688.46
POSITION OF DEFENDER NU 1 X-  956.32 Y- 1595.06
   1    8   20    2     1173.13   1663.31    MOVEMENT     ATTACKER NU 1  WILL MOVE  .16 METERS AT AN ANGLE OF  -7:
   1    8   20    2     1174.20   1688.46    MOVEMENT     ATTACKER NU 2  WILL MOVE  .16 METERS AT AN ANGLE OF  -6:
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DYNAMIC ROUTE FOR ATTACKER MU 1
X,Y COORDINATES ON EACH MOVEMENT FOR THE LEADER OF THIS MU.
     XCYN        YDYN
    1173.13     1663.31
    1156.54     1665.95
    1139.94     1668.59
    1125.98     1687.83
    1109.39     1690.47
    109C.15     1676.51
STATISTICS ON ABOVE DYNAMIC ROUTE
NUMBER OF POINTS IN THE ROUTE :      6

POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1175.49 Y- 1685.87
POSITICN OF DEFENDER MU 1 X-  958.67 Y- 1596.93
   1    8   20   12    1173.13   1663.31   DETECTION     ATTACKER MEMBER: 6 DETECTS DEFENDER MEMBER: 6
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X-  960.68 Y- 1598.54
   1    8   20   20    1173.13   1663.31   MOVEMENT      ATTACKER MU 1  WILL MOVE 0.00 METERS AT AN ANGLE OF  -71
   1    8   20   20    1177.04   1682.74   MOVEMENT      ATTACKER MU 2  WILL MOVE 3.49 METERS AT AN ANGLE OF  -6:
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X-  963.02 Y- 1600.42
   1    8   20   30    1173.13   1663.31   DETECTION     ATTACKER MEMBER: 7 DETECTS DEFENDER MEMBER: 3
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X-  965.36 Y- 1602.29
   1    8   20   40    1173.13   1663.31   DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 6
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X-  967.71 Y- 1604.17
   1    8   20   50    1173.13   1663.31   DETECTION     ATTACKER MEMBER: 1 DETECTS DEFENDER MEMBER: 6
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X-  970.05 Y- 1606.04
   1    8   21    0    1173.13   1663.31   DETECTION     ATTACKER MEMBER: 1 DETECTS DEFENDER MEMBER: 6
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X-  972.39 Y- 1607.91
   1    8   21   10    1173.13   1663.31   DETECTION     ATTACKER MEMBER: 7 DETECTS DEFENDER MEMBER: 2
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POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  974.73 Y- 1609.79
   1    8   21   20     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  977.08 Y- 1611.66
   1    8   21   30     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 1
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  979.42 Y- 1613.54
   1    8   21   40     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  981.76 Y- 1615.41
   1    8   21   50     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 7 DETECTS DEFENDER MEMBER: 4
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  984.10 Y- 1617.28
   1    8   22    0     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 8 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  986.45 Y- 1619.16
   1    8   22   10     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  988.79 Y- 1621.03
   1    8   22   20     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 8 DETECTS DEFENDER MEMBER: 1
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  991.13 Y- 1622.91
   1    8   22   30     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 8 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  993.48 Y- 1624.78
   1    8   22   40     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 4
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X-  [illegible] Y- 1626.65
   1    8   22   50     [illegible]   [illegible]    DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 1
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU [illegible] X- 1177.04 Y- 1682.74
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POSITION OF DEFENDER MU 1 X-  995.86 Y- 1629.09
   1    8   23    4      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1001.21 Y- 1630.96
   1    8   23   13      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 8 DETECTS DEFENDER MEMBER: 2
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1003.55 Y- 1632.84
   1    8   23   23      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 8 DETECTS DEFENDER MEMBER: 3
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1005.89 Y- 1634.71
   1    8   23   33      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 3
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1008.23 Y- 1636.59
   1    8   23   43      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 1 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1010.58 Y- 1638.46
   1    8   23   53      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1012.92 Y- 1640.34
   1    8   24    3      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1015.26 Y- 1642.21
   1    8   24   13      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1017.84 Y- 1644.27
   1    8   24   24      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 4
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1632.74
POSITION OF DEFENDER MU 1 X- 1020.18 Y- 1646.14
   1    8   24   34      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1022.52 Y- 1648.02
   1    8   24   44      1173.13   1663.31   DETECTION     ATTACKER MEMBER: 2 DETECTS DEFENDER MEMBER: 3
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POSITICN CF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN CF DEFENDER MU 1 X- 1024.87 Y- 1649.89
 1   8   24   54      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 2 DETECTS DEFENDER MEMBER: 4
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1027.21 Y- 1651.77
 1   8   25   4       1173.13   1663.31    DETECTION    ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 3
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN CF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1029.55 Y- 1653.64
 1   8   25   14      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 4
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1031.89 Y- 1655.52
 1   8   25   24      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 4
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1034.24 Y- 1657.39
 1   8   25   34      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 7 DETECTS DEFENDER MEMBER: 4
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1037.05 Y- 1659.64
 1   8   25   46      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 1 DETECTS DEFENDER MEMBER: 4
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1039.39 Y- 1661.51
 1   8   25   56      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1041.73 Y- 1663.39
 1   8   26   6       1173.13   1663.31    DETECTION    ATTACKER MEMBER: 5 DETECTS DEFENDER MEMBER: 5
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1044.08 Y- 1665.26
 1   8   26   16      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 3
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1046.42 Y- 1667.13
 1   8   26   26      1173.13   1663.31    DETECTION    ATTACKER MEMBER: 1 DETECTS DEFENDER MEMBER: 4
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
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POSITICN CF DEFFNDER MU 1 X- 1043.76 Y- 1669.01
  1   8   26   36     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 3
POSITICN CF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN CF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1051.10 Y- 1670.88
  1   8   26   46     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 4
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN CF DEFENDER MU 1 X- 1053.45 Y- 1672.76
  1   8   26   56     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 6 DETECTS DEFENDER MEMBER: 5
POSITICN CF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1055.79 Y- 1674.63
  1   8   27    6     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 4 DETECTS DEFENDER MEMBER: 6
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN CF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1058.13 Y- 1676.51
  1   8   27   16     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 7 DETECTS DEFENDER MEMBER: 6
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1060.47 Y- 1678.38
  1   8   27   26     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 1 DETECTS DEFENDER MEMBER: 5
POSITION OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1062.02 Y- 1680.25
  1   8   27   36     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 1 DETECTS DEFENDER MEMBER: 6
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1065.16 Y- 1682.13
  1   8   27   46     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 6 DETECTS DEFENDER MEMBER: 2
POSITICN OF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1067.50 Y- 1684.00
  1   8   27   56     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 3 DETECTS DEFENDER MEMBER: 5
POSITICN CF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN OF DEFENDER MU 1 X- 1069.84 Y- 1685.88
  1   8   28    5     1173.13   1663.31    DETECTION     ATTACKER MEMBER: 8 DETECTS DEFENDER MEMBER: 1
POSITICN CF ATTACKER MU 1 X- 1173.13 Y- 1663.31
POSITICN UF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITICN CF DEFENDER MU 1 X- 1072.19 Y- 1687.75
  1   8   28   16     1173.13   1663.31    DETECTIUN     ATTACKER MEMBER: 7 DETECTS CEFENDER MEMBER: 5
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POSITION OF ATTACKER NO 1 X= 1173.13 Y= 1663.31
POSITION OF ATTACKER NO 2 X= 1177.04 Y= 1682.74
POSITION OF DEFENDER NO 1 X= 1074.53 Y= 1689.52
  1    8    23    25    1173.13    1663.31    DETECTION    ATTACKER MEMBERS 4 DETECTS DEFENDER MEMBERS 4
POSITION OF ATTACKER NO 1 X= 1173.13 Y= 1663.31
POSITION OF ATTACKER NO 2 X= 1177.04 Y= 1682.74
POSITION OF DEFENDER NO 1 X= 1074.97 Y= 1689.97
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1      6    28    27        CASUALTY EVENT
DEFENDER   PATROL SUSTAINS THE NEXT CASUALTY
THE NUMBER OF THE CASUALTY MEMBER IS :  5
THE TYPE OF CASUALTY IS : MIN. WOUND
TIME(SEC) THAT COMBAT OPERATION HAS BEEN UNDERWAY:        1.8720
POSITION : X- 1173.13 Y- 1665.71
POSITION OF ATTACKER MU 1 X- 1172.37 Y- 1663.43
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1662.74
POSITION OF DEFENDER MU 1 X- 1075.30 Y- 1690.24
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1      8    28    29        CASUALTY EVENT
DEFENDER   PATROL SUSTAINS THE NEXT CASUALTY
THE NUMBER OF THE CASUALTY MEMBER IS :  2
THE TYPE OF CASUALTY IS : MAJ. WOUND
TIME(SEC) THAT COMBAT OPERATION HAS BEEN UNDERWAY:        3.2854
POSITION : X- 1172.37 Y- 1663.43
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ATTRIBUTES TABLE AFTER CASUALTY SUSTAINED

ATTACKER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)	
CURRENT AMMO SUPPLY	98	98	98	94	4	98	98	98	0
CASUALTY STATUS	NC	NC	NO	NO	NO	NO	NO	NO	
FIRING STATUS	POINT	POINT	POINT	POINT	POINT	POINT	POINT	POINT	
SUPPRESSION STATE	0	0	0	0	0	5	0	0	0
CURRENT X (METER)	1177.04	1172.37	1176.36	1177.57	1175.73	1178.16	1171.07	1173.78	0.00
CURRENT Y (METER)	1682.74	1663.43	1678.44	1687.56	1674.72	1692.39	1655.25	1663.10	0.00
NEXT X (METER)	1177.19	1156.54	1176.70	1177.67	1176.22	1178.16	1159.20	1154.87	0.00
NEXT Y (METER)	1682.44	1665.95	1677.46	1687.41	1672.48	1692.39	1661.24	1673.66	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND	
MOVING STATUS	STOPPED	NORMAL	STOPPED	STOPPED	STOPPED	STOPPED	NORMAL	NORMAL	
MANEUVER UNIT	2	1	2	2	2	2	1	1	0
ROUNDS REMAIN (MAG.)	18	18	18	14	18	18	18	18	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN	
MOVEMENT RATE(M/SEC)	0.00	.54	0.00	0.00	0.00	0.00	.54	.54	0.00
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT	
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	3	0

DEFENDER PATROL

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47			
CURRENT AMMO SUPPLY	100	100	100	99	100	100	0	0	0
CASUALTY STATUS	NO	MI.WOUND	NO	NO	MI.WOUND	NO			
FIRING STATUS	NOT	NOT	NOT	POINT	NOT	NOT			
SUPPRESSION STATE	0	6	0	0	0	0	0	0	0
CURRENT X (METER)	1076.30	1072.18	1078.42	1059.05	1061.55	1072.13	0.00	0.00	0.00
CURRENT Y (METER)	1690.24	1694.14	1686.44	1698.05	1662.43	1694.14	0.00	0.00	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00
CURRENT POSTURE	STAND	PRONE	STAND	STAND	STAND	STAND			
MOVING STATUS	NORMAL	STOPPED	NORMAL	NORMAL	NORMAL	NORMAL			
MANEUVER UNIT	1	1	1	1	1	1	0	0	0
ROUNDS REMAIN (MAG.)	20	20	20	19	20	20	0	0	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN			
MOVEMENT RATE (M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.			
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA			
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0
SECONDARY WEAPON AVL	NONE	NONE	NONE	NONE	NONE	NONE			
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION
DEFENDER BREAKS, WITHDRAWAL ANGLE= 3.8163
POSITION OF ATTACKER NO 1 X= 1171.58 Y= 1663.56
POSITION OF ATTACKER NO 2 X= 1177.54 Y= 1632.74
POSITION OF DEFENDER NO 1 X= 107?.?? Y= 1689.44

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1    9    29    24       CASUALTY EVENT
DEFENDER    PATROL SUSTAINS THE NEXT CASUALTY
THE NUMBER OF THE CASUALTY MEMBER IS :   4
THE TYPE OF CASUALTY IS : DEATH
TIME(SEC) THAT COMBAT OPERATION HAS BEEN UNDERWAY:       4.8625
POSITION : X- 1171.53 Y- 1663.56
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ATTRIBUTE TABLE AFTER CASUALTY SUSTAINED

ATTACKER PATROL

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-15(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)	
CURRENT AMMO SUPPLY	[illegible]	97	97	91	3	97	97	97	0
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	[illegible]	
FIRING STATUS	POINT	POINT	POINT	POINT	POINT	POINT	POINT	POINT	
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0
CURRENT X (METER)	1177.04	1171.53	1176.36	1177.57	1175.73	1178.16	1170.24	1172.93	0.00
CURRENT Y (METER)	1662.74	1663.56	1676.44	1637.56	1674.72	1692.39	1658.44	1668.22	0.00
NEXT X (METER)	1177.19	1155.54	1176.70	1177.67	1175.22	1175.16	1158.20	1154.67	0.00
NEXT Y (METER)	1662.44	1665.95	1677.45	1587.41	1672.48	1692.39	1661.24	1670.66	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.53	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND	
MOVING STATUS	STOPPED	NORMAL	STOPPED	STOPPED	STOPPED	STOPPED	NORMAL	NORMAL	
MANEUVER UNIT	2	1	2	2	2	2	1	1	0
ROUNDS REMAIN (MAG.)	17	17	17	11	17	17	17	17	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN	
MOVEMENT RATE(M/SEC)	0.00	.54	0.00	0.00	0.00	0.00	.54	.54	0.00
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT	
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	C
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	F. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0

DEFENDER PATROL

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47			
CURRENT AMMO SUPPLY	99	100	100	99	100	100	0	0	0
CASUALTY STATUS	NO	MA.WOUND	DEAD	NO	MI.WOUND	NO			
FIRING STATUS	POINT	NOT	NOT	NOT	NOT	NOT			
SUPPRESSION STATE	0	0	6	6	0	6	0	0	0
CURRENT X (METER)	1074.93	1072.18	1078.05	1068.68	1081.18	1071.81	0.00	0.00	0.00
CURRENT Y (METER)	1669.94	1694.14	1696.04	1697.75	1682.14	1693.85	0.00	0.00	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00
CURRENT POSTURE	STAND	PRONE	PRONE	STAND	STAND	STAND			
MOVING STATUS	TOP SP.	STOPPED	STOPPED	TOP SP.	TOP SP.	TOP SP.			
MANEUVER UNIT	1	1	1	1	1	1	0	0	0
ROUNDS REMAIN (MAG.)	19	20	20	19	20	20	0	0	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN			
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.			
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA			
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE			
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION
POSITION OF ATTACK[illegible] X- 1173.5? Y- 1653.68
POSITION OF ATTACK-[illegible] X- 1177.0[illegible] Y- 1662.74
POSITION OF DEFE[illegible] X- [illegible] Y- 16[illegible].70

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1   [illegible]   [illegible]   [illegible]      CASUALTY EVENT
DEFENDER   PATROL SUSTAINS THE [illegible]AT CASUALTY
THE NUMBER OF THE CASUALTY NUMBER IS :  1
THE TYPE OF CASUALTY IS : MAJ. WOUND
TIME(S-C) THAT COMBAT OPERATION HAS BEEN UNDERWAY:     0.1059
POSITION : X= 1171.[illegible] Y= 1003.63
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ATTRIBUTE TABLE AFTER CASUALTY SUSTAINED

ATTACKER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)	
CURRENT AMMO SUPPLY	96	96	96	88	2	96	96	96	0
CASUALTY STATUS	NC	NC	NO	NO	NO	NO	NC	NO	
FIRING STATUS	POINT	POINT	POINT	POINT	POINT	POINT	POINT	POINT	
SUPPRESSION STATE	0	0	0	0	0	5	0	0	0
CURRENT X (METER)	1177.04	1170.82	1176.36	1177.57	1175.73	1178.16	1169.54	1172.22	0.00
CURRENT Y (METER)	1682.74	1663.68	1678.44	1687.56	1674.72	1692.39	1658.60	1668.31	0.00
NEXT X (METER)	1177.19	1156.54	1176.73	1177.67	1176.22	1178.16	1158.23	1154.87	0.00
NEXT Y (METER)	1682.44	1665.95	1677.46	1687.41	1672.48	1692.39	1661.24	1670.66	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND	
MOVING STATUS	STOPPED	NORMAL	STOPPED	STOPPED	STOPPED	STOPPED	NORMAL	NORMAL	
MANEUVER UNIT	2	1	2	2	2	2	1	1	0
ROUNDS REMAIN (MAG.)	16	16	16	8	16	16	16	16	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN	
MOVEMENT RATE(M/SEC)	0.00	.54	0.00	0.00	0.00	0.00	.54	.54	0.00
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT	
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47			
CURRENT AMMO SUPPLY	99	100	100	98	100	100	0	0	0
CASUALTY STATUS	MA.WOUND	MA.WOUND	DEAD	NO	MI.WOUND	NO			
FIRING STATUS	NOT	NOT	NOT	POINT	NOT	NOT			
SUPPRESSION STAT	0	0	0	0	0	6	0	0	0
CURRENT X (METER)	1074.52	1072.16	1078.05	1063.37	1080.87	1071.50	0.00	0.00	0.00
CURRENT Y (METER)	1689.70	1694.14	1686.04	1697.50	1681.89	1693.60	0.00	0.00	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00
CURRENT POSTURE	PRONE	PRONE	PRONE	STAND	STAND	STAND			
MOVING STATUS	STOPPED	STOPPED	STOPPED	TOP SP.	TOP SP.	TOP SP.			
MANEUVER UNIT	1	1	1	1	1	1	0	0	0
ROUNDS REMAIN (MAG.)	19	20	20	18	20	20	0	0	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN			
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.			
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA			
POSIT. IN FIRE T-AM	1	2	3	4	5	6	0	0	0
SECONDARY WEAPON AVL	NONE	NONE	NONE	NONE	NONE	NONE			
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION
POSITION OF ATTACKER NO 1 X- 1169.97 Y- 1663.81
POSITION OF ATTACKER NO 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER NO 1 X- 1074.62 Y- 1689.70

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1     H    28    31        CASUALTY EVENT
DEFENDER   PATROL SUSTAINS THE NEXT CASUALTY
THE NUMBER OF THE CASUALTY NUMBER IS :  6
THE TYPE OF CASUALTY IS : DEATH
TIME(SEC) THAT COMBAT OPERATION HAS BEEN UNDERWAY:     7.7777
POSITION : X= 1159.97 Y= 1665.81
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ATTRIBUT. TABLE AFTER CASUALTY SUSTAINED

ATTACKER PATROL:

	PATROL MEMBER								
	1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)	
CURRENT AMMO SUPPLY	95	95	95	45	1	95	95	95	0
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO	
FIRING STATUS	POINT	POINT	POINT	POINT	POINT	POINT	POINT	POINT	
SUPPRESSION STAT.	0	0	0	0	0	0	0	0	0
CURRENT X (METER)	1177.34	1164.97	1176.35	1177.57	1175.73	1178.16	1168.70	1171.36	0.00
CURRENT Y (METER)	1552.74	1661.81	1675.44	1567.56	1674.72	1592.39	1658.60	1658.43	0.00
NEXT X (METER)	1177.19	1156.54	1176.70	1177.67	1175.22	1176.15	1158.20	1154.87	0.00
NEXT Y (METER)	1552.44	1605.95	1677.46	1587.41	1572.48	1592.39	1661.24	1670.65	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND	
MOVING STATUS	STOPPED	NORMAL	STOPPED	STOPPED	STOPPED	STOPPED	NORMAL	NORMAL	
MANEUVER UNIT	2	1	2	2	2	2	1	1	0
ROUNDS REMAIN (MAG.)	15	15	15	5	15	15	15	15	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN	
MOVEMENT RATE(M/SEC)	0.00	.54	0.00	0.00	0.00	0.00	.54	.54	0.00
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT	
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	F. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0

DEFENDER PATROL:

PATROL MEMBER

	1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47			
CURRENT AMMO SUPPLY	99	100	100	98	100	100	0	0	0
CASUALTY STATUS	MA.WOUND	MA.WOUND	DEAD	NO	MI.WOUND	DEAD			
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT			
SUPPRESSION STATE	0	0	0	6	3	6	0	0	0
CURRENT X (METER)	1074.62	1072.18	1078.05	1066.00	1080.49	1071.12	0.00	0.00	0.00
CURRENT Y (METER)	1689.70	1696.14	1686.04	1697.21	1681.50	1693.30	0.00	0.00	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00
CURRENT POSTURE	PRONE	PRONE	PRONE	STAND	STAND	PRONE			
MOVING STATUS	STOPPED	STOPPED	STOPPED	TOP SP.	TOP SP.	STOPPED			
MANEUVER UNIT	1	1	1	1	1	1	0	0	0
ROUNDS REMAIN (MAG.)	19	20	20	18	20	20	0	0	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN			
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.			
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA			
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0
SECONDARY WEAPON AVL	NONE	NONE	NONE	NONE	NONE	NONE			
NO.OF FRAG GRENADE	0	0	0	0	0	0	0	0	0
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION
POSITION OF ATTACK [illegible] X= [illegible] Y= 1663.97
POSITION OF ATTACK [illegible] X= 1177.[illegible] Y= [illegible].74
POSITION OF DEFENDER [illegible] X= 1074.[illegible] Y= [illegible].70

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1    4    24    42       CASUALTY EVENT
DEFENDER  PATROL SUSTAINS THE [illegible]AT CASUALTY
THE NUMBER OF THE CASUALTY NUMBER IS :  4
THE TYPE OF CASUALTY IS : DEATH
TIME(SEC) THAT COMBAT OPERATION HAS BEEN UNDERWAY:     9.6705
POSITION : X- 1103.96 Y- 1663.57
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ATTRIBUTE TABLE AFTER CASUALTY SUSTAINED

ATTACKER PATROL:

	PATROL MEMBER								
	1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)	
CURRENT AMMO SUPPLY	94	94	94	82	0	94	94	94	0
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO	
FIRING STATUS	POINT	POINT	POINT	POINT	POINT	POINT	POINT	POINT	
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0
CURRENT X (METER)	1177.04	1168.96	1176.36	1177.57	1175.73	1178.16	1167.70	1170.35	0.00
CURRENT Y (METER)	1682.74	1663.97	1676.44	1687.56	1674.72	1692.39	1659.03	1668.57	0.00
NEXT X (METER)	1177.19	1156.54	1176.70	1177.67	1176.22	1178.16	1158.20	1154.87	0.00
NEXT Y (METER)	1682.44	1665.95	1677.46	1687.41	1672.48	1692.39	1661.24	1670.66	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND	
MOVING STATUS	STOPPED	NORMAL	STOPPED	STOPPED	STOPPED	STOPPED	NORMAL	NORMAL	
MANEUVER UNIT	2	1	2	2	2	2	1	1	0
ROUNDS REMAIN (MAG.)	14	14	14	2	0	14	14	14	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN	
MOVEMENT RATE(M/SEC)	0.00	.54	0.00	0.00	0.00	0.00	.54	.54	0.00
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT	
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0
SECONDARY WEAPON AVL	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47			
CURRENT AMMO SUPPLY	99	100	100	98	100	100	0	0	0
CASUALTY STATUS	MA.WOUND	MA.WOUND	DEAD	DEAD	MI.WOUND	DEAD			
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT			
SUPPRESSION STATE	0	0	0	6	0	0	0	0	0
CURRENT X (METER)	1074.62	1072.18	1078.05	1067.56	1080.05	1071.12	0.00	0.00	0.00
CURRENT Y (METER)	1689.70	1694.14	1686.04	1696.85	1681.23	1693.30	0.00	0.00	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	STAND	PRONE			
MOVING STATUS	STOPPED	STOPPED	STOPPED	STOPPED	TOP SP.	STOPPED			
MANEUVER UNIT	1	1	1	1	1	1	0	0	0
ROUNDS REMAIN (MAG.)	19	20	20	18	20	20	0	0	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN			
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.			
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA			
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE			
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION
POSITION OF ATTACKER MU 1 X- 1159.33 Y- 1665.50
POSITION OF ATTACKER MU 2 X- 1177.04 Y- 1682.74
POSITION OF DEFENDER MU 1 X- 1074.62 Y- 1689.70
1 8 28 49 1159.33 1665.50 MOVEMENT ATTACKER MU 1 WILL MOVE 9.75 METERS AT AN ANGLE OF 171
1 8 28 49 1177.04 1682.74 MOVEMENT ATTACKER MU 2 WILL MOVE 0.00 METERS AT AN ANGLE OF -63

```
BREAK DECISION :  DEFENDER  BREAKS CONTACT DUE TC LACK OF ADEQUATE FIREPOWER

BREAK DECISION :  DEFENDER  BREAKS CONTACT DUE TC HIGH CASUALTY FRACTION
POSITICN OF ATTACKER NU 1 X- 1159.33 Y- 1665.50
POSITICN CF ATTACKER NU 2 X- 1177.04 Y- 1682.74
POSITICN CF DEFENDER NU 1 X- 1074.62 Y- 1689.70
POSITICN CF DEFENDER NU 3 X- 1072.18 Y- 1694.14

   1    8   29    9     NO EVENTS IN 20 SECONDS.

BREAK DECISION :  ATTACKER  BREAKS CONTACT DUE TC EXCESSIVE ELAPSED TIME(FIGHT)

BREAK DECISION :  DEFENDER  BREAKS CONTACT DUE TC LACK OF ADEQUATE FIREPOWER

BREAK DECISION :  DEFENDER  BREAKS CONTACT DUE TC HIGH CASUALTY FRACTION
TC FOR BREAK CONTACT-AVAILABLE
STAF RALLY POINT     1466.2427    1626.8864
ATTACKER WITHDRAWAL ROUTES
    1159.33      1466.24
    1665.50      1626.89
ATTACKER WITHDRAWAL ROUTES
    1177.04      1466.24
    1682.74      1626.89
POSITICN OF ATTACKER NU 1 X- 1180.83 Y- 1662.80
POSITICN CF ATTACKER NU 2 X- 119[illegible].12 Y- 1679.25
POSITICN CF DEFENDER NU 1 X- 107[illegible].[illegible] Y- 1689.70

  1    4   33   46    1451.55  1628.73   MOVEMENT     ATTACKER NU 1  WILL MOVE19.36 METERS AT AN ANGLE OF   -[illegible]
  1    5   33   46    1465.22  1576.43   MOVEMENT     ATTACKER NU 2  WILL MOVE19.36 METERS AT AN ANGLE OF  -1[illegible]
RESOLUTION HAS BEEN CHANGED BACK TO THE RECONNAISSANCE LEVEL OF  50.0 METERS

 DECISION ON CONTINUATION OF RECONNAISSANCE MISSION   AFTER COMBAT OPERATION IS COMPLETED :
   MISSION DECISION : CONTINUE
   CURRENT AMOUNT OF FOOD REMAINING PER MAN(LB.) :       13.6442
   CURRENT AMOUNT OF WATER REMAINING PER MAN(LB.) :       [illegible].3454
   PATROL DURATION (DAYS) :  [illegible]
```

PATROL MEMBER STATISTICS AFTER COMBAT

ATTACKER PATROL:

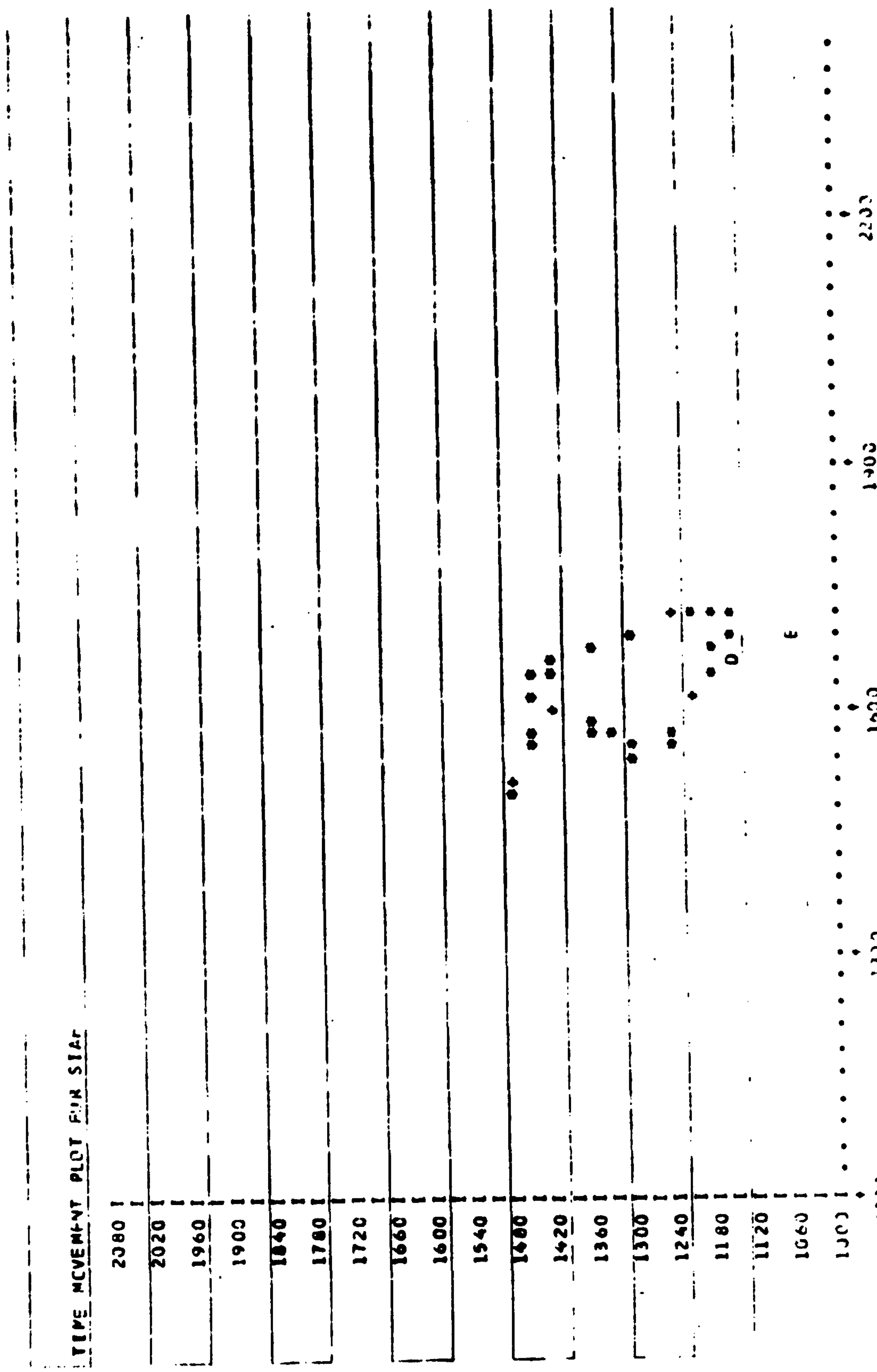
	PATROL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)	
CURRENT AMMO SUPPLY	94	94	94	82	0	94	94	94	0
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO	
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT	
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0
CURRENT X (METER)	1466.22	1451.55	1465.41	1466.79	1464.55	1467.40	1453.58	1652.97	0.00
CURRENT Y (METER)	1626.89	1628.73	1621.96	1631.87	1617.03	1636.84	1623.47	1633.57	0.00
NEXT X (METER)	1466.24	1466.24	1465.41	1467.07	1464.59	1467.90	1465.41	1467.07	0.00
NEXT Y (METER)	1626.89	1626.89	1621.96	1631.82	1617.02	1636.75	1621.96	1631.82	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND	
MOVING STATUS	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	
MANEUVER UNIT	2	1	2	2	2	2	1	1	0
ROUNDS REMAIN (MAG.)	14	14	14	2	0	14	14	14	0
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN	
MOVEMENT RATE(M/SEC)	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	0.00
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT	
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0
NO.OF SMOKE GRENADE	2	1	0	0	0	0	0	0	0

