A COMPUTER SIMULATION FOR THE EVALUATION OF ARTILLERY DIRECT FIRE SUPPORT SYSTEMS

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THESIS

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ABSTRACT

A probablistic event store computer simulation of the artillery direct fire support system at brigade level is presented. The purpose of the model is to serve as a tool in evaluating changes in artillery fire support system effectiveness as system and battlefield parameters are varied. Parameters which are variable in the model pertain to the geometric configuration of the battlefield, artillery weapon employment configurations, artillery weapon ballistic parameters, weapon lethality, target configuration and vulnerability, artillery system time parameters, weapon position accuracy parameters, and target location accuracy parameters. A description of the model and a FORTRAN IV program listing are provided.

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I. INTRODUCTION

Current doctrine holds that the mission of the Army Field Artillery is

"...to provide continuous and timely fire support to the force commander by destroying or neutralizing those targets that jeopardize the accomplishment of his mission".

In order to accomplish its mission the field artillery is required to support the maneuver forces with timely, close, and accurate fires on hostile maneuver elements, deliver counterbattery fires throughout its zone of responsibility, and add depth to combat by delivering fires on hostile logistical installations, reserves, etc..

In combat the field artillery operates as an integral part of the overall fire support system. Within the fire support system all fire support means are coordinated and integrated so that hostile targets are adequately attacked by appropriate means or available weapons. The field artillery fire support system thus operates as a subsystem of the larger overall force fire support system.

The field artillery fire support system can be viewed as consisting of three basic subsystems each with basic functions as described below.

(1) Weapon Subsystem: This subsystem consists of the actual artillery weapons, personnel, and auxiliary equipment. The function of the weapon subsystem is to prepare and fire projectiles in accordance with specific fire commands provided it.

(2) Target Acquisition Subsystem: This subsystem in its simplest form consists of a forward observer team. In more advanced systems this forward observer may be augmented by aerial observers, aerial reconnaissance, and radar. The function of the target acquisition subsystem is twofold. This subsystem has the responsibility for locating and identifying suitable targets for artillery fire. Secondly, in the case of the forward observer, the effects of artillery fire on the hostile targets are observed. Adjustments are made to the impact points in order to achieve the best possible results.

(3) Command and Control Subsystem: The command and control subsystem consists of all elements necessary to coordinate and direct the actions of the other two subsystems. The function of this subsystem is basically to provide the necessary coordination and direction necessary for the proper utilization of these systems. The artillery fire support system command and control system is closely associated with the command and control system of the supported force.

The effectiveness with which an artillery fire support system accomplishes its mission must by definition be evaluated in terms of speed, accuracy, and damage or casualty producing effect that the artillery fire support system achieves against hostile targets in specific situations.

The effectiveness with which the overall system operates is a function of the effectiveness of the component subsystems. In each

of these subsystems, errors are introduced and time is consumed during the fire support process. In conducting a quantitative analytical evaluation of a specific system, one quickly encounters formidable mathematical obstacles. Broad generalizations are sometimes achievable; however, these seldom are of much operational value. Some typical questions which might be asked concerning a fire support system and for which a quantitative answer might be useful are:

(1) Suppose weapon System A is replaced by weapon system B which has greater lethality. What increases in kill rate can be anticipated?

(2) Suppose the current weapon employment configurations are modified. Will this modification yield any appreciable change in kill rate or some other suitably chosen measure of effectiveness?

(3) How is some suitably chosen measure of effectiveness related to width of the battle front, or movement rate of the supported force?

Questions such as those posed above can be extremely basic and important questions when artillery fire support system modifications are being considered or evaluated.

The purpose of this paper is to present a computer simulation model which may be of some assistance in answering questions such as those posed above. As a means of limiting the scope, the brigade level artillery fire support system was selected for modelling. The brigade is assumed to be conducting offensive operations.

II. THE BRIGADE LEVEL ARTILLERY FIRE SUPPORT SYSTEM

At maneuver brigade level artillery fire support is normally provided by an artillery battalion consisting of three firing batteries. This section describes the brigade level artillery fire support system in terms of the basic subsystems identified in Section I.

A. WEAPONS SUBSYSTEM

The weapons subsystem normally consists of three firing batteries each conventionally with six artillery weapons. The weapons are employed in battery size elements. The batteries are located in the offense behind the front line a distance approximately equal to 1/3 the maximum range of the weapon. The units are located laterally as the situation dictates in such a manner as to provide the best possible coverage for the entire brigade front.

B. TARGET ACQUISITION SUBSYSTEM

At brigade level the target acquisition system normally consists of the forward observer sections, the battalion liaison officers, and the battalion countermortar section when available.

Each of the committed maneuver companies in the brigade is provided an artillery forward observer. The mission of the forward observer is threefold. First, the forward observer provides advice and recommendations concerning the use of artillery to the company commander. Secondly, the forward observer serves as a fire support

assistant to the company commander. Thirdly, the forward observer adjusts the artillery when necessary to increase the effectiveness of the fire. The forward observer, being located with the maneuver element company commander, maintains an awareness for the availability of suitable targets for artillery fire.

An artillery liaison officer is provided each of the maneuver battalions in the brigade. The LNO serves as the fire support coordinator for the maneuver battalion. In this capacity, the LNO also maintains a current awareness of the availability of suitable targets for artillery. The LNO maintains his duty station in the battalion operations center and thus is constantly aware of the current intelligence and operational situations.

C. COMMAND AND CONTROL SUBSYSTEMS

The command and control subsystem consists of a Fire Direction Center and a Fire Support Coordination Center. The functions of each of these centers is described below.

1. Fire Support Coordination Center

The Fire Support Coordination Center is collocated with the brigade operations center and serves as the focal point for the coordination of all supporting fires delivered on surface targets. The goal of proper fire support coordination is the complete coordinated integration of all fire support means in an effort to ensure that each target is attacked in the most efficient manner.

The commander of the artillery battalion has responsibility for fire support coordination for the brigade; he thus has responsibility

for the operation of the brigade Fire Support Coordination Center. His representative at the FSC is the artillery battalion liaison officer.

2. Fire Direction Center

The Fire Direction Center (FDC) is that element which exercises tactical and technical fire direction of the battalion. Tactical fire direction consists primarily of selecting unit position areas and selecting the method of attack for targets being engaged. Technical fire direction, on the other hand, consists of the conversion of target location information and the results of the tactical fire direction decisions into suitable firing data for the weapons.

The coordination and integration of the fire support means are carried out in these two centers.

D. THE FIREPLANNING PROCESS

In order to properly coordinate fire support, it is necessary that the need for fire support be anticipated when possible. The artillery fireplanning process is the process whereby the need for artillery is anticipated and the use of available resources is planned. Artillery fireplanning is a continuing process and is conducted at all levels concurrently.

At the lowest level, the forward observer prepares target lists and forwards them to the liaison officer at maneuver battalion. The LNO consolidates the lists and coordinates them where necessary, then forwards them to the artillery fire direction center. The

artillery battalion S3, in the FDC, receives the target lists and other requests for fire and coordinates the allocation of the available artillery resources to satisfy the various requirements for artillery fire.

E. TYPES OF TARGETS

Two basic classification systems are used for artillery targets. Targets are first classified according to the characteristics of the target itself. Under this system the target can be classified as either personnel, material, or a piece of terrain which warrants engagement by fire.

Secondly, targets are classified as either being planned or unplanned. A planned target is a target which appears on one of the target lists described in the previous paragraph. A target of opportunity, or unplanned target, is a target which is observed or detected after an operation begins. Such a target has not been previously considered, analyzed, or planned and fire is frequently required immediately.

The planned targets can be further subcategorized into scheduled and on-call targets. The distinction between the two is clear from the following definitions:

(1) Scheduled Target. A target upon which fire is to be delivered at a specific time during an operation.

(2) On-Call Target. A planned target, other than a scheduled target, for which a need is anticipated but which will be fired on request rather than at a specific time.

F. OFFENSIVE SUPPORTING FIRE

When participating in the fireplanning process, those conducting fireplanning are guided by basic supporting fire requirements. There are three basic supporting fire requirements, namely: offense, defense, and a combination of the two. Since this model portrays the brigade in the offense, only the offense support requirements are considered.

Supporting fire, in general, is fire delivered by supporting units to assist a unit engaged in combat. When the supported unit is engaged in the offense, fires are planned to engage targets before the preparation phase, during the preparation phase, and during the attack. These different types of fires are each briefly described below:

1. Fires Before the Preparation Phase

Fires fired before a preparation phase normally consist of fire to cover the deployment and movement of troops, registration fire, and harrassing and and interdiction fire to restrict the enemy's movement and disrupt his command and control.

2. Fires During the Preparation Phase

Preparation fire is intense prearranged fire delivered in accordance with a time schedule to support an attack and is designed to disrupt the enemy's communications, to disorganize his defenses, and to neutralize his fire support means. Preparation fire starts before, at, or after H-hour and continues until it is lifted, either on a prearranged time schedule or on request of the assault elements.

3. Fires During the Attack

Fires during the attack are those fires delivered to assist the advance of the supported unit. They consist of fires between the line of departure and the objective, fires on the objective, and fires beyond the objective.

Targets generated in the fireplanning process generally include confirmed enemy locations, suspect enemy locations, likely enemy locations, and also prominent terrain features.

III. THE COMPUTER SIMULATION MODEL

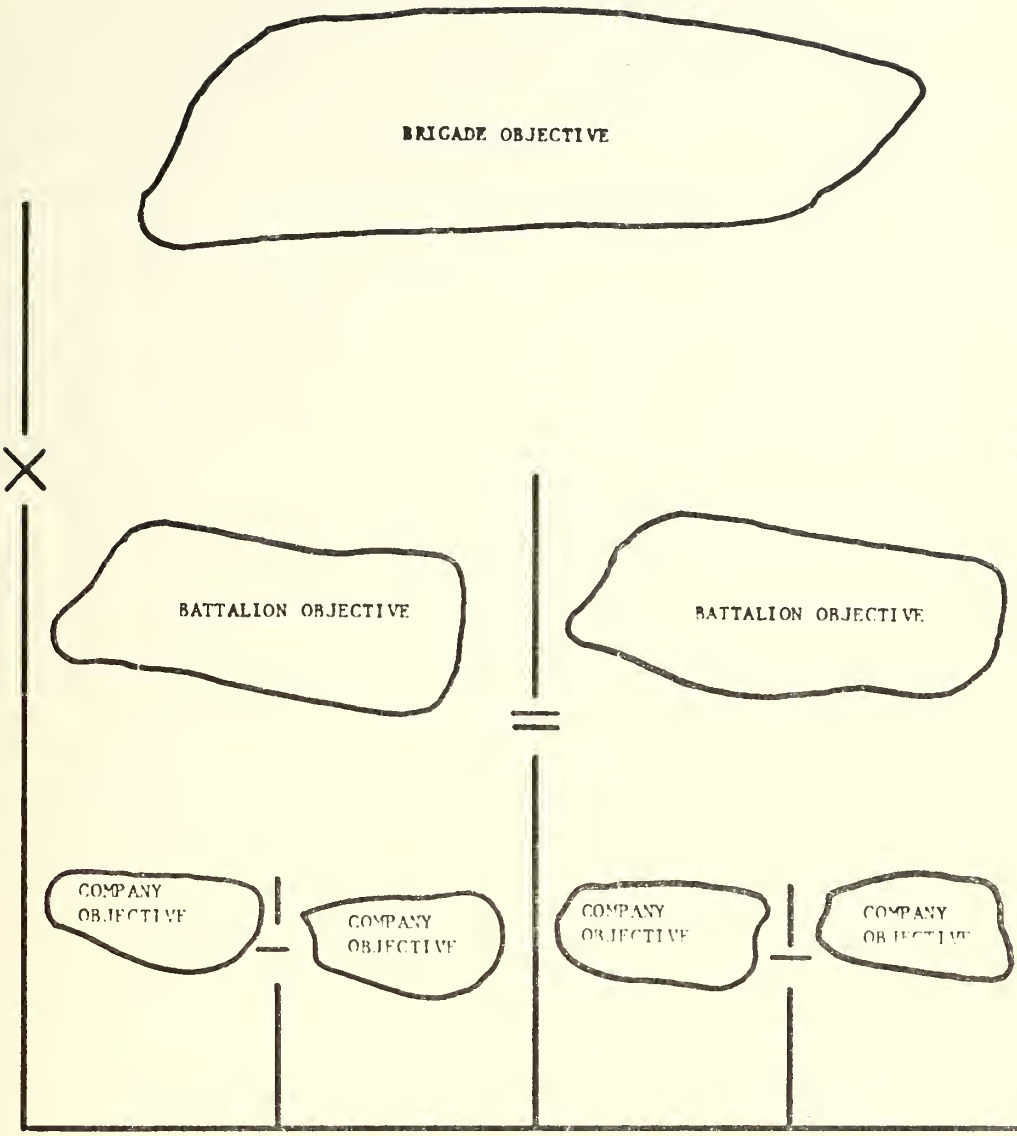
The computer simulation model is a computer representation of a brigade level offensive combat operation. Portrayed in the model are a maneuver brigade supported by a direct support artillery battalion. This section provides a description of the model.

A. SCENARIO

The battle area for the model is defined by the brigade left and right boundaries, the brigade rear area, and the brigade objective. The brigade area of responsibility is subdivided into two battalion areas of responsibility which are themselves each subdivided into two company areas of responsibility. The model thus portrays a brigade operating with a four company front. The brigade battle area is illustrated in Figure 1.

The brigade is supported by a direct support artillery battalion consisting of three batteries of six weapons each. In addition to the direct support battalion, it is assumed that additional artillery battalions are available which are capable of augmenting the fires of the direct support battalion where necessary. These additional supporting battalions play no direct role in the simulation; however, their existence is necessary to assure an orderly progression during the computer simulation.

The terrain is assumed to be flat and weather is considered to be conducive to unobstructed operations. Effects of changes in terrain and weather are not considered in the simulation.



X - Brigade Lateral Boundaries
II - Battalion Lateral Boundaries
I - Company Lateral Boundaries

THE BATTLE AREA

FIGURE 1

There is no friendly attrition or resupply played during the course of the simulation. Units are considered to be free of any logistical constraints. In this regard, it is assumed that sufficient maneuver element personnel replacements exist to sustain the offensive once the attack begins. It is also the case that artillery units have sufficient ammunition immediately available to carry out any and all fire missions as the requirements for fire are generated.

The initial phase of the simulation is a setup phase during which the initial situation is stochastically generated. Force objectives are described for each maneuver unit as are the unit lateral boundaries. Unit objectives are described by stochastically determining four basic objective characteristics for each objective, namely:

(1) distance from the front line to the objective
(2) length of the major axis
(3) length of the minor axis
(4) objective attitude

Using these four characteristics, an objective for each unit is defined and positioned. Figure 2 illustrates the characteristics of the objective.

After the unit objectives and lateral boundaries are specified and initial artillery fire plan is generated, the artillery batteries are positioned to support the fire plan. The battle is initiated by the firing of an artillery preparation in support of the attack on the unit initial objectives if one is called for by the fire plan.

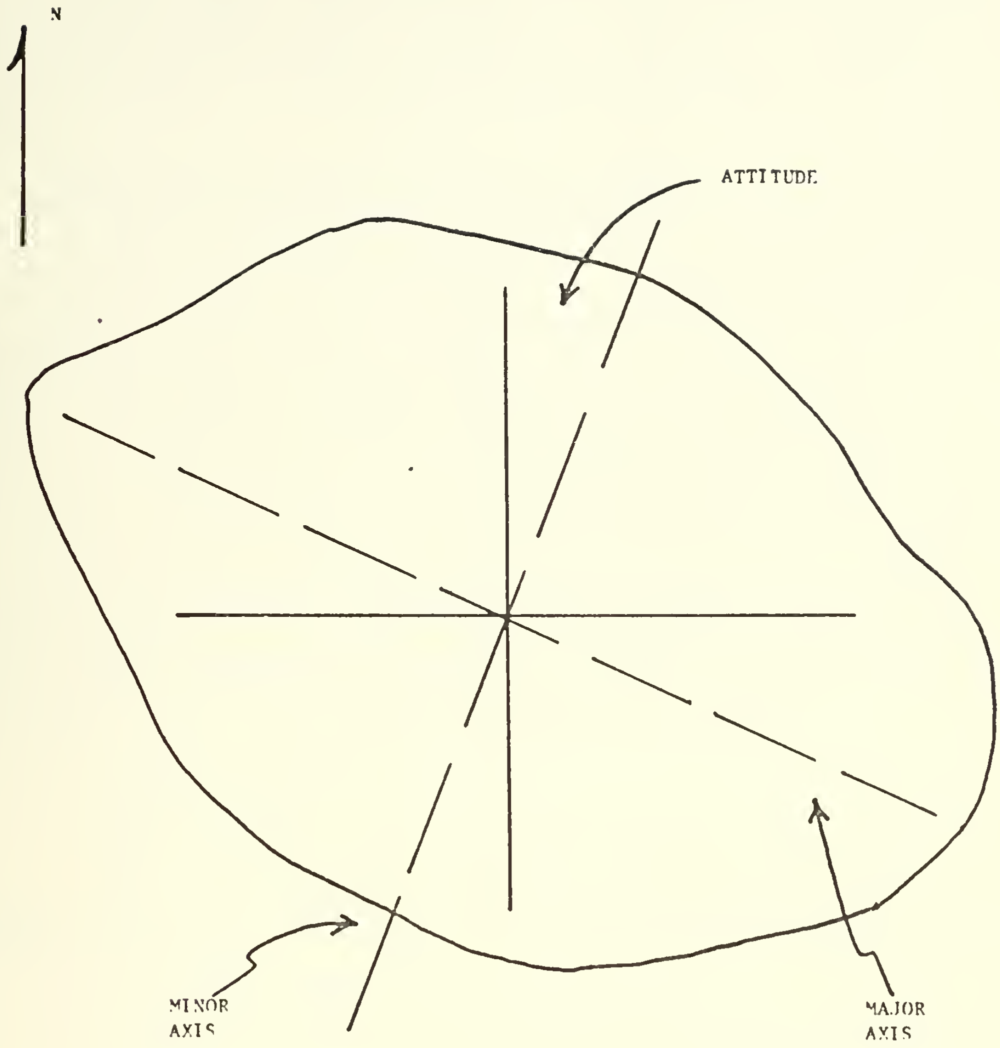


DIAGRAM OF A UNIT OBJECTIVE

FIGURE 2

The enemy force is simulated by randomly introducing targets upon which artillery fire is required. Targets are independent of one another and no starting enemy force disposition is assumed.

B. CONTROL AND MOVEMENT OF MANEUVER ELEMENTS

Control of the maneuver elements is affected by the assignment of subsequent unit objectives as the need arises and the use of control states and coordinated attack times for interunit coordination purposes. Unit locations are represented in the model geometrically by a single geometric point. This point is called the unit "Fire Planning Center (FPC)". A unit FPC corresponds to the geometric center of the dispositions of a unit's forward elements along the front line. Units are moved by moving the unit FPC.

1. Control States

Nine separate numbered control states for maneuver element control are used in the model. A description of each is as follows:

a. Control State 1

This state represents the planning state for the maneuver elements. While in this state fireplanning is conducted. Each unit is initially in this state and the state is re-entered each time a unit objective is secured. The simulated unit remains in this state until the pre-generated attack time for the next maneuver phase is reached.

b. Control State 2

State 2 represents the movement from the unit line of departure (LOD) to a transfer grid at which final closure onto the

objective may begin. The relative location of the transfer grid from the unit objective is a function of the distance from the line of departure for the unit to the objective center. The transfer point is prespecified as being located 2/3 of the distance between the line of departure and the unit objective center. When a unit crosses the transfer grid, it passes to state 3 for control.

c. Control State 3

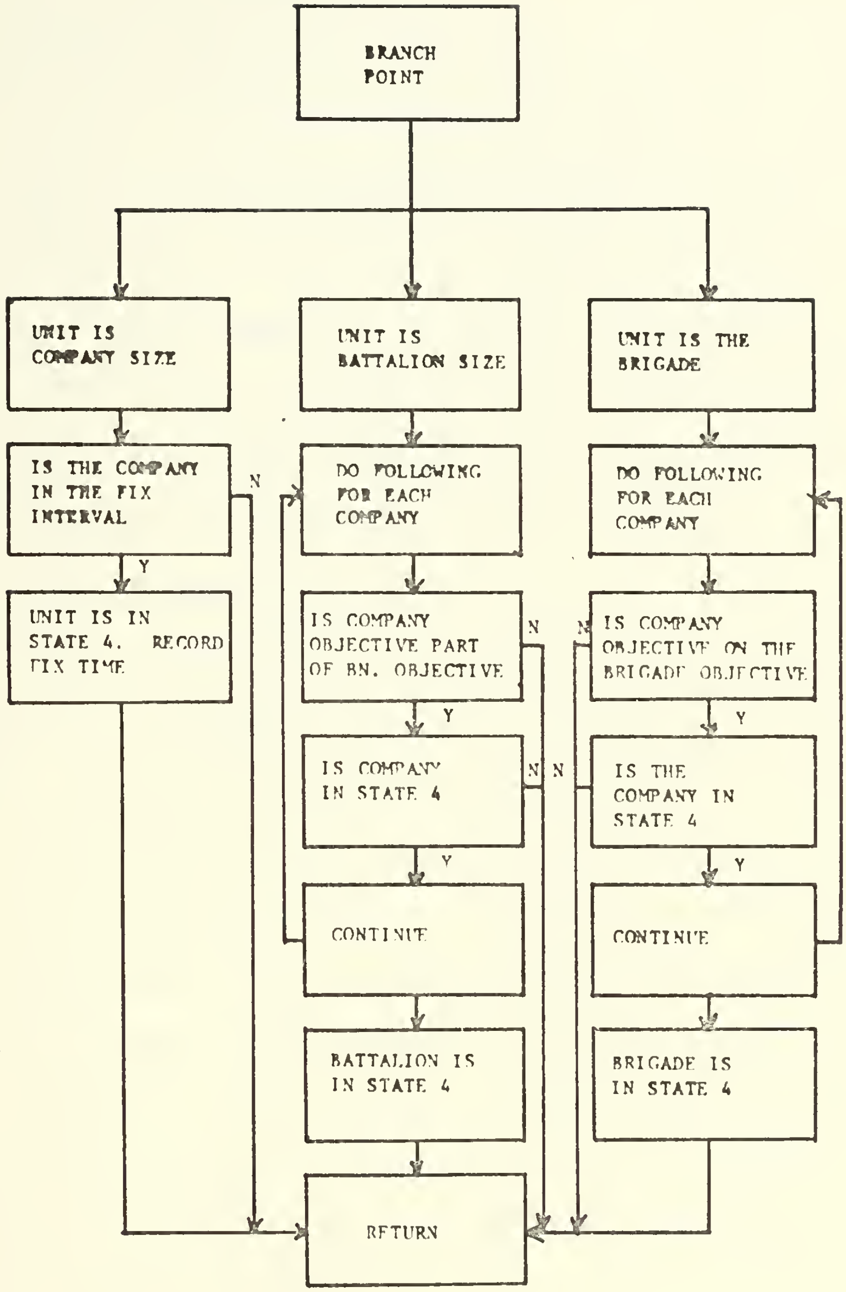
Closure onto the objective takes place while the unit is in control state 3. This state represents the unit movement from assault positions to the objective. While in state 3 the unit FPC is moved incrementally along a path leading directly to the objective center.

d. Control State 4

This state simulates the actions of the unit on and near the objective up until the time the objective becomes secure. A company size unit enters state 4 when it reaches a point less than 200 meters short of its objective center or a point on the far side of its objective center (indicating that the unit has fought through the objective). The logic controlling the assignment of state 4 to units larger than company is depicted in Figure 3.

e. Control State 5

A unit enters state 5 for control purposes when its objective has been secured and the unit objective is not located on the brigade objective. This state is intended to simulate the reorganization and control which takes place once an objective is



LOGIC FOR CONTROL STATE 4

FIGURE 3

secure. The program logic involved in the assignment of this control state is shown in Figure 4.

f. Control State 6

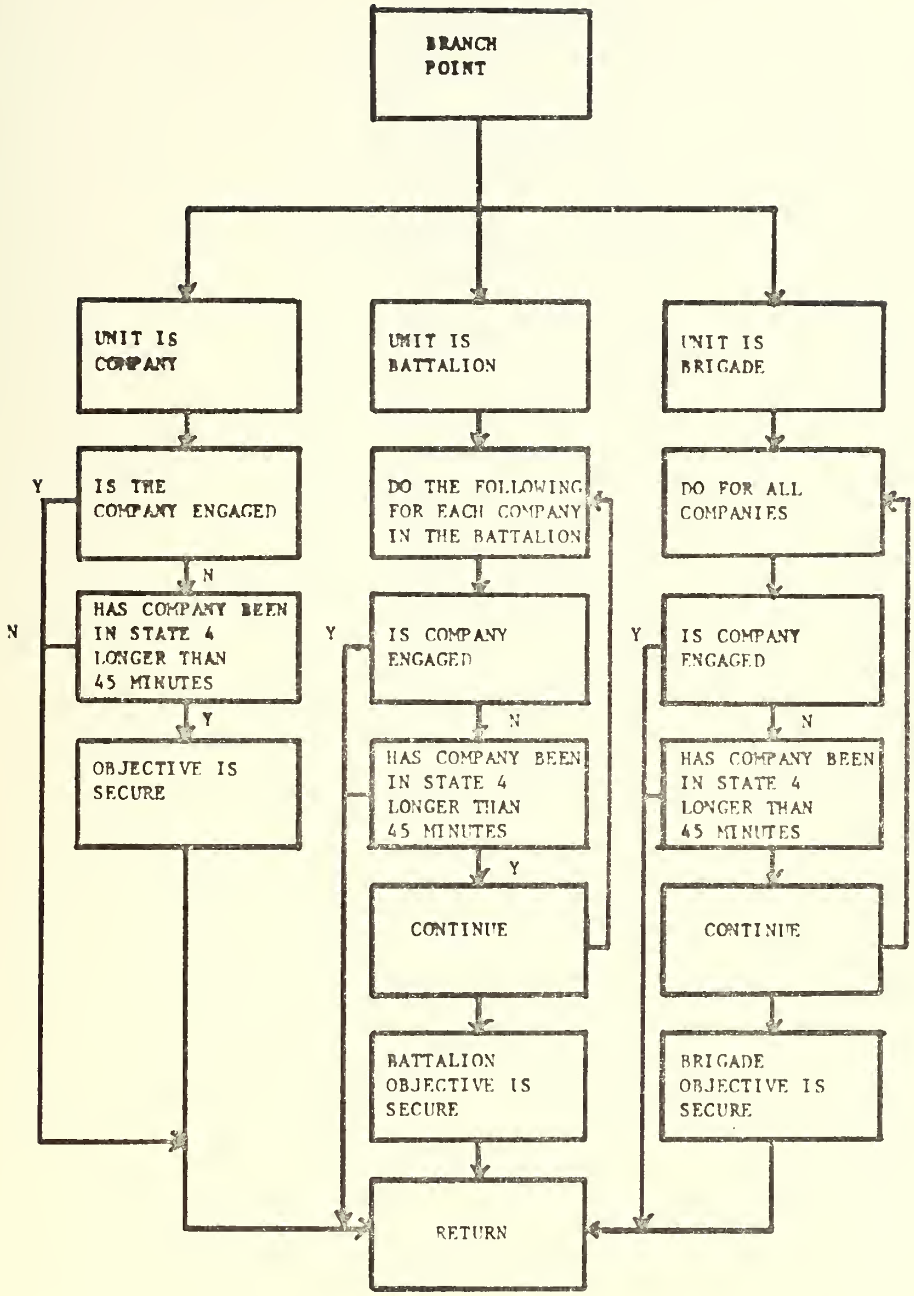
Control in this state pertains to freedom of movement. During the progression of the simulation, a unit FPC is never allowed to advance when it is ahead of its sister unit by more than a specified separation distance. The distance used is 1/5 the distance from the unit line of departure to the objective center. When a unit enters this state, movement becomes restricted. The algorithm controlling unit movement is shown in Figure 8.

g. Control States 7, 8, 9

Once a unit enters state 5, it becomes eligible for the assignment of a subsequent objective. The subsequent objective can be either independent of the next higher objective or can be a portion of this objective. The assignment rules for new objectives are illustrated in Figure 5 and Figure 6. A unit is placed in control state 7 if, when the new objective is generated, the objective is found to be independent of the next higher unit objective. Control state 8 is assigned if this is not the case. Control state 9 is assigned if the next objective is the unit's final objective for the simulation. The nine control states are interrelated as shown in Figure 7.