DEFENCER PATRCL:

	PATRCL MEMBER 1	2	3	4	5	6	7	8	9
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47			
CURRENT AMMO SUPPLY	99	100	100	98	100	100	0	0	0
CASUALTY STATUS	MA.WOUND	MA.WOUND	DEAD	DEAD	MI.WOUND	DEAD			
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT			
SUPPRESSICN STATE	0	0	0	0	0	0	0	0	0
CURRENT X (METER)	1074.62	1072.18	1078.05	1067.56	1006.05	1071.12	0.00	0.00	0.00
CURRENT Y (METER)	1669.70	1694.14	1686.04	1696.85	1622.04	1693.30	0.00	0.00	0.00
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	STAND	PRONE			
MOVING STATUS	STOPPED	STOPPED	STOPPED	STOPPED	TOP SP.	STOPPED			
MANEUVER UNIT	1	1	1	1	1	1	0	0	0
ROUNDS REMAIN (MAG.)	19	20	20	18	20	20	0	0	0
FUNCTICN IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN			
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.			
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA			
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE			
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0

```
SIAF PCSITION:  X- 1456.51 Y- 1625.50      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-09 MINUTES-01
  XTAR =  932        YTAR = 1576        LOS =  1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF PCSITION:  X- 1470.05 Y- 1574.80      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-09 MINUTES-03
  XTAR =  932        YTAR = 1576        LOS =  1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF PCSITION:  X- 1473.20 Y- 1563.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-09 MINUTES-03
  XTAR =  932        YTAR = 1576        LOS =  1

SIAF PCSITION:  X- 1483.60 Y- 1524.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-09 MINUTES-05
  XTAR =  932        YTAR = 1576        LOS =  1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF PCSITION:  X- 1490.00 Y- 1500.00      TARGET DETECTED:   NO        TIME:  DAYS-01 HOURS-09 MINUTES-06
  XTAR =  932        YTAR = 1576        LOS =  1
```


TIME MOVEMENT PLOT FOR STAR
2080
2020
1960
1900
1840
1780
1720
1660
1600
1540
1480
1420
1360
1300
1240
1180
1120
1060
1000
1000
1300
1600
1900
2200

SIAF SURVEILLANCE STATISTICS (PAGE 1)
HUNTER LIGGETT SCENARIO I
1 REPLICATIONS

UNAIDED VISUAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	1
NUMBER OF DETECTIONS	1
DETECTION SUCCESS RATIO	1.000
DETECTION RANGE (METERS)	
MEAN	301.064
STANDARD DEVIATION	0.000
DETECTION TIME (DAYS,HRS,MINS)	
MEAN	010817
STANDARD DEVIATION	000000
DETECTION CUES	
AURAL	0
SENSOR	

IDENTIFICATION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	1
NUMBER OF IDENTIFICATIONS	1
IDENTIFICATION SUCCESS RATIO	1.000
IDENTIFICATION RANGE (METERS)	
MEAN	263.878
STANDARD DEVIATION	0.000
IDENTIFICATION TIME (DAYS,HRS,MINS)	
MEAN	010818
STANDARD DEVIATION	000000

SIAF SURVEILLANCE STATISTICS (PAGE 2)
HUNTER LIGGETT SCENARIO I
1 REPLICATIONS

AURAL DETECTION STATISTICS OF THE TARGETS BY SIAF

TARGET NUMBER	1
NUMBER OF DETECTIONS	0
DETECTION SUCCESS RATIO	0.000
DETECTION RANGE (METERS)	
MEAN	0.000
STANDARD DEVIATION	0.000
DETECTION TIME (DAYS,HRS,MINS)	
MEAN	000000
STANDARD DEVIATION	000000

TARGET LOCATION STATISTICS

TARGET NUMBER	1
TARGET LOCATION CEP (METERS)	
MEAN	43.287
STANDARD DEVIATION	0.000

SIAF/TARGET SURVEILLANCE STATISTICS (PAGE 5)
HUNTER LIGGETT SCENARIO I
1 REPLICATIONS

CAUSES OF NO DETECTION FOR SIAF (PERCENT)

TARGET NUMBER	1
MASKING BY RELIEF	90.000
MASKING BY VEGETATION	10.000
RANGE AND LIGHT LEVEL	0.000
INSUFFICIENT TIME	0.000

CAUSES OF NO DETECTION FOR TARGETS (PERCENT)

TARGET NUMBER	1
MASKING BY RELIEF	90.000
MASKING BY VEGETATION	10.000
RANGE AND LIGHT LEVEL	0.000
INSUFFICIENT TIME	0.000

SIAF MUVEMENT STATISTICS (PAGE 6)
HUNTER LIGGETT SCENARIO I
1 REPLICATIONS

MOVEMENT RATE (KM/HR)
MEAN 1.645
STANDARD DEVIATION .184

PATROL DURATION (DAYS,HRS,MINS)
MEAN 010906
STANDARD DEVIATION CO00CO

DISTANCE TRAVELLED (KM)
MEAN 1.356
STANDARD DEVIATION 0.000

MOVEMENT RATE HISTOGRAM (KM/HR)

PERCENT TIME BETWEEN 0.000 - .200 KM/HR = 0.000

PERCENT TIME BETWEEN .200 - .400 KM/HR = 0.000

PERCENT TIME BETWEEN .400 - .600 KM/HR = 0.000

PERCENT TIME BETWEEN .600 - .800 KM/HR = 0.000

PERCENT TIME BETWEEN .800 - 1.000 KM/HR = 0.000

PERCENT TIME BETWEEN 1.000 - 1.200 KM/HR = 0.000

PERCENT TIME BETWEEN 1.200 - 1.400 KM/HR = 0.000

PERCENT TIME BETWEEN 1.400 - 1.600 KM/HR = .596

PERCENT TIME BETWEEN 1.600 - 1.800 KM/HR = .081

PERCENT TIME BETWEEN 1.800 - 2.000 KM/HR = .323

PERCENT TIME BETWEEN 2.000 - 2.200 KM/HR = 0.000

PERCENT TIME BETWEEN 2.200 - 2.400 KM/HR = 0.000

SIAF NAVIGATION STATISTICS (PAGE 7)
HUNTER LIGGETT SCENARIO I
1 REPLICATIONS

PATROL CEP AT CHECKPOINTS (METERS)	
MEAN	41.515
STANDARD DEVIATION	12.090
TIME TO DETERMINE LOCATION (MIN)	
MEAN	.750
STANDARD DEVIATION	0.000

SIAF INSERTION STATISTICS

INSERTION ATTEMPTS	1
NUMBER OF SUCCESSFUL INSERTIONS	1
NUMBER OF INSERTIONS AT PRIMARY LZ	1
NUMBER OF INSERTIONS AT SEC. LZS	0
INSERTION TIME (DAYS,HRS,MINS)	010800

STAF COMMUNICATION STATISTICS (PAGE 9)
HUNTER LIGGETT SCENARIO I
1 REPLICATIONS

EXTERNAL COMMUNICATIONS

ATTEMPTS	
MEAN	1.000
STANDARD DEVIATION	0.000
COMMUNICATION SUCCESS RATIO	
MEAN	1.000
STANDARD DEVIATION	0.000
AVERAGE POWER LOSSES FOR COMMO FAILURES (PERCENT)	
ATTENUATION DUE TO RELIEF	0.000
ATTENUATION DUE TO VEGETATION	0.000
ATTENUATION DUE TO RANGE	0.000
TOTAL TIME RECIEVING (DAYS,HRS,MINS)	
MEAN	000050
STANDARD DEVIATION	000000
TOTAL TIME TRANSMITTING (DAYS,HRS,MINS)	
MEAN	000001
STANDARD DEVIATION	000000
AMPERE HRS AVAILABLE	138.000
AMPERE HRS USED	
MEAN	.510
STANDARD DEVIATION	0.000

SIAF HUMAN MAINTENANCE STATISTICS (PAGE 10)
HUNTER LIGGETT SCENARIO I
1 REPLICATIONS

	BEGINNING	END	MAX	MIN	AVERAGE
HUMAN PERFORMANCE DEGRADATION					
MEAN	0.0	.004	.004	0.000	.002
STANDARD DEVIATION	0.0	0.000	0.000	0.000	0.000
ENERGY EXPENDED (BTU)					
MEAN	0.0	846.215	846.215	0.000	442.342
STANDARD DEVIATION	0.0	0.000	0.000	0.000	0.000

TIME HISTORY OF HUMAN PERFORMANCE DEGRADATION (FIRST REPLICATION ONLY)

TIME	010801
PERF. DEG.	.000

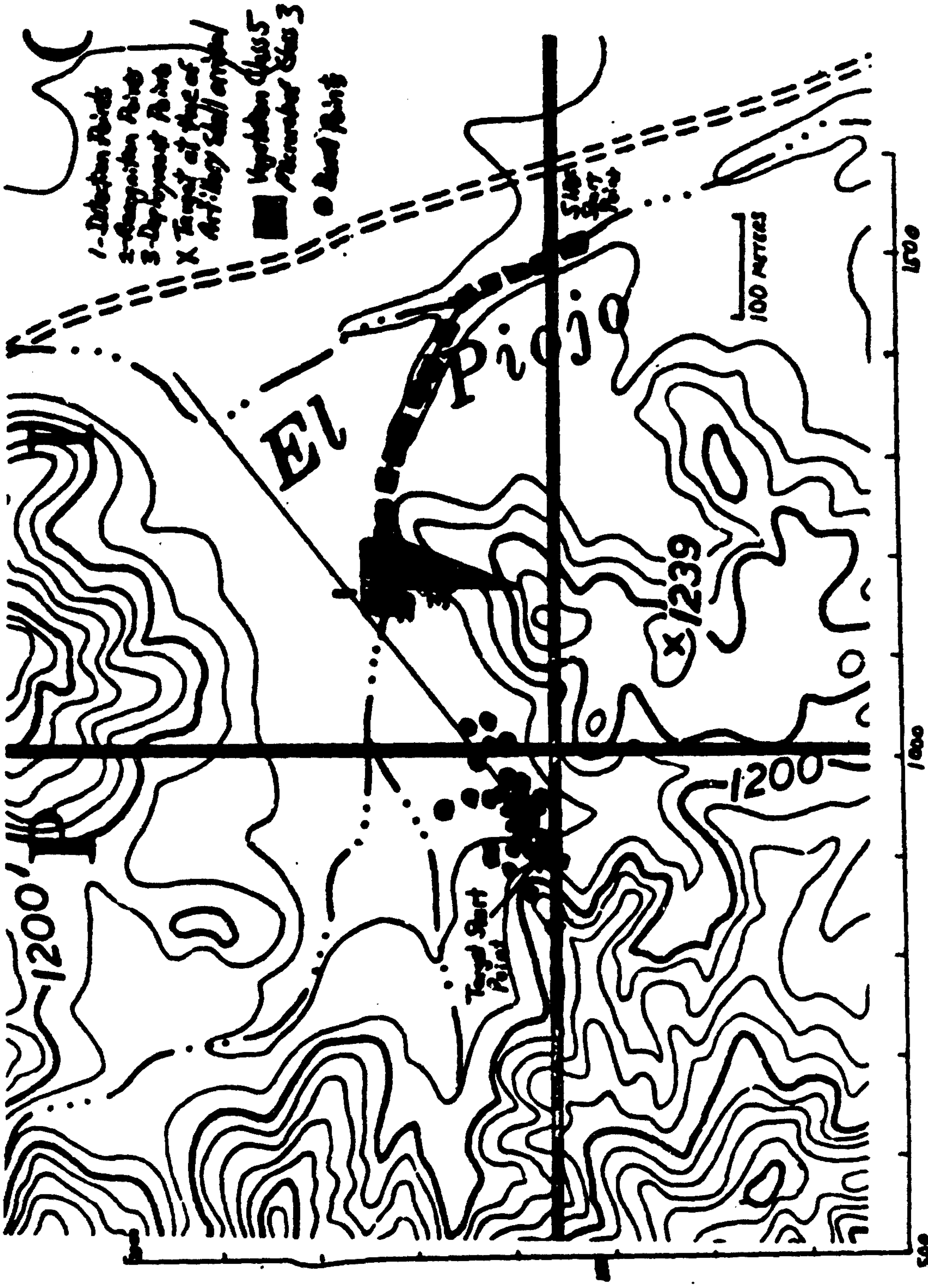


Figure 6.11. EFS Sample Case Diagram

```
X-Y COORDINATES OF EXTERNAL FIRE SUPPORT BURST POINTS
X =     826.57      Y =    1555.07
X =     881.23      Y =    1600.41
X =     897.87      Y =    1559.90
X =     947.97      Y =    1598.93
POSITION OF ATTACKER NO 1 X- 1169.38 Y- 1674.72
POSITION OF ATTACKER NO 2 X- 1168.87 Y- 1699.22
POSITION OF DEFENDER NO 1 X-  946.64 Y- 1587.31
```

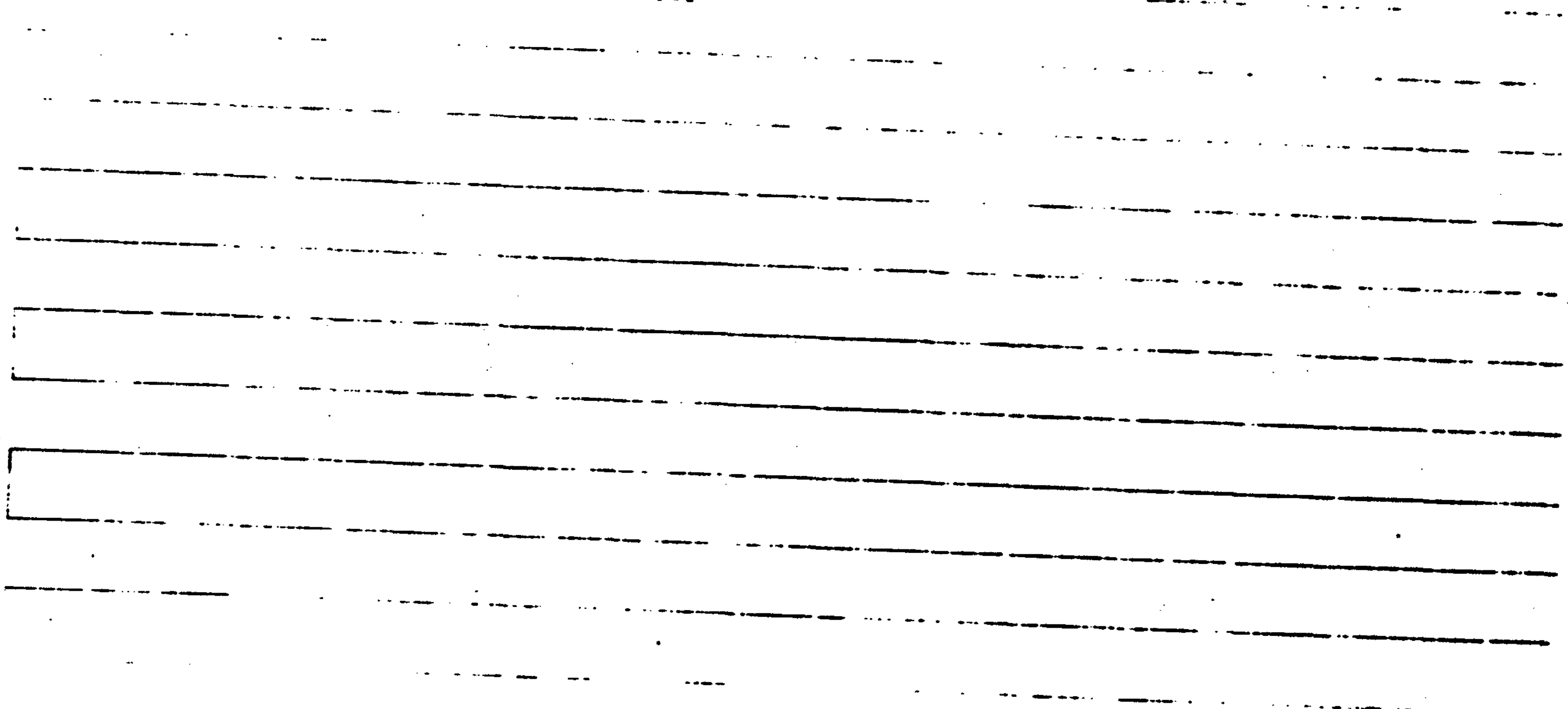


Figure 6.12, EFS Sample Case Output

1 8 19 21

ATTRIBUTES AFTER EFS BURST

ATTACKER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
CASUALTY STATUS	VU	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1168.87	1169.38	1170.21	1168.16	1172.06	1167.23	1170.76	1167.91	0.00	0.(
CURRENT Y (METER)	1699.22	1674.72	1695.77	1701.65	1691.26	1704.74	1670.04	1679.50	0.00	0.(
NEXT X (METER)	1177.19	1173.28	1176.70	1177.67	1176.22	1178.16	1171.82	1174.74	0.00	0.(
NEXT Y (METER)	1682.44	1662.86	1677.46	1687.41	1672.48	1692.39	1658.08	1667.64	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.(
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	20	20	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	.29	.29	.29	.29	.29	.29	.29	.29	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0	

DEFENCER PATRCL:

	PATRCL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	MI.WOUND	MA.WOUND	NO	DEAD	NO	MA.WOUND				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	1	1	1	1	1	1	0	0	0	
CURRENT X (METER)	946.64	941.41	949.76	938.28	952.89	941.41	0.00	0.00	0.00	0.(
CURRENT Y (METER)	1587.31	1589.53	1583.41	1593.43	1579.50	1589.53	0.00	0.00	0.00	0.(
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.(
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	PRONE	PRONE				
MOVING STATUS	NORMAL	STOPPED	NORMAL	STOPPED	NORMAL	STOPPED				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TC LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUF TC HIGH CASUALTY FRACTION

DEFENDER BREAKS, WITHDRAWAL ANGLE= 3.8163
POSITICN OF ATTACKER MU 1 X- 1169.45 Y- 1674.52
POSITICN OF ATTACKER MU 2 X- 1168.96 Y- 1699.03
POSITICN CF DEFENDER MU 1 X- 945.47 Y- 1587.17

```
 1    8   19   21      CASUALTY EVENT
DEFENDER    PATRUL SUSTAINS THE NEXT CASUALTY
THE NUMBER OF THE CASUALTY MEMBER IS :  5
THE TYPE OF CASUALTY IS : MAJ. WOUND
TIME(SEC) THAT COMBAT OPERATION HAS BEEN UNDERWAY:     9.7322
POSITION : X- 1169.45 Y- 1674.52
```

ATTRIBUTE TABLE AFTER CASUALTY SUSTAINED

ATTACKER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	99	99	99	97	5	99	99	99	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	POINT	POINT	POINT	POINT	POINT	POINT	POINT	POINT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1168.96	1169.45	1170.28	1168.28	1172.11	1167.37	1170.78	1168.02	0.00	0.0
CURRENT Y (METER)	1699.03	1674.52	1695.57	1701.47	1691.05	1704.58	1669.83	1679.32	0.00	0.0
NEXT X (METER)	1177.19	1173.28	1176.70	1177.67	1176.22	1178.16	1171.82	1174.74	0.00	0.0
NEXT Y (METER)	1682.44	1662.86	1677.46	1687.41	1672.48	1692.39	1658.08	1667.64	0.00	0.0
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.0
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.0
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	19	19	19	17	19	19	19	19	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	.29	.29	.29	.29	.29	.29	.29	.29	0.00	0.0
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	F. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0	

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	MI.WOUND	MA.WOUND	NO	DEAD	MA.WOUND	MA.WOUND				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	0	0	0	0	6	0	0	0	0	
CURRENT X (METER)	946.47	941.41	949.59	938.28	952.71	941.41	0.00	0.00	0.00	0.[illegible]
CURRENT Y (METER)	1587.17	1589.53	1583.27	1593.43	1579.37	1589.53	0.00	0.00	0.00	0.[illegible]
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.[illegible]
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.[illegible]
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.[illegible]
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.[illegible]
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	PRONE	PRONE				
MOVING STATUS	TOP SP.	STOPPED	TOP SP.	STOPPED	STOPPED	STOPPED				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.[illegible]
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION

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X-Y COORDINATES OF EXTERNAL FIRE SUPPORT BURST POINTS
X =     965.92     Y =    1612.21
X =    1014.78     Y =    1647.15
X =    1034.45     Y =    1621.09
X =    1082.17     Y =    1649.00
POSITION OF ATTACKER MU 1 X-  1170.35  Y- 1671.77
POSITION OF ATTACKER MU 2 X-  1170.24  Y- 1696.44
POSITION OF DEFENDER MU 1 X-   944.12  Y- 1585.30
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1 8 19 31

ATTRIBUTES AFTER EFS BURST

ATTACKER PATROL:	PATROL MEMBER									
	1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	99	99	99	97	5	99	99	99	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1170.24	1170.35	1171.24	1169.88	1172.73	1169.28	1171.03	1169.46	0.00	0.(
CURRENT Y (METER)	1696.44	1671.77	1692.85	1699.07	1688.23	1702.42	1666.95	1676.82	0.00	0.(
NEXT X (METER)	1177.19	1173.28	1176.70	1177.67	1176.22	1178.16	1171.82	1174.74	0.00	0.(
NEXT Y (METER)	1682.44	1662.86	1677.46	1687.41	1672.48	1692.39	1658.08	1667.64	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.(
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	19	19	19	17	19	19	19	19	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	.29	.29	.29	.29	.29	.29	.29	.29	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AV)	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0	

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	MI.WOUND	MA.WOUND	NO	DEAD	MA.WOUND	MA.WOUND				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	1	1	1	1	1	1	0	0	0	
CURRENT X (METER)	944.12	941.41	947.25	938.28	952.71	941.41	0.00	0.00	0.00	0.0
CURRENT Y (METER)	1585.30	1589.53	1581.40	1593.43	1579.37	1589.53	0.00	0.00	0.00	0.0
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.0
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.0
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	PRONE	PRONE				
MOVING STATUS	TOP SP.	STOPPED	TOP SP.	STOPPED	STOPPED	STOPPED				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.0
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION

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X-Y COORDINATES OF EXTERNAL FIRE SUPPORT BURST POINTS
X =     880.46     Y =     1575.04
X =     933.84     Y =     1610.04
X =     949.04     Y =     1571.41
X =     943.72     Y =     1619.40
POSITION OF ATTACKER MU 1 X- 1171.25 Y- 1669.03
POSITION OF ATTACKER MU 2 X- 1171.53 Y- 1693.85
POSITION OF DEFENDER MU 1 X-  941.78 Y- 1583.43
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ATTRIBUTES AFTER FS BURST

ATTACKER PATROL:	PATROL MEMBER									
	1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	99	99	99	97	5	99	99	99	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1171.53	1171.25	1172.21	1171.49	1173.36	1171.20	1171.29	1170.90	0.00	0.(
CURRENT Y (METER)	1693.85	1669.03	1690.13	1696.67	1685.41	1700.26	1664.07	1674.31	0.00	0.(
NEXT X (METER)	1177.19	1173.28	1176.70	1177.67	1176.22	1178.16	1171.82	1174.74	0.00	0.(
NEXT Y (METER)	1682.44	1662.86	1677.46	1687.41	1672.48	1692.39	1658.08	1667.64	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.(
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	19	19	19	17	19	19	19	19	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	.29	.29	.29	.29	.29	.29	.29	.29	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	P. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0	

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	MI.WOUND	MA.WOUND	MI.WOUND	DEAD	MA.WOUND	MA.WOUND				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	1	1	1	1	1	1	0	0	0	
CURRENT X (METER)	941.78	941.41	944.91	938.28	952.71	941.41	0.00	0.00	0.00	0.(
CURRENT Y (METER)	1583.43	1589.53	1579.52	1593.43	1579.37	1589.53	0.00	0.00	0.00	0.(
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.(
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	PRONE	PRONE				
MOVING STATUS	TOP SP.	STOPPED	TOP SP.	STOPPED	STOPPED	STOPPED				
MANEUVER UNIT	1	1	1	1	1	1				
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN	0	0	0	
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30				
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	0.00	0.00	0.00	0.(
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION

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X-Y COORDINATES OF EXTERNAL FIRE SUPPORT BURST POINTS
X =    888.01      Y =    1567.50
X =    934.91      Y =    1603.22
X =    959.04      Y =    1565.42
X =   1004.12      Y =    1602.83
POSITION OF ATTACKER MU 1 X-  1172.15 Y- 1666.28
POSITION OF ATTACKER MU 2 X-  1172.81 Y- 1691.27
POSITION OF DEFENDER MU 1 X-   939.44 Y- 1581.55
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ATTRIBUTES AFTER EFS MUNST

ATTACKER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	99	99	99	97	5	99	99	99	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1172.81	1172.15	1173.17	1173.09	1173.98	1173.11	1171.54	1172.34	0.00	0.0
CURRENT Y (METER)	1691.27	1666.28	1687.41	1694.27	1682.59	1698.09	1661.19	1671.81	0.00	0.0
NEXT X (METER)	1177.19	1178.28	1176.70	1177.67	1176.22	1178.16	1171.82	1174.74	0.00	0.0
NEXT Y (METER)	1682.44	1662.86	1677.46	1687.41	1672.48	1692.39	1658.88	1667.64	0.00	0.0
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.0
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.0
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	19	19	19	17	19	19	19	19	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	P.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	.29	.29	.29	.29	.29	.29	.29	.29	0.00	0.0
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0	

DEFENCER PATRCL:

	PATRCL MEMBER									
	1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	MI.WOUND	MA.WOUND	MI.WOUND	DEAD	MA.WOUND	MA.WOUND				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	1	1	1	1	1	1	0	0	0	
CURRENT X (METER)	939.44	941.41	942.56	938.28	952.71	941.41	0.00	0.00	0.00	0.(
CURRENT Y (METER)	1581.55	1589.53	1577.65	1593.43	1579.37	1589.53	0.00	0.00	0.00	0.(
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.(
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	PRONE	PRONE				
MOVING STATUS	TOP SP.	STOPPED	TOP SP.	STOPPED	STOPPED	STOPPED				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

BREAK DECISION : ATTACKER BREAKS CONTACT DUE TO EXCESSIVE ELAPSED TIME(FIGHT)

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO HIGH CASUALTY FRACTION
IC FOR BREAK CONTACT-AVAILABLE
SIAF RALLY POINT 1470.9600 1644.6567
ATTACKER WITHDRAWAL ROUTES

```
   1172.15      1470.96
   1666.28      1648.06
ATTACKER WITHDRAWAL ROUTES
   1172.81      1470.96
   1691.27      1648.66

X-Y COORDINATES OF EXTERNAL FIRE SUPPORT BURST POINTS
X =     895.52     Y =    1616.86
X =     945.79     Y =    1646.09
X =     959.63     Y =    1609.11
X =    1020.95     Y =    1659.39
POSITION OF ATTACKER NU 1 X- 1182.97 Y- 1665.65
POSITION OF ATTACKER NU 2 X- 1183.54 Y- 1609.73
POSITION OF DEFENDER NU 1 X-  937.10 Y- 1579.68
```

1 8 20 1

ATTRIBUTES AFTER EFS BURST

ATTACKER PATROL:

	PATROL MEMBER									
	1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	99	99	99	97	5	99	99	99	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1183.54	1182.97	1183.89	1183.83	1184.70	[illegible]	1182.36	1183.15	0.00	0.
CURRENT Y (METER)	1689.73	1665.65	1685.83	1692.81	1681.00	1696.67	1660.56	1671.15	0.00	0.
NEXT X (METER)	1470.96	[illegible]	1470.41	1471.51	1469.86	[illegible]	1470.41	1471.51	0.00	0.
NEXT Y (METER)	1648.66	1648.66	1643.69	1653.63	1638.72	1658.60	1643.69	1653.63	0.00	0.
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	19	19	19	17	19	19	19	19	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	0.00	0.
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	P. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	1	0	0	0	0	0	0	0	

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	10
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	MI.WOUND	MA.WOUND	MI.WOUND	DEAD	MA.WOUND	MA.WOUND				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	1	1	1	1	1	1	0	0	0	
CURRENT X (METER)	937.10	941.41	940.22	938.28	952.71	941.41	0.00	0.00	0.00	0.0
CURRENT Y (METER)	1579.68	1589.53	1575.77	1593.43	1579.37	1589.53	0.00	0.00	0.00	0.0
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.0
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.0
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	PRONE	PRONE				
MOVING STATUS	TOP SP.	STOPPED	TOP SP.	STOPPED	STOPPED	STOPPED				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.0
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

POSITION OF ATTACKER NU 1 X- 1201.35 Y- 1664.56
POSITION OF ATTACKER NU 2 X- 1201.77 Y- 1687.13
POSITION OF DEFENDER NU 1 X- 932.41 Y- 1575.93