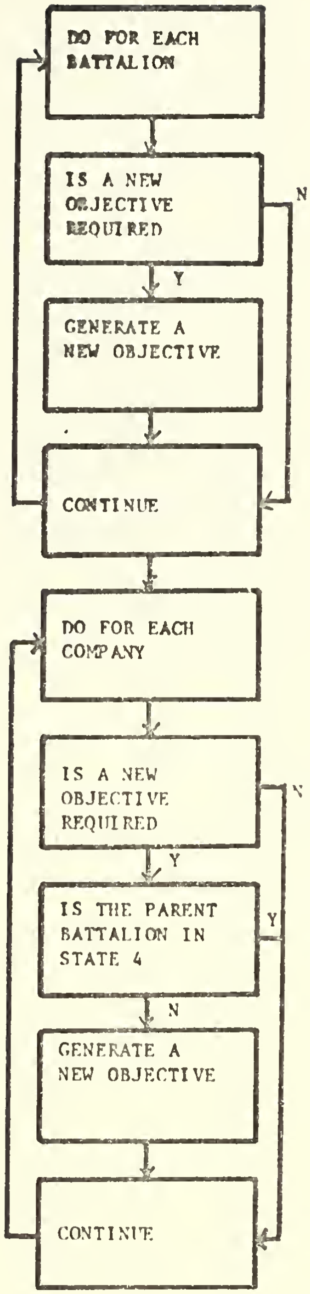
2. Attack Coordination

After a unit objective is secure and a new objective is assigned, a new attack time is established which coordinates the



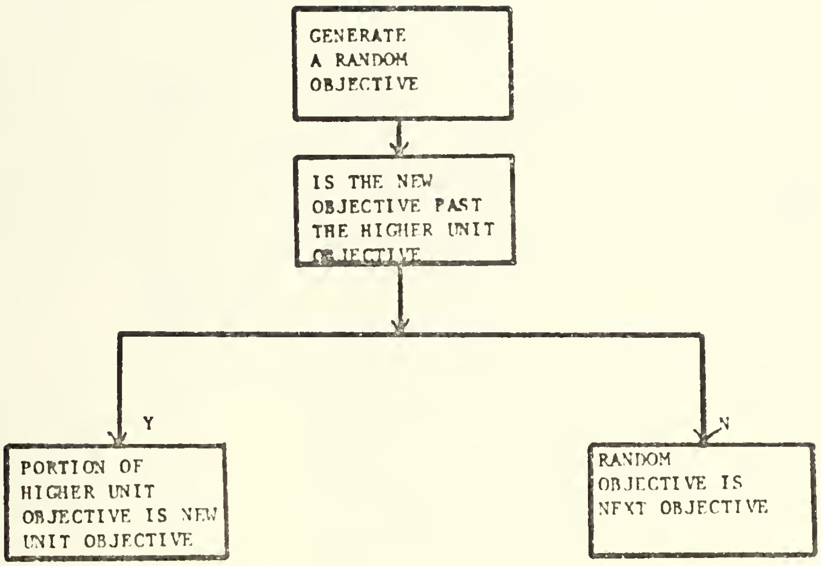
LOGIC FOR CONTROL STATE 5

FIGURE 4



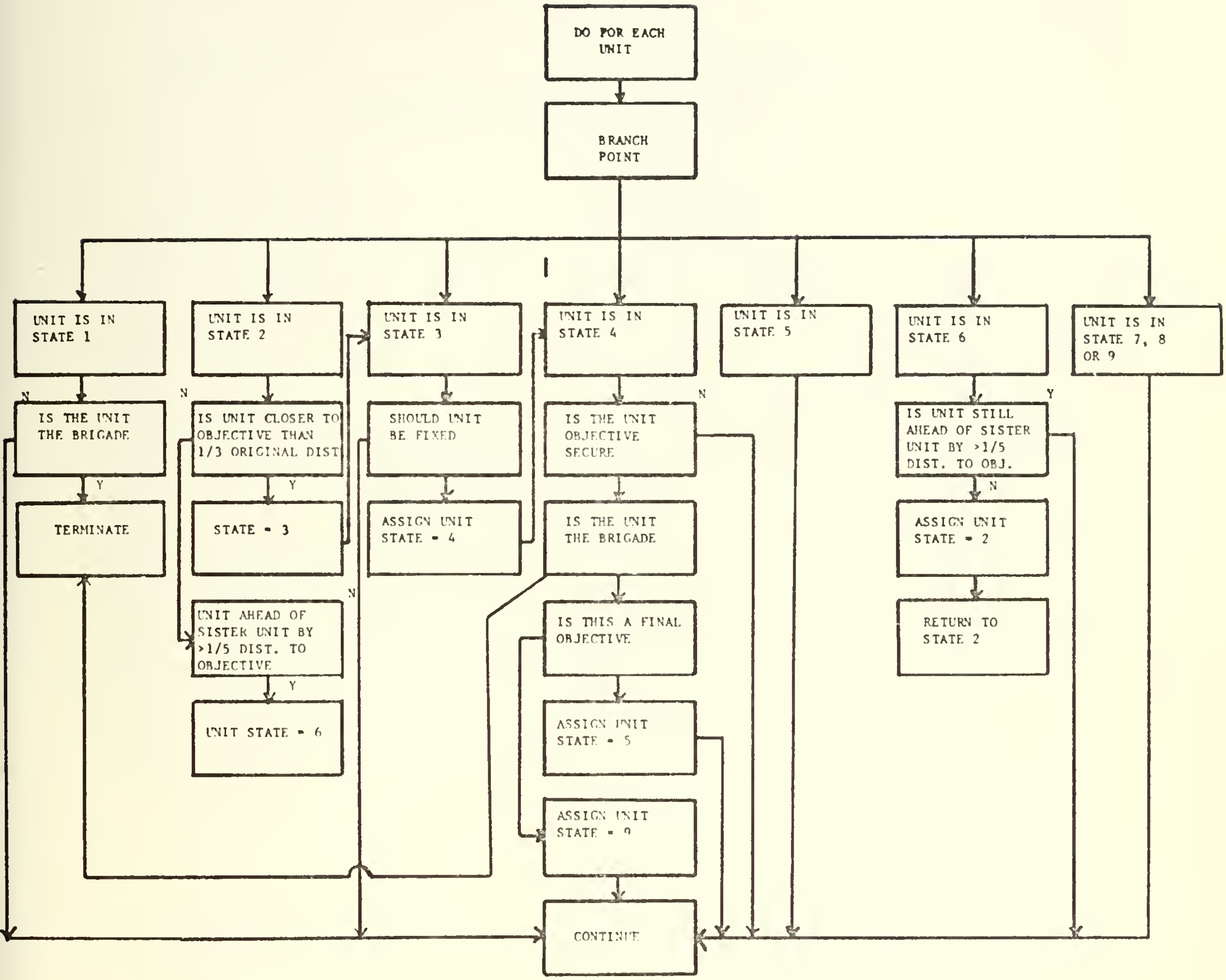
LOGIC FOR ASSIGNMENT OF NEW OBJECTIVES

FIGURE 5



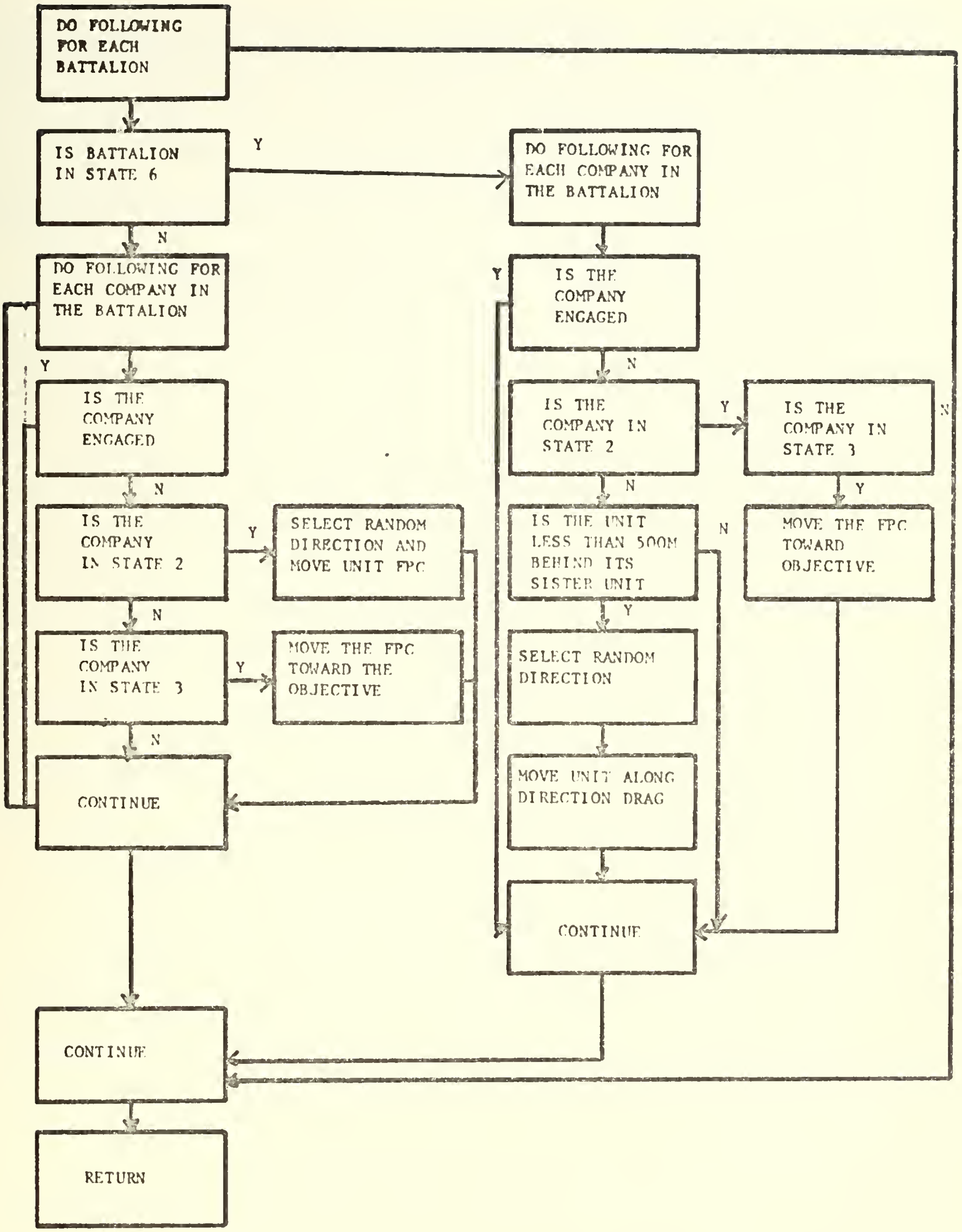
GENERATION OF NEW UNIT OBJECTIVE

FIGURE 6



INTERRELATIONSHIP OF THE CONTROL STATES

FIGURE 7



UNIT MOVEMENT LOGIC

FIGURE 8

unit movement with that of the remaining units. Two or more units are assigned identical attack times in the following situations:

a. Two companies of the same battalion have new objectives on the battalion objective.

b. Attack is initiated on a new battalion objective.

c. Both battalions have new objectives on the brigade objective.

In addition to having identical attack times assigned in the situations described above, fireplanning is coordinated as depicted in Figure 9.

3. Unit Movement

Company size units are moved by moving their respective fire planning centers. Movement of the battalions and the brigade is then reflected by the resulting displacement of their FPC's. Decision rules used to govern unit movement are shown in Figure 8.

4. The Update Sequence

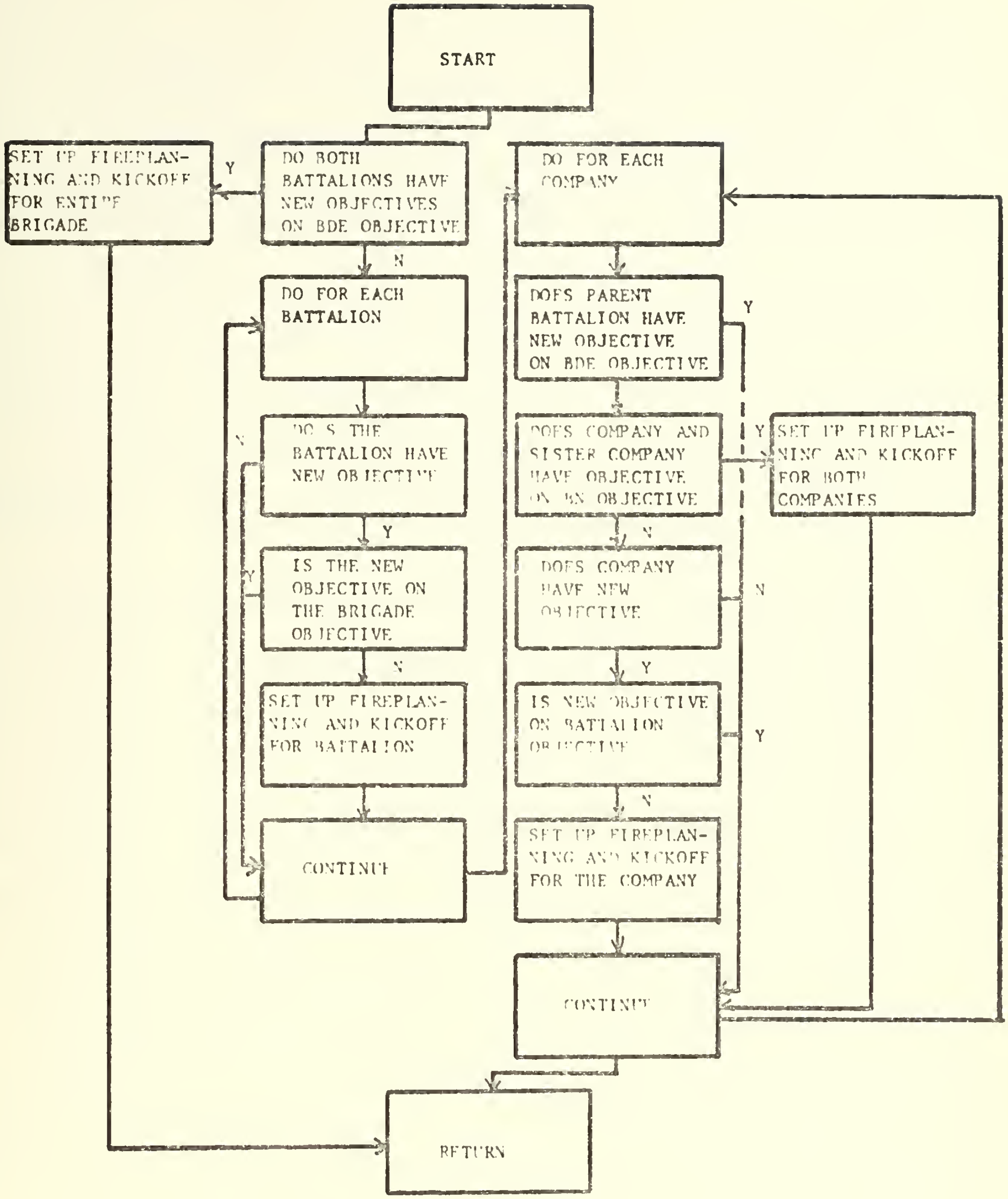
Every ten minutes and one second before generation of an artillery target of opportunity, the model goes through an update sequence. This sequence consists of four basic steps, namely:

a. Step 1

Unit fire planning centers are updated. This is accomplished as described in paragraph B,3 above.

b. Step 2

Unit control states are verified for each unit. It is during this step that changes in unit status are made.



FIREPLANNING AND ATTACK COORDINATION LOGIC

FIGURE 9

c. Step 3

New objectives are assigned if the need exists. This step is described in paragraph B,1 above.

d. Step 4

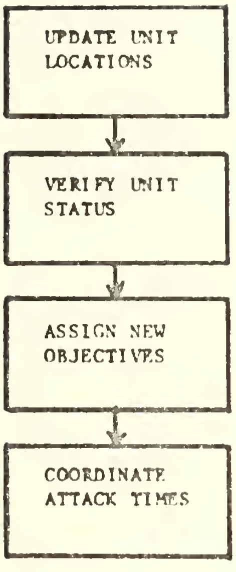
Unit attack times and fire planning are coordinated if a need exists for coordination.

The update sequence is controlled by Subroutine DECIS. The sequence is shown diagrammatically in Figure 10.

C. POSITIONING, MOVEMENT, AND CONTROL OF ARTILLERY UNITS AND WEAPONS

Initially, an artillery battery is positioned behind the geometric center of the front line of each of the maneuver battalions. The third battery is positioned in the center of the brigade area of responsibility. The exact location of each battery in northing and easting is a normal variate about the respective fireplanning centers of the maneuver elements involved.

The azimuth of fire of each battery is initially the angle from the battery center to the center of mass of all company level planned targets. In subsequent position areas, the azimuth of fire for each battery is computed in an analogous manner with the exception that the centers of mass used are the company planned target center of mass points for the appropriate battalions. The center battery in subsequent position areas is layed on the center of mass of company level planned targets for all companies. In the event that there are no company level planned targets at a particular time, a default azimuth of fire of 0000 mils is assigned.



THE UPDATE SEQUENCE

FIGURE 10

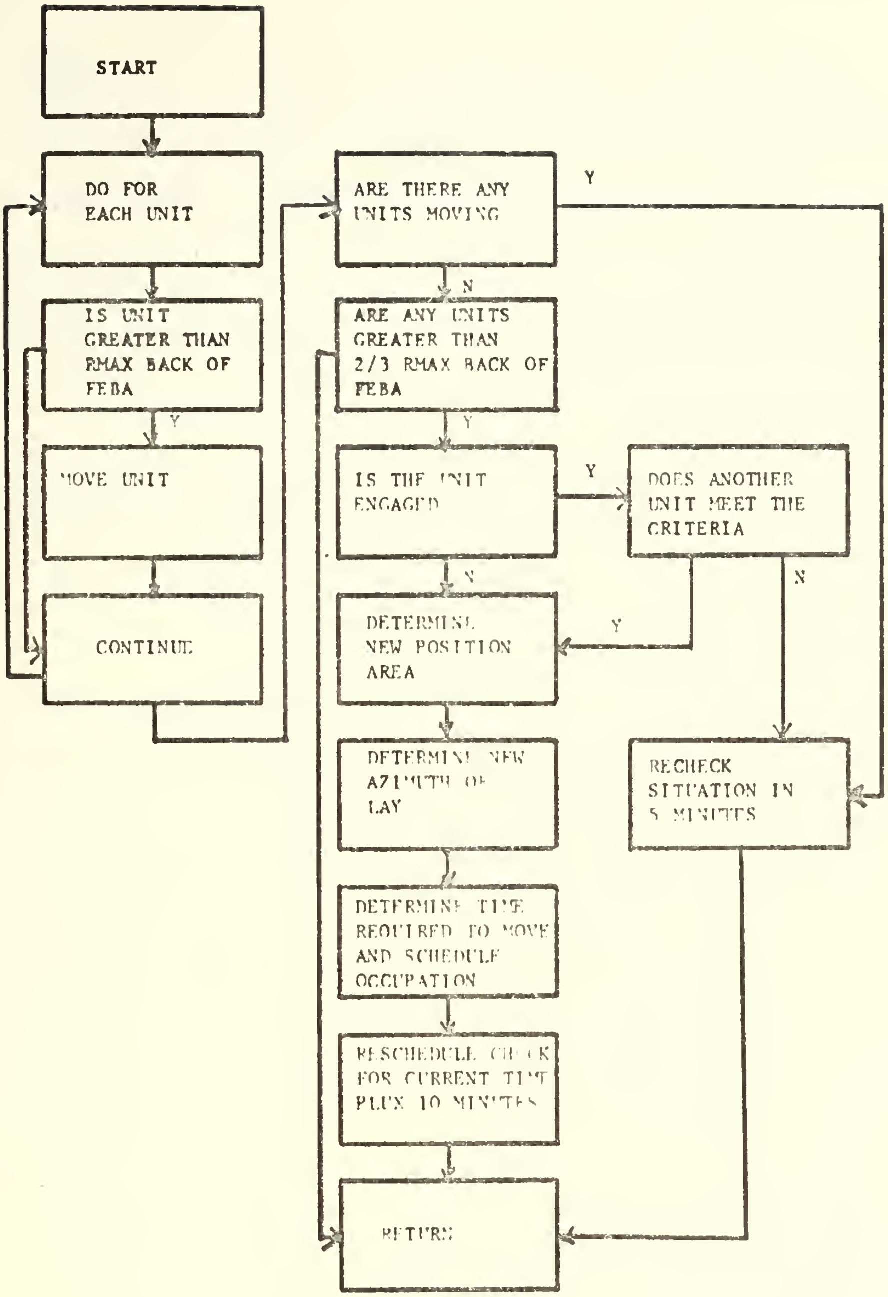
Each weapon in the battery is positioned with respect to the battery center based on input parameters. The parameters describe the bounds on the x and y coordinates of each weapon in a coordinate system with origin at the battery center and positive y axis aligned along the direction fo fire.

Each artillery battery position is validated as still being within supporting range every 10 minutes during the simulation. A battery is said to be in supporting range of the respective unit if the distance between the battery center and the appropriate FPC is less than 2/3 the maximum range. When some battery is greater than a distance of 2/3 maximum range, it is moved provided two conditions are satisfied. First, no unit can move while it is engaged in a fire mission. If the unit selected to move is engaged in a fire mission, the time for the move is delayed until the mission is completed. Secondly, only a single unit is permitted to move at any particular time. In the event that a unit is selected for movement but the movement is constrained, the decision cycle is halved from 10 to five minutes. The movement logic is shown in Figure 11.

Control of the artillery batteries is established using three states described as follows:

1. <u>State 1</u>

The unit is not engaged in a fire mission. The unit is free to move provided no other artillery units are moving.



ARTILLERY MOVEMENT LOGIC

FIGURE 11

2. State 2

The unit is actively engaged in a fire mission. Movement must be delayed until the fire mission is completed.

3. State 3

The unit is moving. While the unit is moving, it is not available for fire missions.

D. FIREPLANNING AND FIRE ALLOCATION

The types of planned targets simulated in the model are as follows:

1. Scheduled Target

A scheduled target is one for which a need can be anticipated for artillery fire. This type of target is engaged at some prespecified time without any additional request for fire.

2. On-Call Target

An on-call target is one for which a need for fire is anticipated; however, no precise engagement time can be prespecified.

3. Preparation Target

A preparatory target is one which will be engaged in support of the initial phase of the attack. All preparation type targets are engaged in accordance with a specified fire plan which is generated in the model.

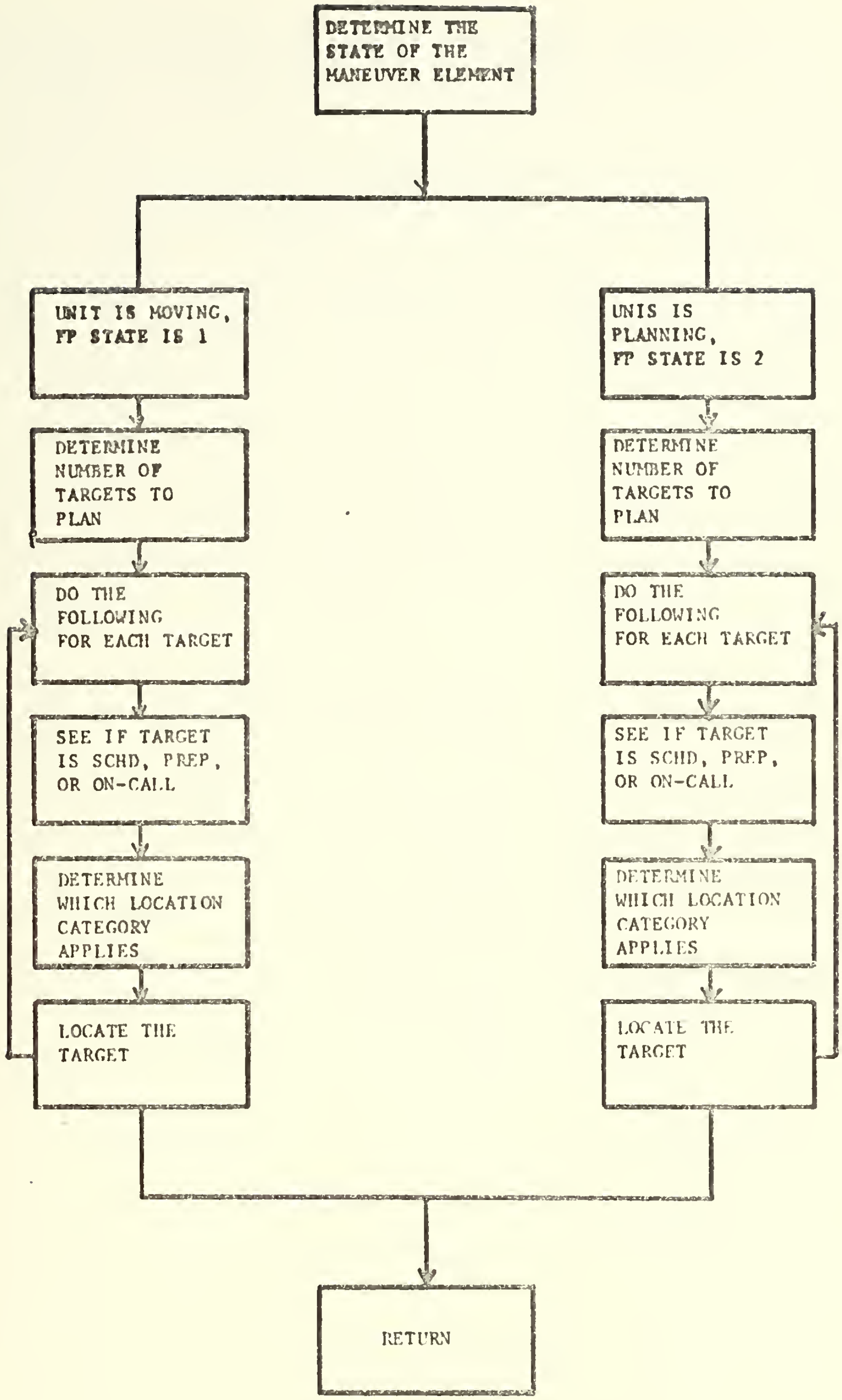
Planned targets are further categorized into three subcategories according to relative location. Targets are classified as lying between the lines of departure (or FEBA) and the objective, on the

objective, and beyond the objective. The probability that an arbitrary planned target falls in one of these location categories is conditioned on the actual fireplanning stage. The specific probabilities involved are a function of unit size and stage. For fireplanning purposes a maneuver element can be in one of two stages, stage 1 or stage 2. A specific unit is considered to be in stage 1 if it is in control state 1; otherwise it is considered to be in stage 2.

The number of targets which will be planned at a given time is a function of the fireplanning stage a unit is in when fireplanning takes place. In this model the total number of targets selected is a conditional discrete random variable. Actual target locations are determined in routines which are described in paragraph E. The fireplanning process is described diagrammatically in Figure 12.

Fire allocation consists of assigning responsibility for a specific target to a specific artillery unit. In this model, target responsibility is assigned to battery level. In the case of scheduled targets, one battery is assigned responsibility for all targets generated by a specific battalion. The center battery is assigned responsibility for the targets scheduled by the brigade. The time for fire is based on the distance between the brigade fireplanning center and the target and the brigade mean rate of advance which is an input parameter.

Preparatory targets are assigned to specific units based on range, time for attack, and an equitable distribution of responsibility. In



FIREPLANNING LOGIC

FIGURE 12

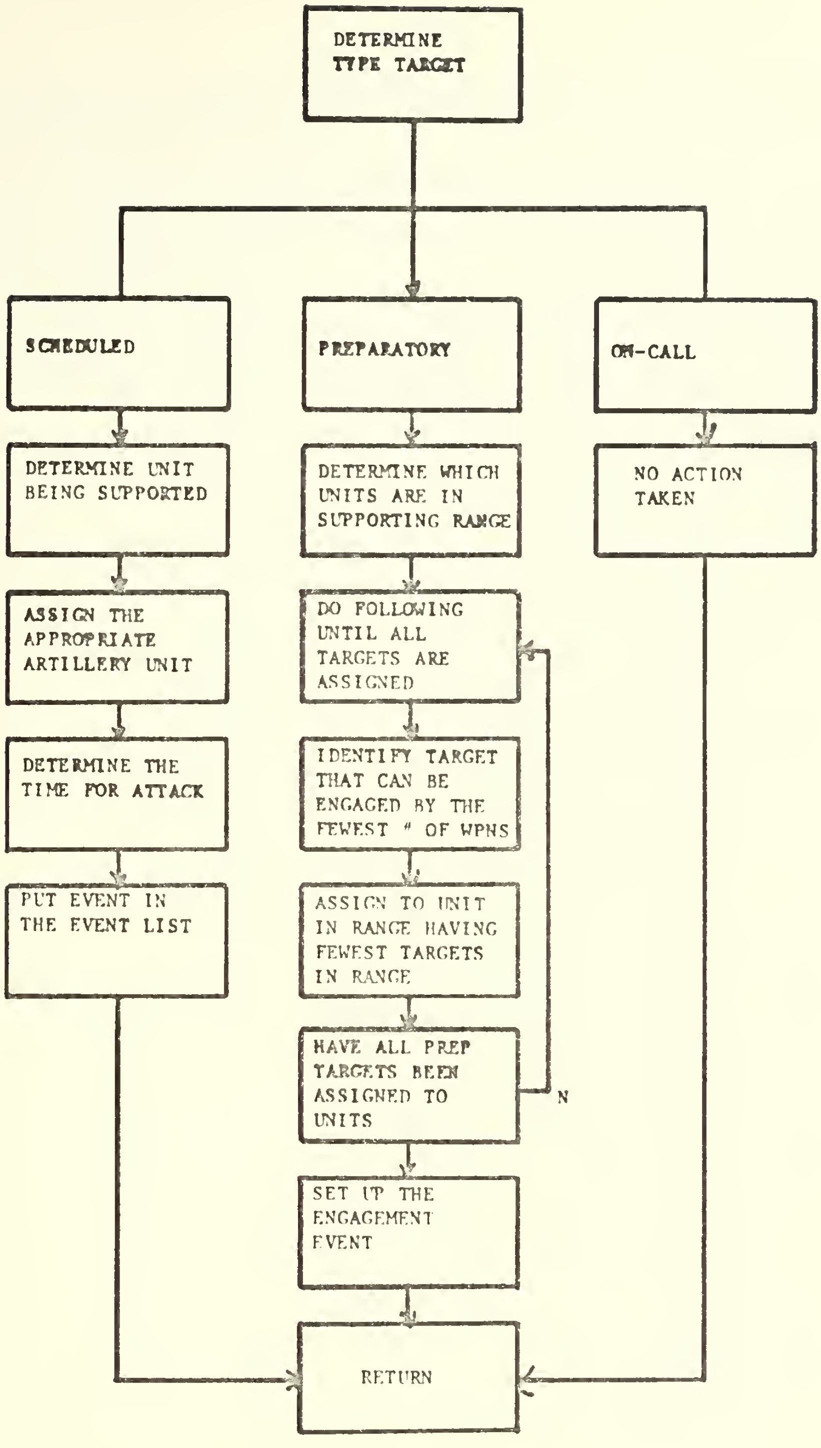
allocating the preparatory fires, the model determines the total number of units which are within range of each target first. Those targets which can be reached by the fewest number of units are then assigned to the unit which can engage the fewest number of targets. The time for attack is based upon the number of targets a specific unit must engage during the preparatory fire phase. The time increment used is two minutes per target. If, for example, a unit had three targets to engage, the first would be engaged at the attack hour (HHOUR) minus four minutes, the second at HHOUR minus two minutes, and the last at HHOUR.

E. LOCATION AND DESCRIPTION OF TARGETS

There are two separate target location routines in the model, one for planned targets and the other for unplanned targets. The scheduled targets are located based upon the general location category which applies. The categories and a brief discussion of the algorithms in each case are given below:

1. Planned Target

For the purposes of target location the term "planned target" applies to all targets which are not classified as targets of opportunity. Due to this distinction, all planned targets can be further categorized into one of three general location categories, namely: between the line of departure (or FEBA) and the objective, on the objective, and beyond the objective. The exact easting and northing coordinates of the target centers are considered to be



FIRE ALLOCATION

FIGURE 13

independent uniform variates. The bounds applicable for each category for a particular unit are as shown in Figure 14.

2. Target of Opportunity

A target of opportunity has associated with it one of the four maneuver companies. The location of a target of opportunity is related to the unit boundaries as shown in Figure 15. In this case the easting and northing coordinates are independent uniform variates. The edges of the box in Figure 15 define the endpoints of the appropriate intervals.

All targets in the model are assumed to be personnel targets. Two general size categories are available. The input parameters define the size parameters and the probability that a random target will belong to one of the two categories.