1 8 20 21 NO EVENTS IN 20 SECONDS.
POSITION OF ATTACKER NU 1 X- 1222.99 Y- 1663.29
POSITION OF ATTACKER NU 2 X- 1220.00 Y- 1684.52
POSITION OF DEFENDER NU 1 X- 927.73 Y- 1572.18

```
    1     8    20    41        NO EVENTS IN 20 SECONDS.
POSITICN CF ATTACKER MU 1 X- 1244.61 Y- 1662.01
POSITICN OF ATTACKER MU 2 X- 1241.45 Y- 1681.46
POSITICN CF DEFENDER MU 1 X-  923.04 Y- 1568.43

    1     8    21     1        NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER MU 1 X- 1266.24 Y- 1660.73
POSITICN OF ATTACKER MU 2 X- 1262.90 Y- 1678.39
POSITICN CF DEFENDER MU 1 X-  918.36 Y- 1564.68

    1     8    21    21        NO EVENTS IN 20 SECONDS.
POSITION OF ATTACKER MU 1 X- 1287.87 Y- 1659.46
POSITICN OF ATTACKER MU 2 X- 1284.34 Y- 1675.33
POSITICN OF DEFENDER MU 1 X-  913.67 Y- 1560.94

    1     8    21    41        NO EVENTS IN 20 SECONDS.
POSITION OF ATTACKER MU 1 X- 1309.50 Y- 1658.18
POSITICN OF ATTACKER MU 2 X- 1305.79 Y- 1672.26
POSITICN OF DEFENDER MU 1 X-  908.99 Y- 1557.19

    1     8    22     1        NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER MU 1 X- 1331.13 Y- 1656.91
POSITICN OF ATTACKER MU 2 X- 1327.24 Y- 1669.20
POSITICN OF DEFENDER MU 1 X-  904.30 Y- 1553.44

    1     8    22    21        NO EVENTS IN 20 SECONDS.
POSITION OF ATTACKER MU 1 X- 1352.76 Y- 1655.63
POSITICN OF ATTACKER MU 2 X- 1348.69 Y- 1666.13
POSITION OF DEFENDER MU 1 X-  899.62 Y- 1549.69

    1     8    22    41        NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER MU 1 X- 1374.39 Y- 1654.35
POSITICN OF ATTACKER MU 2 X- 1370.14 Y- 1663.06
POSITICN OF DEFENDER MU 1 X-  894.93 Y- 1545.94

    1     8    23     1        NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER MU 1 X- 1396.01 Y- 1653.08
POSITICN OF ATTACKER MU 2 X- 1391.59 Y- 1660.00
POSITICN CF DEFENDER MU 1 X-  890.24 Y- 1542.20

    1     8    23    21        NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER MU 1 X- 1417.64 Y- 1651.80
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POSITICN OF ATTACKER NU 2 X- 1413.04 Y- 1656.93
POSITICN OF DEFENDER NU 1 X-  885.56 Y- 1538.45

   1    8   23   41      NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER NU 1 X- 1439.27 Y- 1650.53
POSITICN OF ATTACKER NU 2 X- 1434.49 Y- 1653.87
POSITICN OF DEFENDER NU 1 X-  880.87 Y- 1534.70

   1    8   24    1      NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER NU 1 X- 1460.93 Y- 1649.25
POSITICN OF ATTACKER NU 2 X- 1455.93 Y- 1650.80
POSITICN OF DEFENDER NU 1 X-  876.19 Y- 1530.95

   1    8   24   21      NO EVENTS IN 20 SECONDS.
POSITICN OF ATTACKER NU 1 X- 1470.96 Y- 1648.66
POSITICN OF ATTACKER NU 2 X- 1465.91 Y- 1649.38
POSITICN OF DEFENDER NU 1 X-  874.01 Y- 1529.21
   1    8   24   30      1470.96   1648.66    MOVEMENT     ATTACKER NU 1  WILL MOVE10.08 METERS AT AN ANGLE OF   -
   1    8   24   30      1465.91   1649.38    MOVEMENT     ATTACKER NU 2  WILL MOVE10.08 METERS AT AN ANGLE OF   -
RESOLUTION HAS BEEN CHANGED BACK TO THE RECONNAISANCE LEVEL OF   50.8 METERS

 DECISION ON CONTINUATION OF RECONNAISSANCE MISSION   AFTER COMBAT OPERATION IS CCNPLETED :
    MISSION DECISION : CONTINUE
    CURRENT AMOUNT OF FOOD  REMAINING PER MAN(LB.) :        13.4442
    CURRENT AMOUNT OF WATER REMAINING PER MAN(LB.) :         6.9334
    PATROL DURATION (DAYS) :  1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF RECOGNIZED TARGET NO. 1 AT X- 1470.96 Y- 1648.66 THE RECOGNITION RANGE IS  543.51
```

PATROL MEMBER STATISTICS AFTER COMBAT

ATTACKER PATROL:

	PATROL MEMBER									
	1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	99	99	99	97	5	99	99	99	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1465.91	1470.96	1466.10	1466.46	1466.86	1465.63	1470.35	1467.87	0.00	0.(
CURRENT Y (METER)	1649.38	1646.66	1644.32	1654.31	1639.16	1659.31	1643.69	1651.85	0.00	0.(
NEXT X (METER)	1470.96	1470.96	1470.41	1471.51	1469.86	1472.06	1470.41	1471.51	0.00	0.(
NEXT Y (METER)	1648.66	1648.66	1643.69	1653.63	1638.72	1658.60	1643.69	1653.63	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.(
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.	TOP SP.		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	19	19	19	17	19	19	19	19	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVL	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	1	0	0	0	0	0	0	0	

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	MI.WOUND	MA.WOUND	MI.WOUND	DEAD	MA.WOUND	MA.WOUND				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	374.01	941.41	877.13	938.28	952.71	941.41	0.00	0.00	0.00	0.(
CURRENT Y (METER)	1529.21	1589.53	1525.30	1593.43	1579.37	1589.53	0.00	0.00	0.00	0.(
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.(
CURRENT POSTURE	PRONE	PRONE	PRONE	PRONE	PRONE	PRONE				
MOVING STATUS	TOP SP.	STOPPED	TOP SP.	STOPPED	STOPPED	STOPPED				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

SIAF POSITION: X- 1430.95 Y- 1625.60 TARGET DETECTED: YES TIME: DAYS-01 HOURS-08 MINUTES-26
XTAR = 932 YTAR = 1576 LOS = 1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF POSITION: X- 1422.40 Y- 1620.67 TARGET DETECTED: YES TIME: DAYS-01 HOURS-08 MINUTES-27
XTAR = 932 YTAR = 1576 LOS = 1
SIAF DETECTS TARGET NO. 1 VISUALLY
SIAF POSITION: X- 1371.60 Y- 1591.40 TARGET DETECTED: YES TIME: DAYS-01 HOURS-08 MINUTES-29
XTAR = 932 YTAR = 1576 LOS = 1
SIAF DETECTS TARGET NO. 1 VISUALLY

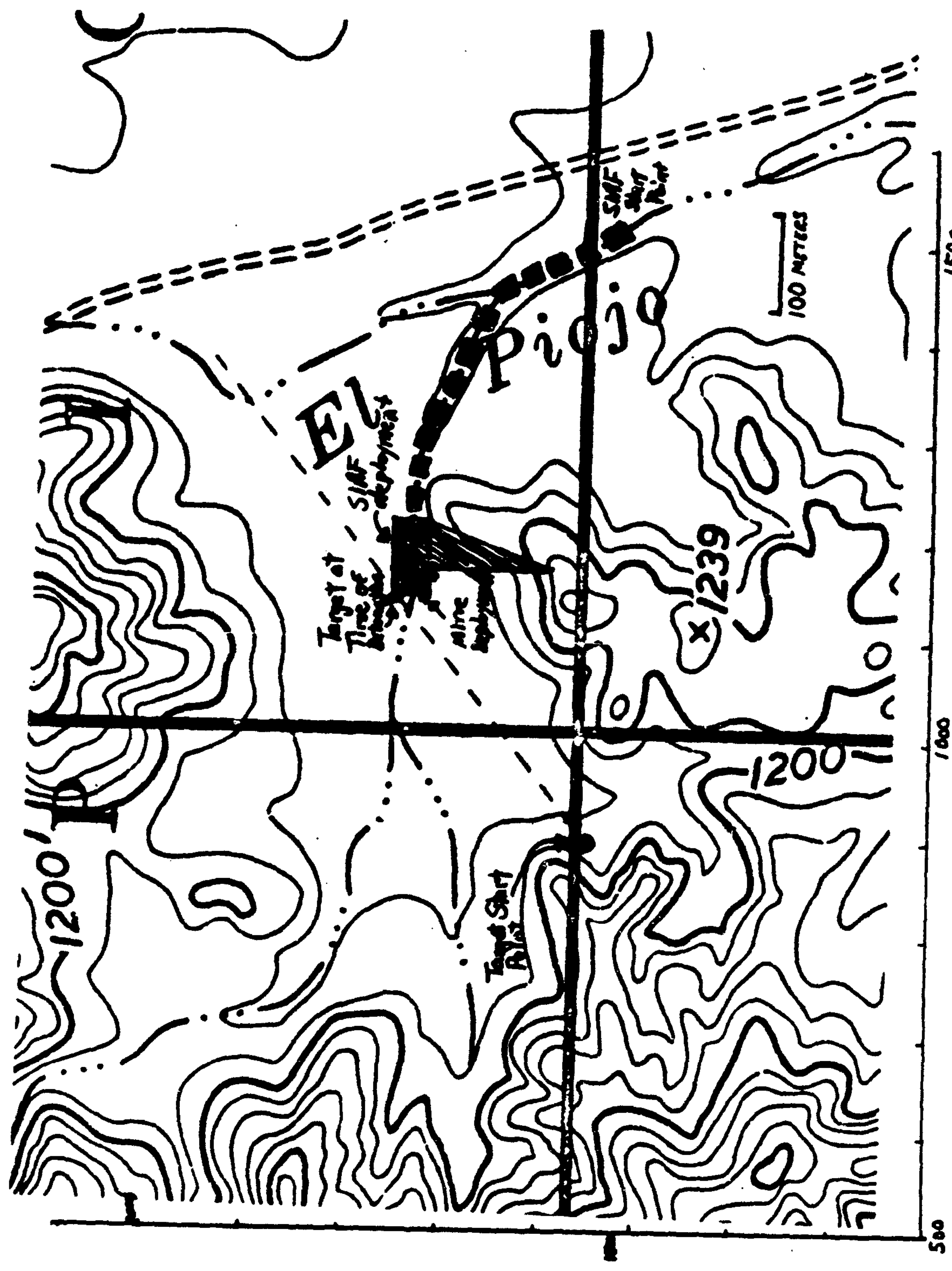

Figure 6.13. Claymore Mines Sample Case Diagram

ATTRIBUTES AFTER DEPLOYMENT OF CLAYMORE MINES

ATTACKER PATROL:	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1157.41	1160.53	1163.66	1166.78	1169.90	1173.03	1176.15	1179.27	0.00	0.(
CURRENT Y (METER)	1716.73	1719.22	1721.72	1724.22	1726.72	1729.22	1731.72	1734.22	0.00	0.(
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.(
CURRENT POSTURE	CROUCH	CROUCH	CROUCH	CROUCH	CROUCH	CROUCH	CROUCH	CROUCH		
MOVING STATUS	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	20	20	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0	

Figure 6.14. Combat Outputs for Claymore Mines Sample Case

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1150.00	1146.88	1153.12	1143.75	1156.25	1146.88	0.00	0.00	0.00	0.0
CURRENT Y (METER)	1750.00	1753.90	1746.10	1757.81	1742.19	1753.90	0.00	0.00	0.00	0.0
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.0
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.0
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND				
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.0
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	130	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

DEPLOYMENT OF CLAYMORE MINES

```
XMINE =    1154.29      YMINE =    1720.63
XMINE =    1166.00      YMINE =    1730.00
XMINE =    1177.71      YMINE =    1739.37
```

ATTRIBUTES AFTER DETONATION OF MINES

ATTACKER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	1	1	0	
WEAPON TYPE	M-16(SA)	M-16(SA)	M-16(SA)	M-16(A)	M-79 GL	M-16(SA)	M-16(SA)	M-16(SA)		
CURRENT AMMO SUPPLY	100	100	100	100	6	100	100	100	0	
CASUALTY STATUS	NO	NO	NO	NO	NO	NO	NO	NO		
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT	NOT	NOT		
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1157.41	1160.53	1163.66	1166.78	1169.90	1173.03	1176.15	1179.27	0.00	0.(
CURRENT Y (METER)	1716.73	1719.22	1721.72	1724.22	1726.72	1729.22	1731.72	1734.22	0.00	0.(
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.(
WIDTH (METER)	.50	.50	.50	.50	.50	.50	.50	.50	0.00	0.(
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND	STAND	STAND		
MOVING STATUS	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED	STOPPED		
MANEUVER UNIT	2	1	2	2	2	2	1	1	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	20	20	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	M.GUNNER	GR.LNCH.	RIFLEMAN	RIFLEMAN	RIFLEMAN		
MOVEMENT RATE(M/SEC)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
INDIV. ASSIGNMENT	BASE FR.	M. UNIT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	M. UNIT	M. UNIT		
INITIAL AMMO SUPPLY	130	100	100	100	6	100	100	100	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA		
POSIT. IN FIRE TEAM	1	1	2	3	4	5	2	3	0	
SECONDARY WEAPON AVI	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.	H. GREN.		
NO.OF HAND GRENADE	4	4	4	4	4	4	4	4	0	
NO.OF SMOKE GRENADE	2	2	0	0	0	0	0	0	0	

DEFENDER PATROL:

	PATROL MEMBER 1	2	3	4	5	6	7	8	9	1
FIRE TEAM NUMBER	1	1	1	1	1	1	0	0	0	
WEAPON TYPE	AK-47	AK-47	AK-47	AK-47	AK-47	AK-47				
CURRENT AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
CASUALTY STATUS	DEAD	DEAD	DEAD	DEAD	DEAD	DEAD				
FIRING STATUS	NOT	NOT	NOT	NOT	NOT	NOT				
SUPPRESSION STATE	0	0	0	0	0	0	0	0	0	
CURRENT X (METER)	1150.00	1146.88	1153.12	1143.75	1156.25	1146.88	0.00	0.00	0.00	0.0
CURRENT Y (METER)	1750.00	1753.90	1746.10	1757.81	1742.19	1753.90	0.00	0.00	0.00	0.0
NEXT X (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
NEXT Y (METER)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
HEIGHT (METER)	1.70	1.70	1.70	1.70	1.70	1.70	0.00	0.00	0.00	0.0
WIDTH (METER)	.50	.50	.50	.50	.50	.50	0.00	0.00	0.00	0.0
CURRENT POSTURE	STAND	STAND	STAND	STAND	STAND	STAND				
MOVING STATUS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL				
MANEUVER UNIT	1	1	1	1	1	1	0	0	0	
ROUNDS REMAIN (MAG.)	20	20	20	20	20	20	0	0	0	
FUNCTION IN PATROL	P.L.	A.P.L.	RIFLEMAN	RIFLEMAN	RIFLEMAN	RIFLEMAN				
MOVEMENT RATE(M/SEC)	.30	.30	.30	.30	.30	.30	0.00	0.00	0.00	0.0
INDIV. ASSIGNMENT	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.	BASE FR.				
INITIAL AMMO SUPPLY	100	100	100	100	100	100	0	0	0	
WEAPON TYPE	AREA	AREA	AREA	AREA	AREA	AREA				
POSIT. IN FIRE TEAM	1	2	3	4	5	6	0	0	0	
SECONDARY WEAPON AVI	NONE	NONE	NONE	NONE	NONE	NONE				
NO.OF HAND GRENADE	0	0	0	0	0	0	0	0	0	
NO.OF SMOKE GRENADE	0	0	0	0	0	0	0	0	0	

POSITION OF ATTACKER MU 1 X- 1160.53 Y- 1719.22
POSITION OF ATTACKER MU 2 X- 1157.41 Y- 1716.73
POSITION OF DEFENDER MU 1 X- 1150.00 Y- 1750.00

1 10 17 51 TIME OF MINES DETONATION

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE FIREPOWER

BREAK DECISION : DEFENDER BREAKS CONTACT DUE TO LACK OF ADEQUATE AMMUNITION

7.0 OPERATING PROCEDURES

This section describes the operating procedures in terms of hardware requirements, software requirements, overlay structure of the model, and sample deck setup.

7.1 HARDWARE REQUIREMENTS

- CDC 6000 series digital computer
- SCOPE operating system
- FORTRAN EXTENDED source program compiler(FTN)
- COMPASS assembler
- Tape drive for input of topocom tape
- 232K of octal 60-bit words central memory
- Temporary and short-term storage devices (i.e., disk or tape)
- Standard system file configuration for input data and object program modules.

7.2 SOFTWARE REQUIREMENTS

- FORTRAN unit 1 is used for reading namelist input data. This data consists of NAML1, NAML2, NAML3, and NAML4. File NLINP is referenced to this unit.
- FORTRAN unit 2 is used for temporary storage. At the beginning of the model the packed reconnaissance elevations are stored here. After the return of a combat operation this unit is read to restore reconnaissance elevation data. File PAKZ is referenced to this unit.
- FORTRAN unit 5 is used for standard input. File INPUT is referenced to this unit.
- FORTRAN unit 6 is used for standard output. File OUTPUT is referenced to this unit.
- FORTRAN unit 7 is used for temporary storage. When a start/stop point is reached, the common blocks are dumped or read from this unit, so that the model can be started or stopped at specific points. File START is referenced to this unit.
- FORTRAN unit 8 is used for reading elevation input data. This file is a direct output of topocom programs, MAPGEN or ROTATE. File ZINP is referenced to this unit.

- FORTRAN unit 9 is used for intermediate storage. The common block STATS is updated on this unit for each replication of the model. File STATS is referenced to this unit.

- Most of the COMMON blocks used by the SIAF program are defined in the following computer pages 1 through 47 of Figure 7.1. These blocks were generated by the BLKGEN program described in Appendix A of this volume. Using these COMMON blocks the SPECPN program defined in Appendix B of this volume, punched out the DIMENSION and EQUIVALENCE statements for all subroutines requiring any variable pertaining to the COMMON blocks.

- To facilitate finding a location of a common variable, Figure 7.2 gives an alphabetical list of all variables in these commons. Furthermore, their location in that block and the block name are given along with its dimension if the variable is an array.

7.3 OVERLAY STRUCTURE

- Figure 7.3 is a chart overview of the overlay structure organization. Within each overlay block the overlay level is given and the subroutine and programs are listed alphabetically, along with the size of the model with that overlay.

7.4 SAMPLE DECK SET-UPS

- Figures 7.4 - 7.6 are listings of card decks that would be required to create the model from tape starting from scratch and end up with an execution of the sample case.

- Figure 7.4, when submitted, will create or copy from the SIAF tape, all source cards and store them on permanent disk files.

- Now, execution of Figure 7.5 will compile all these source cards and create the object modules required for loading. These also are stored on permanent disk files.

- Figure 7.6 takes the generated object modules along with the required input files and executes the sample case.

7.5 INSTALLATION

- The SIAF program as described above was installed and runs on a CDC 6500 digital computer at the USACDC Data Processing Installation, at Fort Leavenworth, Kansas.

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/DATABR/DATABB(625)
CURRENT BLOCK IS DATABB (624) ******

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ATTEN	4	1		
DSW11		5		
DSW12		6		
DRICE		7		
DMT	5,3	8		
H	16,4	23		
HB	9	87		
HMT	5,3	96		
ISECT	20	111		
RHO	16,4	131		
RMTMAX	5,3	195		
RMAX	16,4	210		
REF	16,3	274		
SECT	2,4,2	322		
VEGC	8,16	338		
VISLUM	8,8	466		
W	16,4	530		
WMT	5,3	594		
XLP	16	609		

Figure 7.1. Master Common Listings (Sheet 1)

CURRENT COMMON IS -- MASTER COMMON LISTING PAGE 2
COMMON/DATAB2/DATAB2(103)
CURRENT BLOCK IS DATAB2 (98) ******

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ALIM	2,2	1		
ALLF	3,2	5		
SL1		11		
SL2		12		
SOILF	2,8	13		
TMR	18,3	29		
VEGF	16	83		

Figure 7.1, Master Common Listings (Sheet 2)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/DLOGBL/DLOGBL(10})
CURRENT BLOCK IS DLOGBL (100) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ADM		1		
ALPHA		2		
ALPHA1		3		
ALPHA2		4		
BETA		5		
DSORDP		6		
DSENG		7		
DSPUR		8		
DTDEPL		9		
DTENG		10		
DTPUR		11		
DTWAIT		12		
ICOUNT		13		
IDARK		14		
IFLAG		15		
IPOSE		16		
ISET		17		
ISTOFF		18		
ISUIT		19		
ITAREN		20		
JGO		21		
JSP		22		
JTACT		23		
KTACT		24		
MENOP		25		

Figure 7.1, Master Common Listings (Sheet 3)

MASTER COMMON LISTING

CURRENT BLOCK IS DLOGBL (100) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
MENSP		26		
NGS		27		
NHRMIN		28		
PHI		29		
PURVEL		30		
R		31		
RADV1		32		
RADV2		33		
RC		34		
RS		35		
SF		36		
SVADM		37		
TACKOP		38		
VADM		39		
VCEAL		40		
VCOV		41		
VELOP		42		
VOBS		43		
W1		44		
W2		45		
WA		46		
WB		47		
XDEPL		48		
XICIR		49		
XOP		50		
XSP		51		
YDEPL		52		
YICIR		53		
YOP		54		
YSP		55		
XENG		56		
YENG		57		

Figure 7.1. Master Common Listings (Sheet 4)

MASTER COMMON LISTING

CURRENT BLOCK IS OLOGOL (100) ...... PAGE 5

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ZDEPL		58		
ZENG		59		
ZETA		60		
IR		61		
MGS		62		
GS		63		
OLXDEP		64		
OLYDEP		65		
OLVULX		66		
OLVULY		67		
OLDVEL		68		
OLTACK		69		
ISTU		70		
BLANK1		71		
IMAN		72		
JMAN		73		
IFFSTD		74		
KDEFOP		75		
ISTART		76		
XDEFOP		77		
YDEFOP		78		
TARV		79		
IFFF		80		
ISTALL		81		

Figure 7.1, Master Common Listings (Sheet 5)

MASTER COMMON LISTING PAGE 6

CURRENT COMMON IS --
COMMON/DLOGIN/DLOGIN(150)
CURRENT BLOCK IS DLOGIN (150) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
CADM		1		
CC1		2		
CC2		3		
CC3		4		
CLASS	5,16	5		
DTDAMB		85		
DTDATT		86		
DTEFS		87		
DTENGM		88		
DTPURM		89		
EFSA		90		
FRAMB		91		
FRATT		92		
GMAX		93		
IDIREC		94		
IDUM1		95		
IDUM2		96		
MISS		97		
NSECT		98		
PP1		99		
PP2		100		
PP3		101		
PP4		102		
Q1		103		
Q2		104		

Figure 7.1, Master Common Listings (Sheet 6)

MASTER COMMON LISTING

CURRENT BLOCK IS DLOGIN (150) ...... PAGE 7

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
Q3		105		
RAMB		106		
RAMIN		107		
RATT		108		
REFS		109		
ROBS		110		
RSP		111		
RZ		112		
P5		113		
GSAPRR		114		

Figure 7.1, Master Common Listings (Sheet 7)

MASTER COMMON LISTING

PAGE 8

CURRENT COMMON IS --
COMMON/COMMBA/COMMBA(903)
CURRENT BLOCK IS COMMBA (816) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
A	4,204	1		

Figure 7.1, Master Common Listings (Sheet 8)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/COMMB1/COMMB1(715)
CURRENT BLOCK IS COMMB1 (711) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
AC	16,4	1		
ALL		65		
ATAR		66		
ASIAF		67		
CC		68		
CT		69		
CR		70		
CLL		71		
CR2	2,2	72		
D	204	76		
DBINS		250		
DBINT		251		
DBSPEC	20	252		
EOUT	204	302		
FTHREL		506		
FOHREL		507		
G1OUT	204	508		

Figure 7.1, Master Common Listings (Sheet 9)

MASTER COMMON LISTING PAGE 10

CURRENT COMMON IS --
COMMON/COMMB2/COMMB2(645),CMTAR1(320)
CURRENT BLOCK IS COMMB2 (642) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
G2OUT	204	1		
G3OUT	204	205		
HS		409		
HT		410		
IDE		411		
ISAD		412		
ITAD		413		
IDAY		414		
ITSTRT		415		
IZ		416		
ITIME		417		
ILZAVL	5	418		
ITVEG	20	423		
IGEN	20	443		
IMP	20	463		
IFIRST	20	483		
ISVD		503		
ITVD		504		
IAT		505		
IAS		506		
IWC		507		
IDETS	20	508		
ITYPE	20	528		
IT		548		
ITGRID		549		

Figure 7.1, Master Common Listings (Sheet 10)

MASTER COMMON LISTING

CURRENT BLOCK IS COMMB2 (642) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
IP		550		
IDVOL		551		
ISTP	20	552		
JIT		572		
KEY		573		
LZTAR	20	574		
LFLAG	20	594		
MMQ	5	614		
MS		619		
MT		620		
NBI		621		
NOCH	20	622		
NDAY		642		

Figure 7.1. Master Common Listings (Sheet 11)

MASTER COMMON LISTING PAGE 12

CURRENT BLOCK IS CMTAR1 (320) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ITARG	20,5	1		
IAOR	20,2	101		
IVOR	20,2	141		
ICH	20	181		
ISA	20	201		
ISV	20	221		
ITA	20	241		
ITV	20	261		
IRECOG	20,2	281		

Figure 7.1, Master Common Listings (Sheet 12)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/COMMB3/COMMB3(485),CNTAR2(180)
CURRENT BLOCK IS COMMB3 (481) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
NDETEC		1		
NSEC		2		
PAIR		3		
PALL		4		
PALLB		5		
PNONE		6		
PNONEB		7		
PSKY	2	8		
PSGSKY	2	10		
PSGP	2	12		
POEGL		14		
R	16,4	15		
RLOSS		79		
RS		80		
RT		81		
RN		82		
RH		83		
SNUM		84		
SEGL	20	85		
SEGLGT		105		
STIME		106		
SGENDX		107		
SGENDY		108		
STSTRT		109		
TZ		110		

Figure 7.1. Master Common Listings (Sheet 13)

MASTER COMMON LISTING

CURRENT BLOCK IS COMMB3 (481) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
TARVEL		111		
TNUM		112		
THS		113		
THT		114		
TSTART		115		
THETA	20	116		
TH		136		
TEMP		137		
TDETS	20	138		
TSAVE	20,2	158		
VISM		198		
VIGLEV		199		
VDEG		200		
WV		201		
WS		202		
WT		203		
WD		204		
XB	5,20	205		
XLZ	5	305		
XS		310		
XT		311		
XTAR	20	312		
XZ		332		
XDYNOL	10	333		
YB	5,20	343		
YLZ	5	443		
YS		448		
YT		449		
YTAR	20	450		
YZ		470		
YDYNOL	10	471		
ZZ		481		

Figure 7.1. Master Common Listings (Sheet 14)

MASTER COMMON LISTING

CURRENT BLOCK IS CMTAR2 (100) ...... PAGE 15

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
RANLZ	20,5	1		

Figure 7.1. Master Common Listings (Sheet 15)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/COMMB4/COMMB4(295)
CURRENT BLOCK IS COMMB4 (292) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ISTADT	20,2	1		
ISTRT	20,2	41		
ISTVDT	20,2	81		
STADR	20,2	121		
STRR	20,2	161		
STVDR	20,2	201		
SC4		241		
TC6	20	242		
CEPPAT		262		
CEPTAR	20	263		
CEPPM		283		
CEPPSS		284		
CEPPS		285		
ITNAV		286		
ITNAVS		287		
ITNVSS		288		
ITNAVM		289		
NNAV		290		
SDCEPP		291		
SDITNV		292		

Figure 7.1, Master Common Listings (Sheet 16)

MASTER COMMON LISTING PAGE 17

CURRENT COMMON IS --
COMMON/COMMB5/COMMB5(50),COMMC5(500),COMMD5(500),COMME5(100)
CURRENT BLOCK IS COMMB5 (50) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
AMR		1		
CS	2	2		
FM1		4		
FM2		5		
IOBST		6		
IST		7		
VBAR		8		
VEL	12	9		
XAMR		21		
NOCOM		22		
NREP		23		
PCINT		24		
SUCRAT		25		
TAMPHR		26		
TPCAD		27		
TPCAF		28		
TPCAS		29		
TTIME		30		
TTUSE		31		
APCAD		32		
APCAF		33		
APCAS		34		
ATTEMP		35		
DF1		36		
DF2		37		

Figure 7.1, Master Common Listings (Sheet 17)

MASTER COMMON LISTING

CURRENT BLOCK IS COMMB5 (50) ...... PAGE 18

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
F		38		
IBDEAD		39		
ICOM		40		
IPOWR		41		
ITCOM		42		
COMMO		43		
IPOWRT		44		
ICPER		45		
IXST		46		
HH		47		
PATDIS		48		
D1		49		
D2		50		

Figure 7.1, Master Common Listings (Sheet 18)

MASTER COMMON LISTING PAGE 19

CURRENT BLOCK IS COMMCS (500) ....

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
AAALL	500	1		

Figure 7.1, Master Common Listings (Sheet 19)

MASTER COMMON LISTING

CURRENT BLOCK IS COMMD5 (500) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
KKTIME	500	1		

Figure 7.1. Master Common Listings (Sheet 20)

MASTER COMMON LISTING

CURRENT BLOCK IS COMMES (500) ...... PAGE [illegible]

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
JJTIME	100	1		

Figure 7.1. Master Common Listings (Sheet 21)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/LINSIG/LINSIG(3403)
CURRENT BLOCK IS LINSIG (3403) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
CLMT		1		
DOMV		2		
ETA		3		
FLAMDA		4		
GAM	3,20	5		
ICL	50	65		
II	204,5	115		
IST		1135		
ITRC	50	1136		
KND		1186		
LNR1		1187		
LSVG		1188		
MICR1		1189		
[illegible]M2		1190		
N[illegible]		1191		
NRSOIL		1192		
NRVP		1193		
NUMVEG	204	1194		
SOIL		1398		
VEGC		1399		
VEC1		1400		
XBAR		1401		
XOB	1000	1402		
YBAR		2402		
YOB	1000	2403		

Figure 7.1, Master Common Listings (Sheet 22)

MASTER COMMON LISTING PAGE 23

CURRENT COMMON IS --
COMMON/MISCB1/MISCB(300)
CURRENT BLOCK IS MISCB1 (243) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
AMPHRA		1		
AMUN	4	2		
AMWTAB	21	6		
BSAREA		27		
CLAYMW		28		
CONCAP		29		
CPRAT	7	30		
EQUIP		37		
EXDEGT		38		
FINDEX		39		
FOOD		40		
FOODA		41		
FOODD		42		
FOODU		43		
FWRAT	7	44		
H2O		51		
H2OA		52		
H2OD		53		
H2OTD		54		
H2OU		55		
HANDGW		56		
HTPLOT	50	57		
ICNT		107		
ICOMB		108		
IDYFL		109		

Figure 7.1, Master Common Listings (Sheet 23)

MASTER COMMON LISTING PAGE 24

CURRENT BLOCK IS MISCB1 (243) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
INREP		110		
INREP1		111		
INREP2		112		
IREONE		113		
IRESUP		114		
ISCEN	7	115		
ITHULA		122		
ITIMPR		123		
KK		124		
LAMDAE		125		
MAXREO		126		
MMAX		127		
NCOPY		128		
NHANDG		129		
NHGA		130		
NHU		131		
NLFLAG		132		
NMA		133		
NMINES		134		
NNHJ		135		
NSWT		136		
P		137		
P0		138		
PAKWT		139		
PAKWT2		140		
PAKWT3		141		
PAKWT4		142		
PATROW		143		
PDAVG		144		
PDMAX		145		
PDMIN		146		
PDPLOT	50	147		

Figure 7.1. Master Common Listings (Sheet 24)

MASTER COMMON LISTING

CURRENT BLOCK IS MISCB1 (243) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
PDTOT		137		
PEQUIP		198		
RAMU	4	199		
RFOOD		203		
RH2O		204		
RHANDG		205		
RHOH		206		
RMINES		207		
RPE		208		
RPG		209		
RTIME		210		
SAMU	4	211		
SAMUTE	4	215		
SGAVG		219		
SGMAX		220		
SGMIN		221		
SGTOT		222		
SIGENG		223		
SIGGR		224		
SIGFFR		225		
STS		226		
T		227		
TO		228		
TAMUN		229		
TEQUIP		230		
THETS		231		
WT	4	232		
WTS	4	236		
XP2		240		
XP3		241		
XPAKWT		242		
PS		243		

Figure 7.1, Master Common Listings (Sheet 25)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/OBSTAB/OBSTAB(55)
CURRENT BLOCK IS OBSTAB (53) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
HSIG		1		
HTAU		2		
PSL		3		
WSIG		4		
WTAU		5		
XSIG		6		
XTAU		7		
XTAR2	20	8		
XSIAF		28		
YSIG		29		
YTAU		30		
YTAR2	20	31		
YSIAF		51		
ZSIG		52		
ZTAU		53		

Figure 7.1, Master Common Listings (Sheet 26)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/OUTST1/OUTST1(120)
CURRENT BLOCK IS OUTST1 (120) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
LOSD	20,2	1		
LOSR	20	41		
LOST	20,2	61		
LOSV	20	101		

Figure 7.1, Master Common Listings (Sheet 27)

MASTER COMMON LISTING

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CURRENT COMMON IS --
COMMON/TARINT/TARINT(205)
CURRENT BLOCK IS TARINT (201) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
XGOAL	20	1		
YGOAL	20	21		
ISTART	20	41		
VCHNG	20	61		
ISAA	20	81		
ITAA	20	101		
ISVV	20	121		
ITVV	20	141		
IANCHS	20	161		
IANCHT	20	181		

Figure 7.1, Master Common Listings (Sheet 28)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/MISCB2/MISCB2(500)
CURRENT BLOCK IS MISCB2 (497) ******

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
DMOR		1		
DMORR		2		
DSA		3		
DSAA		4		
DYWT	9,3	5		
IDELA		32		
IDELB		33		
IDELC		34		
IDELD		35		
IDELE		36		
IDV		37		
IGE/BK		38		
IGRID		39		
JCOMAX		40		
JCOMXX		41		
JCS		42		
JCSS		43		
JROMAX		44		
JROMXX		45		
JRS		46		
JRSS		47		
KREC	20	48		
LFLOJJ		68		
MI		69		
MII		70		

Figure 7.1. Master Common Listings (Sheet 29)

MASTER COMMON LISTING

CURRENT BLOCK IS MISCB2 (497) ...... PAGE 30

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
NIDY		71		
NPAR		72		
RAVODD		73		
RAVOID		74		
RFMOR		75		
RFMORR		76		
RFSA		77		
RFSAA		78		
VTYP		79		
XAVODD		80		
XAVOID		81		
XDYN	200	82		
XE		282		
XEE		283		
XPPT		284		
XPPTT		285		
XSV		286		
YAVODD		287		
YAVOID		288		
YDYN	200	289		
YE		489		
YEE		490		
YPPT		491		
YPPTT		492		
YSV		493		
GSAPRX		494		
GSAPXX		495		
ITSTC		496		
NCOM		497		

Figure 7.1. Master Common Listings (Sheet 30)

CURRENT COMMON IS --

COMMON/USIB01/USIB01(110),USTAR1(200)

CURRENT BLOCK IS USIB01 (108) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ANGID		1		
ADXMAX		2		
ADYMAX		3		
CMT	20	4		
CRECOG		24		
DBACK		25		
DOMMT		26		
DRMT	20	27		
DSTEP		47		
DRST	20	48		
ENRNG		68		
FRCMVO	20	69		
FRCMVN	20	89		

Figure 7.1. Master Common Listings (Sheet 31)

MASTER COMMON LISTING PAGE 32

CURRENT BLOCK IS USTAR1 (200) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
GOALTX	10,20	1		

Figure 7.1. Master Common Listings (Sheet 32)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USIB02/USIB02(550),USTAR2(200)
CURRENT BLOCK IS USIB02 (550) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
HLZ		1		
IOB	5	2		
ISEN		7		
ISENLZ		8		
IPREP		9		
IMOV	20	10		
IMV	20	30		
ITMOV	100,5	50		
ITMAX		550		

Figure 7.1. Master Common Listings (Sheet 33)

MASTER COMMON LISTING

CURRENT BLOCK IS USTAR2 (200) ...... PAGE 34

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
GOALTY	10,20	1		

Figure 7.1. Master Common Listings (Sheet 34)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USIB03/USIB03(265),USTAR3(200)
CURRENT BLOCK IS USIB03 (261) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
IDET	20	1		
ISSOFF	5,20	21		
ISSON	5,20	121		
ITST	20	221		
ITSTOP	20	241		
ITZERO		261		

Figure 7.1. Master Common Listings (Sheet 35)

MASTER COMMON LISTING

CURRENT BLOCK IS USTAR3 (200) ...... PAGE 36

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ITINS	10,20	1		

Figure 7.1. Master Common Listings (Sheet 36)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USIB04/USIB04(500)
CURRENT BLOCK IS USIB04 (500) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ISTAY	100,5	1		

Figure 7.1. Master Common Listings (Sheet 37)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USIB05/USIB05(500)
CURRENT BLOCK IS USIB05 (500) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ITSTAY	100,5	1		

Figure 7.1. Master Common Listings (Sheet 38)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USI806/USI806(500)
CURRENT BLOCK IS USI806 (500) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ITARIV	100,5	1		

Figure 7.1, Master Common Listings (Sheet 39)

MASTER COMMON LISTING PAGE 40

CURRENT COMMON IS --
COMMON/USI007/USI007(480),USTAR4(300)
CURRENT BLOCK IS USI007 (478) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
IDOMST		1		
KRECOL		2		
MODE		3		
NOB		4		
NCO	5	5		
NRMT		10		
NSENS		11		
NLZ		12		
NDECOY		13		
NTAR		14		
NFIX		15		
NMP	20	16		
NSTP	20	36		
NWCL	100,2	56		
NPLAN	5	256		
NRST		261		
RANMAX	20	262		
RSEN		282		
RLZ	5	283		
RCMIN	20	288		
RCMAX	20	308		
SC	6	328		
SEGMIN		334		
TZERO		335		
TDEBK	4	336		

Figure 7.1. Master Common Listings (Sheet 40)

MASTER COMMON LISTING

CURRENT BLOCK IS USIB07 (478) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
TPREP		340		
TVEL	20	341		
TOMIN		361		
TSR		362		
TSS		363		
VELM	4	364		
WDAY	10,11	368		
WR		478		

Figure 7.1, Master Common Listings (Sheet 41)

MASTER COMMON LISTING PAGE 42

CURRENT BLOCK IS USTAR4 (300) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
TC	10,20	1		
SOUNDT	5,20	201		

Figure 7.1. Master Common Listings (Sheet 42)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USIB08/USIB08(10),USTAR5(1000)
CURRENT BLOCK IS USIB08 (6) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
XBASE		1		
YBASE		2		
X1FREN		3		
X2FREN		4		
Y1FREN		5		
Y2FREN		6		

Figure 7.1, Master Common Listings (Sheet 43)

MASTER COMMON LISTING

CURRENT BLOCK IS USTAR5 (1000) ......

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VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
XPLAN	100,5	1		
YPLAN	100,5	501		

Figure 7.1. Master Common Listings (Sheet 44)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USIB10/USIB10(200)
CURRENT BLOCK IS USIB10 (31) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
ALLB		1		
ALLW		2		
ATTAR		3		
AA		4		
ATER		5		
AEQ		6		
BE		7		
GR		8		
ITDRPM		9		
ITMNTA		10		
ITNTAR		11		
ITACOS		12		
ITPLSQ		13		
ITPLSA		14		
PMC		15		
PMR		16		
PPLS		17		
RC		18		
RCTAR		19		
RTER		20		
REQ		21		
SCALE		22		
SPEC		23		
SGNTAB		24		
SGNTAW		25		

Figure 7.1. Master Common Listings (Sheet 45)

MASTER COMMON LISTING PAGE 46

CURRENT BLOCK IS USIB10 (31) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
TBUR		26		
THEATA		27		
VH		28		
VK		29		
VISMW		30		
VISMB		31		

Figure 7.1. Master Common Listings (Sheet 46)

MASTER COMMON LISTING

CURRENT COMMON IS --
COMMON/USIB11/USIB11(20)
CURRENT BLOCK IS USIB11 (17) ......

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
IDTIM		1		
WDC		2		
WDM		3		
WTC		4		
WTM		5		
MAXREP		6		
NBAT		7		
NRAD		8		
PT		9		
RNF		10		
RPOWR		11		
TPOWR		12		
TUSE		13		
XOBINS		14		
BETA		15		
BLIFE		16		
FREQ		17		

Figure 7.1, Master Common Listings (Sheet 47)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
AAALL	1	500			COMMCS
ADM	1				DLOGBL
AC	1	16,4			COMMB1
ALIM	1	2,2			DATAB2
ALLF	5	3,2			DATAB2
ALL	65				COMMB1
ALPHA1	3				DLOGBL
ALPHA2	4				DLOGBL
ALPHA	2				DLOGBL
ANGID	1				USIB01
AMPHRA	1				MISCB1
AMR	1				COMMBS
AMUN	2	4			MISCB1
AMNTAB	6	21			MISCB1
APCAD	32				COMMBS
APCAF	33				COMMBS
APCAS	34				COMMBS
AOXMAX	2				USIB01
AOYMAX	3				USIB01
ATAR	66				COMMB1
ASIAF	67				COMMB1
ATTEMP	35				COMMBS
ATTEN	1	4			DATABD
A	1	4,204			COMMBA
BETA	5				DLOGBL
BLANK1	71				DLOGBL
BLANK2	1190				LINSIG
BSAREA	27				MISCB1
CADM	1				DLOGIN
CC1	2				DLOGIN
CC2	3				DLOGIN
CC3	4				DLOGIN
CC	68				COMMB1
CEPPAT	262				COMMB4
CEPPM	263				COMMB4
CEPPSS	264				COMMB4
CEPPS	265				COMMB4

Figure 7-2. Cross-reference of Common Variables (Sheet 1)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
CEPTAR	263	20			COMMB4
CLASS	5	5,16			DLOGIN
CLAYMM	28				MISCB1
CLL	71				COMMB1
CLMT	1				LINSIG
CMT	4	20			USIB01
COMMO	43				COMMB5
CONCAP	29				MISCB1
CPRAT	30	7			MISCB1
CRECOG	24				USIB01
CR2	72	2,2			COMMB1
CR	70				COMMB1
CS	2	2			COMMB5
CT	69				COMMB1
DBACK	25				USIB01
DBINS	280				COMMB1
DBINT	281				COMMB1
DBSPEC	282	20			COMMB1
DF1	36				COMMB5
DF2	37				COMMB5
DMORR	2				MISCB2
DMOR	1				MISCB2
DMT	8	5,3			DATABB
DOMMT	26				USIB01
DOMV	2				LINSIG
DSAA	4				MISCB2
DSA	3				MISCB2
DSDROP	6				DLOGBL
DRICE	7				DATABB
DSENG	7				DLOGBL
DRMT	27	20			USIB01
DTDAMB	65				DLOGIN
DTDATT	86				DLOGIN
DTDEPL	9				DLOGBL
DRST	48	20			USIB01
DTEFS	87				DLOGIN
DTENGM	88				DLOGIN

Figure 7-2. Cross-reference of Common Variables (Sheet 2)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
DTENG	10				DLOGBL
DSPUR	8				DLOGBL
DSTEP	47				USIB01
DSW11	5				DATABB
DSW12	6				DATABB
DTPURM	89				DLOGIN
DTPUR	11				DLOGBL
DTWAIT	12				DLOGBL
DYWT	5	9,3			MISCB2
D1	49				COMMB5
D2	50				COMMB5
D	76	204			COMMB1
EFSA	90				DLOGIN
ENRNG	68				USIB01
EOUT	302	204			COMMB1
ETA	3				LINSIG
EQUIP	37				MISCB1
EXDEGT	38				MISCB1
FLAMDA	4				LINSIG
FINDEX	39				MISCB1
FM1	4				COMMB5
FM2	5				COMMB5
FRAMB	91				DLOGIN
FRATT	92				DLOGIN
FOODA	41				MISCB1
FOODD	42				MISCB1
FOODU	43				MISCB1
FOOD	40				MISCB1
FRCMVD	69	20			USIB01
FRCMVN	89	20			USIBC1
FTHREL	506				COMMB1
FWRAT	44	7			MISCB1
FOHREL	507				COMMB1
F	38				COMMB5
GAM	5	3,20			LINSIG
GMAX	93				DLOGIN
GOALTX	1	10,20			USTAR1

Figure 7-Z. Cross-reference of Common Variables (Sheet 3)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
GOALTY	1	10,20			USTAR2
GSAPRR	114				DLOGIN
GSAPRX	494				MISCB2
GSAPXX	495				MISCB2
GS	63				DLOGBL
G1OUT	508	204			COMMB1
G2OUT	1	204			COMMB2
G3OUT	205	204			COMMB2
HANDGW	56				MISCB1
HB	87	9			DATABB
HH	47				COMMB5
HLZ	1				USIB02
HMT	96	5,3			DATABB
HTAU	2				OBSTAB
HSIG	1				OBSTAB
HTPLOT	57	50			MISCB1
HS	409				COMMB2
HT	410				COMMB2
H2OA	52				MISCB1
H2OD	53				MISCB1
H2OTD	54				MISCB1
H2OU	55				MISCB1
H2O	51				MISCB1
H	23	16,4			DATABB
IBDEAD	39				COMMB5
IDARK	14				DLOGBL
IDAY	414				COMMB2
IANCHS	161	20			TARINT
IANCHT	181	20			TARINT
IAOR	101	20,2			CMTAR1
IAS	506				COMMB2
IAT	505				COMMB2
ICH	181	20			CMTAR1
IDELA	32				MISCB2
IDELB	33				MISCB2
IDELC	34				MISCB2
IDELD	35				MISCB2

Figure 7-2. Cross-reference of Common Variables (Sheet 4)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
IDELE	36				MISCB2
IDETS	508	20			COMMB2
IDET	1	20			USIB03
IDE	411				COMMB2
ICL	65	50			LINSIG
ICNT	107				MISCB1
ICOMB	108				MISCB1
ICOM	40				COMMB5
ICOUNT	13				DLOGBL
ICPER	45				COMMB5
IDIREC	94				DLOGIN
IDOMST	1				USIB07
IDUM1	95				DLOGIN
IDUM2	96				DLOGIN
IFFF	80				DLOGBL
IDYFL	109				MISCB1
IFFSTD	74				DLOGBL
IDYOL	551				COMMB2
IDY	37				MISCB2
IFIRST	483	20			COMMB2
IGEN	443	20			COMMB2
IGETBK	38				MISCB2
IFLAG	15				DLOGBL
IGRID	39				MISCB2
IMAN	72				DLOGBL
II	115	204,5			LINSIG
IOBST	6				COMMB5
IOB	2	5			USIB02
ILZAVL	418	5			COMMB2
IMOV	10	20			USIB02
IMP	463	20			COMMB2
IMV	30	20			USIBC2
INREP1	111				MISCB1
INREP2	112				MISCB1
INREP	110				MISCB1
ISAA	81	20			TARINT
ISAD	412				COMMB2

Figure 7-2. Cross-reference of Common Variables (Sheet 5)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
ISA	201	20			CNTAR[illegible]
IPOSE	16				DLOGBL
IPOWRT	44				COMMB5
IPOWR	41				COMMB5
ITAA	101	20			TARINT
ITAD	413				COMMB2
IPREP	9				USIB02
IRECOG	201	20,2			CNTAR1
ITAREN	20				DLOGBL
ITARG	1	20,5			CNTAR1
ITARIV	1	100,5			USIB06
IREONE	113				MISCB1
IRESUP	114				MISCB1
ISCEN	115	7			MISCB1
ITA	241	20			CNTAR1
ISECT	111	20			DATAB[illegible]
ISENLZ	8				USIB02
ISEN	7				USIB02
ISET	17				DLOGBL
IP	550				COMMB2
ITCOM	42				COMMB5
ITGRID	549				COMMB2
ITHULA	122				MISCB1
ITIME	417				COMMB2
ITINPR	123				MISCB1
ITIMS	1	10,20			USTAR3
ISSOFF	21	5,20			USIB03
ISSON	121	5,20			USIB03
ISTADT	1	20,2			COMMB4
ISTALL	81				DLOGBL
ISTART	76				DLOGBL
ISTART	41	20			TARINT
ISTAY	1	100,5			USIB04
ISTUFF	18				DLOGBL
ISTP	552	20			COMMB2
ISTRT	41	20,2			COMMB4
ISTU	70				DLOGBL

Figure 7-2. Cross-reference of Common Variables (Sheet 6)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
ISTVDT	81	20,2			COMMB4
IST	7				COMMB5
IST	1135				LINSIG
ISUIT	19				DLOGBL
ISVD	503				COMMB2
ISVV	121	20			TARINT
ISV	221	20			CMTAR1
IR	61				DLOGBL
ITMAX	550				USIB02
ITMOV	50	100,5			USIB02
ITNAVM	289				COMMB4
ITNAVS	287				COMMB4
ITNAV	286				COMMB4
ITNVSS	288				COMMB4
ITRC	1136	50			LINSIG
ITSTAY	1	100,5			USIB05
ITSTC	496				MISCB2
ITSTOP	241	20			USIB03
ITSTRT	415				COMMB2
ITST	221	20			USIB03
ITVD	504				COMMB2
ITVEG	423	20			COMMB2
ITVV	141	20			TARINT
ITV	261	20			CMTAR1
ITYPE	528	20			COMMB2
ITZERO	261				USIB03
INC	507				COMMB2
IT	548				COMMB2
IVOR	141	20,2			CMTAR1
IXST	46				COMMB5
IZ	416				COMMB2
JCOMAX	40				MISCB2
JCOMXX	41				MISCB2
JCSS	43				MISCB2
JCS	42				MISCB2
JGO	21				DLOGBL
JMAN	73				DLOGBL

Figure 7-2. Cross-reference of Common Variables (Sheet 7)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
JIT	572				COMMB2
JJTIME	1	100			COMMES
JTACT	23				DLOGBL
JROMAX	44				MISCB2
JROMXX	45				MISCB2
JRSS	47				MISCB2
JRS	46				MISCB2
JSP	22				DLOGBL
KDEFOP	75				DLOGBL
KEY	573				COMMB2
KKTIME	1	500			COMMD5
KND	1186				LINSIG
KK	124				MISCB1
KTACT	24				DLOGBL
KRECOL	2				USIB07
KREC	48	20			MISCB2
LAMDAE	125				MISCB1
LFLAG	594	20			COMMB2
LFLOBJ	68				MISCB2
LNR1	1187				LINSIG
LOSD	1	20,2			OUTST1
LOSR	41	20			OUTST1
LOST	61	20,2			OUTST1
LOSV	101	20			OUTST1
LSVS	1188				LINSIG
LZTAR	574	20			COMMB2
MAXREO	126				MISCB1
MENOP	25				DLOGBL
MENSP	26				DLOGBL
MICR1	1189				LINSIG
MGS	62				DLOGBL
MII	70				MISCB2
MISS	97				DLOGIN
MMAX	127				MISCB1
MMB	614	5			COMMB2
MI	69				MISCB2
MODE	3				USIB07

Figure 7-2. Cross-reference of Common Variables (Sheet 8)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
NS	619				COMMB2
NT	620				COMMB2
NDAY	642				COMMB2
NBI	621				COMMB2
NDECOY	13				USIB07
NDETEC	1				COMMB3
NCOM	497				MISCB2
NCOPY	128				MISCB1
NCO	5	5			USIB07
NHANDG	129				MISCB1
NFIX	15				USIB07
NHGA	130				MISCB1
NIDY	71				MISCB2
NGS	27				DLOGBL
NHRMIN	28				DLOGBL
NHU	131				MISCB1
NMA	133				MISCB1
NNAV	290				COMMB4
NLFLAG	132				MISCB1
NMINES	134				MISCB1
NPAR	72				MISCB2
NOB	4				USIB07
NOCH	622	20			COMMB2
NOCOM	22				COMMB5
NLZ	12				USIB07
NNHU	135				MISCB1
NMP	16	20			USIB07
NPLAN	256	5			USIB07
NTAR	14				USIB07
NREP	23				COMMB5
NSECT	98				DLOGIN
NSEC	2				COMMB3
NSENS	11				USIB07
NRMP	1191				LINSIG
NRMT	10				USIB07
NRSOIL	1192				LINSIG
NRST	261				USIB07

Figure 7-2. Cross-reference of Common Variables (Sheet 9)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
NRVP	1193				LINSIG
NSTP	36	20			USIB07
NSWT	136				MISCB1
NWCL	56	100,2			USIB07
NUMVEG	1194	204			LINSIG
OLDVEL	68				OLOGBL
OLTACK	69				OLOGBL
OLVULX	66				OLOGBL
OLVULY	67				OLOGBL
OLXDEP	64				OLOGBL
OLYDEP	65				OLOGBL
PAIR	3				COMMB3
PDAVG	144				MISCB1
PAKWT2	140				MISCB1
PAKWT3	141				MISCB1
PAKWT4	142				MISCB1
PAKWT	139				MISCB1
PALLB	5				COMMB3
PALL	4				COMMB3
PATDIS	48				COMMB5
PATROW	143				MISCB1
PCINT	24				COMMB5
PDEGL	14				COMMB3
PDMAX	145				MISCB1
PDMIN	146				MISCB1
PDPLOT	147	50			MISCB1
PDTOT	197				MISCB1
PEQUIP	198				MISCB1
PHI	29				OLOGBL
PNONEB	7				COMMB3
PNONE	6				COMMB3
PP1	99				OLOGIN
PP2	100				OLOGIN
PP3	101				OLOGIN
PP4	102				OLOGIN
PSGP	12	2			COMMB3
PSGSKY	10	2			COMMB3

Figure 7-2. Cross-reference of Common Variables (Sheet 10)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
PSKY	8	2			COMMB3
PSL	3				OBSTAB
PS	243				MISCB1
PURVEL	30				DLOGBL
P8	138				MISCB1
P5	113				DLOGIN
P	137				MISCB1
Q1	103				DLOGIN
Q2	104				DLOGIN
Q3	105				DLOGIN
RADV1	32				DLOGBL
RADV2	33				DLOGBL
RAMB	106				DLOGIN
RAMIN	107				DLOGIN
RAMU	199	4			MISCB1
RANLZ	1	20,5			CMTAR2
RANMAX	262	20			USIB07
RATT	108				DLOGIN
RAVODD	73				MISCB2
RAVOID	74				MISCB2
RCMAX	308	20			USIB07
RCMIN	283	20			USIB07
REFS	109				DLOGIN
REF	274	16,3			DATABB
RHANDG	205				MISCB1
RC	34				DLOGBL
RFMORR	76				MISCB2
RFMOR	75				MISCB2
RFOOD	203				MISCB1
RFSAA	78				MISCB2
RFSA	77				MISCB2
RHOH	206				MISCB1
RHO	131	16,4			DATABB
RH2O	204				MISCB1
RMAX	210	16,4			DATABB
RH	83				COMMB3
RLOSS	79				COMMB3

Figure 7-2. Cross-reference of Common Variables (Sheet 11)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
RMINES	207				MISCB1
ROBS	110				DLOGIN
RLZ	283	5			USIB07
RNTMAX	195	5,3			DATABB
RPE	208				MISCB1
RPG	209				MISCB1
RN	82				COMMB3
RSEN	282				USIB07
RSP	111				DLOGIN
RTIME	210				MISCB1
RS	35				DLOGBL
RS	80				COMMB3
RT	81				COMMB3
RZ	112				DLOGIN
R	15	16,4			COMMB3
R	31				DLOGBL
SANUTE	215	4			MISCB1
SAMU	211	4			MISCB1
SDCEPP	291				COMMB4
SECT	322	2,4,2			DATABB
SDITNV	292				COMMB4
SGAVG	219				MISCB1
SEGLGT	105				COMMB3
SEGL	85	20			COMMB3
SEGMIN	334				USIB07
SC4	241				COMMB4
SC	328	6			USIB07
SGENDX	107				COMMB3
SGENDY	108				COMMB3
SGMAX	220				MISCB1
SGMIN	221				MISCB1
SGTOT	222				MISCB1
SF	36				DLOGBL
SIGENG	223				MISCB1
SIGFFR	225				MISCB1
SIGGR	224				MISCB1
SL1	11				DATAB2

Figure 7-2. Cross-reference of Common Variables (Sheet 12)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
SL2	12				DATAB2
SOILF	13	2,8			DATAB2
SOIL	1398				LINSIG
SNUM	84				COMMB3
SOUNDT	201	5,20			USTAR4
STADR	121	20,2			COMMB4
SVADM	37				DLOGBL
SUCRAT	25				COMMB5
STIME	106				COMMB3
STRR	161	20,2			COMMB4
STSTRT	109				COMMB3
STS	226				MISCB1
STVOR	281	20,2			COMMB4
TACKOP	38				DLOGBL
TAMPHR	26				COMMB5
TAMUN	229				MISCB1
TARVEL	111				COMMB3
TARV	79				DLOGBL
TDEBK	336	4			USIB07
TDETS	138	20			COMMB3
TDMIN	361				USIB07
TC6	242	20			COMMB4
TC	1	10,20			USTAR4
TEMP	137				COMMB3
TEQUIP	230				MISCB1
THETA	116	20			COMMB3
THETS	231				MISCB1
THS	113				COMMB3
THT	114				COMMB3
TH	136				COMMB3
THR	29	18,3			DATAB2
TPCAD	27				COMMB5
TPCAF	28				COMMB5
TPCAS	29				COMMB5
TNUM	112				COMMB3
TSAVE	158	20,2			COMMB3
TPREP	340				USIB07

Figure 7-2. Cross-reference of Common Variables (Sheet 13)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
TTIME	30				COMMB5
TSR	362				USIB07
TSS	363				USIB07
TSTART	115				COMMB3
TVEL	341	20			USIB07
TTUSE	31				COMMB5
TZERO	335				USIB07
TZ	110				COMMB3
T0	228				MISCB1
T	227				MISCB1
VBAR	8				COMMB5
VADM	39				DLOGBL
VCEAL	40				DLOGBL
VCHNG	61	20			TARINT
VDEG	200				COMMB3
VCOV	41				DLOGBL
VEGC	338	8,16			DATABB
VEGC	1399				LINSIG
VEGF	83	16			DATAB2
VEG1	1400				LINSIG
VELM	364	4			USIB07
VELOP	42				DLOGBL
VEL	9	12			COMMB5
VIGLEV	199				COMMB3
VISLUM	466	8,8			DATABB
VISM	198				COMMB3
VOBS	43				DLOGBL
VTYP	79				MISCB2
WDAY	368	10,11			USIB07
WA	46				DLOGBL
WB	47				DLOGBL
WD	204				COMMB3
WMT	594	5,3			DATABB
WTAU	5				OBSTAB
WSIG	4				OBSTAB
WR	478				USIB07
WTS	236	4			MISCB1

Figure 7-2. Cross-reference of Common Variables (Sheet 14)

```
SIAF,T100,MT1.
TASK,TN=SIAF,TA=13954,OS=ATDSDPF,TR=TS.
REQUEST,SIAF00,*AM.
REQUEST,SIAF01,*AM.
REQUEST,SIAF02,*AM.
REQUEST,SIAF03,*AM.
REQUEST,SIAF04,*AM.
REQUEST,SIAF05,*AM.
REQUEST,SIAF06,*AM.
REQUEST,SIAF07,*AM.
REQUEST,SIAF08,*AM.
REQUEST,BTPKS,*AM.
REQUEST,NLINP,*AM.
REQUEST,ZINP,*AM.
REQUEST,CONVRT,*AM.
REQUEST,MAPGEN,*AM.
REQUEST,ROTATE,*AM.
VSN,SIAF=0000.
REQUEST,SIAF,*HY.
COPYBR,SIAF,SIAF00.
COPYBR,SIAF,BTPKS
COPYBR,SIAF,SIAF01.
COPYBR,SIAF,SIAF02.
COPYBR,SIAF,SIAF03.
COPYBR,SIAF,SIAF04.
COPYBR,SIAF,SIAF05.
COPYBR,SIAF,SIAF06.
COPYBR,SIAF,SIAF07.
COPYBR,SIAF,SIAF08.
```

Figure 7.4, Creation of Source Files (Sheet 1)

```
SKIPF,SIAF,9.
COPYBR,SIAF,NLINP.
COPYBR,SIAF,ZINP.
COPYBR,SIAF,CONVRT.
COPYBR,SIAF,MAPGEN.
COPYBR,SIAF,ROTATE.
CATALOG,SIAF00,SIAF00,ID=SIAF,RP=100,CY=1.
CATALOG,BTPKS,BTPKS,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF01,SIAF01,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF02,SIAF02,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF03,SIAF03,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF04,SIAF04,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF05,SIAF05,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF06,SIAF06,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF07,SIAF07,ID=SIAF,RP=100,CY=1.
CATALOG,SIAF08,SIAF08,ID=SIAF,RP=100,CY=1.
CATALOG,NLINP,NLINP,ID=SIAF,RP=100,CY=1.
CATALOG,ZINP,ZINP,ID=SIAF,RP=100,CY=1.
CATALOG,CONVRT,CONVRT,ID=SIAF,RP=100,CY=1.
CATALOG,MAPGEN,MAPGEN,ID=SIAF,RP=100,CY=1.
CATALOG,ROTATE,ROTATE,ID=SIAF,RP=100,CY=1.
EOR
EOI
```

Figure 7.4, Creation of Source Files (Sheet 2)

```
SIAF,T400.
TASK,TN=SIAF,TA=13954,OS=ATDSDPF,TR=TS.
REQUEST,NVBFT0,*AM.
REQUEST,NVBFT1,*AM.
REQUEST,NVBFT2,*AM.
REQUEST,NVBFT3,*AM.
REQUEST,NVBFT4,*AM.
REQUEST,NVBFT5,*AM.
REQUEST,NVBFT6,*AM.
REQUEST,NVBFT7,*AM.
REQUEST,NVBFT8,*AM.
ATTACH,SIAF00,SIAF00,ID=SIAF.
ATTACH,BTPKS,BTPKS,ID=SIAF.
ATTACH,SIAF01,SIAF01,ID=SIAF.
ATTACH,SIAF02,SIAF02,ID=SIAF.
ATTACH,SIAF03,SIAF03,ID=SIAF.
ATTACH,SIAF04,SIAF04,ID=SIAF.
ATTACH,SIAF05,SIAF05,ID=SIAF.
ATTACH,SIAF06,SIAF06,ID=SIAF.
ATTACH,SIAF07,SIAF07,ID=SIAF.
ATTACH,SIAF08,SIAF08,ID=SIAF.
FTN,I=SIAF00,B=NVBFT0.
COMPASS,I=BTPKS,B=NVBFT0.
```

Figure 7.5, Creation of Object Files (Sheet 1)

```
FTN,I=SIAF01,B=NVBFT1.
FTN,I=SIAF02,B=NVBFT2.
FTN,I=SIAF03,B=NVBFT3.
FTN,I=SIAF04,B=NVBFT4.
FTN,I=SIAF05,B=NVBFT5.
FTN,I=SIAF06,B=NVBFT6.
FTN,I=SIAF07,B=NVBFT7.
FTN,I=SIAF08,B=NVBFT8.
CATALOG,NVBFT0,NVBFT0,ID=SIAF,CY=1.
CATALOG,NVBFT1,NVBFT1,ID=SIAF,CY=1.
CATALOG,NVBFT2,NVBFT2,ID=SIAF,CY=1.
CATALOG,NVBFT3,NVBFT3,ID=SIAF,CY=1.
CATALOG,NVBFT4,NVBFT4,ID=SIAF,CY=1.
CATALOG,NVBFT5,NVBFT5,ID=SIAF,CY=1.
CATALOG,NVBFT6,NVBFT6,ID=SIAF,CY=1.
CATALOG,NVBFT7,NVBFT7,ID=SIAF,CY=1.
CATALOG,NVBFT8,NVBFT8,ID=SIAF,CY=1.
EOR
EOI
```

Figure 7.5, Creation of Object Files (Sheet 2)

```
SIAF,T700.
TASK,TN=SIAF,TA=13954,OS=ATDSDPF,TR=TS.
ATTACH,NVBFT0,NVBFT0,ID=SIAF.
ATTACH,NVBFT1,NVBFT1,ID=SIAF.
ATTACH,NVBFT2,NVBFT2,ID=SIAF.
ATTACH,NVBFT3,NVBFT3,ID=SIAF.
ATTACH,NVBFT4,NVBFT4,ID=SIAF.
ATTACH,NVBFT5,NVBFT5,ID=SIAF.
ATTACH,NVBFT6,NVBFT6,ID=SIAF.
ATTACH,NVBFT7,NVBFT7,ID=SIAF.
ATTACH,NVBFT8,NVBFT8,ID=SIAF.
ATTACH,NLINP,NLINP,ID=SIAF.
ATTACH,ZINP,ZINP,ID=SIAF.
RFL,150000.
LOAD,NVBFT0.
LOAD,NVBFT1.
LOAD,NVBFT2.
LOAD,NVBFT3.
LOAD,NVBFT4.
LOAD,NVBFT5.
LOAD,NVBFT6.
LOAD,NVBFT7.
LOAD,NVBFT8.
```

Figure 7.6, Execution of Model (Sheet 1)

```
NOGO
RFL,232000.
MNALPH.
EXIT.
DMP,232000.
EOR
 $NAML1
              (REVISIONS TO NAMELIST NAML1)
 $END
 $NAML2
              (REVISIONS TO NAMELIST NAML2)
 $END
 $NAML3
              (REVISIONS TO NAMELIST NAML3)
 $END
 $NAML4
              (REVISIONS TO NAMELIST NAML4)
 $END
EOR
EOI
```

Figure 7.6, Execution of Model (Sheet 2)

8.0 SIAF RELIEF MODEL VALIDATION

8.1 PURPOSE

The purpose of this discussion is to describe the method and results of simulating line of sight experiments to demonstrate the validity of: 1) the line of sight calculations; and 2) the mathematical concept of macro-relief representation in the SIAF Terrain Submodel. The raw data used in the simulation was taken from field measurements at nine different locations in the Hunter-Liggett Military Reservation. The experiment measures line of sight data with respect to macro-relief only; the effects due to vegetation and micro-relief features are neglected.