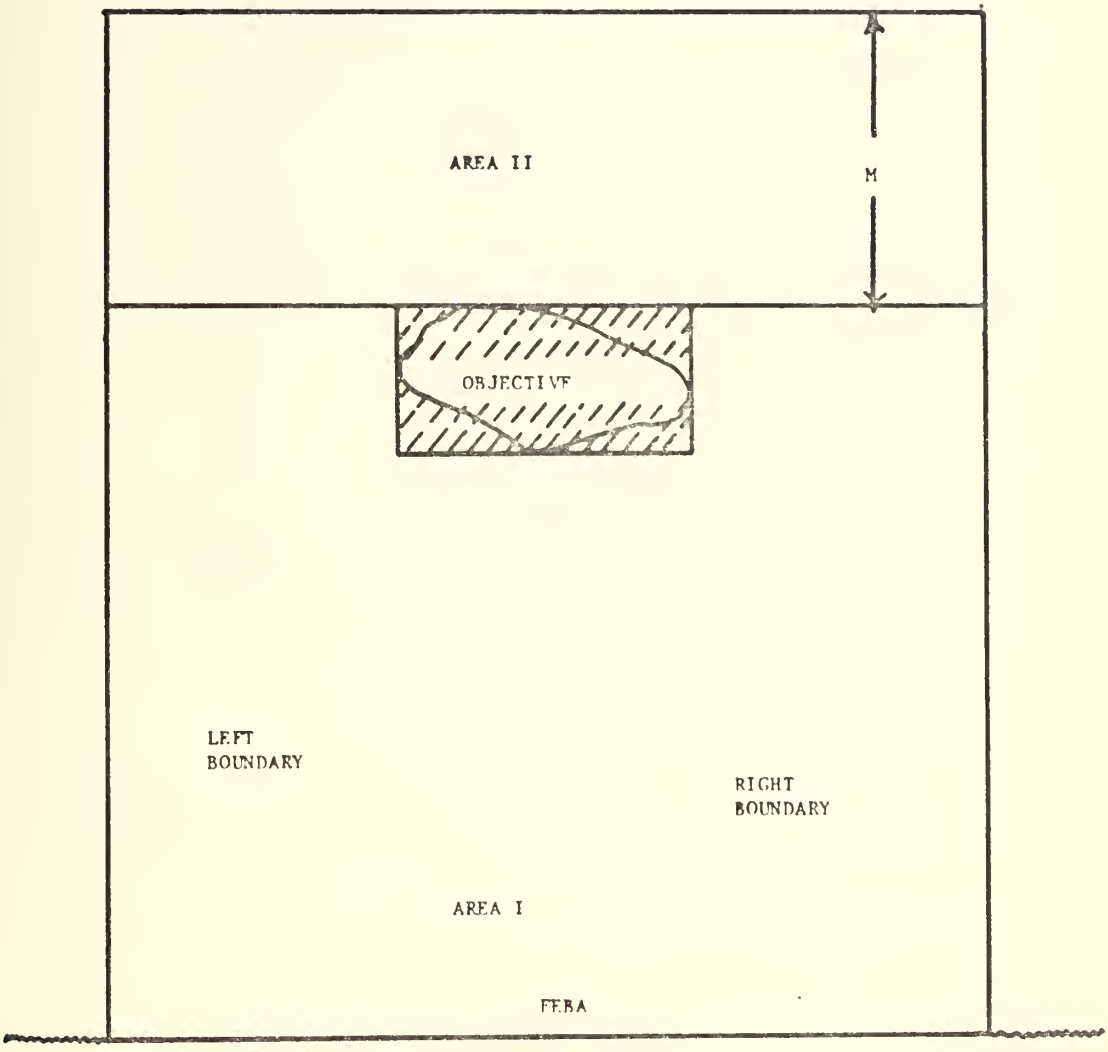
Targets in the model are portrayed by arranging a random number of target elements uniformly within a rectangular array. For purposes of target geometrical description, three zones are defined and identified as Zone 1, Zone 2, and Zone 3. The target-zone organization is shown in Figure 16. The zones have the following significance:

1. Zone 1

Zone 1 is that geographical area within which 50% of the target elements are located.

2. Zone 2

The geographical area within which 40% of the target elements lie.

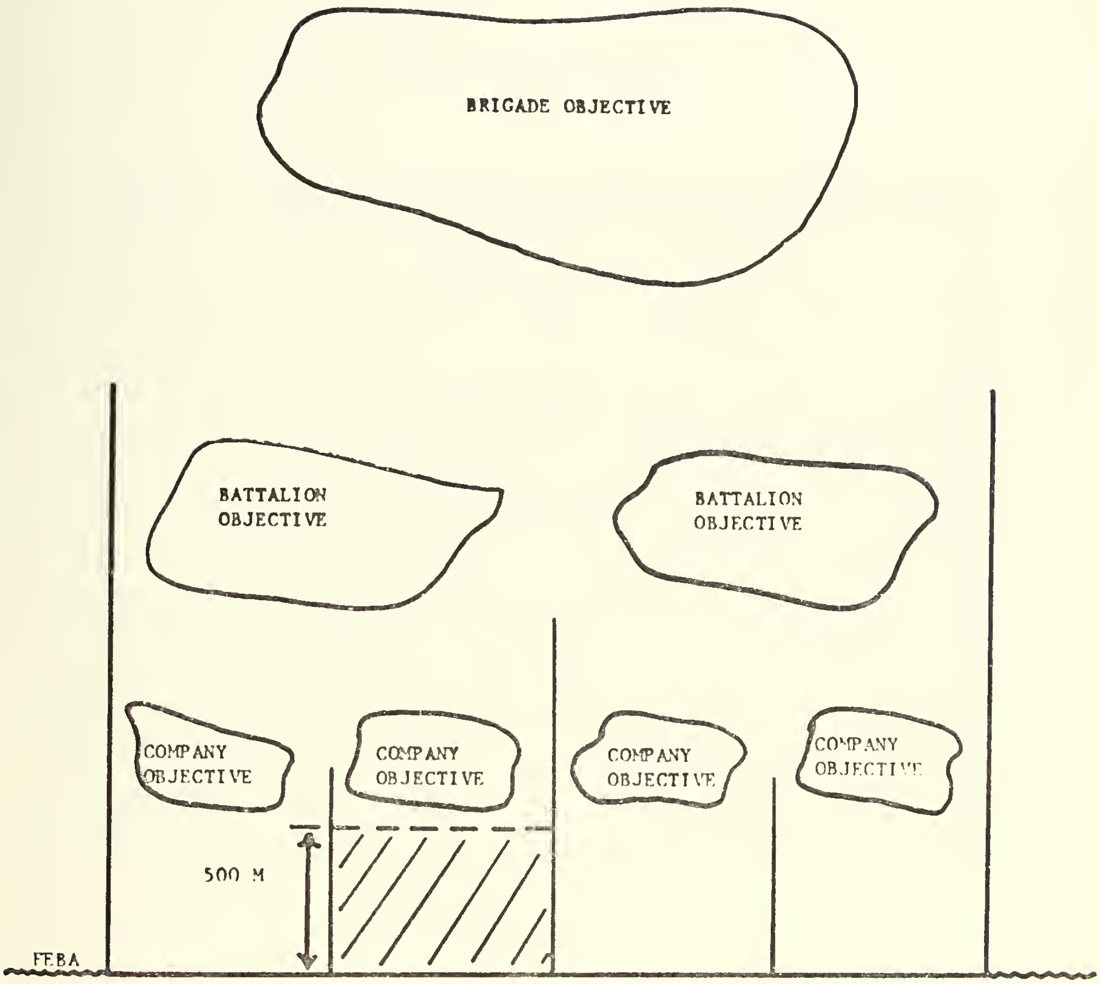


AREA I - BETWEEN LD (OR FEBA) AND OBJECTIVE
AREA II - BEYOND THE OBJECTIVE
////// - ON THE OBJECTIVE

M = { 1000 M - COMPANY
2000 M - BATTALION
3000 M - BRIGADE

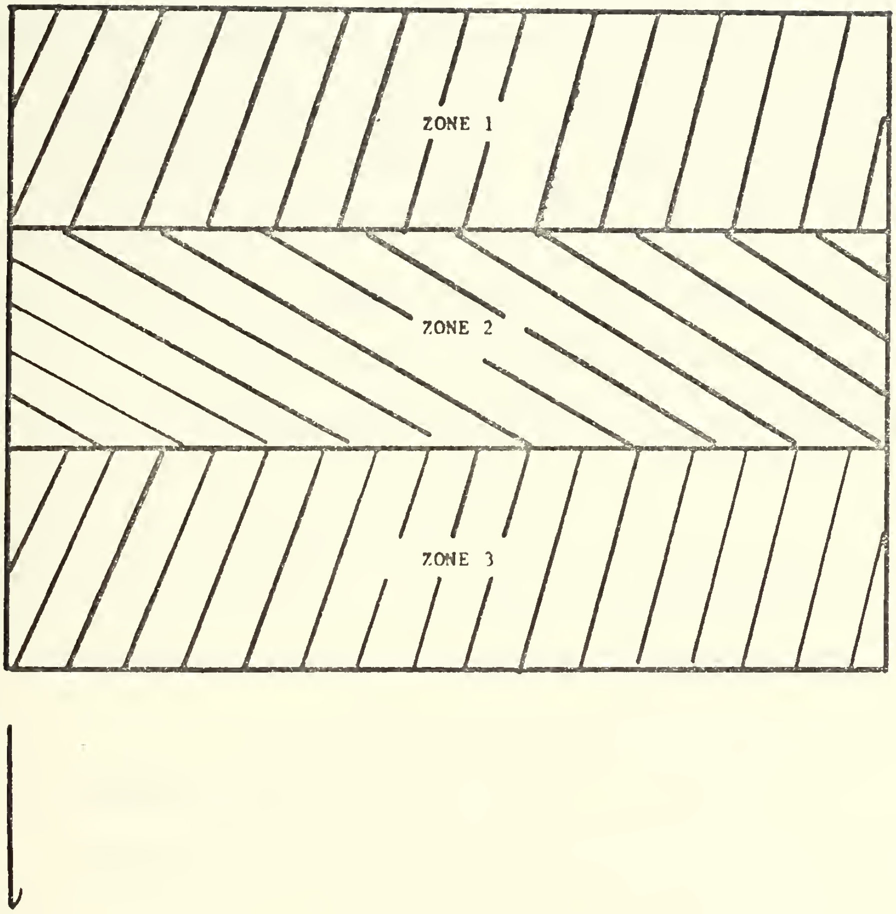
TARGET LOCATION CATEGORIES

FIGURE 14



TARGET LOCATION BOUNDARIES FOR TARGET OF OPPORTUNITY

FIGURE 15



FEBA

TARGET-ZONE ORGANIZATION

FIGURE 16

3. Zone 3

That area within which the remaining 10% of the target elements are located.

Within each zone the exact location of a specified target element is described by easting and northing coordinates which are independent uniform variates having the respective zone boundaries as bounds.

The logic involved in describing a target is shown in Figure 17.

All targets are considered to be stationary and homogeneous. The lethality considerations involved are discussed in paragraph J below.

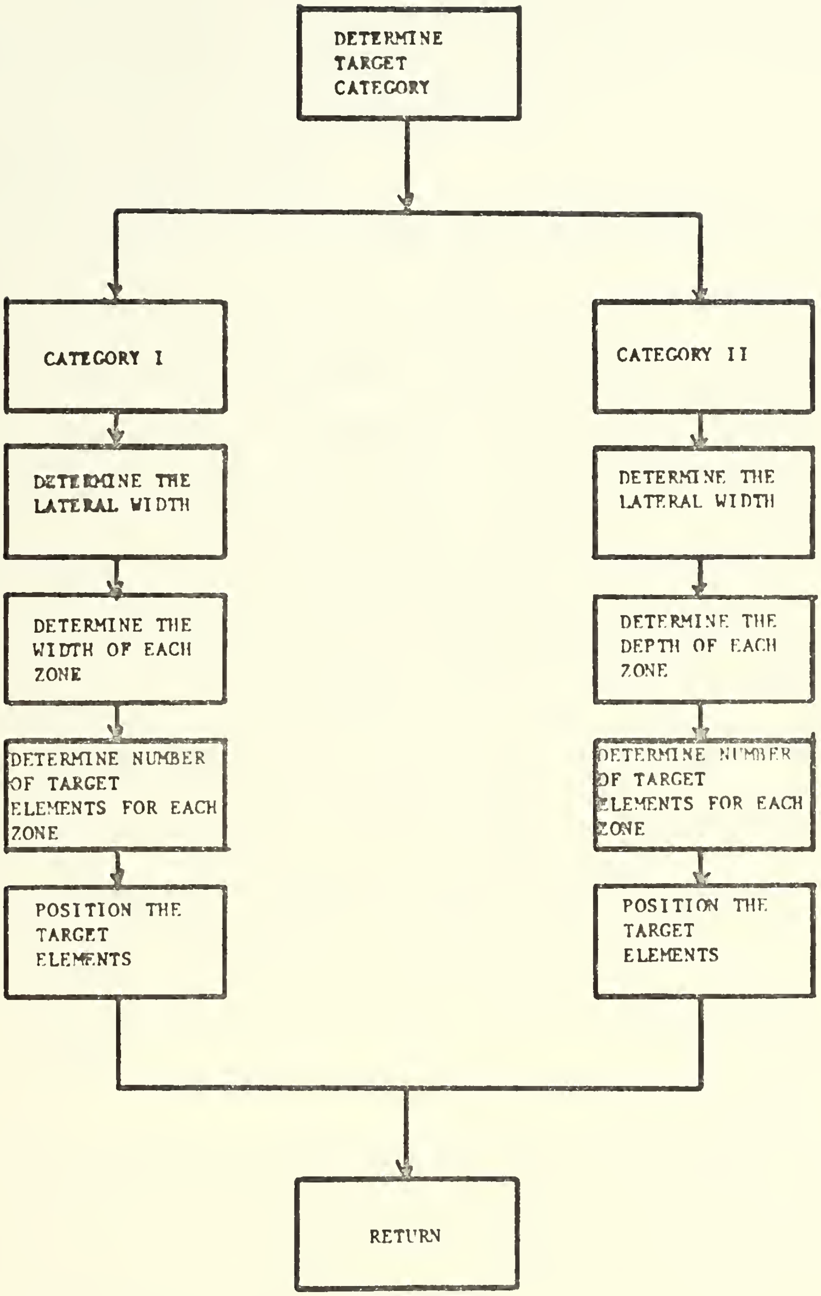
A preset probability of 0.3 is used in the model to determine if there is, in fact, a target located at the designated point in the case of planned targets. If it is determined that there is a target there, it is considered to fall into size Category II.

F. ERRORS IN THE FIRE SUPPORT SYSTEM

The errors simulated in the model can be categorized as firing errors and non-firing errors. The basic non-firing errors included are:

1. Artillery Unit Position Error

Artillery unit position error is defined as the deviation in easting and northing of the actual unit center from that which was assigned. The result of this error is felt in the firing process by virtue of the fact that the assigned location is that location from which the unit firing data are computed. The result is a constant error component in the total round error term. This error



TARGET DESCRIPTION LOGIC

FIGURE 17

is normally compensated for in the adjustment process. The two components of this error, deflection and range, are assumed to be independently distributed normal variates with mean, $\mu = 0$, and variance σ^2, input as a model parameter.

2. Target Location Error

Target location error is defined as the deviation of the actual target location from that reported by the forward observer. This error is applied when targets of opportunity are being engaged. In this case, the error is compensated for in the artillery adjustment process. If no adjustment takes place, the round impact point will have a constant error component equal to the target location error.

This error is assumed to be a function of the distance between the forward observer and the actual target. The error is expressed in the model as consisting of a distance component and a deflection component. These components are independently distributed normal variates with means equal 0 and variances given by the relationships:

$$V_{dist} = a + bx$$

$$V_{def} = c + dx$$

where

V_{dist} = Variance of the distribution of the distance component

V_{def} = Variance of the distribution of the deflection component

x = Distance between the forward observer and the target expressed in meters

"a", "b", "c", and "d" are input parameters to the model.

3. Burst Location Error

Burst location error is defined as the deviation between the actual burst location and the location sensed by the forward observer in the adjustment process. This error is also assumed to be expressible as independently distributed normal variates with distribution parameters defined in the same fashion as those for the target location error.

The only firing error simulated in the model is the terminal ballistic error. The basis for information concerning this error is "probable error" information tabulated experimentally and disseminated for use in the current weapon firing tables. The "probable error" in either range or deflection is defined as the distance within which 50% of the rounds should fall in either deflection or range as appropriate. This information is input to the model and internally converted to distribution variances. The range dispersion and the deflection dispersion are assumed to be independently distributed normal variates with mean equal 0 and variances a function of range and the probable errors as discussed above. Chebychev's inequality and application of the definition of probable error are used to convert a probable error into a distribution variance for some specific range.

Other ballistic firing errors such as internal ballistic errors and errors due to nonstandard meteorological conditions are not represented in the model.

G. TIME FACTORS IN THE FIRE SUPPORT SYSTEM

The time factors included in the model can be categorized as pertaining to the maneuver elements or to the artillery.

1. Time Factors for the Maneuver Elements

The maneuver element times considered were:

a. Movement Rate

The movement rate is assumed to be a uniform random variable measured in kilometers/hour. Each time a unit is required to move during the simulation, the movement rate to apply for the move is obtained by sampling from the distribution. The variation in the rate is assumed to compensate for variation in terrain, etc.. Different type units can be portrayed from a mobility point of view by proper selection of the movement rate.

b. Search and Seizure Time on the Objective

This factor is used to account for the time a unit requires once it reaches an objective to secure the objective. During the simulation a unit objective is not classified as secure until the unit has been on the objective for this specified period of time. The time increment used in the model is forty-five minutes and is fixed.

c. Reorganization and Consolidation Time

This time factor accounts for the time it takes a unit to plan, reorganize, and resupply itself once an objective has been secured. A unit is not allowed to continue the attack in the model until some random time after the unit has secured its objective.

This time increment is a uniformly distributed random variable. The distributions are dependent upon the unit size and situation as described below:

(1) Case I. Both battalions have as their new objectives portions of the brigade objective. In this case all companies conduct a coordinated attack. The time required to coordinate the attack is a uniform variate measured in seconds with lower and upper bounds of 2400 seconds and 4200 seconds respectively.

(2) Case II. One of the battalions is assigned a new objective not on the brigade objective. In this case, the planning time increment is a uniform variate measured in seconds with lower and upper bounds of 1800 seconds and 3600 seconds respectively.

(3) Case III. Both companies of a battalion have new objectives on their battalion objective where the battalion objective is not the brigade objective. In this case, the planning time increment is uniformly distributed with lower and upper bounds of 1800 seconds and 2400 seconds respectively.

(4) Case IV. A company has a new objective not a portion of the battalion objective and the present company objective is not on the battalion objective. The planning time is a uniform variate with lower and upper bounds of 900 seconds and 1800 seconds respectively.

2. Artillery Movement and Preparedness Times

a. Movement Rate

The movement rate is measured in kilometers/hour and is treated as a normal random variable in the model. The variation makes allowances for varying terrain and security conditions.

b. March Order Time

The march order time is the time interval between time of receipt of an order to move and the time the unit is in march formation ready to proceed with the movement. This time increment is assumed to be a normal variate measured in seconds.

c. Emplacement Time

The emplacement time is the time interval from the time the unit arrives at the new position area and the time the unit is ready to engage a target. The time is a normal variate measured in seconds.

3. Fire Mission Processing Times

Time required to process a particular fire mission is a function of the type of mission. Each of the individual time increments in the firing chain is a truncated normal variate. The parameters defining the distributions of these variates are input parameters. A description of the total processing time for each type mission is given below:

a. Target of Opportunity

There are three distinct phases of an engagement of a target of opportunity, namely: the mission preparation phase, the adjustment phase, and the fire for effect phase. If T_p is the time required for the forward observer to prepare a request for fire, T_t is the time required for the observer to transmit the request for fire to the fire direction center, and T_a is the time required for the

fire direction center to analyze the target, select units to fire, compute the firing data, and transmit the data to the firing units, then T_1, the time required for the mission preparation phase, is simply

$$T_1 = T_p + T_t + T_a \quad .$$

If T_f^i is the time required for the fire unit to prepare and fire the ith volley in adjustment; T_o^i is the time of flight for the ith volley; T_c^i is the time required by the forward observer to determine the necessary adjustment corrections for the 8th volley and transmit them to the fire direction center; T_s^i is the time required for the fire direction center to compute subsequent firing data for the ith volley and transmit it to the adjusting battery; and N_a is the number of volleys required for the adjustment, which is a random variable, then T_2, the time required for the adjustment phase, is

$$T_2 = \sum_{i=1}^{N_a} T_f^i + T_o^i + T_c^i \quad + \sum_{j=1}^{N_a - 1} T_s^j \quad .$$

For the fire for effect phase, a distinction must be made concerning the method for determining subsequent aimpoints after the first. Two mission types are defined to make the distinction clear:

(1) <u>Mission Type 1</u>: N_e volleys are fired, all volleys fired at the same aimpoint.

(2) <u>Mission Type 2</u>: N_e volleys are fired, all volleys being fired at different aimpoints.

If F_a is the time required for the fire direction center to compute firing data for a new mass point, determine the mass point, and transmit the data to the firing units; F_{p1} is the time required for a fire unit to prepare and fire a new volley assuming the firing data are different from the last volley; and F_{p2} is the same as F_{p1} except that it is assumed the same data are fired each time; then T_3, the time required for the fire for effect phase is

$$T_3 = F_a^1 + F_{p1} + T_o^1 + \sum_{i=2}^{N_e} F_{p2}^i + T_o^i$$

for a mission of type 1, or

$$T_3 = \sum_{i=1}^{N_e} F_a^i + F_{p1}^i + T_o^i$$

in the case of mission type 2.

The total time required for a target of opportunity type mission, T_M, is then

$$T_M = T_1 + T_2 + T_3 \quad .$$

b. Scheduled Targets

In the case of scheduled targets, the determination of the initial aimpoint, computation of firing data, and transmission of firing data to the fire units are accomplished during slack time. It is assumed in the model that the initial volley in the case of a scheduled target is fired at a specified time. Using the same notation

developed above, then, the time required for a scheduled target is

$$T_M = T_o^1 + \sum_{i=2}^{N_e} F_{p2}^i + T_o^i$$

for a type 1 mission, or

$$T_M = T_o^1 + \sum_{i=2}^{N_e} F_a^i + F_{p1}^i + T_o^i$$

for a type 2 mission.

c. Preparatory Targets

In the case of preparatory targets, the target is always engaged with a single volley. In the event that there is more than a single target in the preparatory fires scheduled for the same unit, the targets are scheduled two minutes apart. The only time consideration for this type target is the time of flight for the volley.

H. TARGET ENGAGEMENT STRATEGY

The strategy used to engage a specific target is dependent upon the type target being engaged primarily. The engagement strategy in the case of a target of opportunity consists of a decision as to whether or not an adjustment will be conducted, a decision concerning the number of volleys to be fired in effect, and an algorithm for determining what specific aimpoint will be used for each of the volleys.

In the simulation the number of volleys to be used in fire for effect is a discrete random variable the distribution for which is an

input parameter. The model provides for different distributions for targets of opportunity with adjustment and scheduled targets or targets of opportunity without adjustment.

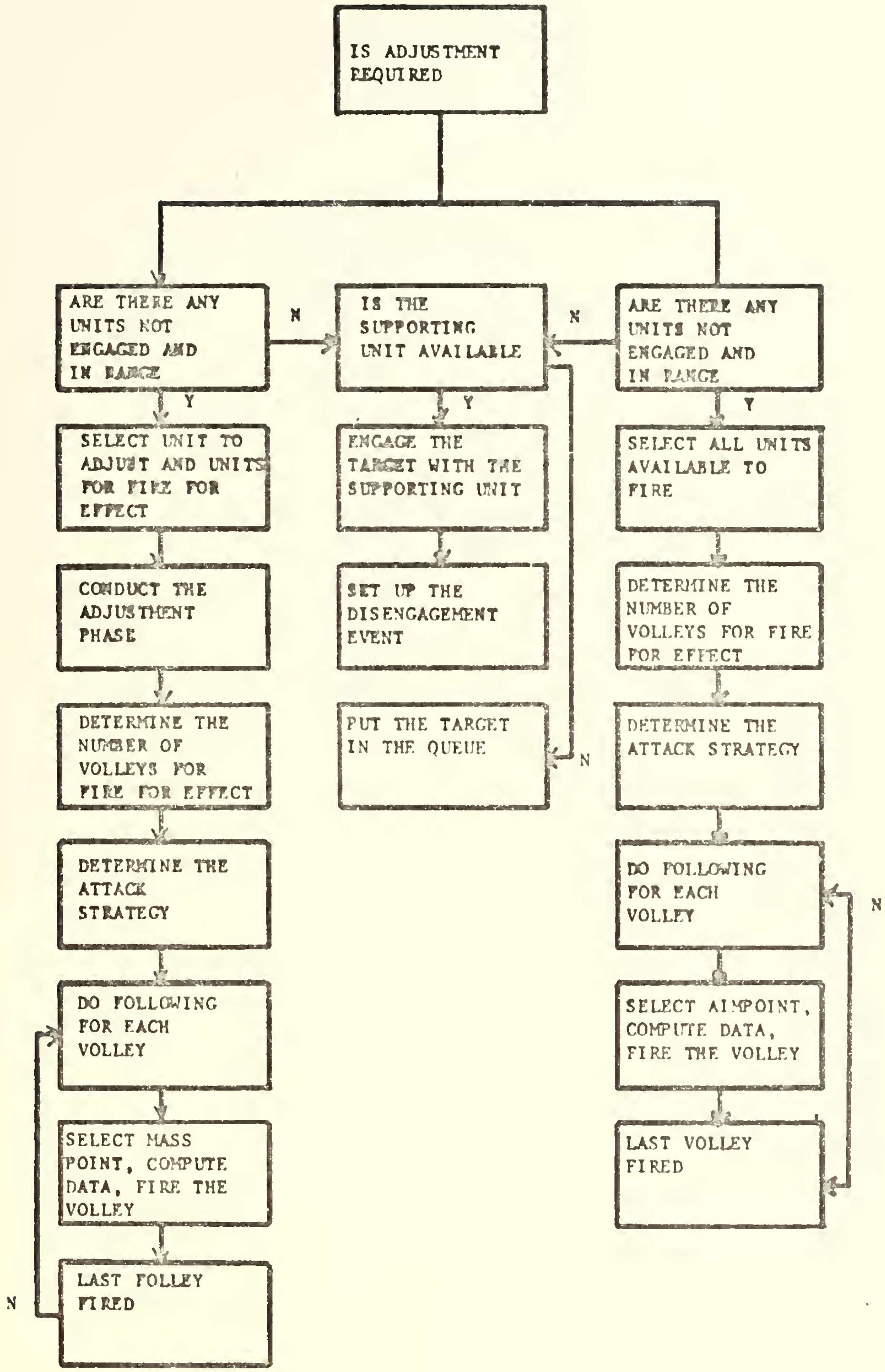
The specific aimpoint for a particular volley in fire for effect is a random variable. For purposes of determining the aimpoint, a rectangle of specified dimensions is superimposed over the reported or adjusted target location. The sides of the rectangle then define the upper and lower limits in range and deflection for the two distributions. The coordinates in easting and northing of the aimpoint are considered to be two independently distributed uniform variates.

The selection of a specific aimpoint then depends in part upon the dimensions of the rectangle. The model provides for the specification of up to eight different sets of specifications and two eight point probability distributions on these specifications. One distribution applies to missions in which adjustment takes place; the other deals with the case where adjustment does not take place. In both cases, the first set of specifications provides for the same aimpoint being used for each volley in the fire for effect phase.

In the case of preparatory targets, the engagement strategy is fixed. In this case, a single volley from a single battery is fired on the reported target location.

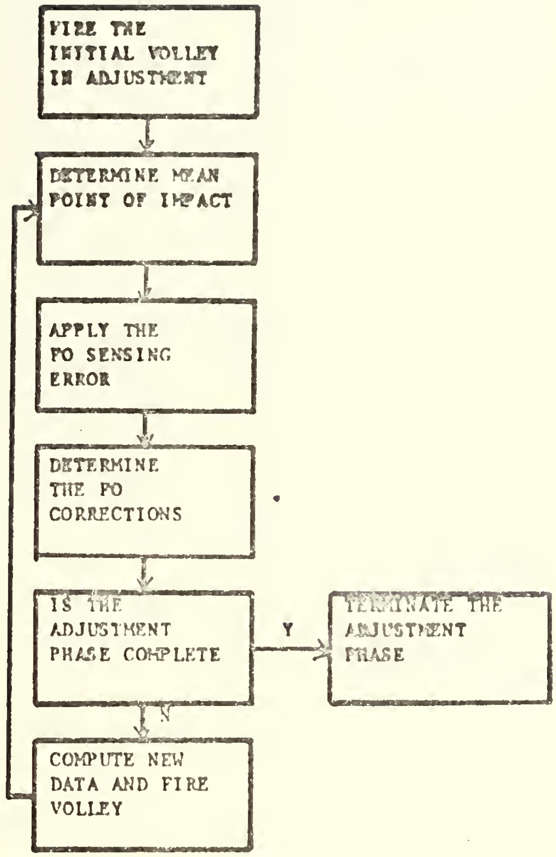
I. TARGET ENGAGEMENT SEQUENCE

The sequence used in firing a target of opportunity is shown in Figure 18. The adjustment sequence is described in greater detail in Figure 19.



TARGET OF OPPORTUNITY SEQUENCE

FIGURE 18



ADJUSTMENT SEQUENCE

FIGURE 19

Scheduled targets are engaged using the sequence in Figure 20. Preparatory targets use the sequence in Figure 21.

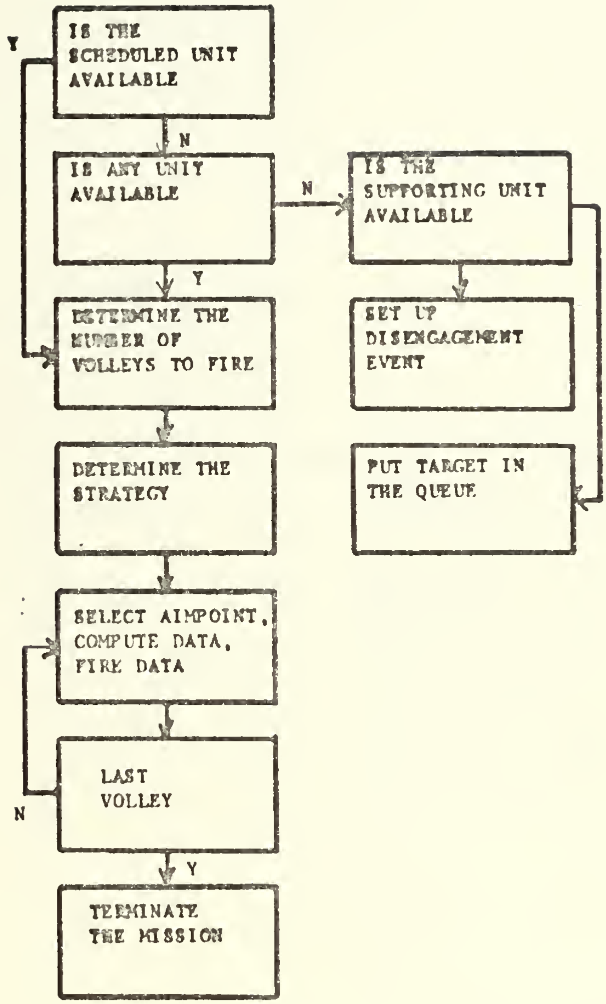
Fire missions are fired as they are generated if units are available. Once the engagement of a target is initiated, it is continued without interruption until the mission is terminated. In the event a mission cannot be fired when the need arises, the mission is placed in a queue until a unit becomes available. There are four queues arranged in priority from one to four. The type target and queue priority are shown below:

(1) Target of Opportunity
(2) Preparatory Target
(3) Scheduled Target
(4) On-Call Target

Upon the completion of a fire mission, the queues are checked in order of priority and if a target is in the queue it is engaged next. In the event of multiple targets in a queue of the same priority, a first-in first-out rule is used.

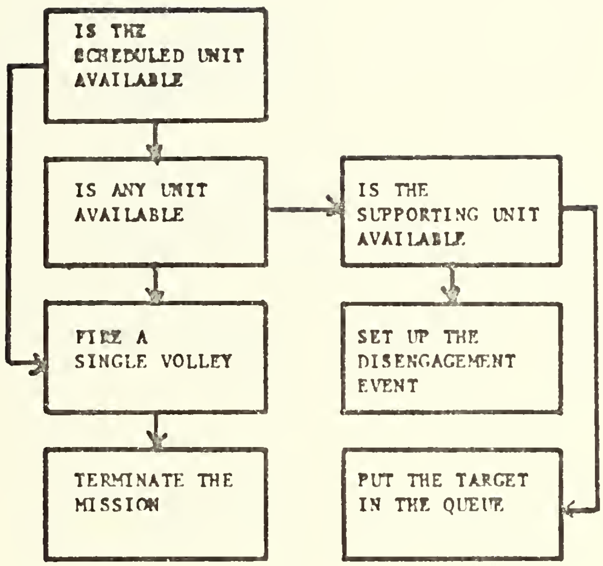
J. LETHALITY AND DAMAGE ASSESSMENT

The targets in the model are homogeneous stationary targets. They are homogeneous to the extent that all target elements are subject to the same lethality function. In actuality, each target element would probably be subject to a different lethality function. For example, an element in a dug-in position with overhead cover some X distance from a burst would not have the same probability of becoming a casualty as another target element the same distance away standing in an erect position.



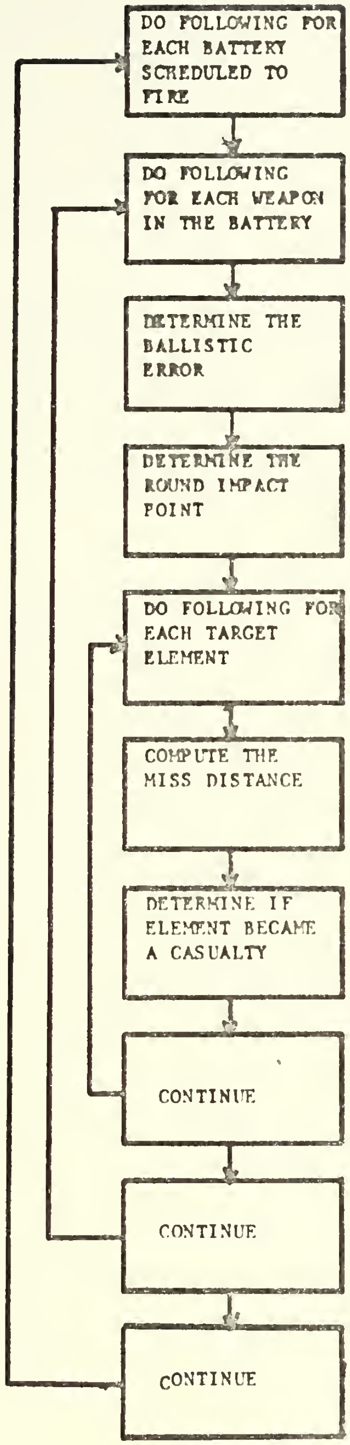
SEQUENCE FOR SCHEDULED TARGET

FIGURE 20



SEQUENCE FOR A PREPARATORY TARGET

FIGURE 21



DAMAGE ASSESSMENT FOR A SINGLE VOLLEY

FIGURE 22

It has been shown empirically that target lethality can be described generally as follows (See Weiss):

$$f(x) = e^{\frac{-x^2}{g^2}}$$

In the above relation, f(x) represents the probability that some target element x distance from the burst point will become a casualty. The symbol g represents the parameter of the function. One would expect that

$$g = g(r_1, r_2, r_3, .., r_n)$$

where r_i represents some effect due to specific target element characteristics or the characteristics of the round being fired such as average size of fragmentation, etc.. Since the target set is considered homogeneous and only a single type round is considered available to the units, g becomes a specified parameter and is applicable to each burst and target element combination.

In accomplishing damage assessment each burst is located and the distance to each target element is determined. This distance is the independent argument of the lethality function. The resulting probability of becoming a casualty is determined and the outcome is determined by sampling from a uniform distribution.

IV. EFFECTIVENESS MODEL

Two basic measures of effectiveness are considered in the model, casualty producing rate and the average number of rounds per casualty inflicted. Each of these measures is described briefly in this section.

If T_k is the total engagement time in seconds for the kth target (where the kth target is a target of opportunity) and C_k is the total number of casualties inflicted on the target, then R, the casualty producing rate, is expressed as

$$R = \frac{\sum_{i=1}^{n} T_k}{\sum_{i=1}^{n} C_k} .$$

At the completion of the simulation run, the value of R is calculated and the result is listed in the output report. In addition to the aggregate casualty rate, the casualty producing rate applicable to each target of opportunity is also calculated and is an element in the target history summary for that particular target.

The average number of rounds per casualty is calculated using

$$S = \frac{N}{T}$$

where:

N = Total casualties inflicted on targets of opportunity

T = Total rounds fired on targets of opportunity

Similarly, as above, the appropriate number of rounds per casualty for each target of opportunity is calculated for each separate target also and is an element in the target history summary for that target.

The basic queue statistics for each of the four queues are also provided and serve as secondary measures of effectiveness. For each queue, the average queue length and the average time in the queue for all targets spending time in the queue are provided. The average queue length for each queue is estimated by sampling each queue every 10 seconds during the simulation and then taking a simple average. The average amount of time spent in the queue for targets entering the queue is computed for each queue by taking the simple average over all targets entering the queue in questions, i.e., if K_m is the average time in queue m then

$$K_m = \sum_{i=1}^{N} \frac{T_i^0 - T_i^I}{N}$$

where:

T_i^0 = Time the ith target in the queue left the queue

T_i^I = Time the ith target entered the queue

N = Total number of targets entering the queue

V. DISCUSSION OF THE MODEL

Some typical questions which might be asked concerning an artillery fire support system were introduced in the Introduction to this paper. It is the purpose of this section to enumerate some areas in which this model might be a useful analytical tool and to discuss some basic limitations of the model.

A. POTENTIAL AREAS FOR USE

Potential areas for use are closely related to those system variables which were selected as parameters in the modelling process. These parameters are entered in the input data stream. The parameters can be categorized as pertaining to the following areas: (1) the geometric characteristics of the battlefield and the maneuver force; (2) force movement rates; (3) time factors in the target engagement sequence; (4) geometrical and lethality characteristics of the target complex; (5) target attack strategies; (6) ballistic dispersion; (7) artillery employment configurations; (8) location errors to include artillery unit location errors, burst location errors, and target location errors.

Through the manipulation of the geometric characteristics of the battlefield, the model can be used to gain insight into a number of basic areas, several of which are as follows:

(1) Varying the front line widths can give insight into the sensitivity of the measures of effectiveness to these changes. As the front line width is increased without bound a point is reached where

the supporting artillery is unable to support elements at the extremes of the front line due to the range limitations of the weapon system. The interaction and interdependencies in front line width, maximum weapon range, and artillery unit employment policy in terms of lateral dispersion of fire units and depth displacement can be analyzed as they pertain to the measures of effectiveness.

(2) The distance to the unit objectives has implications on the number of times the supporting artillery units must move forward to support the force, which in turn has an effect on the number of weapons and units available at a given time to satisfy the mission requirements. The model can be used to study the sensitivity of the basic measures of effectiveness to changes in the objective distance. In this regard, weapon maximum range and the movement rates can also be varied to determine what interactions might exist between these, the measures of effectiveness, and the objective distance.

Manipulation of the force movement rates can provide insight into the following basic areas:

(1) As the movement rate of the maneuver force increases, it generally becomes more difficult for the artillery to provide continuous and timely support. The model can be used to investigate the relationship which might exist between the movement rate of the supported force, weapon maximum range, employment policy, etc., and the measures of effectiveness.

(2) The effect of movement rate of the artillery units on the measures of effectiveness can also be investigated.

The time factors in the engagement sequence can be manipulated to study the relationship between the average queue length and the time required to process a mission.

The target characteristics can be manipulated in terms of density, length and width, and vulnerability in terms of lethality characteristics of the weapon target combination, in order to study the sensitivity of the measures of effectiveness to changes in these parameters.

Other studies similar to the above can be conducted pertaining to the other parameters. The sensitivity of the effectiveness measures to the precision with which the forward observer locates the target can slso be investigated. The relative effectiveness of different artillery battery configurations can also be investigated.

B. MODEL LIMITATIONS

There are several basic limitations in the model. Time and resources did not permit the empirical verification of the form of the underlying distributions for the random variables in the model. An effort was made to select from the more common distributions those forms which were most likely from an experience point of view. Representation of the variances of distribution in some cases as linear functions of range is likewise not supported by empirical evidence. The purpose here was to interject a range

dependence on the appropriate error in as simple a fashion as possible. Any investigation to which this is a critical factor should include a more careful modelling of this particular aspect.

While an attempt was made to include most factors in the model which were basic from a system design point of view, many were out of necessity omitted. Two of the more basic factors omitted were logistical constraints and the absence of any error introduced by varying meteorological conditions.

Due to the physical storage constraints in the computer, there is an upper bound on the size of the storage arrays which can be used for storage of critical information. It is possible to select input parameters which will generate more targets than the program is designed to handle simultaneously. In the event insufficient storage is available to handle such cases, the program includes a routine to print out a suitable message to indicate to the user that overflow conditions have been detected and to identify the particular array which is in an overflow condition. Upon the detection of such a condition, the program terminates. The run statistics up until this time are presented prior to termination as if the run had made a normal termination by the brigade achieving the final objective.

APPENDIX A

Program Names

Data is stored in the model in table form. There are three principal tables for storage of information pertaining to units and targets, namely: GDATA, ARDATA, and TGT. A fourth table, PRDATA, is the storage medium for parameters of the probability distributions in the model.

This appendix is organized into five tabs, Tab 1 - Tab 5. Tab 1 through Tab 4 describe the contents of the four tables previously mentioned. Tab 5 identifies the principal miscellaneous variables in the computer program. The tabs are organized as follows:

Tab 1 - GDATA Table
Tab 2 - ARDATA Table
Tab 3 - TGT Table
Tab 4 - PRDATA Table
Tab 5 - Miscellaneous

Tab 1

APPENDIX A

GDATA TABLE

This table contains all information pertaining to each of the seven maneuver elements in the model. The table is organized into seven rows (one for each unit) of 20 columns each (7x20). The table entries are identified as follows:

GDATA(I,1)	Unit identifier for Unit I.
GDATA(I,2)	Current control state for Unit I.
GDATA(I,3)	Easting coordinate of the west front line end point for Unit I.
GDATA(I,4)	Northing coordinate of the west front line end point for Unit I.
GDATA(I,5)	Easting coordinate of the east front line end point for Unit I.
GDATA(I,6)	Northing coordinate of the east front line end point for Unit I.
GDATA(I,7)	Easting coordinate for the current objective center for Unit I.
GDATA(I,8)	Northing coordinate for the current objective center for Unit I.
GDATA(I,9)	Length of the major axis for the current Unit I objective.
GDATA(I,10)	Length of the minor axis for the current Unit I objective.
GDATA(I,11)	Attitude of Unit I objective. The attitude is defined as the clockwise angle measured in radians from true North to the minor axis of the objective. The angle is a uniform variate in the interval (-.528,+.528).

GDATA(I,12)	Easting coordinate of the current fire planning center for Unit I.
GDATA(I,13)	Northing coordinate for the current fire planning center for Unit I.
GDATA(I,14)	Current time in seconds
GDATA(I,15)	Time Unit I entered State 4. If Unit I is not in State 4, this entry is 0.
GDATA(I,16)	Bit indicating the engagement status for Unit I. This entry can have value 1 or 0 with the following significance: 0 - Not currently engaged 1 - Currently engaged A unit is declared to be engaged in the event a target of opportunity originated by the unit is being processed. Accordingly, only units 1-4 can become engaged.
GDATA(I,17)	Easting coordinate of the geometric center of the front line for Unit I.
GDATA(I,18)	Time Unit I became engaged. If the unit is not engaged, this entry has no significance.
GDATA(I,19)	Initial distance to current Unit I objective.
GDATA(I,20)	If the current Unit I objective is a portion of the next higher unit objective, this entry has a value of 1. Otherwise, the value is 0.

Tab 2

APPENDIX A

ARDATA TABLE

This table contains all the information pertaining to each of the artillery units in the model with the exception of the reinforcing artillery unit. This table is dimensioned 4x7x16. Table entries have the following significance:

ARDATA(I,J,1)	Weapon designator for the Jth weapon in Battery I. I takes on values 1,3. J takes on values 1,6.
ARDATA(I,7,2)	Current state of Battery I. If the battery is not engaged, this entry has value 1. If the battery is engaged, the value is 2. If the battery is moving, the value is 3.
ARDATA(I,J,3)	The easting coordinate for the actual location of the Jth weapon in Battery I.
ARDATA(I,J,4)	The northing coordinate for the actual location of the Jth weapon in Battery I.
ARDATA(I,7,3)	The easting coordinate of the actual geometric center of the weapons in Battery I.
ARDATA(I,7,4)	The northing coordinate of the actual geometric center of the weapons in Battery I.
ARDATA(I,7,6)	Azimuth of lay for the Ith Battery. The azimuth of lay is defined as the clockwise angle measured in radians from true North to the base direction for the weapons. The weapons are positioned about a line perpendicular to the azimuth of lay running through the battery center.

ARDATA(I,7,7)	Easting coordinate of the location assigned to the Ith Battery as its next position area.
ARDATA(I,7,8)	Northing coordinate of the location assigned to Battery I as its next position area.
ARDATA(I,7,9)	Current position error in easting for the Ith Battery. This component is computed using the relation: ARDATA(I,7,9) = ARDATA(L,7,3)- ARDATA(I,7,7)
ARDATA(I,7,10)	Current position error in northing for the Ith Battery. The relation used to compute this is: ARDATA(I,7,10) = ARDATA(I,7,4)- ARDATA(I,7,8)
ARDATA(I,7,13)	Cumulative rounds fired by Battery I.
ARDATA(I,7,14)	If Battery I is engaged this entry gives the priority rating of the target being engaged. The ratings are: 1 - Target of Opportunity 2 - Preparatory Target 3 - Scheduled Target 4 - On-Call Target

Note: Table entries not identified above are open storage locations and as such have no preassigned meaning.

Tab 3

APPENDIX A

TGT TABLE

This table contains all the information pertaining to each target in the model from the time the target is generated until action is completed on the target. The table is dimensioned 250x40. Each of the table entries is identified as follows:

TGT(I,1)	Target number assigned to the Ith target.
TGT(I,2)	Maneuver element generating the requirement for fire.
TGT(I,3)	Actual easting coordinate of the target.
TGT(I,4)	Actual northing coordinate of the target.
TGT(I,5)	If the target is a scheduled target, this entry is 1. Otherwise, the entry is 0.
TGT(I,6)	If the target is an on-call target, this entry is 1. Otherwise, the entry is 0.
TGT(I,7)	If the target is a preparatory target, this entry is 1. Otherwise, the entry is 0.
TGT(I,8)	Time the target is scheduled (applies only in the case of the scheduled or preparatory target).
TGT(I,9)	If the target is a target of opportunity, this entry is 1. Otherwise, the entry is 0.
TGT(I,10)	Time the target was originated.

TGT(I,11)	Artillery unit having responsibility for this target. If the target is a prep or scheduled target, the unit scheduled to fire is entered here. If the target is a target of opportunity, the entry is 4 representing the battalion. If supporting artillery is used, the entry is 100.
TGT(I,12)	Time the mission was completed.
TGT(I,13)	Cumulative rounds expended on this target.
TGT(I,14)	Casualties inflicted on this target.
TGT(I,15-17)	Artillery battery capability description indicator. A value of 1 indicates a battery is in range, a 0 indicates a battery is not in range. Batteries are listed in numerical order in cells 15-17.
TGT(I,18)	Total number of units in range of the target.
TGT(I,20)	If the target is a scheduled or preparatory target, this entry is the row number in the event list (EVLIST) which corresponds to the target engagement event.
TGT(I,21)	Easting component of target location error.
TGT(I,22)	Northing component of target location error.
TGT(I,23)	Category of the target for targets of opportunity. If target is not of this type, the entry is insignificant.
TGT(I,24)	Length of the target measured in meters.
TGT(I,25)	Depth of the target measured in meters.
TGT(I,26)	Number of individual target elements.
TGT(I,27)	Target density measured in elements per square meter of target area.

TGT(I,28)	For a target of opportunity, this entry is the identifier for the adjusting artillery unit. Otherwise, the entry is insignificant.
TGT(I,29)	Initial engagement range from the adjusting unit to the adjusting point.
TGT(I,30)	Number of volleys fired in the adjusting phase.
TGT(I,31)	Strategy used in the fire for effect phase.
TGT(I,32)	Number of volleys fired in the fire for effect phase.
TGT(I,33)	Percent casualties inflicted.
TGT(I,34)	Rounds per casualty inflicted.
TGT(I,35)	The total engagement time measured in seconds.
TGT(I,36)	The kill rate measured in casualties per second of engagement.
TGT(I,37)	Time the engagement began.
TGT(I,38)	Information bit for the first volley in the fire for effect phase. This entry is 1 if the current volley is the initial volley. Otherwise, the entry is 0.
TGT(I,39)	This entry has significance only in the case where the target is either a scheduled or preparatory target. When the target is planned, this entry has value 1. When firing responsibility has been determined, this entry is 0.

Note: Storage areas not identified explicitly above are open storage areas.

Tab 4

APPENDIX A

PRDATA TABLE

PRDATA is a four-dimensional table (3x7x20x10) which is the storage medium for the probability distributions corresponding to discrete random variables and the distribution parameters for the continuous variables. PRDATA is divided into three sub-tables. Table entries for each of the tables are identified as follows:

TABLE 1

Name	Note	Description
PRDATA(1,I,2,1-4)	1	Parameters for the truncated normal distribution corresponding to the length of the front line for Unit I.
PRDATA(1,I,3,1-4)	1	Parameters for the truncated normal distribution corresponding to the objective distance in meters for Unit I.
PRDATA(1,I,4,1-4)	1	Parameters for the truncated normal distribution corresponding to the length of the objective major axis for Unit I.
PRDATA(1,I,5,1-4)	1	Parameters for the truncated normal distribution corresponding to the length of the objective minor axis for Unit I.
PRDATA(1,I,6-1-8)		Probability mass points corresponding to the discrete random variable representing the number of targets Unit I will plan during the fireplanning process while in fireplanning State 1.

PRDATA(1,I,7,1-8)		Same as PRDATA(1,I,6,1-8) except the information pertains to fireplanning State 2.
PRDATA(1,I,8,1-3)		Probability a target planned by Unit I in fireplanning State 1 will fall in one of the following categories: 1 - Preparatory 2 - Scheduled 3 - On-Call
PRDATA(1,I,9,1-3)		Same as PRDATA(1,I,8,1-3) except the appropriate fireplanning state is State 2.
PRDATA(1,I,10,1-3)		Given that a target planned by Unit I in fireplanning State 1 is a preparatory target, the probability that the target is located: 1 - On the objective 2 - Between LD and objective 3 - Beyond the objective
PRDATA(1,I,11,1-3)		Same as PRDATA(1,I,10,1-3) except that the fireplanning state is State 2.
PRDATA(1,I,12,1-3)		Same as PRDATA(1,I,10,1-3) except the target type is scheduled.
PRDATA(1,I,13,1-3)		Same as PRDATA(1,I,11,1-3) except the target type is scheduled.
PRDATA(1,I,14,1-3)		Same as PRDATA(1,I,10,1-3) except the target type is on-call.
PRDATA(1,I,15,1-3)		Same as PRDATA(1,I,11,1-3) except the target type is on-call.
PRDATA(1,I,16,1-2)	2	The lower and upper bounds for the uniform variate representing the movement rate for Unit I.

PRDATA(1,I,17,1-4)	3	The parameters for the truncated normal distribution corresponding to the lateral displacement of the objective of Unit I from the unit center line.
PRDATA(1,I,18,1-8)		Values for the discrete random variables representing the number of targets Unit I plans during the fireplanning process when the unit is in fireplanning State 1. These entries correspond to the probability mass values stored in PRDATA(1,I,6,1-8)
PRDATA(1,I,19,1-8)		Same as PRDATA(1,I,18,1-8) except the data pertains to fireplanning State 2. These entries correspond to the probability mass values stored in PRDATA(1,I,7,1-8)

TABLE 2

PRDATA(2,1,4,1-4)	3	The parameters for the truncated normal distribution corresponding to the lateral displacement of the position area for an artillery battery about the center line of the supported unit.
PRDATA(2,1,5,1-4)	4	The parameters for the truncated normal distribution corresponding to the depth displacement of an artillery unit behind the front line of the supported unit.
PRDATA(2,1,6,1-4)	1	Parameters for the truncated normal distribution corresponding to the movement rate in kilometers/hour for an artillery battery.
PRDATA(2,1,8,1-4)	1	Parameters for the truncated normal distribution corresponding to the emplacement time for an artillery battery measured in seconds.

PRDATA(2,1,9,1-4)	5	Parameters for the truncated normal distribution corresponding to the component error in easting and northing between the assigned location for the unit and the actual occupied location.
PRDATA(2,I,10,1-4)	6	The lower and upper bounds for the uniform variate corresponding to the coordinates of weapon 1 in Battery I. The coordinates are measured in the coordinate system with origin at the battery center and positive y axis aligned along the assigned azimuth of lay for the battery.
PRDATA(2,I,11-15,1-4)	6	Same as PRDATA(2,I,10,1-4) except the information pertains to weapons 2-6 in Battery I.
PRDATA(2,4,2,1-4)	1	Parameters for the truncated normal distribution corresponding to the time required for the forward observer to prepare a request for fire for a target of opportunity. The time increment is measured in seconds.
PRDATA(2,4,3,1-4)	1	Same as above except the time increment is the time measured in seconds for the forward observer to transmit the request for fire to the Fire Direction Center.
PRDATA(2,4,4,1-4)	1	Same as above except the time increment is the target analysis time in the Fire Direction Center. During this time period, the target is analyzed and units are selected to engage and/or adjust when appropriate.
PRDATA(2,1,5,1-4)	1	Same as above except the time increment is the time required for an adjusting unit to prepare and fire a volley in adjustment.

PRDATA(2,1,6,1-4)	1	Same as above except the time increment is the time required for the forward observer to make adjustment corrections and transmit them to the Fire Direction Center.
PRDATA(2,1,7,1-4)	1	Same as above. Time increment is the time required for the FDC to compute new adjusting data and transmit to the adjusting unit.
PRDATA(2,1,8,1-4)	1	Same as above except the time increment is that time required for the FDC to select a mass point in the fire for effect phase, compute the data, and send the data to the firing units.
PRDATA(2,1,9,1-4)	1	Same as above except the time increment is the time required for firing a unit to prepare and fire a volley in the fire for effect phase when the firing data is the same as that for the previous round.
PRDATA(2,4,10,1-4)	1	Same as above except the time increment is that time required for a firing unit to prepare and fire a volley in the fire for effect phase when the firing data has been changed.
PRDATA(2,4,11,1-4)	1	Same as above except the time increment is the time required for the reinforcing artillery unit to engage a target of opportunity.
PRDATA(2,4,12,1-4)	1	Same as above except the time increment is the time required for the reinforcing artillery unit to shoot a scheduled target.
PRDATA(2,4,13,1-4)	1	Same as above except the time increment is the time required for the reinforcing artillery unit to shoot a preparatory target.

PRDATA(2,5,2,1-4)	7	Parameters for the truncated normal distribution corresponding to the deflection deviation error in target location for a target of opportunity.
PRDATA(2,5,3,1-4)	7	Parameters for the truncated normal distribution corresponding to the range error in target location for a target of opportunity.
PRDATA(2,5,4,1-4)	7	Parameters for the truncated normal distribution corresponding to the deflection error in burst location sensing by the forward observer.
PRDATA(2,5,5,1-4)	7	Parameters for the truncated normal distribution corresponding to the range error in burst location sensing by the forward observer.

TABLE 3

PRDATA(3,1,1,1-4)	1	Parameters for the truncated normal distribution corresponding to the lateral length in meters for a Category I target.
PRDATA(3,1,2,1-4)	1	Parameters for the truncated normal distribution corresponding to the depth of Zone 1 in meters for a Category I target.
PRDATA(3,1,3,1-4)	1	Same as PRDATA(3,1,2,1-4) except the zone is Zone 2.
PRDATA(3,1,4,1-4)	1	Same as PRDATA(3,1,2,1-4) except the zone is Zone 3.
PRDATA(3,1,5,1-4)	1	Same as PRDATA(3,1,1,1-4) except the target is a Category II target.
PRDATA(3,1,6,1-4)	1	Same as PRDATA(3,1,2,1-4) except the data is for a Category II target.

PRDATA(3,1,7,1-4)	1	Same as PRDATA(3,1,3,1-4) except the data is for a Category II target.
PRDATA(3,1,8,1-4)	1	Same as PRDATA(3,1,4,1-4) except the data is for a Category II target.
PRDATA(3,1,9,1-2)	2	The lower and upper bounds on the uniform variate representing the number of target elements in a target of Category I.
PRDATA(3,1,10,1-2)	2	Same as PRDATA(3,1,9,1-2) except the data pertains to a Category II target.
PRDATA(3,1,11,1)		Probability that a random target is a Category I target.
PRDATA(3,2,J,1-2)		The length and width of the aimpoint rectangle for Strategy J. J=2,8.
PRDATA(3,2,9,1-8)		The probability mass values associated with the selection of each of the strategies for a fire for effect mission.
PRDATA(3,2,10,1-8)		Probability mass values corresponding to the values of the discrete random variable representing the number of volleys in fire for effect for an adjustment mission.
PRDATA(3,2,11,1-8)		The values of the discrete random variable corresponding to the mass function in PRDATA(3,2,10,1-8).
PRDATA(3,2,12,1-8)		Same as PRDATA(3,2,10,1-8) except for the scheduled type target.
PRDATA(3,2,13,1-8)		Same as PRDATA(3,2,11,1-8) except for the scheduled type target.

PRDATA(3,2,14,1-8) — Same as PRDATA(3,2,9,1-8) except the type target is scheduled.

NOTES

1 - Data is entered in the following order: mean, variance, lower bound, upper bound.

2 - Data is entered in the following order: lower bound, upper bound.

3 - The lower bound and the upper bound correspond to the lateral boundaries of the maneuver element involved.

4 - The lower bound is a point a distance equal to the maximum range behind the fireplanning center of the supported unit. The upper bound is the supported unit fireplanning center.

5 - The lateral bounds on the easting component of error are the same as in Note 3. The bounds on the northing component are as described in Note 4.

6 - Data is entered in the following order: lower bound on y coordinate, upper bound on y coordinate, lower bound on x coordinate, upper bound on x coordinate.

7 - In each case, the distribution mean is 0 and the variance is a linear function of the appropriate distance. Data is entered in the following order: a, b, c, d where

a = Intercept of the linear function Var = a+b(dist)

b = Slope of the above function

c = 0

d = Absolute value of upper bound on the error component

Tab 5

APPENDIX A

MISCELLANEOUS

Descriptions of the principal miscellaneous variables in the model are:

Name	Description
ITGT	Target number of the last target generated at any particular point in time.
IROW	The row number of the current event in the event list.
CTIME	Current time.
TINC,TOPT,SHOUR	General purpose time variables.
J100,J200	General purpose counting variables.
EXMN	The mean intergeneration times for targets of opportunity. This increment is exponentially distributed.
XLETH	The parameter "g" in the general lethality fucntion $f(x) = e^{-\frac{x^2}{g^2}}$ where "x" is the radial miss distance and f(x) is the probability a target element located a distance "x" away from the burst point becomes a casualty.
XTLETH	General purpose variable.
NU	The current seed for the random number generator.

FD105(I,J,K)	The ballistic firing parameters. I refers to charge, J is the range increment, and K indexes the type data, i.e., 1 - Range Probable Error 2 - Deflection Probable Error 3 - Time of Flight
SUP(I)	General storage for information pertaining to the reinforcing artillery unit.
RMAX	The maximum range of the artillery weapons.
NGUNS	Number of guns in the artillery batteries. This is preset at value of 6.
Q(I)	Current length of each of the queues.
QUES(I,J,K)	Temporary storage area for event vectors corresponding to targets in queue.
NCHGS	The number od charges available.
NRINC	The number of range increments for the ballistic data.
STAT(I,1)	Cumulative queue length for queue I.
STAT(I,2)	Number of times the queue length has been sampled for queue I.
STAT(I+4,1)	Cumulative time spent in queue I for targets entering queue I.
STAT(I+4,2)	Number of targets entering queue I.
STAT(9,1)	Cumulative number of casualties inflicted on targets of opportunity.
STAT(9,2)	Cumulative engagement time for targets of opportunity.
STAT(10,1)	Cumulative rounds fired on target of opportunity.
STAT(10,2)	Cumulative number of casualties inflicted on targets of opportunity.

APPENDIX B

Model Input Parameters

Model input parameters must be arranged in accordance with this appendix.

Card #	Columns	Type/Format	Description
1	1-10	F10.2	Distribution mean for the random variable (r.v.) of front line length for a company size element.
	11-20	F10.2	Distribution variance for front line length for a company size element.
	21-30	F10.2	Lower bound on front line length for a company size element.
	31-40	F10.2	Upper bound on front line length for company size element.
2	1-10	F10.2	Distribution mean for the r.v. representing the objective distance for a company size element.
	11-20	F10.2	Variance for objective distance for company size element.
	21-30	F10.2	Blank
	31-40	F10.2	Upper bound on objective distance for company size element.
3	1-10	F10.2	Distribution mean for the r.v. representing the length of the major axis of the unit objective for a company size element.
	11-20	F10.2	Variance in length of objective major axis for company size element.

3	21-30	F10.2	Lower bound on length of objective major axis for company size element.
	31-40	F10.2	Upper bound on length of objective major axis for company size element
4	1-10	F10.2	Distribution mean for r.v. representing the length of the minor axis for a company size objective.
	11-20	F10.2	Variance in length of minor axis for a company size objective.
	21-30	F10.2	Lower bound on length of the objective minor axis for company size element.
	31-40	F10.2	Upper bound on length of objective minor axis for company size element.
5-8	1-40	4F10.2	Same information as on cards 1-4 except for the appropriate unit size is battalion.
9-12	1-40	4F10.2	Same information as on cards 1-4 except unit is brigade size.
13	1-10	F10.2	Lower bound on the r.v. representing the company movement rate expressed in kilometers/hour.
	11-20	F10.2	Upper bound on company movement rate.
14	1-10	F10.2	Distribution variance for the r.v. representing the deviation of the location of the objective center about the unit center line in easting. Data is for a company size element.
	11-20	F10.2	Same as for columns 1-10 except that the data is for a battalion size element.