8.2 HUNTER-LIGGETT FIELD EXPERIMENT

8.2.1 Purpose

The primary purpose of the field experiment was to gather actual line of sight data concerning terrain macro-relief. The line of sight experiments were conducted at nine locations within the map section shown in Figure 8.1.

8.2.2 Equipment

The experiments required three pieces of equipment. A compass was used to determine direction, a one-hundred meter rope, graduated in five meter intervals was used to measure surface distance, and a pair of walkie-talkies was used to relay information.

8.2.3 Methodology:

The typical procedure undertaken is depicted in Figure 8.2. An observer would stand at an easily identifiable point (i.e., landmarks, roads, peaks, saddlepoints, etc.) with a compass and walkie-talkie. One end of the hundred-meter rope is held by the observer. Another individual, designated as the "target", moves away from the observer holding the other end of the rope. The target is also equipped with a walkie-talkie. The target continues to walk away from the stationary observer, until only the target's head is visible (to the observer) due to the interruption of the line of sight by the ground. The observer and target are in radio communication, so that the location of the target at the time of line of sight interruption is established accurately.

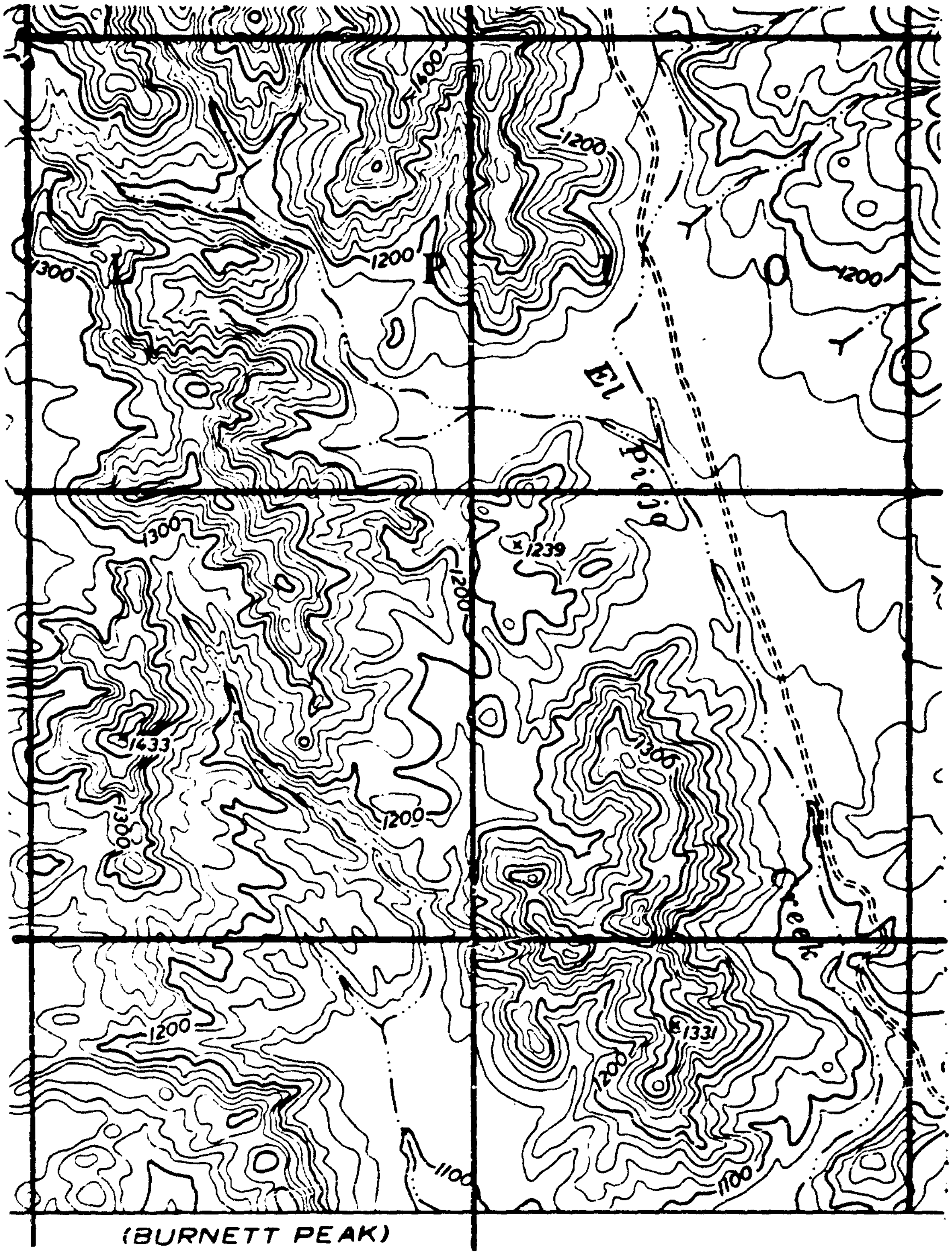

Figure 8.1, Hunter-Liggett Test Area

Figure 8.2, LOS Experimental Procedure

The procedure was repeated at approximately every fifteen degrees of arc, at which time a third individual would record the heading, and the "surface distance" between the observer and target. By "surface distance" we mean the distance traced out by the rope over the curvature of the ground. This is to be distinguished from the "range distance," which is the distance between observer and target when the line of sight is projected onto the grid plane of zero altitude. See Figure 8.3 for the distinction. This procedure continued over a three hundred and sixty degree sweep about the observer, whenever the terrain permitted.

Line of sight data was collected at nine different locations. At each site, several direction headings and the corresponding surface distances were recorded. The nine locations are shown in Figure 8.1, and the experimental data is displayed in Figure 8.4.

8.2.4 Field Measurement Errors

In conducting an experiment of this type, four sources of error are inherent and must be taken into consideration using the data for validation purposes.

- Location Error: Exact determination of the observer's position (grid coordinates) is impossible. Minimizing the effects of this type of error was achieved basically by choosing observer positions near relief landmarks such as roads, peaks, saddle-points, and intersections.

- Compass Error: Compass readings are subject to errors due to alignment, sighting, and reading errors. An additional error source is in the estimation of magnetic north with respect to grid north. It is estimated that the combined effects of such errors amounts to $\pm 2^{\circ}$ error.

- Linear Measurement Error: All distances recorded on a map are given for a grid plane (of zero altitude) normal to any given elevation. The experiment, however, was conducted around sloping, hilly areas. Thus, the measured distance between the observer and target is the sloping surface ("slant") distance, and will be in error as a function of the distance and the difference in elevation between them. An approximation

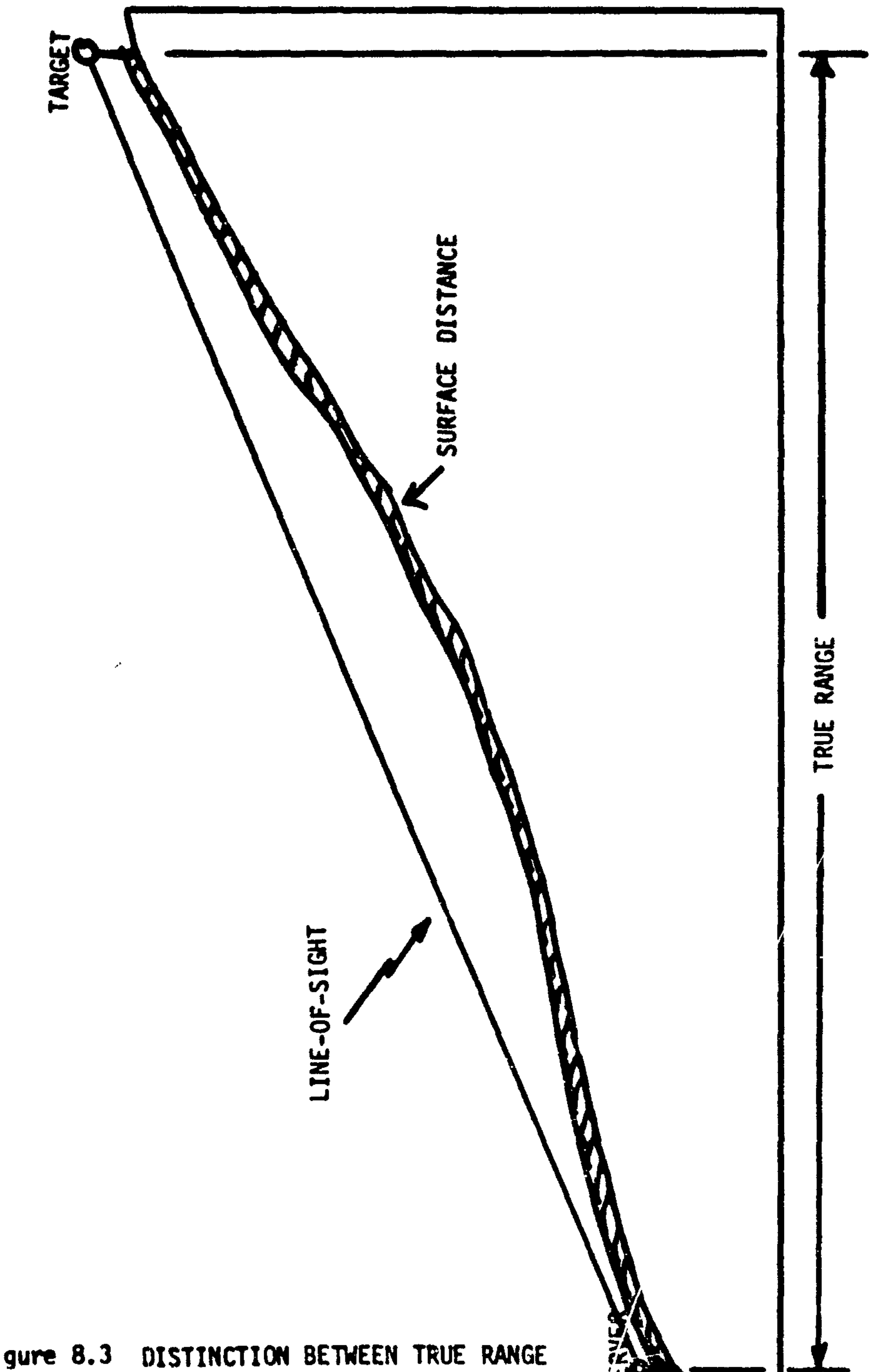

Figure 8.3 DISTINCTION BETWEEN TRUE RANGE AND SURFACE DISTANCE

	POINT 1	POINT 2	POINT 3	POINT 4	POINT 5	POINT 6	POINT 7	POINT 8	POINT 9
MEAS 1	25m, 40°	71m, 85°	26m, 0°	31m, 5°	27m, 30°	60m, 115°	165m, 216°	65m, 100°	139m, 51°
MEAS 2	71m, 115°	65m, 265°	29m, 40°	31m, 15°	29m, 68°	63m, 125°	145m, 223°	60m, 115°	108m, 81°
MEAS 3	50m, 300°	23m, 355°	28m, 55°	35m, 30°	28m, 108°	61m, 140°	172m, 229°	67m, 136°	108m, 94°
MEAS 4			18m, 98°	35m, 40°	24m, 147°	68m, 150°	196m, 234°	[illegible], 152°	109m, 116°
MEAS 5			36m, 122°	66m, 70°	42m, 190°	70m, 158°		81m, 162°	110m, 126°
MEAS 6			47m, 132°	79m, 82°	18m, 171°	65m, 165°		67m, 174°	118m, 147°
MEAS 7			35m, 180°	86m, 90°	30m, 252°	49m, 186°		57m, 185°	249m, 166°
MEAS 8			33m, 217°	62m, 106°	60m, 271°	55m, 190°		57m, 205°	380m, 176°
MEAS 9			44m, 247°	37m, 125°	29m, 350°				281m, 188°
MEAS 10			90m, 290°	29m, 152°					137m, 203°
MEAS 11			63m, 296°	28m, 170°					189m, 215°
MEAS 12			38m, 313°	47m, 240°					104m, 229°
MEAS 13			30m, 345°	35m, 270°					113m, 250°
MEAS 14				32m, 290°					106m, 270°
MEAS 15				35m, 322°					125m, 279°
MEAS 16				35m, 350°					150m, 289°
MEAS 17									176m, 295°

Figure 8.4, Field Data (Hunter Liggett)

of this type of error is given by $D_E = D_M - D_M \cos(\Theta)$, where D_E is the error in the distance measurement, D_M is the actual measured distance, and Θ is the angle of elevation between observer and the target.

- Vegetation: As stated earlier, the intent of the experiment was to validate the SIAF model using line of sight verdicts with respect to macro-relief only. The effects of vegetation on line of sight were ignored. However, the presence of grass, sometimes several feet in height, could have introduced error into the measurements. This type of error is dependent on the density and height of the grass. The distance at which the line of sight is lost tends to be less in the presence of grass than otherwise. The effect of this error was minimized by choosing observer locations having very little vegetation (grass having negligible height) whenever possible.

8.3 ELEMENTS OF SIAF MODEL USED IN VALIDATION

8.3.1 Mathematical Representation at Macro-Relief in SIAF Model

The SIAF model utilizes a grid concept to describe macro-relief. Within each grid square a continuous surface is mathematically represented by a quadratic surface weighting all four corner elevation points. A region under consideration is assumed to be sufficiently small, so that effects due to earth's curvature are neglected, (i.e., a flat earth assumption is made, allowing use to use surface altitudes given by topographical maps). At each grid point, the earth's surface is specified by its altitude. Altitude data is available for grid resolutions as fine as 12.7 meters. The surface at nongrid points are determined as a weighted average of the four altitudes at the corner points of the grid square in which the point lies.

Consider Figure 8.5. Grid lines are defined by

$$x_j = (j-1)\Delta x$$
$$y_k = (k-1)\Delta y$$

where Δx and Δy are grid square dimensions. The j, k^th^ rectangle is bounded by the grid lines $\{x=x_j, y=y_k, x=x_{j+1}, y=y_{k+1}\}$. The surface within the j, k^th^ grid square, as shown in Figure 8.5, is determined in the following manner where $z_{j,k}$, $z_{j,k+1}$, $z_{j+1,k}$ and $z_{j+1,k+1}$ are the input

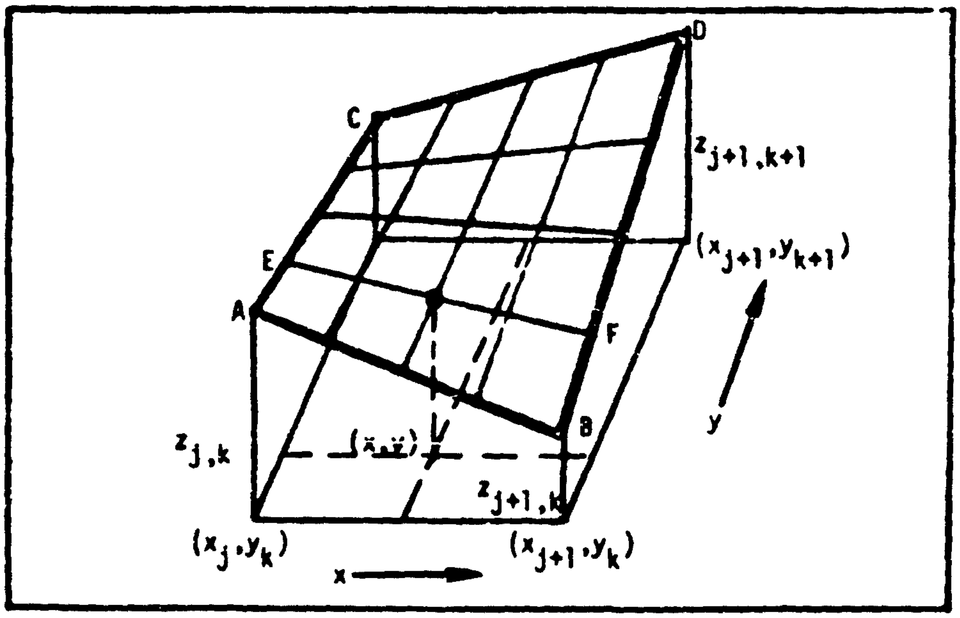

Figure 8.5, Surface Within j,k^th^ Rectangle

altitudes of the four corner points:

Altitude on Line AB: $z_k(x) = \left[z_{j,k} + \frac{x-x_j}{x_{j+1}-x_j} (z_{j+1,k}-z_{j,k}) \right]$

Altitude on Line CD: $z_{k+1}(x) = \left[z_{j,k+1} + \frac{x-x_j}{x_{j+1}-x_j} (z_{j+1,k+1}-z_{j,k+1}) \right]$

Altitude on Line EF (weighted average):

$$z(x,y) = \left\{ z_k(x) + \frac{y-y_k}{y_{k+1}-y_k} [z_{k+1}(x)-z_k(x)] \right\}$$

8.3.2 SIAF Subroutines Used

The subroutine LOSVEG is responsible for the line of sight calculations in the SIAF model. This subroutine is called by the subroutine DETERR. DETERR calculates intervisibility between any pair of points on the terrain for prone and upright positions of both the observer and the target. This intervisibility is characterized in terms of line of sight obstructions and various probabilities of cover and concealment. Cover and concealment are provided by micro-relief features and vegetation. Since the purpose of the field experiment was to consider macro-relief only, the line of sight experiments were performed in areas characterized by little or negligible amounts of micro-relief objects and vegetation. Thus the effects of cover and concealment on intervisibility are neglected in the simulation, and DETERR was modified to do this. Furthermore, for each pair of points on the terrain locating the observer and target, four lines of sight are considered by the subroutine DETERR.

1) "Head to head", i.e., observer and observed both upright.
2) "Head to foot", i.e., observer upright and observed prone.
3) "Foot to head", i.e., observer prone and observed upright.
4) "Foot to foot", i.e., observer and observed both prone.

Since the field experiments considered only "head to head" lines of sight, DETERR was modified such that the simulation considered only that case.

The primary purpose of LOSVEG is to determine if the line of sight between an observer and target is obstructed by the intervening land surface (macro-relief). It accomplishes this by projecting the line of sight onto a grid plane (of zero altitude). Every intersection of the line of sight with horizontal and vertical grid crossings partitions the line of sight into segments. The subroutine checks for line of sight interruptions within or at the end-point of a given segment. This is done segment by segment, beginning with the segment containing the observer's position, until the line of sight is interrupted. If no interruption occurs the fraction of target height and the fraction of observer height covered by macro-relief is calculated; the routine continues on to compute cumulative distance through vegetation. It checks to see whether the cumulative distances through certain vegetation feature types is great enough to cause concealment of the target. This cumulative vegetation check, however, is of no concern to this test.

Detailed documentation and flow charts of LOSVEG and DETERR can be found in Volumes II and V respectively of the SIAF Users Manual.

8.4 COMPUTER SIMULATION OF FIELD TEST

The subroutines discussed above were modified and inserted into a program designed to simulate the line of sight experiments conducted at Hunter Liggett. The program considers only macro-relief features; it also takes into account several of the error sources which were inherent in the field experiments.

8.4.1 Simulation Methodology

The basic simulation procedure tries to model the actual experimental procedure conducted in the field. A given observer's position (grid coordinates on a topographic map) is determined as accurately as possible. Based on this determination, the program reads in all the elevation data in a square area centered about this point. The area is 444.5 grid points (using 12.7 meter resolution).

As in the actual experiments, the target is programmed to move away from the observer in a fixed direction. The target steps off increments of 3.175 meters away from observer. Every step increment initiates a call to subroutine DETERR, which in turn, calls LOSVEG to determine if a "head-to-head" line of sight exists. If it does the target takes another step of 3.175 meters away from the observer. The line of sight routine is called again. The procedure is repeated as long as the line of sight exists. This continues until either the line of sight no longer exists due to macro-relief obstruction, or the target has stepped off so many increments away from the observer that elevation data is no longer available for line of sight calculations. In the latter case, the distance between the observer and the target for which line of sight remains uninterrupted by macro-relief is considered to be unlimited.

Once the line of sight is obstructed, the target is programmed to move towards the observer. The step increment is reduced by half to 1.5875 meters. Again, each step increment initiates a call to the appropriate subroutines giving a line of sight verdict. The target is programmed to continue the inward movement until an uninterrupted line of sight is established again. As soon as the line of sight has been re-established, the target begins moving away from the observer once more. Now the step increments are made smaller (1.5875÷2). As before, each step gives rise to a line of sight verdict. The target continues moving away from the observer until the line of sight is interrupted by macro-relief again. At this instance, the range between the observer and target is recorded. In addition, the ranges between the observer and the line of sight intersections with grid crossings are recorded. These distances are needed to form an approximation of the actual surface between the observer and target. In short the simulation obtains data to approximate the surface distance by pinpointing the target's exact location (in a forward and backward manner) at the instant of line of sight obstruction.

The surface distance approximation is required because LOSVEG projects all lines of sight onto a grid plane of zero altitude, and computes all distances on this plane. Naturally, for extremely undulating relief, the linear range computed would be a poor approximation of the actual surface distance measured at Hunter Liggett. Figure 8.6 illustrates the estimation procedure. The distance between two successive grid crossings is computed. This is done for the C^{th} grid line by subtracting D(C) from D(C+1). The elevations at points where the line of sight intersect the two grid crossings are computed also (ZZZ(C+1), and ZZZ(C)). The difference in elevation at these two points can be computed by subtracting ZZZ(C) from ZZZ(C+1). The surface distance from the C^{th} line is the length of the hypotenuse of the right triangle having sides $|D(C+1)-D(C)|$ and $|ZZZ(C+1)-ZZZ(C)|$. The estimation procedure is repeated for all grid squares having intersections with the line of sight; the results are summed to produce the surface distance from observer to target.

8.4.2 A Measure for Evaluating Validity

A comparison is made between the actual surface distance measured in the field and the estimated surface distance produced by the simulation. The absolute value of the difference between the actual and simulated surface distances is computed. This difference provides a measure for evaluating the credibility of:

1) the line of sight calculations and
2) the mathematical representation of macro-relief.

Specifically, a difference that approaches zero indicates that the simulation is producing reasonable results. However, a very small difference, or a difference of zero should not be interpreted as evidence of complete validity. It merely reflects that the line of sight algorithm, and the mathematical model for relief give reasonable estimates of the true situation.

8.4.3 Error Adjustments

Recall that the raw data from the field experiments was subject to four basic types of error. One such error involved inaccuracies in pin-pointing the exact location of the observer on a topographical map. A pencil point on a map of scale 1:50000, can be in error by as much as 20 meters. Furthermore, the exact location of the target is in doubt, not only due to the uncertainties in the observer's location, but due to

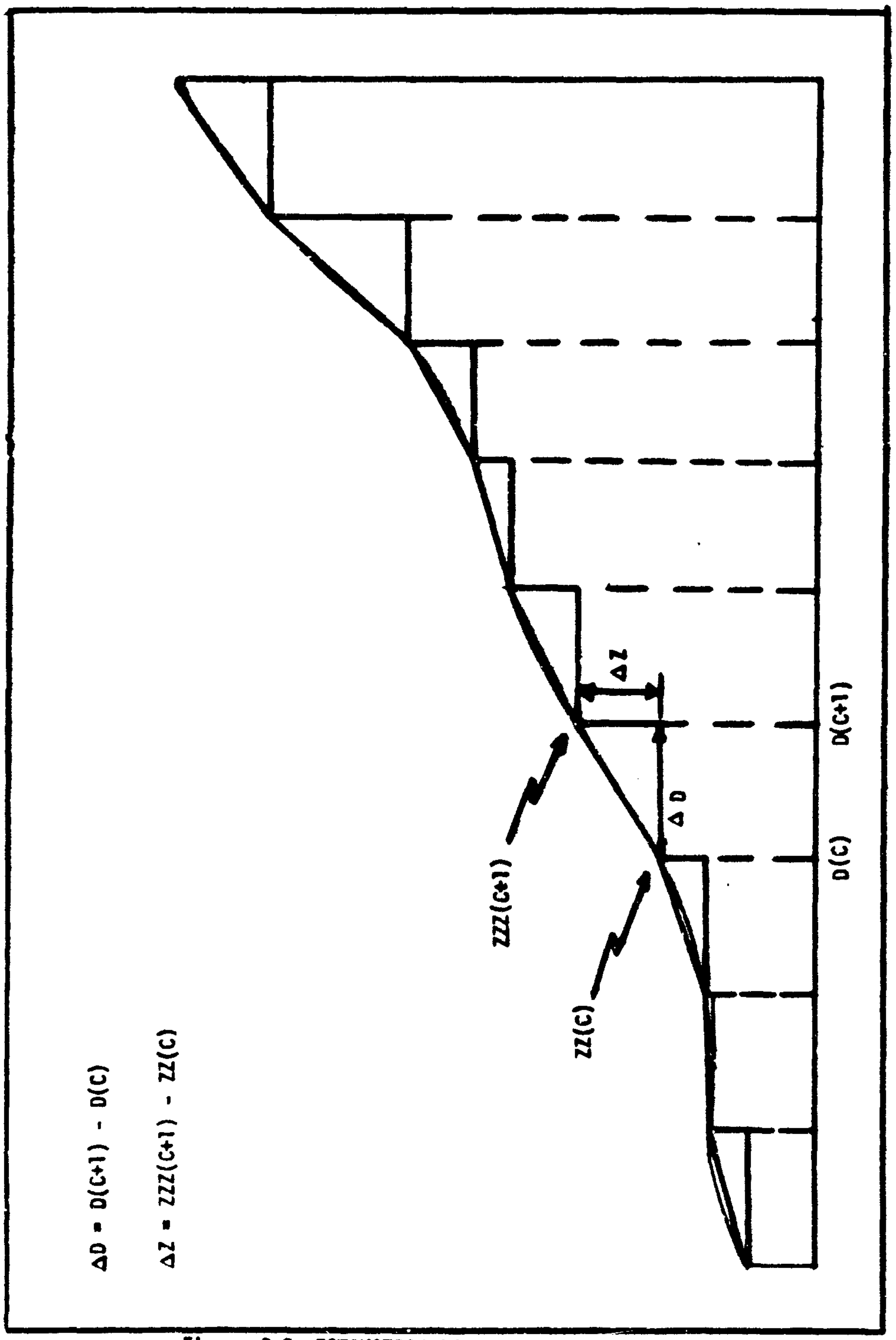

Figure 8.6 ESTIMATION OF SURFACE DISTANCE

compass errors. The computer simulation attempts to correct such errors by:

1) considering a set of observer locations; and
2) slightly perturbing the angle of direction which locates the target relative to the observer.

Instead of investigating one possible observer location, the simulation considers a set of possible locations. Thirty-six equally spaced points within a 12.7 by 12.7 square area are analyzed. Each point is 2.54 meters apart. Thus, the input for "observer location" is not given by a pair of coordinates denoting a single point; it is given by a small grid area enclosing the most likely observer location. See Figure 8.7. This technique removes the guesswork involved with measuring map coordinates (by hand with a ruler), and places more emphasis on locating the observer's position relative to his immediate macro-relief environment.

At every observer location at Hunter Liggett, line of sight data was gathered in several different directions. The recorded angle (relative to magnetic north), for a given direction will be designated the "base angle." This angle contains small uncertainties due to compass reading errors. The simulation attempts to eliminate these uncertainties by perturbing the base angle slightly (±1° and ±2°). Thus, five different line of sight determinations are performed for a given direction:

1) the base angle determination;
2) base angle +2°;
3) base angle +1°;
4) base angle -1°; and
5) base angle -2°.

In each case, the absolute value of the difference between actual and simulated surface distance is computed. The angle resulting in the smallest difference is chosen as the new "base angle" for that given direction. The same procedure is applied to each of the several other directions recorded at the experiment site.