14	21-30	F10.2	Same as for colums 1-10 except the appropriate unit size is brigade.
15	1-80	8F10.2	Values of the discrete r.v. representing the number of targets a company size element will plan while conducting fireplanning in fireplanning state 1. Eight values may be entered.
16	1-80	8F10.2	Probability mass associated with each of the values entered on card 15.
17	1-80	8F10.2	Same information as card 15 except the appropriate unit fireplanning state is state 2.
18	1-80	8F10.2	Same as card 16 except the fireplanning state is state 2.
19	1-10	F10.2	Probability that a randomly selected target planned by a company size element in fireplanning state 1 is a preparatory target.
	11-20	F10.2	Probability that a randomly selected target planned by a company size element in fireplanning state 1 is a scheduled, non-preparatory target.
	21-30	F10.2	Probability that a randomly selected target planned by a company size element in fireplanning state 1 is an on-call target.

Note: Entries must sum to 1.0

20	1-30	3F10.2	Same as card 19 except that the fireplanning state is fireplanning state 2.
21	1-10	F10.2	Probability that a randomly selected company planned preparatory target, planned in fireplanning state 1, is located on the company objective.

	11-20	F10.2	Same as columns 1-10 except that the location category is between the LD and the objective.
21	21-30	F10.2	Same as columns 1-10 except that the location category is beyond the objective.
22	1-30	3F10.2	Same information as on card 21 except that the fireplanning state is state 2.
23	1-30	3F10.2	Same as card 21 except that the target is a scheduled, non-preparatory target, and the fireplanning state is state 1.
24	1-30	3F10.2	Same as card 21 except that the target is a scheduled, non-preparatory target, and the fireplanning state is state 2.
25	1-30	3F10.2	Same as card 21 except that the target is an on-call target and the fireplanning state is state 1.
26	1-30	3F10.2	Same as card 21 except that the target is an on-call target and the fireplanning state is state 2.
27-38	1-80	8F10.2	Same as cards 15-26 except that the unit size is battalion.
39-50	1-80	8F10.2	Same as cards 15-26 except that the unit size is brigade.
51	1-10	F10.2	Blank
	11-20	F10.2	Distribution variance for the r.v. representing the deviation of the location of the battery assigned position in easting about the supported unit center line.
	21-80		Blank

52	1-10	F10.2	Distribution mean for the r.v. representing the distance of the assigned battery center behind the front line of the supported unit.
	11-20	F10.2	Variance in the distance of the assigned battery center behind the front line.
53	1-10	F10.2	Distribution mean for the random variable representing the time required for the battery to march order, measured in seconds.
	11-20	F10.2	Distribution variance for battery march order time.
	21-30	F10.2	Lower bound on battery march order time, measured in seconds.
	31-40	F10.2	Upper bound on battery march order time measured in seconds.
54	1-10	F10.2	Distribution mean for the r.v. representing the battery movement rate, measured in kilometers/hour.
	11-20	F10.2	Distribution variance for the battery movement rate.
	21-30	F10.2	Lower bound on the battery movement rate.
	31-40	F10.2	Upper bound on the battery movement rate.
55	1-10	F10.2	Distribution mean for the r.v. representing the time required for the artillery battery to emplace its weapons. The time is measured in seconds.
	11-20	F10.2	Variance in battery emplacement time.
	21-30	F10.2	Lower bound on battery emplacement time.

	31-40	F10.2	Upper bound on battery emplacement time.
56	1-10	F10.2	Blank
	11-20	F10.2	Distribution variance for the r.v. representing the magnitude of the x and y components of error in locating the battery position center.
	21-30		Blank
	31-40	F10.2	Upper bound on the x and y components of error.
57	1-10	F10.2	Lower bound on the r.v. representing the y coordinate of weapon number 1 in the coordinate system with origin at the battery geometrical center and the positive y axis as the direction of fire.
	11-20	F10.2	Upper bound on the r.v. representing the y coordinate of weapon number 1.
	21-30	F10.2	Lower bound on the r.v. representing the x coordinate of weapon number 1 in the coordinate system previously described.
	31-40	F10.2	Upper bound on the r.v. representing the x coordinate of weapon number 1.
58	1-40	4F10.2	Same information as card 57 except the data pertains to weapon number 2.
59	1-40	4F10.2	Same information as card 57 except the data pertains to weapon number 3.
60	1-40	4F10.2	Same information as card 57 except the data pertains to weapon number 4.

61	1-40	4F10.2	Same information as card 58 except the data pertains to weapon number 5.
62	1-40	4F10.2	Same information as card 57 except the data pertains to weapon number 6.
63	1-10	F10.2	Distribution mean for the r.v. representing the time required for the forward observer to prepare a fire mission request for a target of opportunity. Time is measured in seconds.
	11-20	F10.2	Distribution variance for the above.
	21-30	F10.2	Lower bound on the time required for the forward observer to prepare a fire mission request, measured in seconds.
64	1-40	4F10.2	Same as for card 63 except that the time increment is the time required for the forward observer to transmit the request for fire to the Fire Direction Center. The increment is measured in seconds.
65	1-40	4F10.2	Same as card 63 except the time increment is the time required to analyze the target, select units to engage the target, and select a unit to adjust.
66	1-40	4F10.2	Same as card 63 except that the time increment is the time required for the adjusting unit to prepare and fire a volley in adjustment.
67	1-40	4F10.2	Same as card 63 except the time increment is the time required for the forward observer to determine the adjustment corrections and forward them to the fire direction center.

68	1-40	4F10.2	Same as card 63 except the time increment is the time required for the fire direction center to compute adjustment corrections and transmit new firing data to the adjusting unit.
69	1-40	4F10.2	Same as card 63 except the time increment is the time required for the fire direction center to select a mass point, compute the firing data, and transmit the fire commands to the firing units.
70	1-40	4F10.2	Same as card 63 except the time increment is the time required for the firing unit to prepare and fire a volley in the fire for effect phase when the firing data is different from that used for the previous volley.
71	1-40	4F10.2	Same as card 63 except the time increment is the time required for a firing unit to prepare and fire a volley in the fire for effect phase when the firing data has not changed.
72	1-40	4F10.2	Same as card 63 except the time increment is the time required for the reinforcing artillery unit to conduct an engagement of a target of opportunity.
73	1-40	4F10.2	Same as card 63 except the time increment is the time required for the reinforcing artillery unit to conduct an engagement of a scheduled target.
74	1-40	4F10.2	Same as card 65 except the time increment is the time required for the reinforcing artillery unit to conduct an engagement of a preparatory target.
75	1-10	F10.2	Intercept for the linear function representing the distribution variance for the deviation component of target location error.

	11-20	F10.2	Slope for the above function.
	21-30	F10.2	Blank
	31-40	F10.2	The upper bound on the deviation error described above.
76	1-40	4F10.2	Same as card 75 except the data is for the range component of target location error.
77	1-40	4F10.2	Same as card 75 except the data is for the deviation component of burst location error.
78	1-40	4F10.2	Same as card 75 except data is for the range component of burst location error.
79	1-10	F10.2	Width of fire for effect rectangle corresponding to fire for effect strategy 2.
	11-20	F10.2	Depth of fire for effect rectangle above.

Note: Strategy 1 is defined internally in the model and corresponds to that strategy which specifies that each volley in the fire for effect phase is fired at the adjusted target location or the reported target location as appropriate for the mission.

80	1-20	2F10.2	Same as card 79 except the information pertains to strategy 3.
81	1-20	2F10.2	Same as card 79 except the information pertains to strategy 4.
82	1-20	2F10.2	Same as card 79 except the information pertains to strategy 5.
83-85	1-20	2F10.2	Same as card 79 except the information pertains to strategies 6-8.
86	1-80	8F10.2	Probability mass values corresponding to the adoption of each of the 8 attach strategies when firing for effect on a target of opportunity.

87	1-80	8F10.2	Values of the discrete random variables corresponding to the number of volleys to be fired in effect when a target of opportunity is being engaged.
88	1-80	8F10.2	Probability mass values corresponding to each of the values described for card 87.
89	1-80	8F10.2	Values of the discrete random variable corresponding to the number of volleys to be fired in effect when a scheduled target is being engaged.
90	1-80	8F10.2	Probability mass values corresponding to each of the values described for card 89.
91	1-80	8F10.2	Probability mass values corresponding to the adoption of each of the 8 attack strategies when firing for effect on a scheduled target.
92	1-10	I10	The number of charges for which ballistic firing data is to be entered.
	11-20	I10	The number of range increments to be used. Each range increment is assigned a value of 500 meters.
93	1-10	F10.2	Maximum effective range for the artillery weapon being considered. Must equal the number of range increments times 500.
94-N	1-80	8F10.2	See Block Description below.

BLOCK DESCRIPTION: The weapon ballistic firing parameters are input in this block of data. The data is organized into sub-blocks by charge. Data within each sub-block is entered in the following order: range probable errors, deflection probable errors, and last, time of flight. For each category, i.e., probable errors, etc., exactly NRINC data points must be provided. In the event that some particular charge cannot achieve a range greater than, say, ROTO, then enter the value 1000. For each

range probable error entry after the entry corresponding to RTOT, a value of 0 suffices for the entry corresponding to deflection probable error and time of flight.

N+1	1-10	I10	The seed for the random number generator.
	11-20	I10	Enter the value 6.
N+2	1-10	I10	Probability that a random target is of size category I.
N+3	1-10	F10.2	Distribution mean for the random variable representing the lateral length of a target of size category I. The data is entered in meters.
	11-20	F10.2	The distribution variance for the above.
	21-30	F10.2	Lower bound on the lateral length of target of size category I.
	31-40	F10.2	Upper bound on the lateral length of target of size category I.
N+4	1-40	4F10.2	Same information as card N+3 except the data pertains to the depth of Zone 1 for a Category I target.
N+5	1-40	4F10.2	Same as card N+3 except the data is for Zone 2.
N+6	1-40	4F10.2	Same as card N+3 except the data is for Zone 3.
(N+7)-(N+10)	1-40	4F10.2	Same as cards (N+3)-(N+6) except data pertains to Category II target.
N+11	1-10	F10.2	Lower bound on the number of target elements in a target of Category I.
	11-20	F10.2	Upper bound on the number of target elements in a target of Category I.

N+12	1-20	2F10.2	Same as card N+11 except the data applies to a target in Category II.

A sample input deck is shown in the attachment hereto.

SAMPLE DATA DECK

```
3000.      28000.     1000.      5000.
6000.      28000.                8000.
500.        5000.     200.       800.
250.       500.       200.       400.
6000.      56000.     2100.      10000.
10000.     28000.                15000.
1000.      5000.      500.       1500.
750.       5000.      500.       1000.
12000.     28000.     10000.     14000.
30000.     30000.                40000.
2500.      25000.     1800.      3200.
1250.      25000.     1000.      1500.
2.         4.
25000.     25000.     25000.
2.         2.         2.         2.
.2         .2         .2         .2         .05        .05        .1
2.         2.         2.         2.
.6         .3         .1
.1         .6         .3
           .2         .8
.3         .6         .1
.8         .1         .1
.1         .6         .3
.3         .5         .2
.6         .3         .2
.8         .2
2.         2.         2.         2.
.6         .3         .1
2.         2.         2.         2.
.8         .1         .1
.3         .4         .2
.4         .3         .3
.2         .1         .7
.8         .1         .1
.9         .1
.6         .3         .1
.8         .2
.6         .3         .1
2.         2.         2.         2.
.6         .3         .1
2.         2.         2.         2.
.6         .3         .1
.6         .3         .1
.2         .3         .5
           .5         .5
.8         .2         .1
```

.6	.3	.1					
	.2	.8					
.2	.1	.7					
.6	.3	.1					
		8000000.					
1000.	20000.						
600.	6000.	400.	800.				
20.	400.	10.	30.				
360.	400.	300.	420.				
	9000.		1200.				
10.	10.	-50.	-50.				
-10.	-10.	-30.	-30.				
10.	10.	-10.	-10.				
10.	10.	10.	10.				
-10.	-10.	30.	30.				
10.	10.	50.	50.				
50.	500.	25.	75.				
30.	500.	15.	45.				
60.	500.	50.	70.				
25.	500.	20.	35.				
20.	500.	15.	35.				
30.	500.	15.	45.				
30.	500.	20.	40.				
60.	300.	50.	70.				
15.		15.	15.				
1200.	200.	1000.	1400.				
900.	800.	700.	1100.				
300.		200.	400.				
200.	.03		500.				
2000.	.3		1000.				
200.	.03		400.				
200.	.03		400.				
500.	200.						
400.	300.						
600.	200.						
150.	200.						
195.	200.						
400.	325.						
75.	20.						
.6	.05	.05	.1	.05	.05	.05	.05
.2	.8						
6.	3.						
.5	.5						
6.	1.						
.3	.7						
	4	22					
11000.							
3.	5.	6.	8.	10.	12.	15.	17.

20.	24.	27.	1000.	1000.	1000.	1000.	1000.
1000.	10000.	1000.	1000.	1000.	1000.	1000.	1000.
0.	1.	1.	1.	1.	2.	2.	2.
3.	3.	4.					
1.9	3.9	5.9	8.1	10.3	12.6	15.1	17.8
20.8	24.3	29.1					
4.	5.	6.	8.	9.	11.	13.	16.
18.	21.	24.	28.	32.	36.	1000.	1000.
1000.	1000.	1000.	1000.	1000.	1000.	1000.	1000.
0.	1.	1.	1.	1.	2.	2.	2.
3.	3.	3.	4.	4.	5.		
1.7	3.4	5.2	7.0	8.9	10.8	12.8	15.0
17.2	19.6	22.2	25.1	28.5	33.0		
5.	5.	6.	7.	8.	9.	10.	11.
12.	13.	15.	17.	19.	21.	23.	26.
28.	31.	1000.	1000.	1000.	1000.	1000.	1000.
0.	1.	1.	1.	1.	2.	2.	2.
3.	3.	3.	4.	4.	4.	5.	5.
6.	7.						
1.4	2.9	4.5	6.1	7.8	9.5	11.3	13.1
15.0	17.0	19.0	21.2	23.5	26.0	28.7	31.8
35.5	41.4						
8.	8.	8.	8.	8.	9.	10.	10.
11.	11.	12.	13.	13.	14.	14.	15.
16.	17.	18.	19.	20.	21.	1000.	1000.
0.	1.	1.	1.	1.	2.	2.	2.
3.	3.	3.	4.	4.	4.	5.	5.
5.	6.	6.	7.	7.	9.		
1.1	2.3	3.6	4.9	6.4	8.0	9.6	11.2
12.9	14.7	16.5	18.4	20.4	22.4	24.5	26.7
29.1	31.7	34.5	37.7	41.6	48.4		
	12371	6					
.6							
300.	300.	100.	400.				
100.	300.	50.	125.				
100.	300.	50.	125.				
50.	300.	25.	75.				
400.	1200.	300.	500.				
65.	300.	60.	70.				
65.	300.	60.	70.				
65.	300.	60.	70.				
185.	300.						
60.	120.						
4800.							

Blank

52.3

APPENDIX C

Model Output

Extracts of the output for a sample computer run are attached as a tab hereto. The output report is organized according to the following scheme:

Part I   Input Parameters

- Section I   Maneuver Element Parameters
- Section II   Fireplanning Parameters
- Section III   Artillery Unit Parameters
- Section IV   Fire Mission Processing Parameters
- Section V   Target Characteristic Parameters
- Section VI   Target Attack Strategy Parameters
- Section VII   Artillery Ballistic Data
- Section VIII   Burst Lethality Data

Part II   Initial Situation

- Section I   Initial Maneuver Element Dispositions
- Section II   Initial Artillery Unit Dispositions

Part III   Initial Fire Plan

Part IV   Run Results

- Section I   Event Vector Listing
- Section II   Targets of Opportunity Engaged
- Section III   Scheduled and Preparatory Targets Engaged
- Section IV   Reinforcing Unit Targets
- Section V   Summary Data

PART I

SECTION I

BASIC MANEUVER ELEMENT PARAMETERS

DESCRIPTION	TYPE OF DISTRIBUTION	MEAN	VARIANCE	LOWER LIMIT	UPPER LIMIT
		BRIGADE DATA			
WIDTH OF FRONT	TRUNCATED NORMAL	12000.00	28000.00	10000.00	14000.00
DISTANCE TO OBJECTIVE	TRUNCATED NORMAL	30000.00	30000.00	0.0	40000.00
LENGTH OF OBJ MAJ AXIS	TRUNCATED NORMAL	2500.00	25000.00	1800.00	3200.00
LENGTH OF OBJ MIN AXIS	TRUNCATED NORMAL	1250.00	25000.00	1000.00	1500.00
MOVEMENT RATE (KM/HR)	UNIFORM			2.00	4.00
LATERAL DISPLACEMENT OF UNIT OBJECTIVE ABOUT UNIT CENTER LINE	TRUNCATED NORMAL	0.0	25000.00	SEE NOTE	
		BATTALION DATA			
WIDTH OF FRONT	TRUNCATED NORMAL	6000.00	56000.00	2100.00	10000.00
DISTANCE TO OBJECTIVE	TRUNCATED NORMAL	10000.00	28000.00	0.0	15000.00
LENGTH OF OBJ MAJ AXIS	TRUNCATED NORMAL	1000.00	5000.00	500.00	1500.00
LENGTH OF OBJ MIN AXIS	TRUNCATED NORMAL	750.00	5000.00	500.00	1000.00
MOVEMENT RATE (KM/HR)	UNIFORM			2.00	4.00
LATERAL DISPLACEMENT OF UNIT OBJECTIVE ABOUT UNIT CENTER LINE	TRUNCATED NORMAL	0.0	25000.00	SEE NOTE	
		COMPANY DATA			
WIDTH OF FRONT	TRUNCATED NORMAL	3000.00	28000.00	1000.00	5000.00
DISTANCE TO OBJECTIVE	TRUNCATED NORMAL	6000.00	28000.00	0.0	8000.00
LENGTH OF OBJ MAJ AXIS	TRUNCATED NORMAL	500.00	5000.00	200.00	800.00
LENGTH OF OBJ MIN AXIS	TRUNCATED NORMAL	250.00	500.00	200.00	400.00
MOVEMENT RATE (KM/HR)	UNIFORM			2.00	4.00
LATERAL DISPLACEMENT OF UNIT OBJECTIVE ABOUT UNIT CENTER LINE	TRUNCATED NORMAL	0.0	25000.00	SEE NOTE	

NOTES

(1) ALL DISTANCE MEASUREMENTS ARE IN METERS
(2) BOUNDS OF THE LATERAL DISPLACEMENT OF THE UNIT OBJECTIVES ARE FUNCTIONS OF THE RESPECTIVE UNIT LEFT AND RIGHT BOUNDARIES

FIREPLANNING PARAMETERS

BRIGADE DATA

FIREPLANNING STATE 1

VALUES FOR NUMBER OF TARGETS UNIT WILL PLAN IN THE FIREPLANNING PROCESS	2.00	2.00	2.00	2.00	0.0	0.0	0.0	0.0
PROBABILITIES ASSOCIATED WITH THE ABOVE VALUES	0.60	0.30	0.10	0.0	0.0	0.0	0.0	0.0
PROBABILITY THAT A RANDOM TARGET IS A PREPARATORY TARGET, SCHEDULED TARGET OR AN ON CALL TARGET	0.60	0.30	0.10					
PROBABILITY THAT A RANDOM PREPARATORY TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.0	0.50	0.50					
PROBABILITY THAT A RANDOM SCHEDULED TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE	0.60	0.30	0.10					
PROBABILITY THAT A RANDOM ON CALL TARGET IS LOCATED ON THE UNIT OBJECTIVE,BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.20	0.10	0.70					

FIREPLANNING STATE 2

VALUES FOR NUMBER OF TARGETS UNIT WILL PLAN IN THE FIREPLANNING PROCESS	2.00	2.00	2.00	2.00	0.0	0.0	0.0	0.0
PROBABILITIES ASSOCIATED WITH THE ABOVE VALUES	0.60	0.30	0.10	0.0	0.0	0.0	0.0	0.0
PROBABILITY THAT A RANDOM TARGET IS A PREPARATORY TARGET, SCHEDULED TARGET OR AN ON CALL TARGET	0.20	0.30	0.50					
PROBABILITY THAT A RANDOM PREPARATORY TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.80	0.20	0.10					
PROBABILITY THAT A RANDOM SCHEDULED TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE	0.0	0.20	0.80					
PROBABILITY THAT A RANDOM ON CALL TARGET IS LOCATED ON THE UNIT OBJECTIVE,BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.60	0.30	0.10					

FIREPLANNING STATE 1

VALUES FOR NUMBER OF TARGETS UNIT WILL PLAN IN THE FIREPLANNING PROCESS	2.00	2.00	2.00	2.00	0.0	0.0	0.0	0.0
PROBABILITIES ASSOCIATED WITH THE ABOVE VALUES	0.60	0.30	0.10	0.0	0.0	0.0	0.0	0.0
PROBABILITY THAT A RANDOM TARGET IS A PREPARATORY TARGET, SCHEDULED TARGET OR AN ON CALL TARGET	0.30	0.40	0.20					
PROBABILITY THAT A RANDOM PREPARATORY TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.20	0.10	0.70					
PROBABILITY THAT A RANDOM SCHEDULED TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE	0.90	0.10	0.0					
PROBABILITY THAT A RANDOM ON CALL TARGET IS LOCATED ON THE UNIT OBJECTIVE,BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.80	0.20	0.0					

FIREPLANNING STATE 2

VALUES FOR NUMBER OF TARGETS UNIT WILL PLAN IN THE FIREPLANNING PROCESS	2.00	2.00	2.00	2.00	0.0	0.0	0.0	0.0
PROBABILITIES ASSOCIATED WITH THE ABOVE VALUES	0.80	0.10	0.10	0.0	0.0	0.0	0.0	0.0
PROBABILITY THAT A RANDOM TARGET IS A PREPARATORY TARGET, SCHEDULED TARGET OR AN ON CALL TARGET	0.40	0.30	0.30					
PROBABILITY THAT A RANDOM PREPARATORY TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.80	0.10	0.10					
PROBABILITY THAT A RANDOM SCHEDULED TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE	0.60	0.30	0.10					
PROBABILITY THAT A RANDOM ON CALL TARGET IS LOCATED ON THE UNIT OBJECTIVE,BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.60	0.30	0.10					

FIREPLANNING STATE 1

VALUES FOR NUMBER OF TARGETS UNIT WILL PLAN IN THE FIREPLANNING PROCESS	2.00	2.00	2.00	2.00	0.0	0.0	0.0	0.0
PROBABILITIES ASSOCIATED WITH THE ABOVE VALUES	0.20	0.20	0.20	0.20	0.05	0.05	0.10	0.0
PROBABILITY THAT A RANDOM TARGET IS A PREPARATORY TARGET, SCHEDULED TARGET OR AN ON CALL TARGET	0.10	0.60	0.30					
PROBABILITY THAT A RANDOM PREPARATORY TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.30	0.60	0.10					
PROBABILITY THAT A RANDOM SCHEDULED TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE	0.10	0.60	0.30					
PROBABILITY THAT A RANDOM ON CALL TARGET IS LOCATED ON THE UNIT OBJECTIVE,BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.60	0.30	0.20					

FIREPLANNING STATE 2

VALUES FOR NUMBER OF TARGETS UNIT WILL PLAN IN THE FIREPLANNING PROCESS	2.00	2.00	2.00	2.00	0.0	0.0	0.0	0.0
PROBABILITIES ASSOCIATED WITH THE ABOVE VALUES	0.60	0.30	0.10	0.0	0.0	0.0	0.0	0.0
PROBABILITY THAT A RANDOM TARGET IS A PREPARATORY TARGET, SCHEDULED TARGET OR AN ON CALL TARGET	0.0	0.20	0.80					
PROBABILITY THAT A RANDOM PREPARATORY TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.80	0.10	0.10					
PROBABILITY THAT A RANDOM SCHEDULED TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE	0.30	0.50	0.20					
PROBABILITY THAT A RANDOM ON CALL TARGET IS LOCATED ON THE UNIT OBJECTIVE,BETWEEN THE LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE OR BEYOND THE UNIT OBJECTIVE	0.80	0.20	0.0					

ARTILLERY UNIT PARAMETERS

DESCRIPTION	TYPE OF DISTRIBUTION	MEAN	VARIANCE	LOWER LIMIT	UPPER LIMIT
BATTERY LATERAL DISPLACEMENT ABOUT THE CENTER LINE OF THE SUPPORTED UNIT	TRUNCATED NORMAL	0.0	0.0	SEE NOTES	
BATTERY DEPTH DISPLACEMENT BEHIND THE FRONT LINE OF THE SUPPORTED UNIT	TRUNCATED NORMAL	1000.00	20000.00	SEE NOTES	
MARCH ORDER TIME (SEC)	TRUNCATED NORMAL	600.00	6000.00	400.00	800.00
MOVEMENT RATE(KM/HR)	TRUNCATED NORMAL	20.00	400.00	10.00	30.00
UNIT EMPLACEMENT TIME (SEC)	TRUNCATED NORMAL	360.00	400.00	300.00	420.00
POSITION ERROR COMPONENT	TRUNCATED NORMAL	0.0	9000.00	SEE NOTE	

DISPERSION OF WEAPONS

UNIFORM DISTRIBUTIONS

WEAPON	DEPTH DISPERSION		LATERAL DISPERSION	
	LOWER LIMIT	UPPER LIMIT	LOWER LIMIT	UPPER LIMIT
1	10.0	10.0	-50.0	-50.0
2	-10.0	-10.0	-30.0	-30.0
3	10.0	10.0	-10.0	-10.0
4	10.0	10.0	10.0	10.0
5	-10.0	-10.0	30.0	30.0
6	10.0	10.0	50.0	50.0

NOTES

(1) BOUNDS ON LATERAL DISPLACEMENTS ARE THE LATERAL BOUNDARIES OF THE SUPPORTED UNIT

(2) BOUNDS ON THE DEPTH DISPLACEMENT ARE THE FRONT LINE AND A POINT MAX RANGE BEHIND THE FRONT LINE

(3) LATERAL BOUNDS ON THE ERROR COMPONENT ARE FUNCTIONS OF THE BOUNDS IN (1) AND (2) ABOVE

(4) DISTANCE MEASURES ARE IN METERS

(5) TIME MEASURES ARE IN SECONDS

DESCRIPTION	TYPE OF DISTRIBUTION	MEAN	VARIANCE	LOWER LIMIT	UPPER LIMIT
TIME FOR THE FO TO PREPARE THE FIRE MISSION FOR A TARGET OF OPPORTUNITY	TRUNCATED NORMAL	50.00	500.00	25.00	75.00
TIME FOR THE FO TO TRANSMIT THE REQUEST FOR FIRE TO THE FDC	TRUNCATED NORMAL	30.00	500.00	15.00	45.00
TIME REQUIRED TO CONDUCT THE ANALYSIS OF THE TARGET	TRUNCATED NORMAL	60.00	500.00	50.00	70.00
TIME REQUIRED FOR THE ADJUSTING UNIT TO PREPARE AND FIRE A VOLLEY IN THE ADJUSTMENT	TRUNCATED NORMAL	25.00	500.00	20.00	35.00
TIME FOR THE FO TO MAKE ADJUSTMENT CORRECTIONS AND TRANSMIT THEM TO FDC	TRUNCATED NORMAL	20.00	500.00	15.00	35.00
TIME FOR FDC TO COMPUTE NEW ADJUSTING FIRING DATA AND TRANSMIT IT TO THE ADJUSTING UNIT	TRUNCATED NORMAL	30.00	500.00	15.00	45.00
TIME FOR FDC TO SELECT A MASS POINT IN THE FIRE FOR EFFECT PHASE, COMPUTE THE DATA, AND TRANSMIT IT TO THE FIRING UNITS	TRUNCATED NORMAL	30.00	500.00	20.00	40.00
TIME REQUIRED FOR A FIRING UNIT TO PREPARE AND FIRE A VOLLEY IN FIRE FOR EFFECT WHEN THE DATA IS DIFFERENT FROM THAT USED IN THE PREVIOUS VOLLEY	TRUNCATED NORMAL	60.00	300.00	50.00	70.00
TIME REQUIRED FOR A FIRING UNIT TO PREPARE AND FIRE A VOLLEY IN FIRE FOR EFFECT WHEN THE FIRING DATA IS UNCHANGED	TRUNCATED NORMAL	15.00	0.0	15.00	15.00
TIME FOR THE REINFORCING UNIT TO SHOOT A TARGET OF OPPORTUNITY MISSION	TRUNCATED NORMAL	1200.00	200.00	1000.00	1400.00
TIME FOR THE REINFORCING UNIT TO SHOOT A SCHEDULED MISSION	TRUNCATED NORMAL	900.00	900.00	700.00	1100.00
TIME FOR REINFORCING UNIT TO SHOOT A PREP MISSION	TRUNCATED NORMAL	300.00	0.0	200.00	400.00

BASIC ERROR PARAMETERS

PARAMETERS FOR LINEAR FUNCTIONS REPRESENTING VARIANCE AS A FUNCTION OF RANGE

DESCRIPTION	INTERCEPT	SLOPE
EASTING COMPONENT OF TARGET LOCATION ERROR	200.0000	0.0300
NORTHING COMPONENT OF TARGET LOCATION ERROR	2000.0000	0.3000
DEFLECTION COMPONENT OF BURST LOCATION ERROR	200.0000	0.0300
RANGE COMPONENT OF BURST LOCATION ERROR	200.0000	0.0300

TARGET CHARACTERISTIC PARAMETERS

CATEGORY I TARGET

DESCRIPTION	DISTRIBUTION	LOWER LIMIT	UPPER LIMIT
NUMBER OF TGT ELEMENTS	UNIFORM	60.	120.
DEPTH OF ZONE 1	UNIFORM	100.	300.
DEPTH OF ZONE 2	UNIFORM	100.	300.
DEPTH OF ZONE 3	UNIFORM	50.	300.
LATERAL WIDTH	UNIFORM	300.	300.

CATEGORY II TARGET

DESCRIPTION	DISTRIBUTION	LOWER LIMIT	UPPER LIMIT
NUMBER OF TGT ELEMENTS	UNIFORM	185.	300.
DEPTH OF ZONE 1	UNIFORM	65.	300.
DEPTH OF ZONE 2	UNIFORM	65.	300.
DEPTH OF ZONE 3	UNIFORM	65.	300.
LATERAL WIDTH	UNIFORM	400.	1200.

SECTION VI

ENGAGEMENT STRATEGIES

STRATEGY NUMBER	LENGTH	DEPTH
1	0.0	0.0
2	500.00	200.00
3	400.00	300.00
4	600.00	200.00
5	150.00	200.00
6	195.00	200.00
7	400.00	325.00
8	75.00	20.00

DISTRIBUTION OF NUMBER OF VOLLEYS IN THE FIRE FOR EFFECT PHASE
FOR A TARGET OF OPPORTUNITY

NUMBER OF VOLLEYS	6.	3.	0.	0.	0.	0.	0.	0.
PROBABILITY	0.20	0.80	0.0	0.0	0.0	0.0	0.0	0.0

DISTRIBUTION OF NUMBER OF VOLLEYS IN THE FIRE FOR EFFECT PHASE
FOR A SCHEDULED TARGET

NUMBER OF VOLLEYS	6.	1.	0.	0.	0.	0.	0.	0.
PROBABILITY	0.50	0.50	0.0	0.0	0.0	0.0	0.0	0.0

PROBABILITY DISTRIBUTION ON THE ATTACK STRATEGIES FOR A TARGET OF OPPORTUNITY

STRATEGY NUMBER	1	2	3	4	5	6	7	8
PROBABILITY	.60	.05	.05	.10	.05	.05	.05	.05

PROBABILITY DISTRIBUTION ON THE ATTACK STRATEGIES FOR A SCHEDULED TARGET

STRATEGY NUMBER	1	2	3	4	5	6	7	8
PROBABILITY	.30	.70	.0	.0	.0	.0	.0	.0

NOTES

LENGTH AND WIDTH FOR THE ATTACK STRATEGIES REFER TO THE DIMENSIONS OF THE BOX WHICH IS SUPERIMPOSED OVER THE TARGET AREA

SECTION VII

ARTILLERY BALLISTIC DATA

CHARGE 1

RANGE	PER	PED	TOF
500	3.00	0.0	1.90
1000	5.00	1.00	3.90
1500	6.00	1.00	5.90
2000	8.00	1.00	8.10
2500	10.00	1.00	10.30
3000	12.00	2.00	12.60
3500	15.00	2.00	15.10
4000	17.00	2.00	17.80
4500	20.00	3.00	20.90
5000	24.00	3.00	24.30
5500	27.00	4.00	29.10
6000	1000.00	0.0	0.0
6500	1000.00	0.0	0.0
7000	1000.00	0.0	0.0
7500	1000.00	0.0	0.0
8000	1000.00	0.0	0.0
8500	1000.00	0.0	0.0
9000	10000.00	0.0	0.0
9500	1000.00	0.0	0.0
10000	1000.00	0.0	0.0
10500	1000.00	0.0	0.0
11000	1000.00	0.0	0.0

NOTE: A PER EQUAL TO 1000. INDICATES THE RANGE IS NOT ACHIEVABLE WITH THIS CHARGE

CHARGE 2

RANGE	PER	PED	TOF
500	4.00	0.0	1.70
1000	5.00	1.00	3.40
1500	6.00	1.00	5.20
2000	8.00	1.00	7.00
2500	9.00	1.00	8.90
3000	11.00	2.00	10.80
3500	13.00	2.00	12.80
4000	16.00	2.00	15.00
4500	19.00	3.00	17.20
5000	21.00	3.00	19.60
5500	24.00	3.00	22.20
6000	28.00	4.00	25.10
6500	32.00	4.00	28.50
7000	36.00	5.00	33.00
7500	1000.00	0.0	0.0
8000	1000.00	0.0	0.0
8500	1000.00	0.0	0.0
9000	1000.00	0.0	0.0
9500	1000.00	0.0	0.0
10000	1000.00	0.0	0.0
10500	1000.00	0.0	0.0
11000	1000.00	0.0	0.0

NOTE: A PER EQUAL TO 1000. INDICATES THE RANGE IS NOT ACHIEVABLE WITH THIS CHARGE

CHARGE 3

RANGE	PER	PED	TOF
500	5.00	0.0	1.40
1000	5.00	1.00	2.90
1500	6.00	1.00	4.50
2000	7.00	1.00	6.10
2500	8.00	1.00	7.80
3000	9.00	2.00	9.50
3500	10.00	2.00	11.30
4000	11.00	2.00	13.10
4500	12.00	3.00	15.00
5000	13.00	3.00	17.00
5500	15.00	3.00	19.00
6000	17.00	4.00	21.20
6500	19.00	4.00	23.50
7000	21.00	4.00	26.00
7500	23.00	5.00	28.70
8000	26.00	5.00	31.80
8500	28.00	6.00	35.50
9000	31.00	7.00	41.40
9500	1000.00	0.0	0.0
10000	1000.00	0.0	0.0
10500	1000.00	0.0	0.0
11000	1000.00	0.0	0.0

NOTE: A PER EQUAL TO 1000. INDICATES THE RANGE IS NOT ACHIEVABLE WITH THIS CHARGE

CHARGE 4

RANGE	PER	PED	TOF
500	8.00	0.0	1.10
1000	8.00	1.00	2.30
1500	8.00	1.00	3.60
2000	8.00	1.00	4.90
2500	8.00	1.00	6.40
3000	9.00	2.00	8.00
3500	10.00	2.00	9.60
4000	10.00	2.00	11.20
4500	11.00	3.00	12.90
5000	11.00	3.00	14.70
5500	12.00	3.00	16.50
6000	13.00	4.00	18.40
6500	13.00	4.00	20.40
7000	14.00	4.00	22.40
7500	14.00	5.00	24.50
8000	15.00	5.00	26.70
8500	16.00	5.00	29.10
9000	17.00	6.00	31.70
9500	18.00	6.00	34.50
10000	19.00	7.00	37.70
10500	20.00	7.00	41.60
11000	21.00	9.00	48.40

NOTE: A PER EQUAL TO 1000. INDICATES THE RANGE IS NOT ACHIEVABLE WITH THIS CHARGE

MISS DISTANCE	PROBABILITY OF BECOMING A CASUALTY
2.	.9985387
4.	.9941676
6.	.9869249
8.	.9768737
10.	.9641010
12.	.9487165
14.	.9308510
16.	.9105546
18.	.8882946
20.	.8639531
22.	.8378245
24.	.8101134
26.	.7810311
28.	.7507938
30.	.7196193
32.	.6877249
34.	.6553247
36.	.6226271
38.	.5898335
40.	.5571352
50.	.4009252
60.	.2681707
70.	.1667264
80.	.0963479
90.	.0517518
100.	.0258377
110.	.0119902
120.	.0051718
130.	.0020735
140.	.0007727
150.	.0002677
160.	.0000862
170.	.0000258
180.	.0000072
190.	.0000019
200.	.0000004
210.	.0000001
220.	.0000000
230.	.0000000
240.	.0000000
250.	.0000000
260.	.0000000
270.	.0000000
280.	.0000000
290.	.0000000
300.	.0000000

NOTE: VALUES ARE BASED ON LETHALITY PARAMETER OF 52.300

PART II

INITIAL UNIT DISPOSITIONS

SECTION I

MANEUVER ELEMENTS

BRIGADE

UNIT BOUNDARIES

LEFT	RIGHT
0.0 EAST	11808.438 NORTH

OBJECTIVE DATA

DESCRIPTION	EAST	NORTH
OBJECTIVE CENTER	5834.29	29676.78
LENGTH OF MAJOR AXIS	2483.13 METERS	
LENGTH OF MINOR AXIS	1282.64 METERS	

FIREPLANNING CENTER

EAST	NORTH
5904.219	0.0

UNIT BOUNDARIES

LEFT	RIGHT
0.0 EAST	6043.207 NORTH

OBJECTIVE DATA

DESCRIPTION	EAST	NORTH
OBJECTIVE CENTER	3292.92	9891.28
LENGTH OF MAJOR AXIS	1025.99 METERS	
LENGTH OF MINOR AXIS	707.08 METERS	

FIREPLANNING CENTER

EAST	NORTH
3021.604	0.0

BATTALION 4

UNIT BOUNDARIES

LEFT	RIGHT
6043.207 EAST	11808.438 NORTH

OBJECTIVE DATA

DESCRIPTION	EAST	NORTH
OBJECTIVE CENTER	8931.44	10259.00
LENGTH OF MAJOR AXIS	1037.20 METERS	
LENGTH OF MINOR AXIS	344.31 METERS	

FIREPLANNING CENTER

EAST	NORTH
8925.820	0.0

UNIT BOUNDARIES

LEFT	RIGHT
0.0 EAST	2904.865 NORTH

OBJECTIVE DATA

DESCRIPTION	EAST	NORTH
OBJECTIVE CENTER	1455.02	6210.36
LENGTH OF MAJOR AXIS	545.90 METERS	
LENGTH OF MINOR AXIS	241.96 METERS	

FIREPLANNING CENTER

EAST	NORTH
1452.432	0.0

COMPANY 2

UNIT BOUNDARIES

LEFT	RIGHT
2904.265 EAST	6043.207 NORTH

OBJECTIVE DATA

DESCRIPTION	EAST	NORTH
OBJECTIVE CENTER	4697.77	6115.25
LENGTH OF MAJOR AXIS	364.20 METERS	
LENGTH OF MINOR AXIS	243.93 METERS	

FIREPLANNING CENTER

EAST	NORTH
4474.035	0.0

COMPANY 3

UNIT BOUNDARIES

LEFT	RIGHT
6043.207 EAST	9008.813 NORTH

OBJECTIVE DATA

DESCRIPTION	EAST	NORTH
OBJECTIVE CENTER	7641.54	5890.23
LENGTH OF MAJOR AXIS	528.61 METERS	
LENGTH OF MINOR AXIS	291.91 METERS	

FIREPLANNING CENTER

EAST	NORTH
7526.008	0.0

COMPANY 4

UNIT BOUNDARIES

LEFT	RIGHT
9009.913 EAST	11808.438 NORTH

OBJECTIVE DATA

DESCRIPTION	EAST	NORTH
OBJECTIVE CENTER	10279.54	6096.07
LENGTH OF MAJOR AXIS	546.65 METERS	
LENGTH OF MINOR AXIS	243.74 METERS	

FIREPLANNING CENTER

EAST	NORTH
10408.625	0.0

BATTERY 1

ACTUAL BATTERY CENTER	3065.65	EAST	-892.71	NORTH
ASSIGNED BATTERY CENTER	3021.60	EAST	-872.51	NORTH
POSITION ERROR	-44.05	EAST	20.19	NORTH
AZIMUTH OF LAY	543.40	MILS		

WEAPON LOCATIONS

WEAPON	EAST	NORTH
1	3017.51	-909.51
2	3044.90	-916.57
3	3051.96	-889.18
4	3069.19	-879.01
5	3096.57	-886.07
6	3103.63	-853.63

BATTERY 2

ACTUAL BATTERY CENTER	5805.43	EAST	-1021.38	NORTH
ASSIGNED BATTERY CENTER	5904.22	EAST	-1032.93	NORTH
POSITION ERROR	98.79	EAST	-11.55	NORTH
AZIMUTH OF LAY	108.94	MILS		

WEAPON LOCATIONS

WEAPON	EAST	NORTH
1	5754.65	-1016.77
2	5776.67	-1034.52
3	5794.42	-1012.50
4	5814.31	-1010.37
5	5836.33	-1028.12
6	5854.09	-1006.10

ACTUAL BATTERY CENTER	8937.07	EAST	-1011.99	NORTH
ASSIGNED BATTERY CENTER	8925.82	EAST	-1024.79	NORTH
POSITION ERROR	-11.25	EAST	-12.80	NORTH
AZIMUTH OF LAY	6030.23	MILS		

WEAPON LOCATIONS

WEAPON	EAST	NORTH
1	8893.96	-984.75
2	8905.48	-1010.59
3	8931.31	-999.07
4	8949.98	-1006.23
5	8951.50	-1032.05
6	8997.34	-1020.54

INITIAL FIRE PLAN

LINE NUMBER	TARGET NUMBER	ORIG UNIT	TYPE TARGET	TARGET LOCATION EAST	TARGET LOCATION NORTH	UNIT SCHD	TIME SCHD
0	1.	1.	ON CALL	1700.93	6096.05	0.0	
1	2.	1.	SCHD	972.83	5109.19	1.00	9196.38
2	3.	3.	ON CALL	7533.23	6095.43	0.0	
3	4.	3.	SCHD	7395.24	6923.73	3.00	12462.73
4	5.	4.	SCHD	11437.48	6340.59	3.00	11413.07
5	6.	4.	PREP	10355.20	227.92	1.00	-180.00
6	8.	5.	SCHD	3718.81	9687.38	1.00	17437.29
7	9.	6.	ON CALL	11674.23	29.79	0.0	
8	10.	6.	SCHD	8547.01	9958.55	3.00	17925.39

EVENT VECTOR LISTING

-240.000	1.000	6.000	6.000	0.0	10355.199	227.920	4.000	1.000	0.0
0.0	0.0	0.0	0.0	0.0	1.000	1.000	0.0	0.0	0.0
2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	10355.199	227.920	0.0	0.0	10355.199	227.920	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
-180.000	2.000	6.000	6.000	100.000	10355.199	227.920	4.000	1.000	6.000
0.0	0.0	0.0	0.0	0.0	1.000	1.000	0.0	0.0	0.0
2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	10355.199	227.920	1.000	0.0	10355.199	227.920	1.000	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
-155.350	3.000	6.000	6.000	100.000	10355.199	227.920	4.000	1.000	6.000
0.0	0.0	0.0	0.0	0.0	1.000	1.000	0.0	0.0	0.0
2.000	0.0	0.0	0.0	0.0	98.030	60.520	23.140	11.670	4.500
0.500	10355.199	227.920	1.000	6.000	10355.199	227.920	1.000	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
0.0	14.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
600.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
660.000	8.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
1200.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
1560.000	8.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
1800.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
1800.000	13.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
2400.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
2450.000	8.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000

3000.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3000.000	13.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3200.500	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3201.590	12.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3282.090	1.000	13.000	6.000	1.000	3425.590	2996.600	2.000	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	3417.420	2984.380	0.0	0.0	0.0
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3360.000	8.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3368.770	2.000	13.000	6.000	1.000	3425.590	2996.600	2.000	2.000	0.0
2.000	0.0	0.0	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	2.000	0.0	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3390.420	3.000	13.000	6.000	1.000	3425.590	2996.600	2.000	2.000	0.0
2.000	0.0	0.0	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	92.880	2.000	4.500
8.000	0.0	0.0	2.000	2.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3491.220	2.000	13.000	6.000	1.000	3607.800	2914.140	2.000	2.000	0.0
2.000	0.0	31.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	92.880	2.000	4.500
8.000	0.0	0.0	2.000	2.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3502.090	3.000	13.000	6.000	1.000	3607.800	2914.140	2.000	2.000	0.0
2.000	0.0	31.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	87.620	2.000	4.500
6.000	0.0	0.0	2.000	4.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3580.560	2.000	13.000	6.000	1.000	3425.590	2996.600	2.000	2.000	0.0
2.000	0.0	33.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	87.620	2.000	4.500
8.000	0.0	0.0	2.000	4.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3600.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000

3602.210	3.000	13.000	6.000	1.000	[illegible]	[illegible]	2.000	2.000	0.0
2.000	0.0	33.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	92.880	2.000	4.500
8.000	0.0	0.0	2.000	6.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3568.450	2.000	13.000	6.000	1.000	3607.800	2914.140	2.000	2.000	0.0
2.000	0.0	44.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	92.880	2.000	4.500
8.000	0.0	0.0	2.000	6.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3689.320	3.000	13.000	6.000	1.000	3607.800	2914.140	2.000	2.000	0.0
2.000	0.0	44.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	87.620	2.000	4.500
8.000	0.0	0.0	2.000	8.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3759.090	2.000	13.000	6.000	-1.000	3516.700	2955.370	2.000	2.000	0.0
2.000	0.0	47.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	87.620	2.000	4.500
8.000	0.0	0.0	2.000	8.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3780.350	3.000	13.000	6.000	1.000	3516.700	2955.370	2.000	2.000	0.0
2.000	0.0	47.000	0.0	0.0	0.0	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	0.0	50.020	60.520	90.230	2.000	4.500
8.000	0.0	0.0	2.000	10.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3897.780	2.000	13.000	6.000	1.000	3516.700	2955.370	2.000	2.000	6.000
6.000	6.000	60.000	0.0	0.0	1.000	1.000	193.000	3201.500	0.0
1.000	3.000	3.000	3.000	1.000	50.020	60.520	90.230	2.000	4.500
8.000	3516.700	2955.370	2.000	10.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3919.040	2.000	13.000	6.000	1.000	3516.700	2955.370	2.000	2.000	6.000
6.000	6.000	60.000	0.0	0.0	1.000	1.000	193.000	3201.500	0.0
1.000	2.000	2.000	2.000	1.000	50.020	60.520	90.230	2.000	4.500
8.000	3516.700	2955.370	2.000	28.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3934.040	2.000	13.000	6.000	1.000	3516.700	2955.370	2.000	2.000	6.000
6.000	6.000	87.000	0.0	0.0	1.000	1.000	193.000	3201.500	0.0
1.000	2.000	2.000	2.000	1.000	50.020	60.520	90.230	2.000	4.500
8.000	3516.700	2955.370	2.000	28.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3955.300	3.000	13.000	6.000	1.000	3516.700	2955.370	2.000	2.000	6.000
6.000	6.000	87.000	0.0	0.0	1.000	1.000	193.000	3201.500	0.0
1.000	1.000	1.000	1.000	1.000	50.020	60.520	90.230	2.000	4.500
8.000	3516.700	2955.370	2.000	46.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3970.300	2.000	13.000	6.000	1.000	3516.700	2955.370	2.000	2.000	6.000
6.000	6.000	101.000	0.0	0.0	1.000	1.000	193.000	3201.500	0.0
1.000	1.000	1.000	1.000	1.000	50.020	60.520	90.230	2.000	4.500
8.000	3516.700	2955.370	2.000	46.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
3991.560	3.000	13.000	6.000	1.000	3516.700	2955.370	2.000	2.000	6.000
6.000	6.000	101.000	0.0	0.0	1.000	1.000	193.000	3201.500	0.0
1.000	0.0	0.0	0.0	1.000	50.020	60.520	90.230	2.000	4.500
8.000	3516.700	2955.370	2.000	64.000	3417.420	2984.380	1.000	1.000	1.000
3425.590	2996.600	-1.150	0.0	0.0	0.0	0.0	0.0	0.0	1.000
4200.000	7.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000

TARGET NUMBER	13.00		
LOCATION	3417.42	EAST	2984.38 NORTH
FO ERROR	-8.19	EASTING	-12.22NORTHING
TARGET CATEGORY	2.00		
LATERAL LENGTH	439.90	METERS	
DEPTH	198.61	METERS	
NUMBER OF TARGET ELEMENTS	193.00		
TARGET DENSITY	0.0		
TIME GENERATED	3201.50		
UNIT BEING SUPPORTED	2.00		
ADJUSTING UNIT	2.00		
INITIAL ENGAGEMENT RANGE	4730.83	METERS	
NUMBER OF VOLLEYS IN ADJUSTMENT	5.00		
STRATEGY USED IN FFE	1.00		
NUMBER OF VOLLEYS IN FFE	3.00		
TOTAL ROUNDS FIRED ON TARGET	64.00		
NUMBER OF CASUALTIES INFLICTED	101.00		
PERCENT CASUALTIES INFLICTED	0.52		
ROUNDS/CASUALTY	0.63		
TOTAL ENGAGEMENT TIME	790.07	SECONDS	
KILL RATE	0.130	CASUALTIES/SECOND	

TARGET NUMBER	3.00		
LOCATION	7532.23	EAST	6095.43 NORTH
FO ERROR	0.0	EASTING	0.0 NORTHING
TARGET CATEGORY	1.00		
LATERAL LENGTH	262.27	METERS	
DEPTH	249.05	METERS	
NUMBER OF TARGET ELEMENTS	62.00		
TARGET DENSITY	0.0		
TIME GENERATED	10517.61		
UNIT BEING SUPPORTED	3.00		
ADJUSTING UNIT	2.00		
INITIAL ENGAGEMENT RANGE	7312.13	METERS	
NUMBER OF VOLLEYS IN ADJUSTMENT	2.00		
STRATEGY USED IN FFE	4.00		
NUMBER OF VOLLEYS IN FFE	3.00		
TOTAL ROUNDS FIRED ON TARGET	58.00		
NUMBER OF CASUALTIES INFLICTED	49.00		
PERCENT CASUALTIES INFLICTED	0.79		
ROUNDS/CASUALTY	1.18		
TOTAL ENGAGEMENT TIME	619.37	SECONDS	
KILL RATE	0.080	CASUALTIES/SECOND	

```
TARGET NUMBER                          6.00   SCHD          1.00PREP
TARGET TYPE                            0.0
UNIT ORIGINATING                       4.00
TIME SCHEDULED                      -180.00
TIME FIRED                          -240.00
UNIT FIRED                             1.00
STRATEGY USED                          1.00
NUMBER OF VOLLEYS IN FFE               1.00
TOTAL ROUNDS FIRED                     6.00
TOTAL TARGET ELEMENTS                  0.0
TOTAL CASUALTIES INFLICTED             0.0

TARGET NUMBER                          1.00
TARGET TYPE                            1.00   SCHD          0.0 PREP
UNIT ORIGINATING                       1.00
TIME SCHEDULED                         0.0
TIME FIRED                          7546.89
UNIT FIRED                             1.00
STRATEGY USED                          1.00
NUMBER OF VOLLEYS IN FFE               6.00
TOTAL ROUNDS FIRED                    36.00
TOTAL TARGET ELEMENTS                  0.0
TOTAL CASUALTIES INFLICTED             0.0

TARGET NUMBER                          5.00
TARGET TYPE                            1.00   SCHD          0.0 PREP
UNIT ORIGINATING                       4.00
TIME SCHEDULED                     11413.07
TIME FIRED                         11353.07
UNIT FIRED                             3.00
STRATEGY USED                          2.00
NUMBER OF VOLLEYS IN FFE               1.00
TOTAL ROUNDS FIRED                     6.00
TOTAL TARGET ELEMENTS                  0.0
TOTAL CASUALTIES INFLICTED             0.0

TARGET NUMBER                          4.00
TARGET TYPE                            1.00   SCHD          0.0 PREP
UNIT ORIGINATING                       3.00
TIME SCHEDULED                     12462.73
TIME FIRED                         12402.73
UNIT FIRED                             3.00
STRATEGY USED                          1.00
NUMBER OF VOLLEYS IN FFE               6.00
TOTAL ROUNDS FIRED                    36.00
TOTAL TARGET ELEMENTS                210.00
TOTAL CASUALTIES INFLICTED            95.00
```

TARGET NUMBER	34.00					
TARGET TYPE	0.0	SCHD	0.0	PREP	1.00	TGT OPP
UNIT SCHEDULED TO FIRE	100.00					
TIME SCHEDULED OR ORIGINATED	37535.07					
TIME FIRED	37607.98					
TOTAL ENGAGEMENT TIME	1199.13					

TARGET NUMBER	21.00					
TARGET TYPE	1.00	SCHD	0.0	PREP	0.0	TGT OPP
UNIT SCHEDULED TO FIRE	100.00					
TIME SCHEDULED OR ORIGINATED	0.0					
TIME FIRED	39105.32					
TOTAL ENGAGEMENT TIME	897.06					

TARGET NUMBER	44.00					
TARGET TYPE	0.0	SCHD	1.00	PREP	0.0	TGT OPP
UNIT SCHEDULED TO FIRE	100.00					
TIME SCHEDULED OR ORIGINATED	0.0					
TIME FIRED	40737.42					
TOTAL ENGAGEMENT TIME	300.00					

TARGET NUMBER	41.00					
TARGET TYPE	0.0	SCHD	1.00	PREP	0.0	TGT OPP
UNIT SCHEDULED TO FIRE	100.00					
TIME SCHEDULED OR ORIGINATED	0.0					
TIME FIRED	41007.42					
TOTAL ENGAGEMENT TIME	300.00					

TARGET NUMBER	38.00					
TARGET TYPE	1.00	SCHD	0.0	PREP	0.0	TGT OPP
UNIT SCHEDULED TO FIRE	100.00					
TIME SCHEDULED OR ORIGINATED	0.0					
TIME FIRED	49697.13					
TOTAL ENGAGEMENT TIME	906.19					

SUMMARY DATA

AVERAGE QUEUE LENGTH BY QUEUE

1	2	3	4
0.0007144	0.0061912	0.0	0.0

AVERAGE TIME TARGET IN QUEUE(BY QUEUE)

1	2	3	4
63.13	175.11	0.0	0.0

AVERAGE KILL RATE FOR A TARGET OF OPPORTUNITY 0.1278993 CASUALTIES/SECOND OF ENGAGEMENT TIME

AVERAGE ROUNDS / CASUALTY FOR TARGET OF OPPORTUNITY 0.498486 ROUNDS / CASUALTY

APPENDIX D

Event Vector Guide

The model event chain resides in the array EVLIST which is dimensioned 250x50. Each time a requirement for some future event is generated, an event vector is initialized. Each time the next event in time is selected from the EVLIST array, the vector is stored temporarily as the row vector CEVENT. This appendix describes the relevent storage locations for each of the type events in the model. Tabs to this appendix describe the event vector location descriptions according to the scheme below:

Tab	Description
1	Target Analysis Shooting Event Damage Assessment
2	Tactical Situation Update Current Artillery Position Evaluation Target of Opportunity Generation On-Call Target Conversion Queue Checking Event Storage Maintenance
3	Weapon Positioning Fireplanning Event Fire Allocation Reinitialize Unit Status Flags Disengage a Maneuver Element

Tab 1

APPENDIX D

Target Analysis
Shooting Event
Damage Assessment

The storage locations in the event vector are identified as follows for the above events:

Storage Location	Description
1	Time the event will take place.
2	Routine code.
3	Target number of the target in question.
4	Row in the target history array (TGT) where the target information is being stored.
5	Row in the target description array where position information on the target elements is stored.
6	Easting component of the reported target location.
7	Northing component of the reported target location.
8	Maneuver element being supported.
9	Artillery unit scheduled to fire.
10	Number of rounds that Battery 1 will fire on the next volley.
11	Number of rounds that Battery 2 will fire on the next volley.
12	Number of rounds that Battery 3 will fire on the next volley.

13	Number of casualties inflicted.
14	Time the mission was terminated.
15	Time for the maneuver element to become disengaged.
16	Adjustment completion code. This entry is 1 if no adjustment is taking place or if the adjustment is completed. If these are not the case, the value is 0.
17	Initial fire request code. If the request is an initial request, this entry is 1. If not, the entry is 0.
18	Number of target elements in the target complex.
19	The time the engagement was initiated.
20	Open Storage.
21	Priority of the target.
22	Number of volleys remaining for Battery 1 to fire.
23	Number of volleys remaining for Battery 2 to fire.
24	Number of volleys remaining for Battery 3 to fire.
25	Strategy identifier for the strategy to be used in fire for effect phase.
26	Variance of the distribution of range error for Battery 1.
27	Variance of the distribution of range error for Battery 2.
28	Variance of the distribution of range error for Battery 3.
29	Variance of the distribution of deflection error for Battery 1

30	Variance of the distribution of deflection error for Battery 2.
31	Variance of the distribution of deflection error for Battery 3.
32	Easting coordinate of the initial fire for effect aimpoint.
33	Northing coordinate of the initial fire for effect aimpoint.
34	Principal artillery unit involved in the mission.
35	Cumulative rounds fired on the target.
36	Easting coordinate of the actual target location.
37	Northing coordinate of the actual target location.
38	If Battery 1 is committed to the mission, this entry is 1. Otherwise, the entry is 0.
39	If Battery 2 is committed to the mission, this entry is 1. Otherwise, the entry is 0.
40	If Battery 3 is committed to the mission, this entry is 1. Otherwise, the entry is 0.

Tab 2

APPENDIX D

Tactical Situation Update
Current Artillery Position Evaluation
Target of Opportunity Generation
On-Call Target Conversion
Queue Checking Event
Storage Maintenance

For the above events, the storage locations in the CEVENT vector have the following significance:

Storage Location	Description
1	Time the event will take place.
2	Routing code appropriate to the particular event. The routing code corresponds to the IKEY variable in the main program.

Tab 3

APPENDIX D

Weapon Positioning
Fireplanning Event
Fire Allocation
Reinitialize Unit Status Flag
Disengage a Maneuver Element

The storage locations in the CEVENT vector have the following descriptions for the above events:

Storage Location	Description
1	Time the event will take place.
2	Routing code.
3	Specific unit involved.
4	Has significance only for the fire allocation event and specifies the time for reinitialization of the attack.

APPENDIX E

Computer Program

This appendix contains the complete program to include the necessary job control cards for the IBM 360 computer. The programming language used is FORTRAN IV.

The program contains all the subroutines necessary for random number generation. The pseudorandom numbers used in the program are generated using a congruential method. The routine which generates the random numbers is the UGEN routine. Normal variates are generated by the NGEN routine and the truncated normal variates are generated by the TNGEN routine. The exponential variates are generated by the EXPON routine. The methods used to generate the standard normal, exponential, and uniform variates are as described by Naylor (1). Truncated normal variates are generated using a rejection technique. Under this method, variates are generated until one falls within the limits defined for the variable. All numbers generated prior to the selected number are discarded.

The random number generator, UGEN, is initialized by specifying a seed, NU, which is an input parameter to the program. Any positive number can be selected for NU. The characteristics of mixed congruential generators are such that only through empirical testing can one have confidence in the statistical properties of sequences generated by this method.