In most instances, the simulation examined only three recorded directions at each experiment site. These three directions were chosen arbitrarily, but remained the same for each of the thirty-six points at

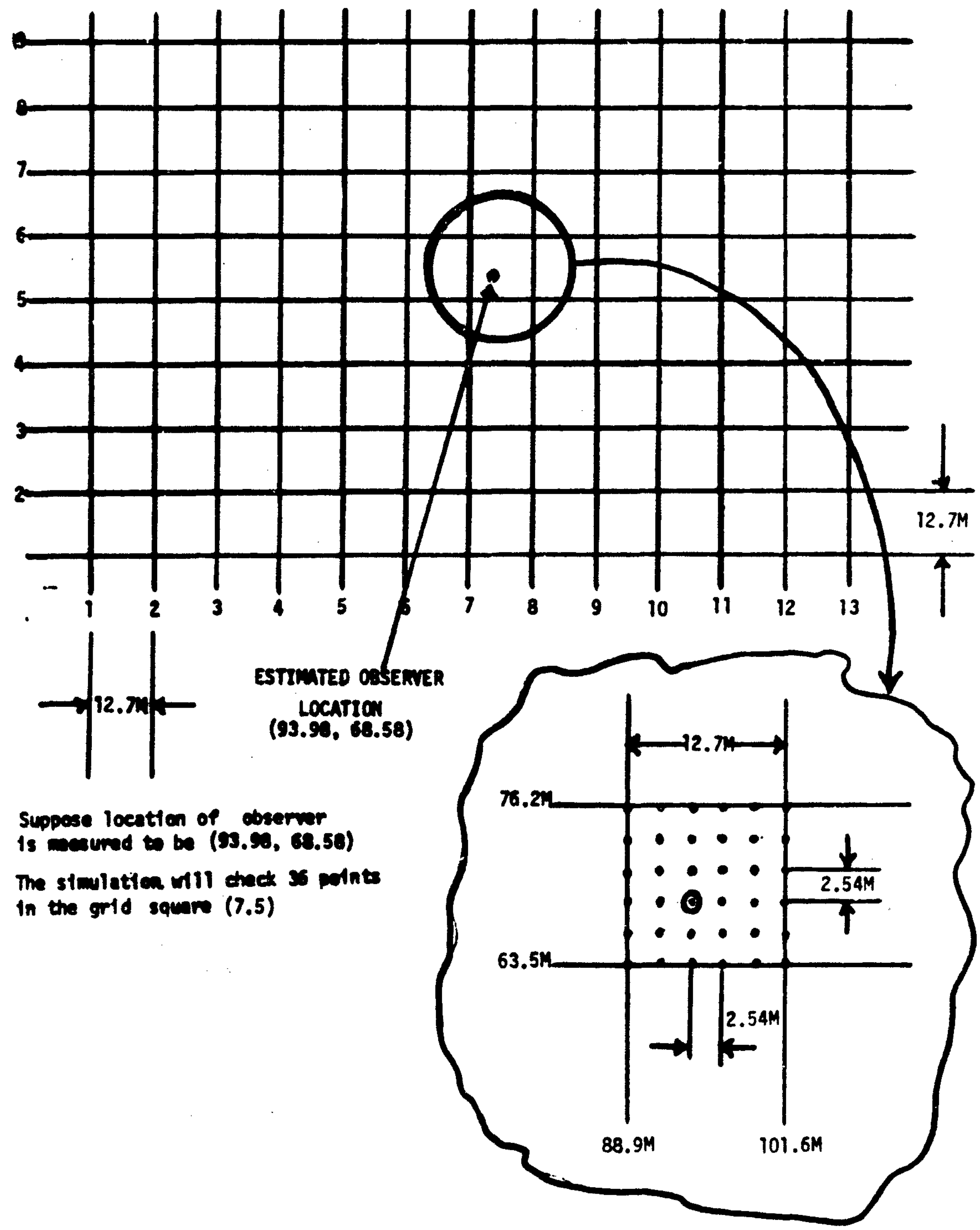

Figure 8.7 GRID OR OBSERVER LOCATION

a given location. Computer costs involved with examining more than three directions were prohibitive: the simulation considers thirty-six points. If three directions are examined, then fifteen line of sight experiments are performed (3x5). Thus there are 36x15=360 line of sight experiments performed for one location at Hunter Liggett.

8.4.4 Overall Measure of Validity

Recall that the absolute difference provided a measure of validity for a line of sight experiment conducted in one direction. But for each point, three different directions were analyzed. Thus a summary statistic, measuring the accuracy of line of sight calculations for all three directions, was needed.

The root mean square of the difference in each direction was chosen to measure the accuracy of all line of sight calculations at a given point. Specifically, the quantity measuring overall validity for line of sight calculations in all directions is given by:

$$\sqrt{\frac{\sum_{I=1}^{N} \{D_A(I)-D_C(I)\}^2}{N}}$$, where $D_A(I)$ is the actual

surface distance in the I^{th} direction, $D_C(I)$ is calculated surface distance in the I^{th} direction, and N is the number of directions analyzed (N=3 in this simulation). Thus every one of the thirty-six possible points under consideration has associated with it, a root mean square difference. This number reflects the accuracy of the simulation experiments at each of these points. The location of the point having the least root mean square difference is chosen to represent the actual position of the observer in the field experiement.

8.4.5 Simulation Using Different Resolutions

The simulations were conducted using three grid size resolutions. The initial simulation was done with elevation data available at grid points 12.7 meters apart. This was the finest resolution of elevation data available; hence this resolution was used to locate the actual positions of the observer at the experiment sites. Having established these locations, the simulation was performed using coarser resolution: elevation data points 25.4 and 50.8 meters apart respectively. The simulation procedure using cruder resolution is exactly the same as described above, except that it no longer examines the set of thirty-six possible points for an actual location (it uses the actual locations derived from the initial simulation, thus avoiding a great deal of processing).

8.5 ANALYSIS OF SIMULATION RESULTS.

The root mean square (of differences between actual and simulated surface distance in all line of sight directions examined for a given experiment site at Hunter Liggett) provides a measure for evaluating the validity of the line of sight routines and macro-relief representation. Figure 8.8 gives these measures for all nine Hunter Liggett experiment sites, at the various resolutions used in the simulation. Figure 8.9 presents the simulation results broken down into individual line of sight experiments. The overall root mean square difference is given on this figure also.

As Figure 8.8 indicates, the simulation performed under 12.7 meter resolution produce very credible results. The results using 25.4 and 50.8 meter resolution are credible, but not as sharp. The reason for this is that the line of sight interruption distances measured are relatively short (i.e., with respect to the length of the side of the grid squares). Many of the line of sight obstruction distances measured at Hunter Liggett were less than 100 meters in length. These short distances do not affect the simulation when the resolution is very fine (i.e., 12.7 meter resolution), but as the resolution becomes coarser, the simulation results are more inaccurate. It must be stressed that this happens only when simulation is attempted over very <u>short</u> lines of sight using very <u>coarse</u> resolution. The inaccuracies appear in the form of large root mean square differences. Coarse resolution should be used in line of sight determinations when the observer and target are over 200 meters away.

SITE	12.7 METERS RESOLUTION		25.4 METERS RESOLUTION		50.8 METERS RESOLUTION	
	ROOT MEAN SQUARE	PERCENT	ROOT MEAN SQUARE	PERCENT	ROOT MEAN SQUARE	PERCENT
1	5.9M	10.6	8.2M	42.7	67.8M	107.0
2	1.7M	3.3	18.6M	50.0	11.5M	43.0
3	1.6M	4.0	4.7M	40.6	*	100.
4	0.3M	0.5	4.7M	12.3	39.0M	107.2
5	2.1M	5.0	24.6M	82.8	38.9M	105.9
6	2.7M	4.6	10.0M	13.7	31.0M	52.8
7	8.1M	4.9	40.1M	25.9	67.7M	62.9
8	9.1M	9.7	16.0M	19.7	39.6M	71.8
9	3.0M	1.7	22.6M	12.1	48.1M	52.3

* UNLIMITED LINE OF SIGHT (i.e., TARGET HAS STEPPED OFF SO MANY INCREMENTS FROM OBSERVER THAT ELEVATION DATA IS NO LONGER AVAILABLE FOR LOS CALCULATIONS). FIGURE 8.10 ILLUSTRATES HOW THIS CAN HAPPEN.

FIGURE 8.8 ROOT MEAN SQUARE ERROR AT DIFFERENT RESOLUTIONS

SITE	RESOLUTION	DIRECTION 1 MEASURED DISTANCE	DIRECTION 1 ERROR	DIRECTION 2 MEASURED DISTANCE	DIRECTION 2 ERROR	DIRECTION 3 MEASURED DISTANCE	DIRECTION 3 ERROR	ROOT MEAN SQUARE
1	12.7	25.	1.8	71.	6.3	50.	7.8	5.9
	25.4		*		6.8		9.3	8.2
	50.8		*		25.3		92.	67.8
2	12.7	71.	1.9	65.	2.2	23.	-.9	1.7
	25.4		-8.2		25.		*	18.6
	50.8		-15.6		4.6		*	11.5
3	12.7	26.	.9	29.	-.4	36.	-2.6	1.6
	25.4		*		1.1		6.5	4.7
	50.8		*		*		*	*
4	12.7	36.	.0	29.	-.3	47.	.3	0.3
	25.4		-6.8		3.2		-3.0	4.7
	50.8		*		50.1		-23.0	39.0
5	12.7	27.	-3.6	28.	.0	42.5	.7	2.1
	25.4		*		30.6		-16.6	24.6
	50.8		*		55.		9.0	38.9

*Unlimited Line of Sight (i.e., target has stepped off so many increments from observer that elevation data is no longer available for LOS calculations). Figure 8.10 illustrates how this can happen.

Error = $D_C(I)-D_A(I)$ where $D_C(I)$ is the calculated surface distance in the I^{th} direction and $D_A(I)$ is the actual measured surface distance in the I^{th} direction.

Figure 8.9, Detailed Simulation Results (Sheet 1)
(ALL MEASUREMENTS IN METERS)

SITE	RESOLUTION	DIRECTION 1 MEASURED DISTANCE	DIRECTION 1 ERROR	DIRECTION 2 MEASURED DISTANCE	DIRECTION 2 ERROR	DIRECTION 3 MEASURED DISTANCE	DIRECTION 3 ERROR	ROOT MEAN SQUARE
6	12.7	61.	-1.8	61.	-3.7	49.	-2.4	2.7
	25.4		-14.5		-9.3		1.0	10.0
	50.8		-33.5		-35.8		-21.9	31.0
7	12.7	145.	11.8	145.	5.3	172.	-6.2	8.1
	25.4		30.0		50.8		27.0	40.1
	50.8		43.3		86.4		*	67.7
8	12.7	67.	-10.6	88.	-11.8	57.	.0	9.1
	25.4		-10.1		-24.0		9.5	16.0
	50.8		*		38.0		41.2	39.6
9	12.7	130.	.6	118.	5.1	152.	.5	3.0
	25.4		-12.9		-1.1		40.	22.6
	50.8		-67.4		9.8		*	48.1

*Unlimited line of sight (i.e., target has stepped off so many increments from observer that elevation data is no longer available for LOS calculations). Figure 8.10 illustrates how this can happen.

Error = $D_C(I)-D_A(I)$ where $D_C(I)$ is the calculated surface distance in the I^{th} direction and $D_A(I)$ is the actual measured surface distance in the I^{th} direction.

Figure 8.9, Detailed Simulation Results (Sheet 2)

(ALL MEASUREMENTS IN METERS)

Figure 8.10 demonstrates what can happen when line of sight calculations are conducted over a short distance using various resolutions. An observer and target, both of height 1.8 meters, stand 12 meters apart. Macro-relief described with 12.7 meter resolution indicates a line of sight interruption at approximately 6.7 meters from the observer. However, no such line of sight interruption occurs when describing macro-relief with 25.4 or 50.8 meter resolution. The figure shows that the hump at about 6.7 meters from the observer is not modeled when describing macro-relief using the cruder resolutions. This explains why some of the root mean square differences are so large when the simulation was run using 25.4 and 50.8 resolution (recall that the target keeps moving away from the observer until a verdict of obstruction is given).

The simulation results particularly those obtained when using the 12.7 meter resolution demonstrate that the SIAF line of sight routine and the SIAF representation of macro-relief are "reasonable". Furthermore, line of sight calculations are sensitive to resolution when the distance between observer and target is small (i.e., less than 100 meters). For the reason, the SIAF concept of switching resolution (using less resolution in the Reconnaissance Mode when long distances are involved; and finer resolution in the Combat Mode when shorter distances are involed, and more detailed computation are required) appears well founded.

8.6 SUMMARY

Line of sight data was collected at nine different locations at the Hunter Liggett Military Reservation. At each location, line of sight experiments were conducted in several different directions. Inherent errors in compass reading and in locating positions on a topographical map required the simulation to consider a set of possible locations and to vary the directions between observer and target. The initial simulation examines a set of thirty-six equally spaced (2.54 meters apart) points enclosed in a 12.7 by 12.7 meter grid square. Each of the thirty-six points are analyzed as follows. Three arbitrary experimental directions were chosen. Each direction is perturbed by $\pm 1°$ and $\pm 2°$, so that five line of sight verdicts are obtained. The verdict which offers the minimum

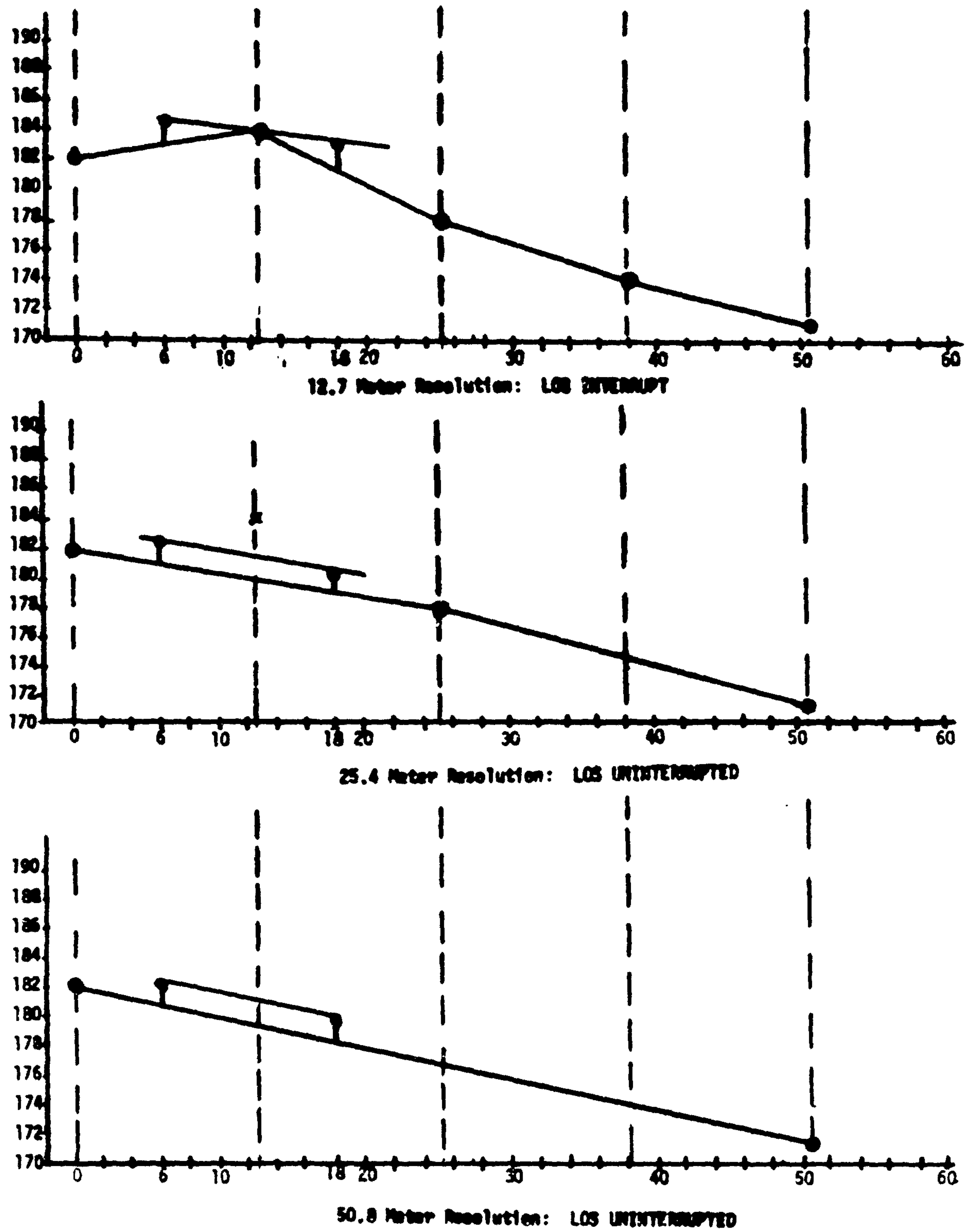

Figure 8.10 LOS VERDICT USING DIFFERENT RESOLUTIONS

difference between actual and computed surface distance determines the base angle for that direction. Thus each direction has associated with it, a measure of how accurate the simulation was. The root mean square of these individual differences gives an over measure of how accurate the simulation of the field experiment was at that point. The root mean square difference is given by:

$$\sqrt{\frac{\sum_{I=1}^{N} \{D_A(I)-D_C(I)\}^2}{N}}$$

where $D_A(I)$ is the actual surface distance, $D_C(I)$ is the computed surface distance, and N is the number of directions analyzed.

The initial simulation examines thirty-six possible points for a given experiment location, thus producing thirty-six root mean square differences. The location of the point having smallest root mean square is considered the site where the line of sight experiment actually took place. All nine experiment sites at Hunter Liggett were determined by the above procedure.

The simulation was repeated using resolutions of 25.4 and 50.8 meters. The same procedure was applied, except the observer positions are inputted (from initial simulation) instead of calculated.

The results of the simulation demonstrate that the SIAF line of sight calculations and the SIAF model of macro-relief are valid. Also, when the distance between observer and target is small (i.e., less than 100 meters), the line of sight calculations are dependent on resolution.

8.7 COMPARISON WITH ASARS BATTLE MODEL

Macro-relief models usually employ a grid square concept in which elevation data is known at four corners of each grid. The elevation at points lying between these data points are represented by an interpolated value using the known data points. Different methods are used to obtain these interpolated values. As mentioned before, the STAF model uses a continuous surface representation within a grid square based on the four surrounding grid points. A less complex method uses two intersecting triangular planes within a grid square to obtain interpolated values. This scheme is used in the ASARS model. The simulation experiment was done utilizing both representations of macro-relief; the results were compared.

8.7.1 ASARS Methodology

ASARS macro-relief is modeled by specifying two triangular planes within a grid square. The planes are defined by specifying a diagonal within the grid square (a positive diagonal if it connects the lower left corner with the upper right corner; a negative diagonal if it connects the upper left corner with the lower right corner). The orientation of the diagonal is the same for all grid squares under consideration. Positive diagonals were used in the simulation.

The line of sight subroutine in the ASARS model is basically a series of comparisons. The line of sight between the observer and the target is projected onto a grid plane (of zero altitude) and partitioned into a set of segments. The endpoints of these segments are defined by the intersection of the line of sight with horizontal and vertical grid crossings and with diagonals. Initially, the horizontal distance between observer and target, and the vertical difference in elevation between the top of the observer and the top of the target are computed. These quantities are used to compute the tangent of the angle subtended by the line of sight and a horizontal line parallel to the grid plane at the top of the observer. This tangent value is designated "TANLIM".

The line of sight routine proceeds as follows: the elevation of the ground surface at an endpoint of a segment is referenced. The horizontal range from the observer to the endpoint is computed. These quantities are used to compute the tangent of the angle subtended by the line extending from the top of the observer to the ground surface at that endpoint, and the horizontal line parallel to the grid plane at the observer's height. Call this quantity "TAN". Figure 8.12 illustrates the above procedure. A comparison is made between TANLIM and TAN, to determine the line of sight verdict: If TAN is greater than or equal to TANLIM, the line of sight is interrupted at that endpoint. Otherwise, the line of sight exists and the

SITE	RESOLUTION	DIRECTION 1 MEAS. DIST.	DIRECTION 1 SIAF ERROR	DIRECTION 1 ASARS ERROR	DIRECTION 2 MEAS. DIST.	DIRECTION 2 SIAF ERROR	DIRECTION 2 ASARS ERROR	DIRECTION 3 MEAS.	DIRECTION 3 SIAF ERROR	DIRECTION 3 ASARS ERROR	SIAF R.M.S.	ASARS R.M.S.
1	12.7	25.	1.8	1.4	71.	6.3	5.3	50.	7.8	*	5.9	3.9
	25.4		*	*		6.8	*		9.3	94.9	8.2	94.9
	50.8		*	*		26.3	*		92.	189.2	67.8	189.2
2	12.7	71.	1.9	.9	65.	2.2	-2.7	23.	-.9	1.6	1.7	1.9
	25.4		-8.2	-3.0		25.	-172.0		*	*	18.6	121.8
	50.8		-15.6	175.3		4.5	171.0		*	*	11.5	173.2
3	12.7	26.	.9	15.	29.	-.4	5.8	36.	-2.6	9.8	1.6	10.9
	25.4		*	131.6		1.1	*		6.5	*	4.7	131.6
	50.8		*	69.7		*	*		*	*	*	69.7
4	12.7	35.	.0	7.0	29.	-.3	-6.1	47.	.3	.5	.3	5.4
	25.4		-6.8	182.7		3.2	201.4		-3.0	179.1	4.7	188.0
	50.8		*	*		50.1	201.5		-23.0	178.4	39.0	190.3
5	12.7	27.	-3.6	-2.4	28.	.0	-4.7	42.5	.7	-10.2	2.1	6.6
	25.4		*	*		30.6	*		-16.6	*	24.6	131.6
	50.8		*	*		55.	104.8		9.0	170.7	38.9	141.6

* UNLIMITED LINE OF SIGHT (i.e., TARGET HAS STEPPED OFF SO MANY INCREMENTS FROM OBSERVER THAT ELEVATION DATA IS NO LONGER AVAILABLE FOR LOS CALCULATIONS). FIGURE 8.10 ILLUSTRATES HOW THIS CAN HAPPEN.

ERROR = $D_C(I) - D_A(I)$ WHERE $D_C(I)$ IS THE CALCULATED SURFACE DISTANCE IN THE I^{TH} DIRECTION AND $D_A(I)$ IS THE ACTUAL MEASURED SURFACE DISTANCE IN THE I^{TH} DIRECTION.

FIGURE 8.11 SIAF AND ASARS SIMULATION RESULTS (SHEET 1)
(ALL MEASUREMENTS IN METERS)

SITE	RESOLUTION	DIRECTION 1 MEAS. DIST.	DIRECTION 1 SIAF ERROR	DIRECTION 1 ASARS ERROR	DIRECTION 2 MEAS. DIST.	DIRECTION 2 SIAF ERROR	DIRECTION 2 ASARS ERROR	DIRECTION 3 MEAS. DIST.	DIRECTION 3 SIAF ERROR	DIRECTION 3 ASARS ERROR	SIAF R.M.S	ASARS R.M.S
6	12.7	61.	-1.8	-8.7	61.	-3.7	-25.6	49.	-2.4	-23.0	2.7	20.6
	25.4		-14.5	32.5		-9.3	31.1		1.0	98.9	10.0	62.7
	50.8		-33.5	89.3		-35.8	160.7		-21.9	*	31.0	130.
7	12.7	166.	11.8	-35.7	146.	5.3	-37.3	172.	-5.2	*	8.1	36.5
	25.4		39.0	112.9		50.8	20.9		27.0	26.7	40.1	68.1
	50.8		43.3	86.2		85.4	66.4		*	29.2	67.7	65.0
8	12.7	67.	-10.5	2.5	80.	-11.8	15.5	57.	.0	*	9.1	11.1
	25.4		-10.1	21.9		-24.0	.9		9.5	64.2	16.0	39.2
	50.8		*	146.1		38.0	80.0		41.2	122.7	39.6	120.
9	12.7	139.	.6	50.	118.	5.1	*	152.	.5	-61.0	3.0	55.7
	25.4		-12.9	130.3		-1.1	143.4		40.	*	22.6	137.0
	50.8		-67.4	212.		9.8	144.3		*	*	48.1	181.3

* UNLIMITED LINE OF SIGHT (i.e., TARGET HAS STEPPED OFF SO MANY INCREMENTS FROM OBSERVER THAT ELEVATION DATA IS NO LONGER AVAILABLE FOR LOS CALCULATIONS). FIGURE 8.10 ILLUSTRATES HOW THIS CAN HAPPEN.

ERROR = $D_C(U) - D_A(I)$ WHERE $D_C(I)$ IS THE CALCULATED SURFACE DISTANCE IN THE I^{TH} DIRECTION AND $D_A(I)$ IS THE ACTUAL MEASURED SURFACE DISTANCE IN THE I^{TH} DIRECTION

FIGURE 8.11 SIAF AND ASARS SIMULATION RESULTS (SHEET 2)

(ALL MEASUREMENTS IN METERS)

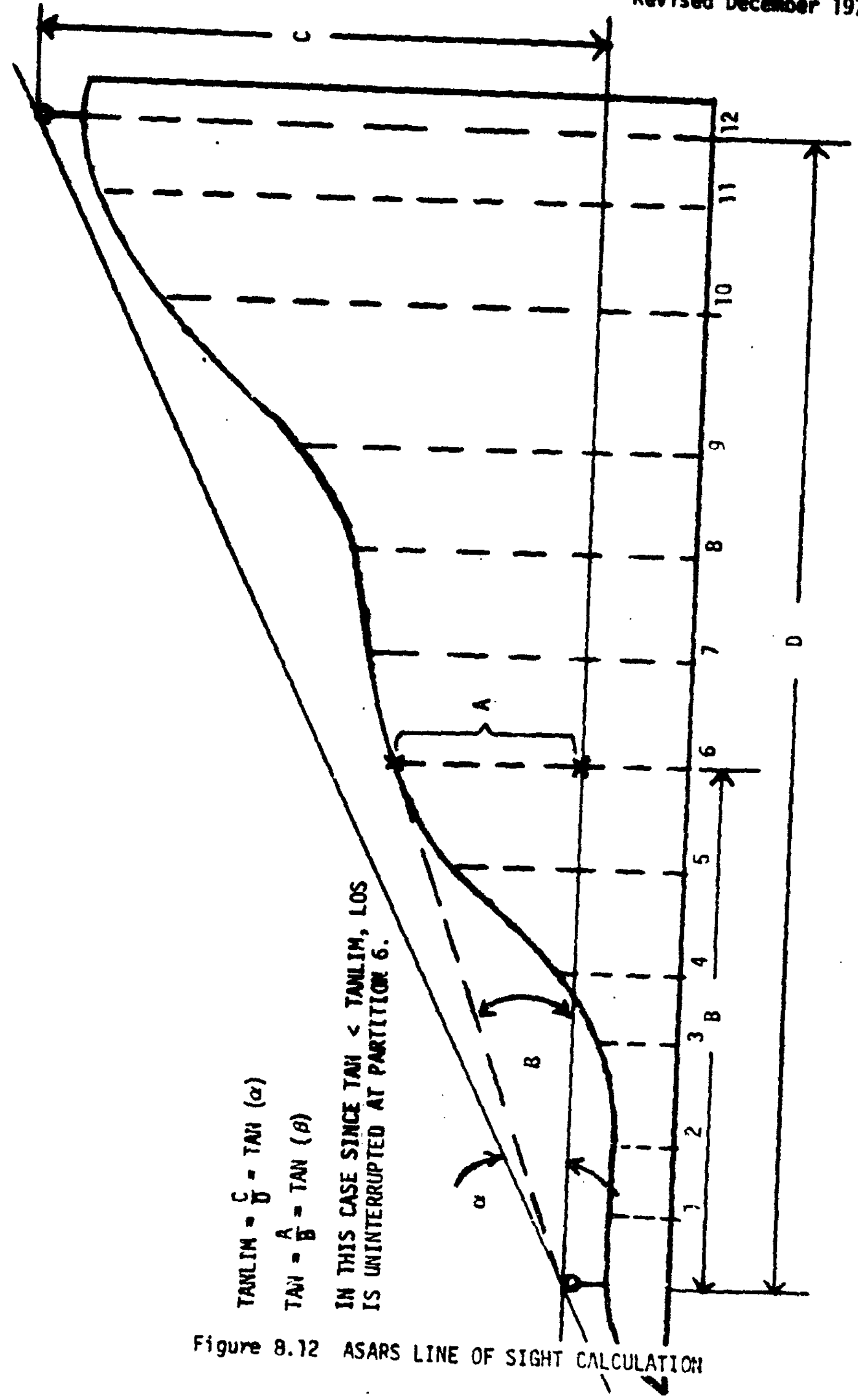

Figure 8.12 ASARS LINE OF SIGHT CALCULATION

procedure is repeated at the next endpoint.

The above procedure starts at the observer position and continues toward the target, until line of sight interruption occurs. If no interruption occurs, the fraction of target height covered by intervening macro-relief is computed.

The ASARS method of representing macro-relief along with the ASARS line of sight routine were inserted into the simulation program. Appropriate minor modifications in the simulation program were made to accommodate the change. Otherwise, the exact methodology used in the SIAF macro-relief simulation was followed for the ASARS simulation.

8.7.2 Comparison

The simulation results using the ASARS macro-relief model did not compare as well as those of the SIAF simulation. The ASARS simulation produced credible results at 12.7 meters resolution. As figure 8.11 indicates, the SIAF results at this resolution were generally better than those returned by the ASARS method (though in some instances the ASARS method gave better approximations). At coarser resolutions (25.4 and 50.8 meters), the SIAF results were significantly better. In almost every instance, the SIAF simulation gave smaller errors, and thus smaller root mean square differences. Also, the ASARS simulation produced more instances where erroneous "unlimited" lines of sight were given (see figure 8.10 for explanation).

The large root mean square differences at the coarser resolutions may be attributed to the less accurate scheme for approximating macro-relief. Intepolated values in the SIAF model use data from all four surrounding grid points, whereas the ASARS model use only three of the four data points available. In addition, the ASARS relief model has the disadvantage that the choice of which grid square diagonal to use in forming the two triangular planes must be held constant throughout the entire gridded area under consideration. This disadvantage results in a loss of realism (this method does not give a unique representation of relief). A situation depicted in figure 8.13 illustrates this disadvantage. In both case 1 and case 2, the same set of four data points is input. Suppose case 2 is the desired approximation (ridge), but because positive diagonals (lower left corner to upper right corner) was the established choice of diagonal orientation, we

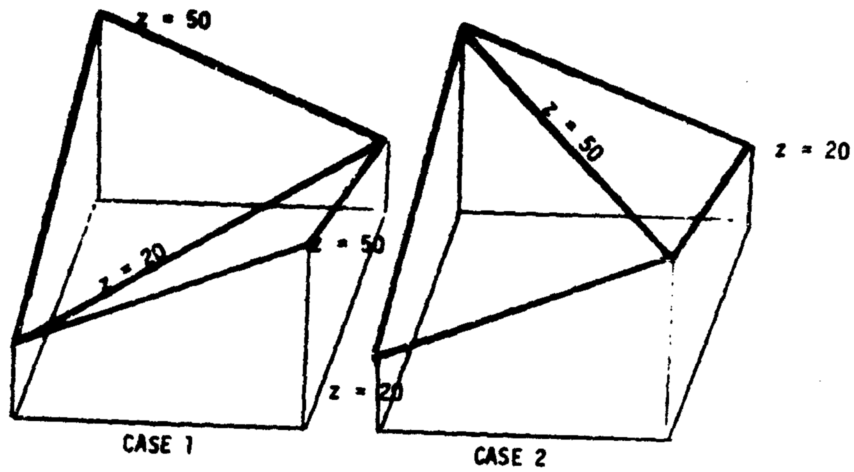

Figure 8.13 Non-Unique Terrain Surface Representation

obtained an inaccurate representation (ravine). Clearly, the two surfaces resulting are quite different depending on the choice of diagonals. Thus, in comparison, it appears that the two-triangular-plane method of ASARS requires a smaller grid size to represent macro-relief to the same resolution as the four-point continuous surface scheme of SIAF.

9.0 REFERENCES

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2. "Training for SIAF, Program Description Number 1: Land Navigation," HumRRO Division 4.