JOB CONTROL SECTION

```
//     EXEC   FORTCLG,TIME.FORT=2,TIME.LINK=2,REGION.GO=370K,TIME.GO=10
//FORT.SYSPRINT DD SPACE=(CYL,(9,1))
//FORT.SYSIN DD *
/
C
C      ARTILLERY FIRE SUPPORT SIMULATION MODEL
C
C      MAIN PROGRAM
C
       COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
       COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
C      READ IN THE MODEL PARAMETERS
C
       CALL RDPAR
C
C      GENERATE THE INITIAL TACTICAL SITUATION
C
       CALL SETUP
1000   DO 999 I=1,50
999    CEVENT(I)= 0.0
C
C      LOCATE THE CURRENT EVENT AND RECORD THE EVENT IN OFFLINE STORAGE
C
       CALL TNE
       IF(CEVENT(2) .EQ. 6) GO TO 1500
       CALL WEVENT
1500   CONTINUE
       CTIME=CEVENT(1)
       IKEY= CEVENT(2)
       GO TO (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15),IKEY
C
C      CONDUCT ANALYSIS OF TARGET
C
1      CALL TOANAL
       GO TO 1000
C
C      DETERMINE THE FIRING PARAMETERS
C
2      CALL SHOOT
       GO TO 1000
C
C      ASSESS DAMAGE TO THE TARGET
```

```
C                                                                       MA 00430
3     CALL DAMAGE                                                       MA 00440
      GO TO 1000                                                        MA 00450
C                                                                       MA 00460
C                                                                       MA 00470
C     CHECK THE QUEUES FOR TARGETS ON HOLD STATUS                       MA 00480
C                                                                       MA 00490
4     CALL CKQUE                                                        MA 00500
      GO TO 1000                                                        MA 00510
C                                                                       MA 00520
C     INTERJECT AN ON CALL TARGET                                       MA 00530
C                                                                       MA 00540
5     CALL CONV                                                         MA 00550
      GO TO 1000                                                        MA 00560
C                                                                       MA 00570
C     GATHER THE QUEUE STATISTICS                                       MA 00580
C                                                                       MA 00590
6     CALL ASTAT                                                        MA 00600
      GO TO 1000                                                        MA 00610
C                                                                       MA 00620
C     UPDATE THE TACTICAL SITUATION                                     MA 00630
C                                                                       MA 00640
7     CALL DECIS(RMODE)                                                 MA 00650
      IF (RMODE .EQ. 1) GO TO 2000                                      MA 00660
      GO TO 1000                                                        MA 00670
C                                                                       MA 00680
C     DETERMINE IF ANY ARTILLERY UNITS SHOULD MOVE                      MA 00690
C                                                                       MA 00700
8     CALL MOARTY                                                       MA 00710
      GO TO 1000                                                        MA 00720
C                                                                       MA 00730
C     MOVE SPECIFIED ARTILLERY UNIT                                     MA 00740
C                                                                       MA 00750
9     NUNIT= CEVENT(3)                                                  MA 00760
      CALL WPLOC(NUNIT)                                                 MA 00770
      GO TO 1000                                                        MA 00780
C                                                                       MA 00790
C     SPECIFIED UNIT CONDUCTS FIRE PLANNING                             MA 00800
C                                                                       MA 00810
10    NUNIT= CEVENT(3)                                                  MA 00820
      CALL FIPLAN(NUNIT)                                                MA 00830
      QHOUR= CEVENT(4)                                                  MA 00840
C                                                                       MA 00850
C     ALLOCATE TARGETS TO FIRE UNITS                                    MA 00860
C                                                                       MA 00870
11    CALL FIALOC(QHOUR)                                                MA 00880
      GO TO 1000                                                        MA 00890
C                                                                       MA 00900
```

```
C         GENERATE A TARGET OF OPPORTUNITY
C
12        CALL TOGEN
          GO TO 1000
C
C         CLEAR STORAGE ARRAYS OF UNNECESSARY INFORMATION
C
13        CALL EXTGT
          GO TO 1000
C
C         REINITIALIZE SPECIFIED UNIT STATUS FLAGS
C
14        NUNIT= CEVENT(3)
          CALL RESET(NUNIT)
          GO TO 1000
C
C         DISENGAGE A MANEUVER ELEMENT
C
15        CALL DISGE
          GO TO 1000
C
C         PRINT OUT FINAL REPORT
C
2000      CALL SUMRY
          STOP
          END


          SUBROUTINE DECIS (RMODE)
C
          COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
       2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
       3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
          COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
       2XTLETH ,STAT(20,4)
C
C         UPDATE LOCATIONS OF UNIT FPC'S
C
          CALL MUNIT
C
C         VERIFY STATUS OF EACH UNIT
C
          DO 1000 I=1,7
302       ISTAT= GDATA(I,2)
7000      GO TO (100,200,300,400,500,600,1000,1000,1000),ISTAT
C
C         VERIFY STATE 1
C
```

```
100     CONTINUE                                                        MA 01370
        IF(I .NE. 7) GO TO 1000                                         MA 01380
        RMODE=1.0                                                       MA 01390
        GO TO 7500                                                      MA 01400
C                                                                       MA 01410
C       CURRENT UNIT STATE IS 2, SEE IF SHOULD GO TO STATE 3            MA 01420
C                                                                       MA 01430
200     IF((GDATA(I,8)-GDATA(I,13)) .LE. 1/3.*GDATA(I,19)) GDATA(I,2)=3.0MA 01440
        IF(GDATA(I,2) .EQ. 3.0) GO TO 302                               MA 01450
        GO TO (201,202,203,204,205,206,1000),I                          MA 01460
201     IS=2                                                            MA 01470
        GO TO 220                                                       MA 01480
202     IS=1                                                            MA 01490
        GO TO 220                                                       MA 01500
203     IS=4                                                            MA 01510
        GO TO 220                                                       MA 01520
204     IS=3                                                            MA 01530
        GO TO 220                                                       MA 01540
205     IS=6                                                            MA 01550
        GO TO 220                                                       MA 01560
206     IS=5                                                            MA 01570
C                                                                       MA 01580
C       CHECK TO SEE IF UNIT SHOULD GO TO ADMIN MOLD                    MA 01590
C                                                                       MA 01600
220     IF((GDATA(I,13)-GDATA(IS,13)) .GE. 1/5.*GDATA(I,19) .AND. GDATA( MA 01610
     2IS,2) .NE. 8)  GDATA(I,2)= 6.0                                    MA 01620
        GO TO 1000                                                      MA 01630
C                                                                       MA 01640
C       CURRENT UNIT STATE IS 3, SEE IF SHOULD GO TO STATE 4            MA 01650
C                                                                       MA 01660
300     CALL FIX(I,IRES1)                                               MA 01670
        IF(IRES1 .EQ. 0) GO TO 1000                                     MA 01680
        GDATA(I,2)= 4.0                                                 MA 01690
        GO TO 302                                                       MA 01700
C                                                                       MA 01710
C       CURRENT UNIT STATE IS 4, SEE IF SHOULD BE 5                     MA 01720
C                                                                       MA 01730
400     CALL OBJSEC(I,JRES1)                                            MA 01740
        IF(JRES1 .EQ. 1 .AND. I .EQ. 7) GO TO 100                       MA 01750
        IF(JRES1 .EQ. 0) GO TO 1000                                     MA 01760
        CALL FIOBJ(I,KRES)                                              MA 01770
        IF (KRES .EQ. 0) GO TO 402                                      MA 01780
        IF (KRES .EQ. 1) GO TO 403                                      MA 01790
402     GDATA(I,2)= 5.0                                                 MA 01800
        GO TO 302                                                       MA 01810
403     GDATA(I,2)= 9.0                                                 MA 01820
        GO TO 302                                                       MA 01830
500     GO TO 1000                                                      MA 01840
```

```
C
C       UNIT IS UNDER ADMIN HOLD, SEE IF SHOULD BE LIFTED
C
600     GO TO (601,602,603,604,605,606,1000),I
601     IS=2
        GO TO 650
602     IS=1
        GO TO 650
603     IS=4
        GO TO 650
604     IS=3
        GO TO 650
605     IS=6
        GO TO 650
606     IS=5
650     IF((GDATA(I,13)-GDATA(IS,13)) .GE. 1/5.*GDATA(I,19) .AND. GDATA(
       2IS,2) .NE. 8) GO TO 1000
        GDATA(I,2)= 2.0
        GO TO 302
1000    CONTINUE
C
C       ASSIGN NEW BATTALION OBJECTIVES IF NECESSARY
C
        I1=5
        I2=6
        IU=7
1005    DO 1100 I=I1,I2
        IF(GDATA(I,2) .NE. 5) GO TO 1100
        CALL OBJ(I,GDATA(I,2))
1100    CONTINUE
C
C       ASSIGN NEW COMPANY OBJECTIVES IF NECESSARY
C
        DO 1200 I=1,4
        IF(GDATA(I,2) .NE. 5) GO TO 1200
        IF(I .GT. 2) IU=6
        IF(I .LE. 2) IU=5
        IF(GDATA(IU,2) .EQ. 4) GO TO 1200
        CALL OBJ(I, GDATA(I,2))
1200    CONTINUE
C
C       DO FIREPLANNING AND ASSIGN NEW KICKOFF TIMES IF NECESSARY
C
1300    IF(GDATA(5,2) .EQ. 8 .AND. GDATA(6,2) .EQ. 8) GO TO 4000
        DO 4010 I=5,6
        IF(GDATA(I,2) .NE. 7) GO TO 4010
        IF( I .EQ. 5) R1=8.
        IF( I .EQ. 6) R1=9.
```

```
      R2= I
      CALL UGEN((CTIME+1800),(CTIME+3600),QHOUR)
      CALL SET(QHOUR,R1,R2)
      GDATA(I,2)= 1.0
      IF(I .EQ. 5) GO TO 4005
      IN1=3
      IN2=4
      GO TO 4006
4005  IN1=1
      IN2=2
4006  DO 4007 IV= IN1,IN2
4007  GDATA(IV,2)= 1.0
4010  CONTINUE
      DO 4100 I=1,4
      IF(I .EQ. 1) ISIS=2
      IF(I .EQ. 2) ISIS=1
      IF(I .EQ. 3) ISIS=4
      IF( I .EQ. 4) ISIS=3
      IF(I .LE. 2) J=5
      IF(I .GT. 2) J=6
      IF(GDATA(J,2) .EQ. 8) GO TO 4100
      IF(GDATA(I,2) .EQ. 8 .AND. GDATA(ISIS,2) .EQ. 8) GO TO 4300
      IF(GDATA(I,2) .NE. 7) GO TO 4100
      CALL UGEN((CTIME+900),(CTIME+1800),QHOUR)
      R2=I
      R1=I
4013  CALL SET(QHOUR,R1,R2)
      GDATA(I,2)= 1.0
      GO TO 4100
4300  CALL UGEN((CTIME+1800),(CTIME+2400),QHOUR)
      IF(I .EQ. 1 .OR. I .EQ. 2) R1=8.
      IF(I .EQ. 3 .OR. I .EQ. 4) R1= 9.
      IF( I .EQ. 3 .OR. I .EQ. 4) R2=6.
      IF(I .EQ. 1 .OR. I .EQ. 2) R2=5.
      GDATA(ISIS,2)= 1.0
      GO TO 4013
4100  CONTINUE
      GO TO 6000
4000  CALL UGEN((CTIME+2400),(CTIME+4200),QHOUR)
      R1= 10.
      R2=7.
      CALL SET(QHOUR,R1,R2)
      DO 4700 I=1,6
4700  GDATA(I,2)= 1.0
6000  RMODE=0.0
      IF(IROW .EQ. 4) GO TO 7600
      EVLIST(IROW,1)= CTIME+600
      GO TO 7500
```

```
7600  EVLIST(IROW,1)= 1000000.
7500  RETURN
      END

      SUBROUTINE MUNIT
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
C     CHECK TO SEE IF THE BATTALION IS UNDER A HOLD
C
      DO 100 I=5,6
      IF (GDATA(I,2) .EQ.6) GO TO 200
C
C     BATTALION IS FREE
C
      GO TO 105
100   CONTINUE
      GO TO 300
105   IF (I.EQ.5) J=1
      IF (I.EQ.6) J=3
      K=J+1
      DO 251 IJ=J,K
      ISTAT= GDATA(IJ,2)
540   IF (GDATA(IJ,16) .EQ. 1) GO TO 250
      GO TO (250,240,241,250,250,250,250,250,250),ISTAT
240   IF (GDATA(IJ,12).GT.GDATA(IJ,17)) GO TO 270
      CALL UGEN (0.0,1.0472,ANGLE)
      GO TO 261
270   CALL UGEN (0.0,-1.0472,ANGLE)
261   CALL NLOC2(IJ,ANGLE)
250   GDATA(IJ,14)= CTIME
251   CONTINUE
      GO TO 100
241   CALL NLOC3(IJ)
      GO TO 250
C
C     BATTALION IS UNDER A HOLD
C
200   CONTINUE
      IF( I .EQ. 5) J=1
      IF (I.EQ.6) J=3
      K=J+1
      DO 600 IJ=J,K
```

```
      IF (GDATA(IJ,16) .EQ. 1) GO TO 599
      ISTAT= GDATA(IJ,2)
      GO TO (599,500,501,599,599,599,599,599),ISTAT
500   SDIS= GDATA(I,13)-GDATA(IJ,13)
      IF (SDIS .GE. 0) GO TO 599
      IF (SDIS .GE. -500) GO TO 599
      IF (GDATA(IJ,12) .GT. GDATA(IJ,17)) GO TO 620
      CALL UGEN (0.0,1.0472,ANGLE)
      GO TO 621
620   CALL UGEN(0.0,-1.0472,ANGLE)
621   CALL NLOC2(IJ,ANGLE)
599   GDATA(IJ,14)= CTIME
600   CONTINUE
      GO TO 100
501   CALL NLOC3(IJ)
      GO TO 599
C
C     COMPUTE NEW FIREPLANNING CENTERS
C
300   DO 1200 I=5,6
      IF (I.EQ.5) J=1
      IF (I.EQ.6) J=3
      SUME=0.0
      SUMN=0.0
      K=J+1
      DO 1201 IJ=J,K
      SUME= SUME+GDATA(IJ,12)
      SUMN= SUMN+ GDATA(IJ,13)
1201  CONTINUE
      GDATA(I,12)= SUME/2
      GDATA(I,13)= SUMN/2
1200  CONTINUE
C
C     DO THE BRIGADE NOW
C
      GDATA(7,12)=(GDATA(5,12)+GDATA(6,12))/2.
      GDATA(7,13)= (GDATA(5,13)+ GDATA(6,13))/2.
      RETURN
      END


      SUBROUTINE NLOC2(NUNIT,ANGLE)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
```

```
C
C       DETERMINE THE RANDOM RATE OF ADVANCE
C
        CALL UGEN(PRDATA(1,NUNIT,16,1),PRDATA(1,NUNIT,16,2),RATE)
        SRATE= 1000.*RATE/3600
C
C       COMPUTE DISTANCE MOVED
C
        DIS= SRATE*(CTIME-GDATA(NUNIT,14))
C
C       DETERMINE NEW FIRE PLANNING CENTER
C
200     GDATA(NUNIT,12)= GDATA(NUNIT,12)+ DIS*SIN(ANGLE)
        GDATA(NUNIT,13)= GDATA(NUNIT,13)+ DIS*COS(ANGLE)
6000    RETURN
        END


        SUBROUTINE NLOC3(NUNIT)
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
C       COMPUTE X AND Y COMPONENTS OF DISTANCE FROM FPC TO UNIT OBJECTIVE
C       AND CURRENT DIRECTION TO OBJECTIVE.
C
        DISN= GDATA(NUNIT,8)-GDATA(NUNIT,13)
100     DISE= GDATA(NUNIT,7)-GDATA(NUNIT,12)
        ARG=DISE/DISN
        ANGLE= ATAN(ARG)
C
C       DETERMINE RATE OF MOVEMENT AND COMPUTE DISTANCE MOVED
C
200     CALL UGEN(PRDATA(1,NUNIT,16,1),PRDATA(1,NUNIT,16,2),RATE)
        SRATE= 1000.*RATE/3600
        DIS= SRATE*(CTIME-GDATA(NUNIT,14))
C
C       DETERMINE NEW FIRE PLANNING CENTER
C
        GDATA(NUNIT,12)= GDATA(NUNIT,12)+ DIS*SIN(ANGLE)
        GDATA(NUNIT,13)= GDATA(NUNIT,13)+DIS*COS(ANGLE)
6000    RETURN
        END
```

```
      SUBROUTINE FIX(NUNIT,IRES)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      IRES=0
      GO TO (400,400,400,400,500,500,700),NUNIT
      IF (GDATA(NUNIT,2) .EQ. 4.) GO TO 6000
400   DISE= ABS(GDATA(NUNIT,7)-GDATA(NUNIT,12))
      DISN= GDATA(NUNIT,8)-GDATA(NUNIT,13)
      DISOBJ= SQRT(DISE**2+DISN**2)
      IF (DISOBJ .LT. 200.OR. GDATA(NUNIT,13) .GT.GDATA(NUNIT,8))
     2IRES= 1
      IF(IRES .NE. 1) GO TO 7000
      GDATA(NUNIT,15)= CTIME
      GDATA(NUNIT,2)= 4.0
      GO TO 7000
500   IF(NUNIT .EQ. 5) J=1
      IF(NUNIT.EQ.6) J=3
      K=J+1
      DO 1100 IJ=J,K
      IF(GDATA(IJ,20) .NE. 1 .OR. GDATA(IJ,2) .NE. 4) GO TO 7000
1100  CONTINUE
      IRES=1
      GO TO 7000
700   DO 1200 I= 1,4
      IF( I .LE. 2) J=5
      IF(I .GT. 2) J=6
      IF(GDATA(I,20) .NE. 1 .OR. GDATA(J,20) .NE. 1) GO TO 7000
      IF(GDATA(I,2) .LT. 4) GO TO 7000
1200  CONTINUE
6000  IRES= 1
      GO TO 7000
5900  IRES= 0
      GO TO 7000
7000  RETURN
      END

      SUBROUTINE OBJSEC(NUNIT,IRES)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
```

```
     2XTLETH ,STAT(20,4)
C
      IRES=0
      GO TO (100,100,100,100,500,500,600),NUNIT
100   IF (GDATA(NUNIT,16) .EQ. 0.0 .AND. (CTIME-GDATA(NUNIT,15))
     2.GT. 2700) GO TO 101
      IRES= 0
      GO TO 6000
101   IRES= 1
      GO TO 6000
500   IF (NUNIT .EQ. 5) J=1
      IF (NUNIT .EQ. 6) J=3
      K=J+1
      DO 1100 IJ=J,K
      IF(GDATA(IJ,16) .NE. 0.0 .OR. (CTIME-GDATA(IJ,15)) .LT.
     2 2700) GO TO 501
1100  CONTINUE
      IRES=1
      GO TO 6000
501   IRES=0
      GO TO 6000
600   DO 602 I=1,4
      IF (GDATA(I,16) .NE. 0.0 .OR. (CTIME-GDATA(I,15)) .LT.
     2 2700) GO TO 605
602   CONTINUE
      IRES=1
      GO TO 6000
605   IRES=0
6000  RETURN
      END


      SUBROUTINE OBJ(NUNIT,SRES)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      GO TO (100,100,100,100,200,200),NUNIT
100   IF (NUNIT .EQ. 1.OR.NUNIT.EQ.2) J=5
      IF (NUNIT.EQ.3.OR.NUNIT.EQ.4) J=6
      IF(ABS(GDATA(J,8)-GDATA(NUNIT,8)) .LT.  PRDATA(1,NUNIT,3,1)/3.
     2) GO TO 140
      SRES=7.
      GDATA(NUNIT,20)= 0.0
      OLDDIS= GDATA(NUNIT,8)
```

```
      CALL TNGEN((GDATA(NUNIT,8)+PRDATA(1,NUNIT,3,1)),PRDATA(1,NUNIT,3,
     22),GDATA(NUNIT,13),(GDATA(NUNIT,13)+PRDATA(1,NUNIT,3,4)),
     3GDATA(NUNIT,8))
      GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS
      IF(GDATA(NUNIT,8) .GE. (GDATA(J,8)-GDATA(J,10))) GO TO 1627
      CALL TNGEN(GDATA(NUNIT,17),PRDATA(1,NUNIT,17,2),GDATA(NUNIT,3),
     2GDATA(NUNIT,5),GDATA(NUNIT,7))
      CALL TNGEN(PRDATA(1,NUNIT,4,1),PRDATA(1,NUNIT,4,2),PRDATA(1,NUNIT
     2,4,3),PRDATA(1,NUNIT,4,4),GDATA(NUNIT,9))
      CALL TNGEN(PRDATA(1,NUNIT,5,1),PRDATA(1,NUNIT,5,2),PRDATA(1,NUNIT
     2,5,3),PRDATA(1,NUNIT,5,4),GDATA(NUNIT,10))
      GO TO 6000
1627  GDATA(NUNIT,8)= OLDDIS
140   SRES=8.
      GDATA(NUNIT,20)= 1.0
      OLDDIS= GDATA(NUNIT,8)
      IF(NUNIT .EQ. 1 .OR. NUNIT .EQ. 3) GO TO 141
      ISIDE= 2
      GO TO 143
141   ISIDE= 1
C
C     LEFT MOST COMPANY
C
143   DE=GDATA(J,9)/2*COS(ABS(GDATA(J,11)))
      DN= GDATA(J,9)/2*SIN(ABS(GDATA(J,11)))
      GO TO (144,145),ISIDE
144   IF (GDATA(J,11)) 150,150,151
150   GDATA(NUNIT,7)= GDATA(J,7)-DE/2
      GDATA(NUNIT,8)= GDATA(J,8)+DN/2
      GDATA(NUNIT,11)= GDATA(J,11)
      GDATA(NUNIT,9)= GDATA(J,9)/2
      GDATA(NUNIT,10)= GDATA(J,10)
      GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS
      GO TO 6000
151   GDATA(NUNIT,7)= GDATA(J,7)-DE/2
      GDATA(NUNIT,8)= GDATA(J,8)-DN/2
      GDATA(NUNIT,11)= GDATA(J,11)
      GDATA(NUNIT,9)= GDATA(J,9)/2
      GDATA(NUNIT,10)= GDATA(J,10)
      GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS
      GO TO 6000
145   GDATA(NUNIT,7)= GDATA(J,7)+DE/2
      IF (GDATA(J,11)) 160,160,161
160   GDATA(NUNIT,8)= GDATA(J,8)-DN/2
      GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS
      GO TO 170
161   GDATA(NUNIT,8)= GDATA(J,8)+DN/2
170   GDATA(NUNIT,9)= GDATA(J,9)/2
```

```
      GDATA(NUNIT,10)= GDATA(J,10)                                      MB 01410
      GDATA(NUNIT,11)= GDATA(J,11)                                      MB 01420
      GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS                            MB 01430
      GO TO 6000                                                        MB 01440
200   IF(ABS(GDATA(7,8)-GDATA(NUNIT,8)) .LT. PRDATA(1,NUNIT,3,1)/3.)    MB 01450
     2 GO TO 500                                                        MB 01460
C                                                                       MB 01470
C     REGULAR OBJECTIVE                                                 MB 01480
C                                                                       MB 01490
      SRES=7.0                                                          MB 01500
      GDATA(NUNIT,20)= 0.0                                              MB 01510
      OLDDIS= GDATA(NUNIT,8)                                            MB 01520
      CALL TNGEN((GDATA(NUNIT,8)+PRDATA(1,NUNIT,3,1)),PRDATA(1,NUNIT,3,MB 01530
     22),GDATA(NUNIT,13),(GDATA(NUNIT,13)+PRDATA(1,NUNIT,3,4)),         MB 01540
     3GDATA(NUNIT,8))                                                   MB 01550
      IF(GDATA(NUNIT,8) .GE. (GDATA(7,8)-GDATA(7,10))) GO TO 1623       MB 01560
      CALL TNGEN(PRDATA(1,NUNIT,5,1),PRDATA(1,NUNIT,5,2),PRDATA(1,NUNITMB 01570
     2,5,3),PRDATA(1,NUNIT,5,4),GDATA(NUNIT,10))                        MB 01580
      CALL TNGEN(PRDATA(1,NUNIT,4,1),PRDATA(1,NUNIT,4,2),PRDATA(1,NUNITMB 01590
     2,4,3),PRDATA(1,NUNIT,4,4),GDATA(NUNIT,9))                         MB 01600
      CALL UGEN(-.5236,.5236, GDATA(NUNIT,11))                          MB 01610
      CALL TNGEN(GDATA(NUNIT,17),PRDATA(1,NUNIT,17,2),GDATA(NUNIT,3),   MB 01620
     2GDATA(NUNIT,5),GDATA(NUNIT,7))                                    MB 01630
      GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS                            MB 01640
      GO TO 6000                                                        MB 01650
1623  GDATA(NUNIT,8)= OLDDIS                                            MB 01660
      GO TO 500                                                         MB 01670
C                                                                       MB 01680
C     BATTALION OBJECTIVE IS ON THE BRIGADE OBJECTIVE                   MB 01690
C                                                                       MB 01700
500   SRES=8.                                                           MB 01710
      GDATA(NUNIT,20)= 1.0                                              MB 01720
      OLDDIS= GDATA(NUNIT,8)                                            MB 01730
      IF(NUNIT .EQ. 5) GO TO 501                                        MB 01740
      ISIDE= 2                                                          MB 01750
      GO TO 502                                                         MB 01760
501   ISIDE= 1                                                          MB 01770
502   DE= GDATA(7,9)/4*COS(ABS(GDATA(7,11)))                            MB 01780
      DN= GDATA(7,9)/4*SIN(ABS(GDATA(7,11)))                            MB 01790
      GDATA(NUNIT,9)= GDATA(7,9)/2                                      MB 01800
      GDATA(NUNIT,10)= GDATA(7,10)                                      MB 01810
      GDATA(NUNIT,11)= GDATA(7,11)                                      MB 01820
      GO TO (550,560),ISIDE                                             MB 01830
550   GDATA(NUNIT,7)= GDATA(7,7)-DE                                     MB 01840
      IF(GDATA(7,11)) 551,551,552                                       MB 01850
551   GDATA(NUNIT,8)= GDATA(7,8)+DN                                     MB 01860
      GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS                            MB 01870
      GO TO 6000                                                        MB 01880
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552     GDATA(NUNIT,8)= GDATA(7,8)-DN
        GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS
        GO TO 6000
C
C       BN IS ON THE RIGHT SIDE
C
560     GDATA(NUNIT,7)= GDATA(7,7)+ DE
        IF(GDATA(7,11)) 561,561,562
561     GDATA(NUNIT,8)= GDATA(7,8)-DN
        GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS
        GO TO 6000
562     GDATA(NUNIT,8)= GDATA(7,8)+DN
        GDATA(NUNIT,19)= GDATA(NUNIT,8)-OLDDIS
6000    RETURN
        END


        SUBROUTINE IALOC
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
      2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
      3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
      2XTLETH ,STAT(20,4)
C
C       LOCATE BATTERY CENTERS FIRST
C
        DO 100 I=1,3
        IF (I .EQ. 1) K=5
        IF (I .EQ. 2) K=7
        IF (I .EQ. 3) K=6
        CALL TNGEN((GDATA(K,13)-PRDATA(2,I,5,1)),PRDATA(2,I,5,2),
      2(GDATA(K,13)-RMAX),GDATA(K,13),ARDATA(I,7,8))
100     CALL TNGEN(GDATA(K,12),PRDATA(2,I,4,2),GDATA(K,3),GDATA(K,5),
      2ARDATA(I,7,7))
C
C       FIND THE AZIMUTH OF LAY
C
C       FIND CENTER OF MASS OF INFANTRY COMPANY TARGETS FIRST
C
        CMN=0.0
        CME=0.0
        ICOUNT=0
        DO 200 I=1,250
        IF(TGT(I,1) .EQ. 0) GO TO 202
        DO 201 J=5,7
        IF (TGT(I,2) .EQ. J) GO TO 200
201     CONTINUE
```

```
      CME= CME+ TGT(I,3)                                                MB 02340
      CMN= CMN+ TGT(I,4)                                                MB 02350
      ICOUNT= ICOUNT+1                                                  MB 02360
  200 CONTINUE                                                          MB 02370
  202 CONTINUE                                                          MB 02371
      TCME= CME/ICOUNT                                                  MB 02380
      TCMN= CMN/ICOUNT                                                  MB 02390
C                                                                       MB 02400
C     NOW FIND THE AZIMUTH OF LAY                                       MB 02410
C                                                                       MB 02420
      DO 300 I=1,3                                                      MB 02430
      IF(CME .EQ. 0 .AND. CMN .EQ. 0) GO TO 300                         MB 02431
      ARG= (TCME-ARDATA(I,7,7))/(TCMN-ARDATA(I,7,8))                    MB 02440
      ANGLE= ATAN(ARG)                                                  MB 02450
      IF (ANGLE .LE. 0) ARDATA(I,7,6)= 6.2832-ABS(ANGLE)                MB 02460
      IF (ANGLE .GT. 0) ARDATA(I,7,6)= ANGLE                            MB 02470
  300 CONTINUE                                                          MB 02480
C                                                                       MB 02490
C     POSITION THE WEAPONS                                              MB 02500
C                                                                       MB 02510
      DO 400 I=1,3                                                      MB 02520
      CALL WPLOC(I)                                                     MB 02530
  400 CONTINUE                                                          MB 02540
      RETURN                                                            MB 02550