3. Army Map Sheets, Numbers 1755 IV NE, 1755 I NW, 1755 IV SE, and 1755 I SW, for Alder Peak, California, 1:25,000.

4. TRW Systems Group, "SIAF Model Development, Validation, and Implementation Final Report," 16905-6012-R0-00.

APPENDICES

Included herein are Appendix A, Block Data Generator Program and Appendix B, Specification Statement Punch Program (SPECPN) User's Guide.

These Appendices describe two computer programs which were originally written for the IBM 7094. These programs have recently been modified to run on the IBM 360, and in the process an additional change has been made.

The main external difference in the programs is that BLKGEN no longer punches a BLOCK DATA subprogram which must be input to SPECPN. The necessary information is written on tape and is read back directly into the necessary COMMON blocks for SPECPN. This eliminates the need for two separate passes through the machine, since the two programs can be run as one single program. They can, however, be run as separate phases if necessary, using a previously generated tape as input to SPECPN.

The conversion to the 360 was handled in this manner for several reasons:

1. It eliminated the need for unnecessary card handling associated with a punched BLOCK DATA.
2. It eliminated the need for two separate passes through the machine, since there is no need to compile a BLOCK DATA subprogram, and thus improved turnaround.
3. It improved the running time of the program by eliminating the punching of the BLOCK DATA.

The inputs to both BLKGEN and SPECPN remain unchanged from those described in Appendix A and Appendix B. The 360 version can thus be run using existing decks with no modifications. However, since the programs have been combined utilizing a short driver, an additional control card is necessary to specify whether BLKGEN, SPECPN, or both are to be executed. This control card must precede all other data. Card column 1 is punched non-zero if it is desired to execute BLKGEN; card column 2 is punched non-zero if it is desired to execute SPECPN.

The appropriate column is punched zero or left blank if it is desired to skip execution of either program. The standard input decks follow this card, with no separation between BLKGEN and SPECPN inputs, if both are being run. The output will be identical to that of the 7094 version, with the exception of a punched BLOCK DATA.

APPENDIX A

BLOCK DATA GENERATOR PROGRAM
(BLKGEN)
User's Guide

I. History:

Because many large programs use COMMON quite extensively, it has become a common practice to set up all the variables of a program, equate them to blocks, and put all the blocks in a COMMON array. In order to use the variables in a subroutine, one would have to write COMMON, DIMENSION, and EQUIVALENCE cards for each variable. It soon became apparent that it would be desirable to be able to generate these COMMON, DIMENSION, and EQUIVALENCE statements by some external means. The Specification Statement Punch Program (SPECPN)[1] fulfills this desirability, but it requires a rather complicated BLOCK DATA sub-program to be written by the user to describe all the variables in COMMON.

The BLKGEN program was written to generate this BLOCK DATA sub-program from input cards which are easily written and changed. The combination of the BLKGEN and SPECPN programs allow an easy way to create and update a master COMMON of blocks and variables. By using these two programs, it should be fairly easy for one to generate the COMMON, DIMENSION, and EQUIVALENCE cards for each subroutine.

II. Usage:

For a picture of the organisation and the usage of the BLKGEN and SPECPN programs, look at Section V. It can be seen that the usage of the two programs requires two passes on the computer. On the first pass, the master input cards are input to the BLKGEN program. The output of the BLKGEN program is the BLOCK DATA sub-program punched on cards. The BLOCK DATA sub-program is input with the variable names for each subroutine to the SPECPN program on the second pass. The second pass output are the COMMON, DIMENSION, and EQUIVALENCE cards which are directly placed into the respective subroutines.

Since the specific usage of the SPECPN program is given in the SPECPN User's Guide, the only additional required information is the format of the input cards to the BLKGEN program. There are nine different cards accepted as input to the BLKGEN program, and each is described below:

1. IDENT Card:

The IDENT card is always the first card input to a run. The word IDENT starts in c.c. 1 and the number of cards that are to follow the IDENT card to describe the job is punched in c.c. 30. If c.c. 30 contains a 3, then there are three cards which contain information describing a run.

Example:

c.c. 1	c.c. 30
IDENT	1

THIS IS A SAMPLE RUN

The information punched on the card(s) following IDENT appears as comments in the BLOCK DATA program generated by BLKGEN. Columns 1 - 71 may be used for the comments cards.

2. PROGRAMMER Card:

The PROGRAMMER card simply contains identification information concerning the programmer, and it is always the second control card in a run following IDENT and the comment cards specified by IDENT. The word PROGRAMMER starts in c.c. 1, and the programmer's name follows immediately after (one space is skipped). Up to 24 characters may be used for the PROGRAMMER name.

Example:

c.c. 1	c.c. 12
PROGRAMMER	J. Gerry Purdy

3. DATE Card:

The DATE card must always be the third control card in any run. The word DATE starts in c.c. 1, followed by a blank, followed by the date.

Example:

c.c. 1	c.c. 7
DATE	November, 1966

Following the IDENT, PROGRAMMER, and DATE control cards are the cards which actually describe the COMMON blocks of the user's program. Each COMMON block is described separately in the following way:

a) The actual cards which define the COMMON block of interest are presented to BLKCEN.

b) Each master variable name of interest from the above defined COMMON block is denoted followed by a series of control cards identifying the variables within the master variable, their dimension, and their relative position within the block.

c) After all master variables have been described a signal is given (ENDCOM) and the next COMMON block is defined. Following the last COMMON block definition a signal is given (ENDJOB) terminating the job. Each control card will now be described.

4. COMMON Card:

The COMMON control card must be the first card of each COMMON set. The number of cards that are to follow is placed in c.c. 30. What follows is the card or cards which define the COMMON block exactly as they would be punched for the user's program.

Example:

c.c. 1	c.c. 30
COMMON	2

COMMON/VSTR/BLK(50), B(6), ~~10(36)~~

In this example, cards are used to define the COMMON block VSTR. BLKGEN constructs a card image of these COMMON statements and places it in the FMT array in the output BLOCK DATA cards for processing by SPECPN.

Only 1 COMMON block name (e.g. VSTR) may be defined per use of COMMON. Subsequent COMMON entries would be used if the user has more than 1 COMMON block in his program. Blank or labeled COMMON blocks are acceptable. A maximum of 9 cards may be used for each COMMON block definition.

5. <u>M Card</u>:

The M card identifies the block name under the current COMMON. The M is placed in c.c. 1, the block name (up to 6 characters) starts in c.c. 10, and the description of the block (up to 24 characters) starts in c.c. 40.

Example:

c.c. 1	c.c. 10	c.c. 40
M	BLK1	FLOATING CONSTANTS

Sets of M and subsequent V cards may be repeated for each block in the current COMMON. The order in which the blocks are processed from the COMMON cards is arbitrary and the descriptions given starting in c.c. 40 are optional.

6. <u>V Card:</u>

The V card is the variable card and contains information about the variable which is contained within the current block. The V is in c.c. 1, the variable name (up to 6 characters) starts in c.c. 10, the dimension, if any, <u>ends</u> in c.c. 30, and the description of the variable (up to 24 characters) starts in c.c. 40, (optional). Singly dimensioned variables are indicated by placing a "1" or blank in c.c. 30.

Example:

c.c. 1	c.c. 10	c.c. 30	c.c. 40
V	CGMR	10	GM RATIO OF E, M, S, V, M, S, J, TO EARTH

7. JUMP Card:

The JUMP card allows spaces to be skipped in the current block for perhaps future expansion. The word JUMP begins in c.c. 1 and the number of spaces to be skipped ends in c.c. 30.

Example:

c.c. 1	c.c. 30
JUMP	20

The above card would cause a "hole" of 20 cells to be made in the current COMMON block.

8. ENDCOM Card:

The ENDCOM Card is simply a signal to the program that the current COMMON block is finished. The ENDCOM starts in c.c. 1.

Example:

c.c. 1

ENDCOM

Following the ENDCOM card is either a new COMMON card or the ENDJOB card.

9. ENDJOB Card:

The ENDJOB card is simply a signal to the program that the inputs are finished. It is always the last card in a job.

Example:

c.c. 1

ENDJOB

III. Sample Inputs:

On the following pages is a listing of a sample set of input cards to the BLKGEN program. No labeled COMMON was used in this case, although both labeled and blank COMMON will work.

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
WS	202				COMMB3
WT	232	4			MISCB1
WT	203				COMMB3
WV	201				COMMB3
W1	44				DLOGBL
W2	45				DLOGBL
W	538	16,4			DATABB
XBAR	1401				LINSIG
XBASE	1				USIB08
XAMR	21				COMMB5
XAVODD	80				MISCB2
XAVOID	81				MISCB2
XDEFOP	77				DLOGBL
XDEPL	48				DLOGBL
XEE	283				MISCB2
XB	205	5,20			COMMB3
XDYNOL	333	10			COMMB3
XDYN	82	200			MISCB2
XENG	56				DLOGBL
XE	282				MISCB2
XICIR	49				DLOGBL
XGOAL	1	20			TARINT
XLP	609	16			DATABB
XPAKWT	242				MISCB1
XOB	1402	1000			LINSIG
XLZ	305	5			COMMB3
XOP	50				DLOGBL
XPLAN	1	100,5			USTARS
XPPTT	285				MISCB2
XPPT	284				MISCB2
XTAR2	8	20			OBSTAB
XTAR	312	20			COMMB3
XTAU	7				OBSTAB
XP2	240				MISCB1
XP3	241				MISCB1
XSIAF	28				OBSTAB
XSIG	6				OBSTAB

Figure 7-2. Cross-reference of Common Variables (Sheet 15)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
XSP	51				DLOGBL
XSV	286				MISCB2
XS	310				COMMB3
XT	311				COMMB3
X1FREN	3				USIB08
XZ	332				COMMB3
X2FREN	4				USIB08
YBAR	2402				LINSIG
YBASE	2				USIB08
YAVODD	287				MISCB2
YAVOID	288				MISCB2
YDEFOP	78				DLOGBL
YDEPL	52				DLOGBL
YB	343	5,20			COMMB3
YEE	490				MISCB2
YDYNOL	471	10			COMMB3
YDYN	289	200			MISCB2
YENG	57				DLOGBL
YE	489				MISCB2
YICIR	53				DLOGBL
YGOAL	21	20			TARINT
YOB	2403	1000			LINSIG
YLZ	443	5			COMMB3
YOP	54				DLOGBL
YPPTT	492				MISCB2
YPPT	491				MISCB2
YTAR2	31	20			OBSTAB
YTAR	450	20			COMMB3
YTAU	30				OBSTAB
YSIAF	51				OBSTAB
YSIG	29				OBSTAB
YSP	55				DLOGBL
YSV	493				MISCB2
YS	448				COMMB3
YT	449				COMMB3
Y1FREN	5				USIB08
YZ	470				COMMB3

Figure 7-2. Cross-reference of Common Variables (Sheet 16)

COMMON VARIABLES IN ALPHABETICAL ORDER

VARIABLE NAME	COMMON PSN	DIMENSION SIZE	T	DEFINITION	BLOCK NAME
V2FREN	6				USIB08
ZDEPL	58				DLOGBL
ZENG	59				DLOGBL
ZETA	60				DLOGBL
ZTAU	53				OBSTAB
ZSIG	52				OBSTAB
ZZ	481				COMMB3

Figure 7-2. Cross-reference of Common Variables (Sheet 17)

OVERLAY [illegible]

[illegible] IN	[illegible]
	[illegible]
[illegible] IP	NORM
[illegible] IN	OUTSID
[illegible]	PC[illegible]NCL
[illegible]TERR	PCOVER
ELEV	PODS
FIRATE	PEOTN
FIREOP	RANDU
F[illegible]	REACT
[illegible]WRITE	RERT
[illegible]INOBS	TERCON
[illegible]VEG	TIME
[illegible]SOL	VEGCON
[illegible]GEN	BTFK
MITCON	

206,066 Octal Words

[illegible]	OVERLAY(2,0)	OVERLAY(3,0)		OVERLAY(4,0)	OVERLAY(5,0)	OVERLAY(6,0)	OVERLAY(7,0)	OVERLAY(8,0)
[illegible]	OLSUB2	OLSUB3	ICOR[illegible]	OLSUB4	OLSUB5	OLSUB6	OLSUB7	OLSUB10
[illegible]	C[illegible]	AURAL	ICL[illegible]	COMSET	CCO	ARAS	[illegible]	CMREAD
[illegible]	FFSMIN	DETAF	ICMSG	DROUTE	OLOGIC	ARPT1	BREAK	PACKIN
[illegible]	[illegible]	DETECT	ICRAD	FFSTIM	OLOG1	[illegible]	[illegible]	RCREAD
[illegible]	[illegible]ERT	DISCHK	INTERP	FORMST	OLOG2	ERX	EFCAS	
[illegible]	[illegible]PCK	DTRCFR	LOGI[illegible]	IRAIN	OLOG3	FALOC	FIPINT	
[illegible]	[illegible]	EFS	MINES	MOVDRV	OLOG4	LETH	FRCVCN	
[illegible]	[illegible]ORM	EXC[illegible]	MOVE[illegible]	MOVPLN	OLOG5	NEXTC	MISGO	
[illegible]	[illegible]	[illegible]RML	NTRPOL	MVRATE	OLOG6	OBJ	POSTUR	
[illegible]	FRNSCAL	FRENEL	[illegible]	SLOPE	OLOG7	[illegible]	[illegible]	
	REF[illegible]N	FRFP	[illegible]	WETHR	OLOG8	PK[illegible]	[illegible]ER	
	TARGEN	F6	TARGEL		OLOG9	PTPTPK	[illegible]SUB[illegible]	
	TARMOV	F[illegible]	THCLL		OLOG10	[illegible]		
		[illegible]	TMDRVR		OLOG11	S1		
		IC	TW[illegible]DIM		F			
		ICA[illegible]R	VISUAL		OLOGIC			
					OLOG04			
					OLOG06			
					OLOG07			
					OLOG08			
					OLOG09			
					OLOG10			
224,303	216,346	222,512		225,446	216,660	225,407	213,501	231,675

Figure 7.3. Overlay Structure (1 Page)

```
      THIS [illegible] PROGRAM TO GENERATE COMMON,
      [illegible] DS FOR THE ISP PROGRAM.
PROGRAMMER  J. GERRY [illegible]
DATE  NOVEMBER, 1966
COMMON                       4
      COMMON        BLK1 ( 125), BLK2 (   50), BLK3 ( 100), BLK4 (  50)
     1, BLK5 (  50), BLK6 ( 200), BLK7 ( 200), BLK8 ( 500), BLK9 (  75)
     2, BLK10( 200), BLK11( 200), BLK12(  50), BLK13(  50), BLK14( 200)
     3, BLK15( 300)
M       BLK1                                   FLOATING POINT CONSTANTS
V       CAE                                    EQUATORIAL RADIUS OF EARTH
V       CBE                                    POLAR RADIUS OF EARTH
V       CELLIP                                 ELLIPTICITY OF EARTH
V       CMU                                    GRAVITATION CONSTANT OF EARTH
V       CWE                                    ROTATIONAL RATE OF EARTH
V       CGMR                  10               GM RATIO OF E,M,S,V,M,J,S TO EARTH
V       RCB                   10               RADIUS OF E,M,S,V,M,J,S TO EARTH
V       CERAU                                  EARTH RADII PER ASTRONOMICAL UNIT
V       CFTER                                  FEET PER EARTH RADII
V       CIN1                                   INITIAL CONDITION INPUT PER EARTH RADII
V       CIN2                                   INITIAL CONDITION TIME PER MINUTE
V       COUT1                                  TERMINAL CONDITION OUTPUT PER EARTH RADII
V       COUT2                                  TERM. COND. OUTPUT TIME PER MINUTE
V       CLIGHT                                 SPEED OF LIGHT
V       CNMER                                  NAUTICAL MILES PER EARTH RADII
V       CKMER                                  KILOMETERS PER EARTH RADII
V       CSOLC                                  SOLAR CONSTANT (WATTS/METER SQ.)
V       CDAYMN                12               DAYS PER MONTH IN NON-LEAP YEAR
V       CDEG                                   DEGREES PER RADIAN
V       CJD50                                  JULIAN DATE OF JANUARY 1, 1950
V       CPI2                                   PI/2
V       CPI                                    PI
V       C2PI                                   2*PI
V       CHMAX                                  MAXIMUM STEPSIZE FOR TRAJ
V       CHMIN                                  MINIMUM STEPSIZE FOR TRAJ
V       CYMIN                                  AUXILIARY PARAMETER FOR TRAJ
V       CTRM1                                  TERM USED TO CAL. RADIUS OF EARTH
V       CTRM2                                  TERM USED TO CAL. RADIUS OF EARTH
V       CER                                    ERROR BOUND FOR TRAJ
V       RASHE                                  IMPACT PARAMETER FOR TRAJ
```

V	CRASHM		MIN. TEST ALTITUDE FOR TRAJ
V	CFACT		(1.-CELLIP)
V	CFACT2		(1.-CELLIP)**2
V	ACRACY		DESIRED ACCURACY IN TOF
M	BLK2		FIXED POINT CONSTANTS
V	KOUT		SYSTEM OUTPUT UNIT
V	KIN		SYSTEM INPUT UNIT
V	KTRAJ		UNIT FOR TRAJECTORY OUTPUT
V	KTPEIN		UNIT FOR INPUT TAPE
V	KEPHEM		UNIT FOR EPHEMERIS TAPE
V	KERNO		FOR INTR2
V	IBFGEM	10	MASTER BODY FLAGS FOR E,M CENTER
V	IBFGS	10	MASTER BODY FLAGS FOR SUN CENTER
V	IBFGOB	10	MASTER BODY FLAGS FOR OTHER BODY CENTER
M	BLK3		FLOAT. PT. INPUTS
V	TEPOCH		EPOCH TIME (MIN. FROM 0 HOURS)
V	TJDATE		JULIAN DATE OF 0 HOURS EPOCH DAY
V	TALFAG		RT. ASCEN. OF GREEN., 0 HR. EPOCH DAY
V	DYEAR		EPOCH YEAR MINUS 1900
V	DMONTH		EPOCH MONTH NUMBER
V	DDAY		EPOCH DAY NUMBER
V	DHOUR		EPOCH HOUR
V	DMIN		EPOCH MINUTE
V	DSEC		EPOCH SECONDS AND FRACTIONS
V	DTYPE		TYPE OF INITIAL CONDITIONS INPUT
V	DBASE		DAYS SINCE JAN. 1, 1950 TO EPOCH DAY
V	TNOMX	6	CARTESIAN POS. AND VEL. AT EPOCH
V	TNOMP	6	POLAR POS. AND VEL. AT EPOCH
V	TICOND	10	INITIAL CONDITIONS INPUT
V	RANGLE		RT. ASC. OF ICONDS X AXIS
V	CDAD2M		CDA/2M (FT.**2/SLUG)
V	CK		DRAG VARIATION
V	CKSLCT		TYPE DRAG VAR. (=1 PER.,=2 SECULAR)
V	CDRAGM		DRAG ATMOS. MODEL
V	DAREA		AREA OF CRAFT FOR RAD. PRESSURE (M**2)
V	DMASS		MASS OF CRAFT FOR RAD. PRESS. (KILO.)
V	TSTEP		INITIAL STEPSIZE FOR INTEGRATION
V	COVAR	21	INPUT COVARIANCE MATRIX
V	POWFLT	10	POWERED FLIGHT INPUTS (ASPOF)
V	TRACE		FLAG TO SET UP TRACING THRU EXECUTION
V	BPRIM		FACTOR TO MULT. TOF FOR NEW ESTIMATE

M	[illegible]		FIXED POINT INPUTS
V	[illegible]		EQUINOX OF INPUT ICONDS
V	[illegible]		EQUINOX OF OUTPUT TRAJECTORY PRINT
V	ICB		INITIAL CENTRAL BODY
V	NITER		MAXIMUM NO. OF ITERATIONS
V	NDPR		NO. OF VARIATIONAL EQUATIONS
M	BLK5		MASTER POINTERS AND FLAGS
V	ISRCH		SEARCH FLAG, .NE. 0 IF SEARCH IS ON
V	IOVRID		OVER-RIDE FLAG, .NE. 0 TO PRINT ON SRCH.
V	IFIRST		FLAG SET IN SEGIN FOR 1ST TIME THRU SLECT
M	BLK6		WORKING STORAGE
V	CMUC		CURRENT MU
V	RCCB		RADIUS OF CURRENT CENTRAL BODY
V	TEMP	50	TEMPORARY STORAGE
V	RTCB		RADIUS OF TARGET CENTRAL BODY
V	DCAOUT	6	OUTPUT VECTOR FROM TDCA
V	TNOWJD		VALUE OF JULIAN DATE FOR CURRENT TIME
V	VEPOCH	36	INIT. VAR. EQ., MEAN OF 50
V	TG		TIME TO INTEGRATE TO IN TRAJ
M	BLK7		TRAJECTORY STORAGE
V	TR		RADIUS FROM CENTRAL BODY TO PROBE
V	TR2		TR**2
V	TR3		TR**3
V	TR5		TR**5
V	TR7		TR**7
V	COLA		COSINE LAMDA (CURRENT VEH. LAT.)
V	SILA		SINE LAMDA (CURRENT VEH. LAT.)
V	TV		VELOCITY OF PROBE REL. TO ROT. EARTH
V	TVA		MAGNITUDE OF TV
V	TDON		COEFF. IN DIURNAL DRAG VARIATION
V	CRSHB		SEMI-MINOR AXIS OF CURRENT CERAL BODY
V	TPOT	3	PERT. ACEL. DUE TO POTEN. OF CCB.
V	TBPERT	3	PERT. ACEL. DUE TO OTHER BODIES
V	TRPRES	3	PERT. ACEL. DUE TO RAD. PRESSURE
V	ATHRST	3	PERT. ACEL. DUE TO THRUST
V	TDRAG	3	PERT. ACEL. DUE TO ATMOSPHERIC DRAG
V	PMAT	9	POST. EFFECTS TO CAL. 2ND DER. OF V. EQ.
V	VMAT	9	VEL. EFFECTS TO CAL. 2ND DER. OF V. EQ.
V	FLVE		FLAG, =0 TO NOT CAL. V EQ.
V	TCRASH		FLAG, .NE. 0 WHEN CCB IMPACTED IN TRAJ
V	PRALT		ESTIMATE [illegible] PERIGEE ALT. FOR TRAJ

V	SKIP		FLAG, .EQ. 0 TO EVAL. V. EQ. PRED. ONLY
V	SCALE		VALUE OF K IN K*R EVAL. FOR TDCA
V	TICRT	6	ICONDS, CARTESIAN, MEAN OF 50
V	PSENUM		CURRENT PHASE NUMBER
V	BSETME		BASE TIME FOR PHASE DELTA T, T S
V	TALFA		FLAG, NON-ZERO FOR RAD. PRS. CAL.
V	XN	30	EPHEMERIS POSITIONS
V	XNDOT	30	EPHEMERIS VELOCITIES
V	TEMPTG		TEMPORARY VALUE OF TG IN SELECT
V	TLASTM		LAST T IN MASTER DELTA T, T LIST
V	STORTG		STORAGE OF TEMPTG
V	TLASTP		LAST T IN PHASE DELTA T, T LIST
V	TSEC	2	FOR INTPL, SEC. FROM 1950 (PSEUDO D.P.)
V	COLA		COS(CURRENT VEH. LONGITUDE)
V	SILA		SIN(CURRENT VEH. LONGITUDE)
V	COPH		COS(CURRENT VEH. LATITUDE)
V	SIPH		SIN(CURRENT VEH. LATITUDE)
V	CSALF		COS(CURRENT VEH. RIGHT ASCENSION)
V	SNALF		SIN(CURRENT VEH. RIGHT ASCENSION)
V	TRJPRT		FLAG, NON-ZERO FOR PRINT. IN TRAJ
M	BLK8		INTEGRATION INPUT
V	TLIST	489	INTEGRATION INPUT LIST
M	BLK9		INTEGRATION OUTPUT
V	TRAJX	57	INTEGRATION OUTPUT LIST
M	BLK10		EARTH-MOON HARMONICS
V	CEJ	12	EARTH ZONAL HARMONICS J1,J2,....,J12
V	CEC	21	EARTH SECTORAL-TESSERAL HAR., C11...C66
V	CES	21	EARTH SECTORAL-TESSERAL HAR., S11...S66
V	CMJ	12	MOON ZONAL HARMONICS J1,J2,....,J12
V	CMC	21	MOON SECTORAL-TESSERAL HAR. C11...C66
V	CMS	21	MOON SECTORAL-TESSERAL HAR. S11...S66
V	FJ	12	CURRENT ZONALS BEING USED IN GPERT
V	C	21	CURRENT SECT.-TESS. BEING USED IN GPERT
V	S	21	CURRENT SECT.-TESS. BEING USED IN GPERT
M	BLK11		TIMES FOR
V	TIMES	200	ALL PROCESS TIMES
M	BLK12		FIXED WORKING STORAGE
V	ICCB		CURRENT CENTRAL BODY
V	IOCB		PREVIOUS CENTRAL BODY
V	INCB		NEW CENTRAL BODY
V	NEOP		STARTING POST. OF PHASE SHIFT T IN TIMES

V	[illegible]		[illegible] POST. OF TOF IN TIMES
V	NMC		STARTING POST. OF MID-COURSE T S IN TIMES
V	MJD		START. POST. OF JULIAN DATE T S IN TIMES
V	NDTT		START. POST. OF MASTER D T S IN TIMES
V	NSPT		START. POST. OF SPECIAL PRT. T S IN TIMES
V	NPDTT		START. POST. OF PHASE D T S IN TIMES
V	ITCB		VALUE OF TARGET CENTRAL BODY FOR TDCA
V	NPHASE		START. PSN. OF CURRENT PHASE IN LIST
V	NXTPHS		START. PSN. OF NEXT PHASE
V	JPHSNO		PSN. OF PHASE NO. IN CURRENT PHASE
V	JTYPE		PSN. OF PHASE TYPE IN CURRENT PHASE
V	JFINCD		PSN. OF FINAL CONDITION IN CURRENT PHASE
V	JTCB		PSN. OF TARGET CENT. BODY IN CURR. PHASE
V	JCCB		PSN. OF CURRENT CENT. BODY IN CURR. PHASE
V	JRPRES		PSN. OF RAD. PRES. FLAG IN CURR. PHASE
V	JDELTT		PSN. OF DELTA T FLAG IN CURRENT PHASE
M	BLK13		FIXED TRAJECTORY STORAGE
V	N1		DEGREE OF HIGHEST ZONAL HARMONICS
V	N2		DEGREE OF HIGHEST SECTORAL HARMONICS
V	N3		DEGREE OF HIGHEST TESSERAL HARMONICS
V	NOPT	2	OPTION FLAG FOR ROTAT
V	ITMNUS		FLAG, .NE. 0 FOR FIRST PRE-EPOCH TIME
V	IPHSE		FLAG, .NE. 0 1ST TIME THRU PHASE
V	IQUIT		FLAG, .NE. 0 WHEN ALL TIMES PROCESSED
V	IPRTFG		FLAG, .NE. 0 TO PRINT AFTER INTEG.
V	ITYPTM		TYPE OF TIME RETURNED FROM SELECT
V	IBFLGS	10	FLAGS FOR BODIES EFFECTS THIS PHASE
V	IQUAD		FLAG FOR DESIRED QUADRANT IN TDCA
V	IBPRIM		FLAG FOR 1ST TIME LESS THAN ACCRACY
V	IMAX		MAXIMUM LOOPS THRU TDCA
V	ISLECT		FLAG FOR SELECT SET IN PHASE
V	IRUNOT		FLAG SET IN PHASE FOR SELECT
V	IWKFLG		FLAG SET IN PHASE FOR WORK TO CALL TDCA
V	INTRX		FLAG RETURNED FROM INTR2 FOR ERRORS
V	NVEL		FLAG FOR INTPL. INTR3..=1,P.A.V.,=0,P ONLY
V	NRRR		FLAG. NON-ZERO FOR FXD. STP. R-K IN TRAJ
M	BLK14		PHASE LIST STORAGE
V	PHASES	200	CONTAINS ALL PHASES TO BE PROCESSED
M	BLK15		INPUT STORAGE BUFFER
V	ICOND	10	INITIAL CONDITIONS
V	ITYPE	1	COORD. TYPE OF ICONDS

```
V      [illegible]     [illegible]   [illegible]
V      [illegible]     [illegible]   [illegible]
V      SPTIME     25    SPECIAL PRINT TIMES
V      MCTIME     25    MIDCOURSE TIMES
V      JDTIME     25    JULIAN DATE TIMES
V      STYPE      10    SEARCH VARIABLES
V      TARGET      1    TARGET BODY FOR SEARCH
V      TRMCON     10    TERM CONDITIONS FOR SEARCH
V      DELTRM     10    BOUNDS FOR TERMINAL CONDITIONS
V      DELSRH     10    BOUNDS FOR SEARCH VARIABLES
V      PHASE       1    PHASE I. D. NUMBER (.LT. 99999.)
V      PTYPE       1    PHASE TYPE
V      FINCON      5    PHASE FINAL CONDITIONS
V      FINBOD      1    PHASE TARGET CENTRAL BODY
V      CURBOD      1    CURRENT CENTRAL BODY
V      RPRESS      1    FLAG FOR RADIATION PRESSURE
V      PDELTT     50    PHASE DELTA T. T LIST
V      ENDJOB      1    END JOB FLAG
ENDCOM
ENDJOB
```

IV. Sample Output:

On the following pages is a listing of the outputs of the BLKGEN program.

MASTER COMMON LISTING PAGE

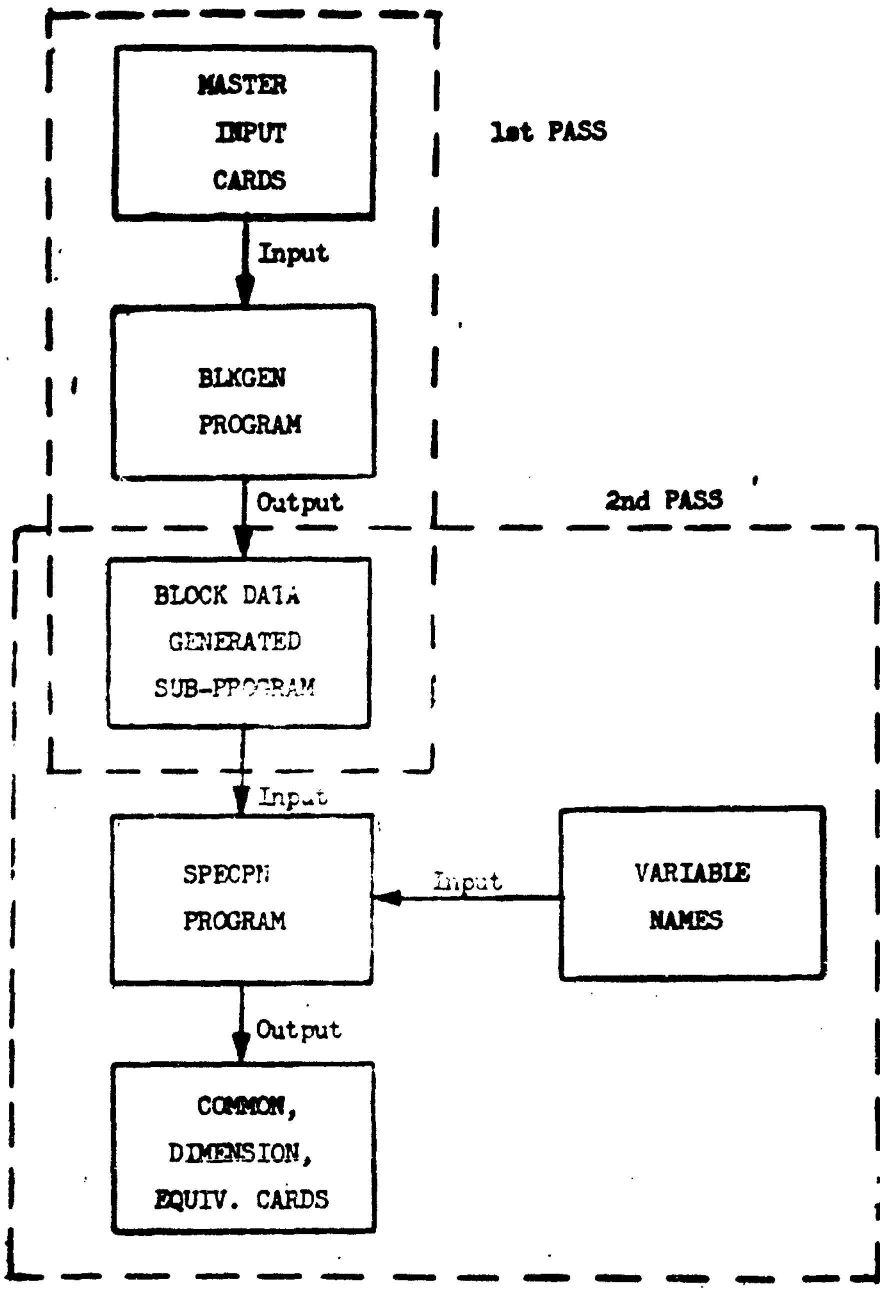
CURRENT COMMON IS --

```
                  COMMON        BLK1 ( 125), BLK2 (  50), BLK3 ( 100), BLK4 (  50)
               1, BLK5 (  50), BLK6 ( 200), BLK7( 200), BLK8( 500), BLK9 (  75)
               2, BLK10( 200), BLK11( 200), BLK12(  50), BLK13(  50), BLK14( 200)
               3, BLK15( 300)
```

CURRENT BLOCK IS BLK1 (0) ...... FLOATING POINT CONSTANTS

VARIABLE	DIMENSION	POSITION	TYPE	DESCRIPTION
CAE		1		EQUATORIAL RADIUS OF EARTH
CBE		2		POLAR RADIUS OF EARTH
CEELIP		3		ELLIPTICITY OF EARTH
CMU		4		GRAVITATION CONSTANT OF EARTH
CWE		5		ROTATIONAL RATE OF EARTH
CGMR	10	6		GM RATIO OF E,M,S,V,M,J,S TO EARTH
RCB	10	16		RADIUS OF E,M,S,V,M,J,S, TO EARTH
CERAU		26		EARTH RADII PER ASTRONOMICAL UNIT
CFTER		27		FEET PR EARTH RADII
CIN1R		28		INITIAL CONDITION PER EARTH RADII
CIN2R		29		INITIAL CONDITION TIME PER MINUTE
COUT1		30		TERMINAL CONDITION OUTPUT PER EARTH RADII
COUT2		31		TERM. COND. OUTPUT TIME PER MINUTE
CLIGHT		32		SPEED OF LIGHT
CNMER		33		NAUTICAL MILES PER EARTH RADII
CKMER		34		KILOMETERS PER EARTH RADII
CSOLC		35		SOLAR CONSTANT (WATTS/METER SQ)
CDAYMN	12	36		DAYS PER MONTH IN NON-LEAP YEAR
CDEG		48		DEGREES PER RADIAN

V. Organization and Usage of BLKGEN and SPECPN Flow Chart:



VI. References:

1. Specification Statement Punch Program (SPECPN) User's Guide, A. J. DeSalvio and J. Rau, September 15, 1966, CDRC Report Number 3127.21-01.

APPENDIX B

SPECIFICATION STATEMENT PUNCH PROGRAM (SPECPN) User's Guide

SPECPN USERS GUIDE

The SPECPN (SPECification statement PuNch) program was written to aid the FORTRAN programmer in his preparation of COMMON, DIMENSION, and EQUIVALENCE statements. It was designed primarily for programs which use the philosophy of master COMMON blocks and EQUIVALENCE variables e.g.

```
COMMON/COMMAN/BLK1 (100), BLK2 (5000)
EQUIVALENCE (BLK1 (26), VAR1), (BLK2 (63), VAR2)
```

In this example only the variables VAR1, VAR2 are needed from the 100 cell block BLK1 and the 5000 cell block BLK2. Using EQUIVALENCE statements to identify only those variables actually used in a subroutine significantly reduces the card volume for a subroutine and the size of the symbol table necessary at compile time. This technique is opposed to the standard one of stringing out the actual COMMON variable names in the COMMON statement e.g.

```
COMMON/COMMAN/ A, B, C(3), D, E, F(16), G(2), VAR1
```

To use SPECPN one must supply input in two forms. First, a BLOCK DATA subprogram must be prepared [illegible] of the master COMMON blocks including a complete map of each variable in COMMON, EQUIVALENCE numbers, and [illegible]. This BLOCK DATA subprogram is then compiled and submitted as part of the SPECPN [illegible]. Unless the COMMON map changes, the BLOCK DATA subprogram [illegible] be altered again. The second input to SPECPN is data cards specifying by subroutine those variables defined in COMMON. These variables may be in blank COMMON or any of the labeled COMMON blocks defined in the BLOCK DATA subprogram. The output from SPECPN is the COMMON, DIMENSION, and EQUIVALENCE statements necessary for each subroutine.

The advantages of using SPECPN are several:

a) The format of the punched cards is uniform. This makes the program listing neat and easy to read.

b) Once the BLOCK DATA subprogram has been verified for accuracy, the worry of mis-equivalencing a COMMON variable is ended.

c) If significant changes are made in the COMMON map of a large scale program such that the equivalence numbers are disturbed, only the BLOCK DATA subprogram need be re-keypunched. The data cards used with the old COMMON may be re-submitted with SPECPN to recover all the COMMON, DIMENSION, and EQUIVALENCE statements for the new COMMON map.

BLOCK DATA Input to SPECPN

The BLOCK DATA subprogram must contain the following four labeled COMMON blocks:

COMMON/ISIZE/ISIZE
COMMON/BLK /BLK(I)
COMMON/FMT /FMT(J)
COMMON/XMCOM/XMCOM(ISIZE)

COMMON/ISIZE/ISIZE

ISIZE is an integer which defines the size of XMCOM. ISIZE will be 3 * N, where N is the total number of COMMON variables defined in the users program.

COMMON/BLK /BLK(I)

BLK is a dimensioned array which contains the name of each master COMMON block in BCD. The order of the names within BLK is arbitrary. If the following COMMON statements appeared in the user's program:

COMMON/ / BLK1(100), BLK2(5000)
COMMON/COMA/ABLK1(50), ABLK2(25), ABLK3(500)

the master COMMON block names BLK1, BLK2, ABLK1, ABLK2, ABLK3 must appear in BLK , left adjusted, in BCD. For example:

```
      COMMON /BLK/BLK(5)
      DATA (BLK(I),I= 1,5) /6HABLK2 ,6HBLK1  ,6HABLK3 ,
     16HBLK2  ,6HABLK1 /
```

could be used to define /BLX/ for this program. The labeled COMMON block names, i.e. COMA, are not specified within BLK.

COMMON / FMT / FMT(J)

FMT is a dimensioned array defining the COMMON statements that appear in the user's program. All the information in FMT is in BCD. Since the format of a COMMON statement is so arbitrary (is it blank COMMON, or labeled COMMON; how many variables etc.) and the elements of the card so variable, the user is required to store in FMT the actual FORMAT statement that would cause the COMMON statements defined in the users program to be punched. For example; the COMMON card

```
COMMON /COMNAM / BLK1(100), BLK2(5000)
```

could be punched with the following statements

```
WRITE (12, 901)
901   FORMAT(6X,34HCOMMON/COMNAM/BLK1(100),BLK2(5000))
```

What goes into the array FMT is exactly what the compiler would generate in core at location FMT: the BCD equivalent of what follows the word FORMAT, each character from " (" to the terminating ")" inclusive. In this example:

```
 COMMON /FMT/FMT(7)
 DATA (FMT(I),I=1,7)          /6H(6X,34,6HHCOMMO,
16HN/COMN,6HAM/BLK,6H1(100),6H,BLK2(,6H5000))/
```

would be used to load the array FMT. Each COMMON statement is specified in the above manner, in any order within FMT. If the final BCD word for a given format is not a full 6 characters, fill out the word with blanks following the ")" since each "FORMAT" must begin in a new word within FMT.

COMMON/XMCOM/XMCOM(ISIZE)

XMCOM is an N x 3 array stored singly subscripted by rows. (N is the total number of COMMON variables in the user's program). In column 1 of XMCOM is placed the name of each COMMON variable, left adjusted, in BCD. Column 2 of XMCOM contains integer code words of the form I * 10000 + J. I is the entry in BLK which identifies the master COMMON block name appropriate for this variable. J is the equivalence number of the given variable within the master COMMON block. Column 3 of XMCOM contains integer code words of the form

K * 10000 + L. L is the dimension of the given variable. (Non-dimensioned variables are indicated with L = 1) K is the entry in FMT of the first word of the "FORMAT" statement which identifies the COMMON statement containing the given master COMMON block name. A sample XMCOM will now be constructed from the following COMMON map:

```
 COMMON//BLK1(24)
 COMMON/COMA/ABLK1(50)
 EQUIVALENCE            (BLK1   (    1),CAE    ),(BLK1   (    2),TEMP   )
1,(BLK1   (   12),CBE    ),(BLK1   (   13),CDAYMN)
 DIMENSION TEMP(10),CDAYMN(12)
 EQUIVALENCE            (ABLK1  (    1),NPR    ),(ABLK1  (    2),NDPR   )
1,(ABLK1  (    3),MATRIX)
 DIMENSION MATRIX(48)
```

To compute ISIZE, we simply count the number of COMMON variables:

CAE, TEMP, CBE, CDAYMN, NPR, NDPR, MATRIX... 7

ISIZE: 3 * 7 = 21

COMMON/ISIZE/ISIZE

DATA ISIZE /21/

The entries in BLK will be the master COMMON block names:

BLK1, ABLK1

COMMON / BLK / BLK(2)

DATA (BLK(I), I = 2) / 6HBLK1 , 6HABLK1 /

The FMT array would be constructed from the following FORMAT statements:

```
 FORMAT(6X,16HCOMMON//BLK1(24))
 FORMAT(6X,21HCOMMON/COMA/ABLK1(50))
 COMMON/FMT/FMT(9)
 DATA (FMT(I),I=1,4)/
16H(6X,16,6HHCOMMO,6HN//BLK,6H1(24))/
 DATA (FMT(I),I=5,9)/
16H(6X,21,6HHCOMMO,6HN/COMA,6H/ABLK1,6H(50)) /
```

XMCOM would look as follows:

① VARIABLE NAME
② BLK ENTRY
③ EQUIVALENCE NO.
④ FMT ENTRY
⑤ DIMENSION

```
 COMMON/XMCOM/XMCOM(21)
 EQUIVALENCE (XMCOM,IXMCOM)
 DIMENSION IXMCOM(21)
 DATA (XMCOM(I),I= 1,21) /
16HCAE    , 10001, 10001,
26HTEMP   , 10002, 10010,
36HCBE    , 10012, 10001,
46HCDAYMN, 10013, 10012,
56HNPR    , 20001, 50001,
66HNDPR   , 20002, 50002,
76HMATRIX, 20003, 50048/
    ↑        ↑     ↑     ↑     ↑
    ①        ②     ③     ④     ⑤
```

For compatibility with the G.E. computer, XMCOM should be set up as follows:

```
 DATA (XMCOM(I),I= 1,21,3) /6HCAE    ,6HTEMP   ,6HCBE    ,6HCDAYMN
1,6HNPR    ,6HNDPR   ,6HMATRIX/
 DATA ((IXMCOM(I),IXMCOM(I+1)),I= 2,20,3)/
1 10001, 10001,
2 10002, 10010,
3 10012, 10001,
4 10013, 10012,
5 20001, 50001,
6 20002, 50002,
7 20003, 50048/
```

DATA CARD Input to SPECPN

The BLOCK DATA subprogram described above contains the complete definition of each COMMON block in the users program. The remaining inputs to SPECPN are a series of fixed format data cards describing the individual COMMON variables defined in each subroutine in the users program. The data cards have the following format:

For each subroutine:

Card 1 — Contains the subroutine name in columns 1 - 6. This card serves to identify the routine which the punched and printed output from SPECPN belongs. The name punched in cc 1 - 6 may be any combination of alphanumeric characters except ENDSUB or ENDJOB.

Cards 2-(N - 1) Contains the COMMON variable names, punched up to 12 per card, in columns 1 - 6, 7 - 12, 13 - 18, etc. The variable names must be left adjusted in each field.

Card N Contains ENDSUB in columns 1 - 6. The entry ENDSUB indicates to SPECPN that all the variables for this subroutine have been entered. Columns 7 - 72 of this card are ignored.

The above series of cards are repeated for as many subroutines as desired. Following the final ENDSUB card must be placed a card with ENDJOB to indicate the end of the input data. See figure 1 and appendix for an example of the deck set-up and data card samples.

Output from SPECPN

SPECPN delivers both printed and punched output. The first block of printed output will be the XMCOM array after having been algebraically sorted about column 1. For each subroutine name card in the data deck, a message is printed stating:

THE FOLLOWING CARDS ARE FOR SUBROUTINE XXXXXX

This card is also punched. Next will be the EQUIVALENCE, DIMENSION, and COMMON cards, in that order. Continuation cards are indicated with an E in column 6 for EQUIVALENCE and a D in column 6 for DIMENSION. A card image is printed and punched. In the event that a variable is requested in the data deck that does not appear in XMCOM, the following error message is printed only:

ERROR - XXXXXX NOT IN XMCOM.

Operating Notes

One point that should be noted is the flexibility which results from the use of the FMT array in the BLOCK DATA subprogram. As was explained above, SPECPN simply executes a WRITE (12, FMT(I)) in order to punch the Ith COMMON statement. In theory then, the user can direct

SPECPN to punch any card, in any arbitrary format for any arbitrary subroutine. For instance the user could place in FMT the necessary control characters to cause comments cards to be punched before or after COMMON statements, which define the variables in that COMMON block. Another use of FMT might be to include DIMENSION card images for those variables which are multi-dimensioned in the user's program since there is no provision in XMCOM for indicating such. This could be accomplished as follows:

a) Place in FMT(J) the FORMAT statement that would cause the desired DIMENSION statement to be punched.

b) In the appropriate column 3 entry in IXMCOM, set the dimension of the multi-dimensioned variable to 1.

c) Instead of pointing to the COMMON card image in FMT for this variable, point to the DIMENSION card image, J.

d) Be sure that another variable in the subroutine list does point to the proper COMMON card image.

Setting the dimension to 1 will suppress the punching of a standard DIMENSION card.

To aid the spot checking of EQUIVALENCE variables it is a good practice to list the variables in ascending EQUIVALENCE order on the data cards for each subroutine. If it is desired to obtain EQUIVALENCE cards by master COMMON block, that is, have SPECPN start with a new EQUIVALENCE card for each new master COMMON block, it is only necessary to break up the variables by COMMON block within a subroutine and submit each set under the name of the same subroutine. The fact that the subroutine name is repeated within the data deck is immaterial since it is used only for identification of the output.

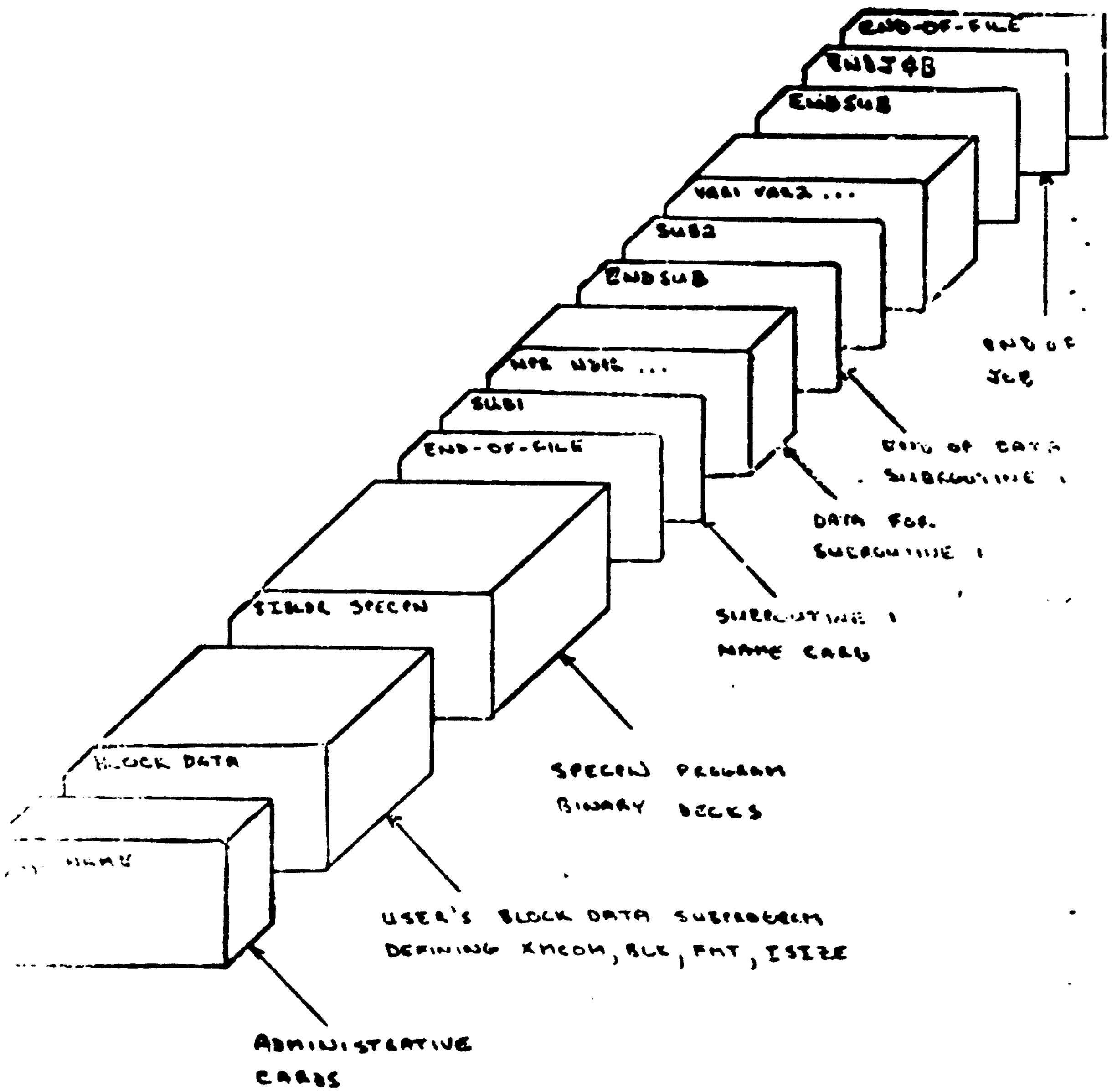
The following restrictions should be observed when running SPECPN:

a) The total size of XMCOM + BLK + FMT must not exceed $22,753_{10}$ cells. This is based on the SPECPN version currently in use on the 7094.

b) Do not use a subroutine card with ENDSUB or ENDJOB in columns 1 - 6. These variables may appear on a data card providing they are not placed in columns 1 - 6.

c) No variable name may be repeated in XMCOM.

d) When operating on the 7094, a PUNCH card should be included in the administrative cards if more than 500 punched cards are expected or if it is desired to have the punched cards listed and/or interpreted.



SPECPN DECK SETUP - FIGURE 1

The following page is an example of the data card input to SPECPN

```
FIRST
CAE    ACT    DIP   KLT    FADK   ZOT    NPR   BUM   NON   QNK    MP    TNS
KNT                 THUMP                                              KKK
       NOUNT  DNR   DOG    DRV    XUFK   INT   UMP         ORB          CK
ONTL   GGGG   DGN   HLT    BLKK
NNN    AROUSEUWV    UVW    KZY    FLY    FADK  ZXA                     LO
KNOLM  ANT          SPOT                       AAAD  LAVA              CDM
ENDSUB
SECOND
CDAYMNABAB    DNK   SPOT   KLT    INT    FADK  ZOT   FLY   NON    MP    BLKK
CBE    DALP   CAT   UMP    XOLT   KZY    DRV   NDPR  QPT   FDP    AHLT  JOB
KJJ    DNR    CK    TORB   DIP    AAAD   RTS   QKL   AGGG  LAVA   ZXA   KNT
DOT    ACT    KKK   BBNFK  ORB    CNTP   CGNOM UVV   NPP   BUM    DOG   DAB
XUFK   ER     ZMPT  MOUSE  CELLIPABAL    KQQ   CAEM  [illegible] KLRSS NNN ONK
OINK   XUFK   DGN   BOND   TNS    DDDP   RTS   STOL  LCAE  AZMPT  MTHUMPTHUMP
XOLT   KQQ    QNK   BLKK   FLY    DGN    HLT   DOT   BOND  QPI    NPR   DIP
CK     MP     KKK   BNFK   ACT    [illegible] LUT CDM NPF  ABAB   CDAYMNTNS
ENDSUB
THIRD
CELLIPCDAYMNKKK     FLY                        LAND
ENDSUB
FOURTH
ACT    JOB
ENDSUB
FIFTH
CAT
ENDSUB
SIXTH
                    XUFK                                               CELLIP
ENDSUB
SIX
KQQ    FLY    DOT   DIP    ABAB   DNK    ZOT   KKK   DRV
ENDSUB
ENDJOB
```

The following pages illustrate the punch card output from SPECPN

```
C THE FOLLOWI[illegible]                    FIRST
  EQUIVALE[illegible]          (BLK1  (  1),CAE   ),(BLK3  (  23),ACT    )
E,(MZA   (  4),DIP    ),(BLK6  (  19),KLT   ),(BLK4  (  11),FADK   )
E,(TJA   (  6),ZOT    ),(BLK2  (  1),NPR    ),(BLK6  (  1),BUM     )
E,(COLB  (  26),NON   ),(COLB  (  4),QNK    ),(TRAJ  (  6),MP      )
E,(TRAJ  (  1),TNS    ),(BLK3  (  6),KNT    ),(BLK3  (  24),THUMP  )
E,(BLK6  (  11),KKK   ),(BLK6  (  15),ONR   ),(BLK4  (  1),DOG     )
E,(MZA   (  2),DRV    ),(BLK5  (  5),XUFK   ),(BLK5  (  2),INT     )
E,(BLK5  (  1),UMP    ),(BLK4  (  9),ORB    ),(BLK6  (  17),CK     )
E,(COLB  (  24),ONTL  ),(TRAJ  (  3),GGGG   ),(DOPLR (  1),DGN     )
E,(DOPLR (  2),HLT    ),(BLK7  (  1),BLKK   ),(COLB  (  25),NNN    )
E,(COLB  (  8),UWV    ),(COLB  (  6),UVW    ),(BLK3  (  2),KZY     )
E,(DOPLR (  11),FLY   ),(BLK4  (  11),FADK  ),(BLK3  (  5),ZXA     )
E,(BLK3  (  26),SPOT  ),(BLK2  (  3),AAAD   ),(DOPLR (  8),LAVA    )
E,(BLK3  (  1),CDM    )
  DIMENSION     DIP   (   6),ZOT   (   4),KKK   (   6),DRV   (   2)
D,XUFK  (   6),UWV   (   8),FLY   (   2),AAAD  (   3)
  COMMON //BLK1(10),BLK2(8),TJA(2)
  COMMON/BLAH/MZA(26),BLK3(9),BLK4(1),BLK5(2),BLK6(19),COLB(26)
1,BLK7(1)
  COMMON /HIPPO/TRAJ(6),DOPLR(12)
C THE FOLLOWING CARDS ARE FOR SUBROUTINE     SECOND
  EQUIVALENCE          (BLK1  (  10),CDAYMN),(BLK2  (  6),ABAB    )
E,(MZA   (  10),DNK   ),(BLK3  (  26),SPOT  ),(BLK6  (  19),KLT   )
E,(BLK5  (  2),LNT    ),(BLK4  (  11),FADK  ),(TJA   (  6),ZOT    )
E,(DOPLR (  11),FLY   ),(COLB  (  26),NON   ),(TRAJ  (  6),MP     )
E,(BLK7  (  1),BLKK   ),(BLK1  (  2),CBE    ),(TJA   (  2),DALP   )
E,(BLK4  (  2),CAT    ),(BLK5  (  1),UMP    ),(BLK6  (  2),XCLT   )
E,(BLK3  (  2),KZY    ),(MZA   (  2),DRV    ),(BLK2  (  2),NDPR   )
E,(COLB  (  2),CPT    ),(TRAJ  (  2),FCP    ),(DOPLR (  3),JOD    )
E,(DOPLR (  4),KJJ    ),(BLK6  (  18),ONR   ),(BLK4  (  9),ORB    )
E,(MZA   (  4),DIP    ),(BLK2  (  3),AAAD   ),(COLB  (  7),RTS    )
E,(DOPLR (  8),LAVA   ),(BLK3  (  5),ZXA    ),(BLK3  (  6),KNT    )
E,(BLK3  (  10),DOT   ),(BLK5  (  23),ACT   ),(BLK6  (  3),BRFK   )
E,(BLK4  (  9),ORB    ),(TJA   (  3),CNTP   ),(BLK1  (  4),CGNOM  )
E,(COLB  (  8),UWV    ),(MZA   (  1),NPP    ),(BLK6  (  1),BUM    )
E,(BLK4  (  1),DOG    ),(BLK2  (  3),DAB    ),(BLK6  (  5),XUFK   )
E,(BLK6  (  4),ZMPT   ),(BLK4  (  8),MOUSE  ),(BLK1  (  3),CELLIP )
E,(BLK2  (  6),ABAB   ),(COLB  (  17),KCD   ),(TJA   (  1),CAEM   )
E,(BLK3  (  1),CDG    ),(COLB  (  22),KLRSS ),(COLB  (  25),NMN   )
E,(COLB  (  4),QNK    ),(BLK6  (  3),XUFK   ),(DOPLR (  1),DGN    )
```

```
E,(DOPLR (    9),BOND   ),(TRAJ  (    1),TNS    ),(COLB  (    7),RIS   )
 DIMENSION      ABAB  (    3),DNK    (    3),ZOT    (    4),FLY   (    2)
D,CAT    (    6),DRV    (    2),KJJ    (    2),DIP    (    6),AAAD  (    3)
D,DOT    (    3),CGNOM  (    6),UWV    (    8),XUFK   (    6),ABAB  (    3)
D,KQQ    (    2),XUFK   (    5)
 EQUIVALENCE           (COLB   (   23),STQL   ),(BLK3  (   24),THUMP )
E,(BLK6  (    2),XOLT   ),(COLB   (   17),KQQ    ),(COLB  (    4),UNK   )
E,(BLK7  (    1),BLKK   ),(DOPLR  (   11),FLY    ),(DOPLR (    1),DGN   )
E,(DOPLR (    2),HLT    ),(BLK3   (   10),DOT    ),(DOPLR (    9),BOND  )
E,(BLK2  (    1),NPR    ),(MZA    (    4),DIP    ),(BLK6  (   17),CK    )
E,(TRAJ  (    6),MP     ),(BLK6   (   11),KKK    ),(BLK6  (    3),BNFK  )
E,(BLK3  (   23),ACT    ),(BLK3   (   25),DUMP   ),(BLK3  (   13),LOT   )
E,(BLK3  (    1),CDM    ),(MZA    (    1),NPP    ),(BLK2  (    6),ABAB  )
E,(BLK1  (   10),CDAYMN),(TRAJ   (    1),TNS    )
 DIMENSION      KQQ   (    2),FLY    (    2),DOT    (    3),DIP   (    6)
D,KKK    (    6),LOT    (   10),ABAB   (    3)
  COMMON //BLK1(10),BLK2(8),TJA(2)
  COMMON/BLAH/MZA(26),BLK3(9),BLK4(1),BLK5(2),BLK6(19),COLB(26)
 1,BLK7(1)
  COMMON /HIPPO/TRAJ(6),DOPLR(12)
C THE FOLLOWING CARDS ARE FOR SUBROUTINE    THIRD
  EQUIVALENCE           (BLK1   (    3),CELLIP),(BLK1  (   10),CDAYMN)
E,(BLK6  (   11),KKK    ),(DOPLR  (   11),FLY    ),(DOPLR (   10),LAND  )
  DIMENSION     KKK   (    6),FLY    (    2)
  COMMON //BLK1(10),BLK2(8),TJA(2)
  COMMON/BLAH/MZA(26),BLK3(9),BLK4(1),BLK5(2),BLK6(19),COLB(26)
 1,BLK7(1)
  COMMON /HIPPO/TRAJ(6),DOPLR(12)
C THE FOLLOWING CARDS ARE FOR SUBROUTINE    FOURTH
  EQUIVALENCE           (BLK3   (   23),ACT    ),(DOPLR (    3),JOB   )
  COMMON/BLAH/MZA(26),BLK3(9),BLK4(1),BLK5(2),BLK6(19),COLB(26)
 1,BLK7(1)
  COMMON /HIPPO/TRAJ(6),DOPLR(12)
C THE FOLLOWING CARDS ARE FOR SUBROUTINE    FIFTH
  EQUIVALENCE           (BLK4   (    2),CAT    )
  DIMENSION     CAT   (    6)
  COMMON/BLAH/MZA(26),BLK3(9),BLK4(1),BLK5(2),BLK6(19),COLB(26)
 1,BLK7(1)
C THE FOLLOWING CARDS ARE FOR SUBROUTINE    SIXTH
  EQUIVALENCE           (BLK6   (    5),XUFK   ),(BLK1  (    3),CELLIP)
  DIMENSION     XUFK  (    6)
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      COMMON [illegible](1),BLK5(2),BLK6(19),COLB(26)
     1,BLK7(1)
      COMMON //BLK1(10),BLK2(8),TJA(2)
C     THE FOLLOWING CARDS ARE FOR SUBROUTINE     SIX
      EQUIVALENCE          (COLB  (  17),KOO    ),(DOPLR (  11),FLY   )
     E,(BLK3  (  10),DOT    ),(MZA   (   4),DIP    ),(BLK2  (   6),ABAB  )
     E,(MZA   (  10),DNK    ),(TJA   (   6),ZOT    ),(BLK6  (  11),KKK   )
     E,(MZA   (   2),DRV    )
      DIMENSION     KOO   (   2),FLY   (   2),DOT   (   3),DIP   (   6)
     D,ABAB  (   5),DNK   (   3),ZOT   (   4),KKK   (   6),DRV   (   2)
      COMMON/BLAH/MZA(26),BLK3(9),BLK4(1),BLK5(2),BLK6(19),COLB(26)
     1,BLK7(1)
      COMMON /HIPPO/TRAJ(6),DOPLR(12)
      COMMON //BLK1(10),BLK2(8),TJA(2)
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