      END                                                               MB 02560


      SUBROUTINE FIPLAN (NUNIT)                                         MB 02570
C                                                                       MB 02580
      REAL GDATA, PRDATA, TGT                                           MB 02590
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,         MB 02600
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),  MB 02610
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                   MB 02620
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,   MB 02630
     2XTLETH ,STAT(20,4)                                                MB 02640
C                                                                       MB 02650
      INTEGER TYPE                                                      MB 02660
      KUNIT=NUNIT                                                       MB 02670
      K=0                                                               MB 02680
      NCOUNT= NUNIT                                                     MB 02690
      GO TO (1200,1200,1200,1200,1200,1200,1200,1208,1209,1210),NCOUNT MB 02700
 1200 IK=KUNIT                                                          MB 02710
      J=KUNIT                                                           MB 02720
      GO TO 1211                                                        MB 02730
 1208 IK=1                                                              MB 02740
      J=2                                                               MB 02750
      GO TO 1211                                                        MB 02760
 1209 IK=3                                                              MB 02770
```

```
      J=4
      GO TO 1211
1210  IK=1
      J=7
      GO TO 1211
1211  DO 1100 KUNIT=IK,J
      IF(GDATA(KUNIT,2) .EQ. 1) ISTAGE=1
      IF(GDATA(KUNIT,2) .GT. 1) ISTAGE=2
      UNIT=KUNIT
C
C     DETERMINE THE NUMBER OF TARGETS
C
      GO TO (600,601),ISTAGE
600   CALL EVENT (KUNIT,6,NTGTS)
      GO TO 1000
601   CALL EVENT (KUNIT,7,NTGTS)
C
C     ENTER THIS POINT WITH THE NUMBER OF TARGETS
C
C     INITIAL FIRE PLAN STAGE =1
C
1000  CONTINUE
      IF(NTGTS .EQ. 0) GO TO 6820
      DO 1100 I=1,NTGTS
      ITGT= ITGT+1
      STGT=ITGT
C
C     FIND STORAGE VECTOR IN TARGET HISTORY ARRAY
C
      CALL HARRAY(NUM)
      TGT(NUM,1)= STGT
      TGT(NUM,2)= UNIT
      GO TO (1700,1800),ISTAGE
1700  CALL EVENT (KUNIT,8,TYPE)
1900  GO TO (1710,1720,1730), TYPE
C
C     TARGET IS PREP
C
1710  TGT(NUM,7)= 1.0
      CALL EVENT (KUNIT,10,MODE)
      CALL TGTGEN(KUNIT,MODE,NUM)
      GO TO 1100
C
C     TARGET IS SCHEDULED
C
1720  TGT(NUM,5)= 1.0
      CALL EVENT (KUNIT,12,MODE)
      CALL TGTGEN(KUNIT,MODE,NUM)
```

```
      GO TO 1100
C
C     TARGET IS ON CALL
C
 1730 TGT(NUM,6)= 1.0
      CALL EVENT (KUNIT,14,MODE)
      CALL TGTGEN(KUNIT,MODE,NUM)
      GO TO 1100
C
C     UNIT IS NOT IN FULL PLANNING STATE
C
 1800 CALL EVENT(KUNIT,9,TYPE)
      GO TO (1810,1820,1830),TYPE
C
C     TARGET IS A PREPARATORY TARGET
C
 1810 TGT(NUM,7)= 1.0
      CALL EVENT(KUNIT,11,MODE)
      CALL TGTGEN(KUNIT,MODE,NUM)
      GO TO 1100
C
C     TARGET IS SCHEDULED
C
 1820 TGT(NUM,5)= 1.0
      CALL EVENT(KUNIT,13,MODE)
      CALL TGTGEN(KUNIT,MODE,NUM)
      GO TO 1100
C
C     TARGET IS ON CALL
C
 1830 TGT(NUM,6)= 1.0
      CALL EVENT(KUNIT,15,MODE)
      CALL TGTGEN(KUNIT,MODE,NUM)
 1100 CONTINUE
 6820 CONTINUE
      IF( K .EQ. 6) GO TO 6012
      GO TO (6000,6000,6000,6000,6000,6000, 6000,5009,5010,6000),NCOUNT
 5009 IK=5
      J=5
      K=6
      GO TO 1211
 5010 IK=6
      J=6
      K=6
      GO TO 1211
 6012 CONTINUE
 6000 IF (IROW .EQ. 0) GO TO 6001
      DO 2000 I=1,50
```

```
2000  EVLIST(IROW,I)= 0.0
6001  RETURN
      END

      SUBROUTINE TGTGEN(NUNIT,MODE,NUM)
C
      REAL GDATA, PRDATA, TGT
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
C     DETERMINE THE BOUNDS
C
      XUL= -GDATA(NUNIT,9)/2.
      YUL= GDATA(NUNIT,10)/2.
      XUR= GDATA(NUNIT,9)/2.
      YUR= GDATA(NUNIT,10)/2.
      XLL= XUL
      YLL= -GDATA(NUNIT,10)/2.
      XLR= XUR
      YLR= YLL
C
C     TRANSFORM THE COORDINATES
C
      A= GDATA(NUNIT,11)
      XULT= XUL*COS(A)+YUL*SIN(A)+GDATA(NUNIT,7)
      YULT= YUL*COS(A)-XUL*SIN(A)+GDATA(NUNIT,8)
      XURT= XUR*COS(A)+YUR*SIN(A)+GDATA(NUNIT,7)
      YURT= YUR*COS(A)-XUR*SIN(A)+GDATA(NUNIT,8)
      XLLT= XLL*COS(A)+YLL*SIN(A)+GDATA(NUNIT,7)
      YLLT= YLL*COS(A)-XLL*SIN(A)+GDATA(NUNIT,8)
      XLRT= XLR*COS(A)+YLR*SIN(A)+GDATA(NUNIT,7)
      YLRT= YLR*COS(A)-XLR*SIN(A)+GDATA(NUNIT,8)
      YLIM1= AMAX1( YULT,YURT,YLLT,YLRT)
      YLIM2= AMIN1( YULT,YURT,YLLT,YLRT)
      XLIM1= AMIN1( XULT,XURT,XLLT,XLRT)
      XLIM2= AMAX1( XULT,XURT,XLLT,XLRT)
      GO TO (100,200,300),MODE
C
C     TARGET IS ON THE OBJECTIVE
C
100   CALL UGEN(XLIM1,XLIM2,TGT(NUM,3))
      CALL UGEN(YLIM2,YLIM1,TGT(NUM,4))
      GO TO 600
C
```

```
C       TARGET IS BETWEEN THE LD AND THE OBJECTIVE
C
200     CALL UGEN(GDATA(NUNIT,3),GDATA(NUNIT,5),TGT(NUM,3))
        IF(TGT(NUM,3) .GE. XLIM1 .AND. TGT(NUM,3) .LE. XLIM2) GO TO 201
        CALL UGEN(GDATA(NUNIT,13),YLIM1,TGT(NUM,4))
        GO TO 600
201     CALL UGEN(GDATA(NUNIT,13),YLIM2,TGT(NUM,4))
        GO TO 600
C
C       TARGET IS BEYOND THE OBJECTIVE
C
300     IF(NUNIT .LE. 4) XD=1000.
        IF(NUNIT .EQ. 5 .OR. NUNIT .EQ. 6) XD= 2000.
        IF(NUNIT .EQ. 7) XD= 3000.
        CALL UGEN(GDATA(NUNIT,3),GDATA(NUNIT,5),TGT(NUM,3))
        CALL UGEN(YLIM1,YLIM1+XD,TGT(NUM,4))
600     RETURN
        END


        SUBROUTINE FIALOC(QTIME)
C
        INTEGER CK
        DIMENSION NUM(3),CK(3)
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
       2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
       3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
       2XTLETH ,STAT(20,4)
C
C       ALLOCATE NON PREP SCHEDULED FIRES FIRST
C
        IF (CTIME .EQ. 0) QTIME= CTIME
        IF (CTIME .NE. 0) QTIME= CEVENT(4)
        DO 100 I=1,250
        IF (TGT(I,8) .NE. 0) GO TO 100
        ITYPE= TGT(I,5)+1
        GO TO (100,200),ITYPE
100     CONTINUE
        GO TO 2400
200     IF (TGT(I,2).EQ.1.0.OR.TGT(I,2).EQ.2.0) TGT(I,11)= 1.0
        IF (TGT(I,2).EQ. 3.0.OR.TGT(I,2).EQ.4.0) TGT(I,11)= 3.0
        IF (TGT(I,2).EQ. 5.0) TGT(I,11)= 1.0
        IF (TGT(I,2) .EQ. 6.0) TGT(I,11)= 3.0
        IF (TGT(I,2) .EQ. 7.0) TGT(I,11)= 2.0
        TGT(I,8)= QTIME+((TGT(I,4)-GDATA(7,13))*7200./(1000.*PRDATA(1,1,
       216,2)))
        GO TO 100
```

```
C
C       NOW THE PREP
C
C       DETERMINE THE UNIT CAPABILITIES
C
2400    DO 300 I=1,250
        IF (TGT(I,8) .NE. 0) GO TO 300
        ITYPE= TGT(I,7)+1
        GO TO(300,600),ITYPE
600     DO 301 J=1,3
        IF(ARDATA(J,7,2) .EQ. 3) GO TO 301
        IF (RANGE(TGT(I,3),TGT(I,4),J) .LT. RMAX)  TGT(I,14+J)= 1.0
301     CONTINUE
300     CONTINUE
        DO 1705 I=1,250
        ITYPE= TGT(I,7)+ 1
        GO TO (1705,800),ITYPE
800     SUM=0.0
        DO 1200 J= 1,3
        SUM= SUM+ TGT(I,J+14)
1200    TGT(I,18) = SUM
1705    CONTINUE
        SUM1= 0.0
        SUM3= 0.0
        SUM2= 0.0
C
C
C       DETERMINE THE NUMBER OF TARGETS EACH UNIT CAN HIT
C
        DO 2600 IJ=1,250
        IF(TGT(IJ,15) .EQ. 1) SUM1=SUM1+1
        IF(TGT(IJ,16) .EQ. 1) SUM2= SUM2+1
        IF(TGT(IJ,17) .EQ. 1) SUM3= SUM3+1
2600    CONTINUE
        NUM(1)= SUM1
        NUM(2)= SUM2
        NUM(3)= SUM3
        DO 1706 I=1,250
        NSUM= TGT(I,18)+1
        GO TO (1706,1707,1708,1709), NSUM
C
C       ONE UNIT ONLY CAN REACH THE TARGET
C
1707    DO 1216 J=1,3
        IF (TGT(I,J+14).EQ.1.AND.NUM(J).GT.0) GO TO 1215
1216    CONTINUE
        DO 8610 JX=1,40
8610    TGT(I,JX)=0.0
```

```
      GO TO 1706
1215  TGT(I,11)= 1.*J
      NUM(J)= NUM(J)-1
      GO TO 1706
C
C     TWO UNITS CAN HIT THE TARGET
C
1708  ICOUNT=0
      IR=0
      DO 7010 JX=1,3
7010  CK(JX)=0
      DO 1225 K=1,3
      IF (TGT(I,K+14) .EQ.1 .AND. NUM(K).GT.0) GO TO 1226
      GO TO 1225
1226  CK(K)=1
      ICOUNT= ICOUNT+1
1225  CONTINUE
      IF (ICOUNT .EQ. 0) GO TO 1275
      GO TO (6300,6301),ICOUNT
6300  DO 6302 IK=1,3
      IF (CK(IK) .NE. 0) NUNIT=IK
6302  CONTINUE
      TGT(I,11)= 1.*NUNIT
      NUM(NUNIT)= NUM(NUNIT)-1
      GO TO 1706
1275  CONTINUE
      DO 1276 JX=1,40
1276  TGT(I,JX)= 0.0
      GO TO 1706
6301  DO 6900 JX1=1,3
      DO 6900 JX2= 1,3
      IF(JX1 .EQ. JX2) GO TO 6900
      IF(CK(JX1) .EQ. 1 .AND. CK(JX2) .EQ. 1) GO TO 6901
6900  CONTINUE
6901  CONTINUE
      IF(NUM(JX1) .LT. NUM(JX2)) GO TO 6902
      IF(NUM(JX1) .GT. NUM(JX2)) GO TO 6903
C
C     NUMBER OF TARGETS ARE EQUAL
C
      CALL UNIF(RNNR)
      IF(RNNR .LT. .5) IR=JX1
      IF(RNNR .GE. .5) IR=JX2
      TGT(I,11)= IR*1.
      NUM(JX1)= NUM(JX1)-1
      NUM(JX2)= NUM(JX2)-1
      GO TO 1706
6902  TGT(I,11)= JX2*1.
```

```
      NUM(JX1)= NUM(JX1)-1
      NUM(JX2)= NUM(JX2)-1
      GO TO 1706
6903  TGT(I,11)= JX1*1.
      NUM(JX1)= NUM(JX1)-1
      NUM(JX2)= NUM(JX2)-1
      GO TO 1706
C
C     ALL UNITS CAN HIT
C
1709  ICOUNT=0
      DO 2000 L=1,3
      IF(NUM(L) .GT. 0) ICOUNT=ICOUNT+1
2000  CONTINUE
      IF(ICOUNT .EQ. 0) GO TO 1275
1901  GO TO (1707,1708,1995),ICOUNT
C
C     FIND MIN NUM
C
1995  MIN=100
      DO 1996 L=1,3
      IF (NUM(L) .LT. MIN) GO TO 1997
1996  CONTINUE
      GO TO 1998
1997  MIN= NUM(L)
      N=L
      GO TO 1996
1998  TGT(I,11)= 1.*N
      DO 1999 L=1,3
1999  NUM(L)= NUM(L)-1
1706  CONTINUE
C
C     REZERO TARGET FLAGS
C
      DO 2700 I=1,250
      DO 2700 J=14,18
2700  TGT(I,J)= 0.0
C
C     STACK THE EVENT LIST FOR ALL SCHEDULED TARGETS
C
      DO 2500 I=1,250
      IF (TGT(I,5) .EQ. 0 .OR. TGT(I,39) .EQ. 0) GO TO 2500
      CALL EARRAY(IOPEN)
      EVLIST(IOPEN,1)=TGT(I,8)-60
      EVLIST(IOPEN,2)= 1.
      EVLIST(IOPEN,3)=TGT(I,1)
      EVLIST(IOPEN,4)= 1.*I
      EVLIST(IOPEN,6)= TGT(I,3)
```

```
      EVLIST(IOPEN,7)= TGT(I,4)                                         MC 02340
      EVLIST(IOPEN,8)= TGT(I,2)                                         MC 02350
      EVLIST(IOPEN,9)= TGT(I,11)                                        MC 02360
      EVLIST(IOPEN,16)= 1.                                              MC 02370
      EVLIST(IOPEN,17)= 1.0                                             MC 02380
      EVLIST(IOPEN,21)= 4.0                                             MC 02390
      EVLIST(IOPEN,32)= TGT(I,3)                                        MC 02400
      EVLIST(IOPEN,33)= TGT(I,4)                                        MC 02410
      EVLIST(IOPEN,36)= TGT(I,3)                                        MC 02420
      EVLIST(IOPEN,37)= TGT(I,4)                                        MC 02430
      TGT(I,39)= 0.0                                                    MC 02440
      TGT(I,20)= IOPEN*1.                                               MC 02450
 2500 CONTINUE                                                          MC 02460
C                                                                       MC 02470
C     DETERMINE TIMES FOR PREP TARGETS AND STACK EVENT LIST             MC 02480
C                                                                       MC 02490
      DO 2800 I=1,3                                                     MC 02500
      TIME= QTIME                                                       MC 02510
      DO 2701 J=1,250                                                   MC 02520
      IF (TGT(J,7) .EQ. 0 .OR. TGT(J,39) .EQ. 0) GO TO 2701             MC 02530
      IF(TGT(J,11) .NE. I) GO TO 2701                                   MC 02540
      TIME= TIME -180.                                                  MC 02550
      TGT(J,8)= TIME                                                    MC 02560
      TGT(J,39)= 0.0                                                    MC 02570
      CALL EARRAY(IO)                                                   MC 02580
      EVLIST(IO,1)= TIME -60                                            MC 02590
      EVLIST(IO,2)= 1.                                                  MC 02600
      EVLIST(IO,17)= 1.0                                                MC 02610
      EVLIST(IO,3)= TGT(J,1)                                            MC 02620
      EVLIST(IO,4)= 1.*J                                                MC 02630
      EVLIST(IO,6)= TGT(J,3)                                            MC 02640
      EVLIST(IO,7)= TGT(J,4)                                            MC 02650
      EVLIST(IO,8)= TGT(J,2)                                            MC 02660
      EVLIST(IO,9)= TGT(J,11)                                           MC 02670
      EVLIST(IO,16)= 1.                                                 MC 02680
      EVLIST(IO,21)= 2.0                                                MC 02690
      EVLIST(IO,32)= TGT(J,3)                                           MC 02700
      EVLIST(IO,33)= TGT(J,4)                                           MC 02710
      EVLIST(IO,36)= TGT(J,3)                                           MC 02720
      EVLIST(IO,37)= TGT(J,4)                                           MC 02730
      TGT(J,20)= IO*1.                                                  MC 02740
 2701 CONTINUE                                                          MC 02750
 2800 CONTINUE                                                          MC 02760
      RETURN                                                            MC 02770
      END                                                               MC 02780
```

```
      SUBROUTINE MOARTY
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      DIMENSION USAT(3,3)
      NCOUNT=0
      RC= 2.*RMAX/3.
C
C     IF UNIT IS GREATER THAN RMAX BACK OF FRONT LINE MOVE IT
C
      DO 2100 I=1,3
      IF((GDATA(7,13)-ARDATA(I,7,8)) .GE. RMAX) CALL MAUNIT(I)
2100  CONTINUE
C
C     DETERMINE IF ANY UNITS ARE ALREADY MOVING (RESCHEDULE DECISION)
C
      DO 100 I=1,3
      IF (ARDATA(I,7,2) .EQ. 3.0) GO TO 101
100   CONTINUE
C
C     DETERMINE IF ANY UNIT IS GREATER THAN 2/3 MAX RANGE BACK OF FORWA
C     ELEMENTS
C
      DO 200 I=1,3
      IF (I .EQ. 1) IS=5
      IF (I .EQ. 2) IS= 7
      IF (I .EQ. 3) IS= 6
      UN= I
      USAT (I,1)= UN
      USAT (I,2)= ARDATA (I,7,2)
      USAT(I,3)= GDATA(IS,13)-ARDATA(I,7,8)
200   CONTINUE
      IF(USAT(1,3) .LT. RC .AND. USAT(2,3) .LT. RC .AND. USAT(3,3)
     2.LT. RC) GO TO 102
401   RMIN= AMAX1(USAT(1,3),USAT(2,3),USAT(3,3))
      IF (RMIN .EQ. 0) GO TO 103
      DO 300 N=1,3
      IF (USAT(N,3) .EQ. RMIN) NUN= N
300   CONTINUE
      IF (USAT(NUN,2) .EQ.1) GO TO 400
      USAT(NUN,3)= 0.0
      GO TO 401
101   EVLIST(IROW,1)= CTIME+600
      GO TO 1700
```

```
102     EVLIST(IROW,1)= CTIME+ 900                                          MC 03270
        GO TO 1700                                                          MC 03280
103     EVLIST(IROW,1)= CTIME+ 300                                          MC 03290
400     CALL MAUNIT(NUN)                                                    MC 03300
        GO TO 102                                                           MC 03310
1700    RETURN                                                              MC 03320
        END                                                                 MC 03330


        SUBROUTINE MAUNIT(NUN)                                              MD 00010
C                                                                           MD 00020
        DIMENSION USAT(3,3)                                                 MD 00030
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,           MD 00040
       2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),    MD 00050
       3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                     MD 00060
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,     MD 00070
       2XTLETH ,STAT(20,4)                                                  MD 00080
C                                                                           MD 00090
C       MOVE UNIT NUN                                                       MD 00100
C                                                                           MD 00110
400     IF (NUN.EQ. 1) ID= 5                                                MD 00120
        IF (NUN.EQ.2) ID= 7                                                 MD 00130
        IF (NUN.EQ.3) ID= 6                                                 MD 00140
C                                                                           MD 00150
C       FIND NEW POSITION                                                   MD 00160
C                                                                           MD 00170
        OE= ARDATA(NUN,7,7)                                                 MD 00180
        ON= ARDATA(NUN,7,8)                                                 MD 00190
        SMN= GDATA(ID,13) -PRDATA(2,NUN,5,1)                                MD 00200
        CALL TNGEN(SMN,PRDATA(2,NUN,5,2),(GDATA(ID,13)-RMAX),               MD 00210
       2GDATA(ID,13),ARDATA(NUN,7,8))                                       MD 00220
        CALL TNGEN(GDATA(ID,17),PRDATA(2,NUN,4,2),GDATA(ID,3),              MD 00230
       2GDATA(ID,5),ARDATA(NUN,7,7))                                        MD 00240
C                                                                           MD 00250
C       FIND AZIMUTH OF FIRE                                                MD 00260
C                                                                           MD 00270
        IF (NUN .EQ. 2) GO TO 500                                           MD 00280
        IF (NUN .EQ. 3) GO TO 501                                           MD 00290
        U1= 1.0                                                             MD 00300
        U2= 2.0                                                             MD 00310
        GO TO 502                                                           MD 00320
501     U1= 3.                                                              MD 00330
        U2= 4.                                                              MD 00340
502     CME= 0.0                                                            MD 00350
        CMN= 0.0                                                            MD 00360
        DO 701 I=1,250                                                      MD 00370
        IF (TGT(I,2) .EQ. U1 .OR. TGT(I,2) .EQ. U2 .AND. TGT(I,5) .EQ. 1    MD 00380
       2.AND.TGT(I,8) .GT. (CTIME+900)) GO TO 702                           MD 00390
```

```
701     CONTINUE
        IF (CME .EQ.0.0 .AND. CMN .EQ. 0.0) GO TO 800
        GO TO 703
702     CME= CME+ TGT(I,3)
        CMN= CMN+ TGT(I,4)
        NCOUNT=NCOUNT+1
        GO TO 701
703     SLD= CME/NCOUNT-ARDATA(NUN,7,7)
        SDD= CMN/NCOUNT-ARDATA(NUN,7,8)
        ARG= SLD/SDD
        ANGLE= ATAN(ARG)
        IF (ANGLE .LE. 0) ARDATA(NUN,7,6)= 6.2832- ABS(ANGLE)
        IF (ANGLE .GT. 0) ARDATA(NUN,7,6) = ANGLE
        GO TO 700
800     ARDATA (NUN,7,6)= 0.0
        GO TO 700
500     CMN= 0.0
        CME= 0.0
        DO 1100 I=1,250
        IF (TGT(I,5) .EQ. 1 .AND. TGT(I,8) .GT. (CTIME+900)) GO TO 1200
1100    CONTINUE
        IF (CME .EQ. 0.0 .AND. CMN .EQ. 0.0) GO TO 800
        GO TO 703
1200    CMN= CMN+ TGT(I,4)
        CME= CME+ TGT(I,3)
        NCOUNT=NCOUNT+1
        GO TO 1100
700     ARDATA (NUN,7,2)= 3.
        CALL UGEN (1.0,2.0,RESULT)
        DIS= SQRT((ARDATA(NUN,7,3)-OE)**2+(ARDATA(NUN,7,4)-ON)**2)*
      2RESULT
        CALL TNGEN(PRDATA(2,NUN,7,1),PRDATA(2,NUN,7,2),PRDATA(2,NUN,7,3),
      2PRDATA(2,NUN,7,4),RATE)
        CALL TNGEN(PRDATA(2,NUN,6,1),PRDATA(2,NUN,6,2),PRDATA(2,NUN,6,3),
      2PRDATA(2,NUN,6,4),TMOD)
        CALL TNGEN(PRDATA(2,NUN,8,1),PRDATA(2,NUN,8,2),PRDATA(2,NUN,8,3),
      2PRDATA(2,NUN,8,4),TEMPL)
        TMOV= DIS * 3600/(1000.*RATE)
        CALL EARRAY(IOPEN)
        EVLIST(IOPEN,1) = CTIME+ TMOV+ TMOD+ TEMPL
        EVLIST(IOPEN,2)= 9.0
        EVLIST(IOPEN,3)= NUN*1.0
1700    RETURN
        END
```

```
      SUBROUTINE WPLOC (NUNIT)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      DIMENSION DEP(6), SLAT(6), THETA (6), DIS(6)
C
C
C     FIND THE ACTUAL BATTERY CENTER
C
      CALL TNGEN(ARDATA(NUNIT,7,7),PRDATA(2,NUNIT,9,2),
     2(ARDATA(NUNIT,7,7)-PRDATA(2,NUNIT,9,4)),(ARDATA(NUNIT,7,7)+
     3PRDATA(2,NUNIT,9,4)),ARDATA(NUNIT,7,3))
      CALL TNGEN(ARDATA(NUNIT,7,8),PRDATA(2,NUNIT,9,2),
     2AMAX1((ARDATA(NUNIT,7,8)-RMAX),(ARDATA(NUNIT,7,8)-PRDATA(2,NUNIT,
     39,4))),AMIN1(GDATA(7,13),(ARDATA(NUNIT,7,8)+PRDATA(2,NUNIT,9,4))),
     4ARDATA(NUNIT,7,4))
C
C     COMPUTE THE ERROR
C
      DO 3701 I=9,10
      ARDATA(NUNIT,7,I)= ARDATA(NUNIT,7,(I-2))-ARDATA(NUNIT,7,(I-6))
3701  CONTINUE
C
C     POSITION THE WEAPONS
C
      DO 100 I=1,6
      CALL UGEN (PRDATA(2,NUNIT,(I+9),1),PRDATA(2,NUNIT,(I+9),2),
     2DEP(I))
100   CALL UGEN (PRDATA (2,NUNIT,(I+9),3),PRDATA(2,NUNIT,(I+9),4),
     2 SLAT(I))
      DO 700 I= 1,NGUNS
      ANGLE= ARDATA(NUNIT,7,6)
      ARDATA(NUNIT,I,3)= -DEP(I)*SIN(ANGLE)+SLAT(I)*COS(ANGLE)+ARDATA
     2(NUNIT,7,3)
      ARDATA(NUNIT,I,4)= DEP(I)*COS(ANGLE)+SLAT(I)*SIN(ANGLE)+ARDATA
     2(NUNIT,7,4)
700   CONTINUE
C
C     ALTER UNIT STATUS LIGHTS
C
2000  ARDATA(NUNIT,7,2)= 1.0
      IF (IROW .EQ. 0) GO TO 6000
      DO 2700 I=1,50
2700  EVLIST(IROW,I)= 0.0
6000  RETURN
```

```
      END

      SUBROUTINE TOGEN
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
C     DETERMINE THE NUMBER OF UNITS NOT ENGAGED AND SELECT A UNIT
C
      JCOUNT=0
      DO 1600 I=1,4
      IF(GDATA(I,16) .EQ. 1) GO TO 1600
      IF((CTIME-GDATA(I,15)) .GT. 2700 .AND. GDATA(I,2) .EQ. 4) GO TO
     21600
      IF(GDATA(I,2) .EQ. 1) GO TO 1600
      IF(GDATA(I,2) .GT. 4) GO TO 1600
      GO TO 120
1600  CONTINUE
      GO TO 125
120   JCOUNT=JCOUNT+1
      GO TO 1600
125   NUM= JCOUNT+1
      IF (NUM .GT. 1) ITGT= ITGT+1
      GO TO (5000,700,800,900,1000),NUM
C
C     ONE UNIT NOT ENGAGED
C
700   DO 160 I=1,4
      IF (GDATA(I,16) .EQ. 0) GO TO 500
160   CONTINUE
500   NUNIT= I
      GO TO 4000
C
C     TWO UNITS NOT ENGAGED
C
800   CALL UNIF(RNNR)
      IF (RNNR .LE. .5) GO TO 801
      NUM=2
      GO TO 802
801   NUM=1
802   ICOUNT=0
      DO 803 I=1,4
      IF(GDATA(I,16) .NE. 0) GO TO 803
      ICOUNT=ICOUNT+1
```

```
      IF(ICOUNT .EQ. NUM) GO TO 804
803   CONTINUE
804   NUNIT=I
      GO TO 4000
C
C     THREE UNITS NOT ENGAGED
C
900   CALL UNIF(RNNR)
      IF(RNNR .LE. .333) GO TO 901
      IF (RNNR .LE. .667) GO TO 902
      NUM=1
      GO TO 903
901   NUM=2
      GO TO 903
902   NUM=3
      GO TO 903
903   ICOUNT=0
      DO 1200 I=1,4
      IF(GDATA(I,16) .EQ. 1) GO TO 1200
      IF((CTIME-GDATA(I,15)) .GT. 2700 .AND. GDATA(I,2) .EQ. 4) GO TO
     21200
      IF(GDATA(I,2) .EQ. 1) GO TO 1200
      IF(GDATA(I,2) .GT. 4) GO TO 1200
      ICOUNT= ICOUNT+1
      IF(ICOUNT .EQ. NUM) GO TO 1201
1200  CONTINUE
1201  NUNIT=I
      GO TO 4000
C
C     ALL UNITS ARE FREE
C
1000  CALL UNIF(RNNR)
      IF (RNNR .LE. .25) GO TO 1001
      IF (RNNR .LE. .5) GO TO 1002
      IF (RNNR .LE. .75) GO TO 1003
      NUNIT= 4
      GO TO 4000
1001  NUNIT= 1
      GO TO 4000
1002  NUNIT=2
      GO TO 4000
1003  NUNIT=3
      GO TO 4000
C
C     DETERMINE THE LOCATION OF THE TARGET
C
4000  CALL HARRAY(I)
      TGT(I,1)= 1.*ITGT
```

```
C
C     DETERMINE THE ACTUAL TARGET LOCATION
C
      CALL UGEN(GDATA(NUNIT,3),GDATA(NUNIT,5),TGT(I,3))
      CALL UGEN(GDATA(NUNIT,13),(GDATA(NUNIT,13)+500),TGT(I,4))
C
C     COMPUTE THE ANGLE FROM FPC TO TARGET
C
      ARG= (TGT(I,3)-GDATA(NUNIT,12))/(TGT(I,4)-GDATA(NUNIT,13))
      ANGLE= ATAN(ARG)
C
C     COMPUTE RANGE FROM FPC TO TARGET
C
      TRAN= DIST(TGT(I,3),TGT(I,4),GDATA(NUNIT,12),GDATA(NUNIT,13))
C
C     DETERMINE LOCATION IN FO COORDINATE SYSTEM
C
C     COMPUTE ERROR VARIANCES
C
      VARE= PRDATA(2,5,2,1)+PRDATA(2,5,2,2)*TRAN
      VARN= PRDATA(2,5,3,1)+PRDATA(2,5,3,2)*TRAN
      CALL TNGEN(0.0,VARE,-PRDATA(2,5,2,4),PRDATA(2,5,2,4),TGE)
      CALL TNGEN(0.0,VARN,-PRDATA(2,5,3,4),PRDATA(2,5,3,4),TGN)
C
C     TRANSFORM COORDINATES TO BASE COORDINATE SYSTEM
C
      CN= TGT(I,4)+ TGN*COS(ANGLE)+TGE*SIN(ANGLE)
      CE= TGT(I,3)+ TGE*COS(ANGLE)-TGN*SIN(ANGLE)
C
C     ENTER DATA IN TARGET ARRAY
C
      TGT(I,9)= 1.0
      TGT(I,10)= CTIME
      TGT(I,2)= 1.*NUNIT
      TGT(I,21)= TGT(I,3)-CE
      TGT(I,22)= TGT(I,4)-CN
C
C     SET UP EVENT IN EVENT CHAIN
C
C     DETERMINE TIME FOR MISSION PREPARATION BY FO
C
400   CALL TNGEN(PRDATA(2,4,2,1),PRDATA(2,4,2,2),PRDATA(2,4,2,3),
     2PRDATA(2,4,2,4),PTIME)
C
C     DETERMINE THE TIME REQUIRED FOR TRANSMISSION TO FDC
C
      CALL TNGEN(PRDATA(2,4,3,1),PRDATA(2,4,3,2),PRDATA(2,4,3,3),
     2PRDATA(2,4,3,4),TTIME)
```

```
C
C       PUT EVENT IN EVENT CHAIN
C
        CALL EARRAY(IS)
        EVLIST(IS,1)= CTIME+ TTIME+PTIME
        EVLIST(IS,2)= 1.0
        EVLIST(IS,3)= TGT(I,1)
        EVLIST(IS,4)= 1.*I
        TGT(I,20)= IS*1.
        CALL DARRAY(IA)
        EVLIST(IS,5)= 1.*IA
        EVLIST(IS,6)= CE
        EVLIST(IS,7)= CN
        EVLIST(IS,8)= 1.*NUNIT
        EVLIST(IS,16)= 0.0
        EVLIST(IS,17)= 1.0
        EVLIST(IS,19)= CTIME
        EVLIST(IS,21)= 1.0
        EVLIST(IS,36)= TGT(I,3)
        EVLIST(IS,37)= TGT(I,4)
        EVLIST(IS,41)= CE
        EVLIST(IS,42)= CN
        EVLIST(IS,43)= ANGLE
        CALL DESTGT(IA,I,IS)
C
C       ENGAGE THE UNIT
C
        GDATA(NUNIT,16)= 1.0
        GDATA(NUNIT,18)= CTIME
C
C       SET UP NEXT TARGET EVENT
C
5000    CALL EARRAY(NEXT)
        CALL EXPON(TINC)
        EVLIST(NEXT,1)=CTIME+ TINC
        EVLIST(NEXT,2)= 12.0
        TOPT= CTIME+ TINC
C
C       SET UP DECISION EVENT
C
        EVLIST(5,1)= TOPT-1
        DO 6850 I=1,50
6850    EVLIST(IROW,I)= 0.0
6000    RETURN
        END
```

```
      SUBROUTINE DESTGT(IA,ISOK,I)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      CALL UNIF(RNNR)
      IF (RNNR .LE. PRDATA(3,1,11,1)) GO TO 100
C
C     TARGET IS SIZE CAT I
C
      TGT(ISOK,23)= 1.0
      CALL UGEN(PRDATA(3,1,10,1),PRDATA(3,1,10,2),SNO)
      NPERS= SNO
      CALL TNGEN(PRDATA(3,1,1,1),PRDATA(3,1,1,2),PRDATA(3,1,1,3),
     2PRDATA(3,1,1,4),SLAT)
      CALL TNGEN(PRDATA(3,1,2,1),PRDATA(3,1,2,2),PRDATA(3,1,2,3),
     2PRDATA(3,1,2,4),ZONE1)
      CALL TNGEN(PRDATA(3,1,3,1),PRDATA(3,1,3,2),PRDATA(3,1,3,3),
     2PRDATA(3,1,3,4),ZONE2)
      CALL TNGEN(PRDATA(3,1,4,1),PRDATA(3,1,4,2),PRDATA(3,1,4,3),
     2PRDATA(3,1,4,4),ZONE3)
5000  NZN1= NPERS*.5
      NZN2= NPERS*.4
      NZN3= NPERS*.1
      SLATL= TGT(ISOK,3)-SLAT/2
      SLATR= TGT(ISOK,3)+ SLAT/2
      Z1F= TGT(ISOK,4)
      Z1R= TGT(ISOK,4)+ZONE1
      Z2F= Z1R
      Z2R= Z1R+ ZONE2
      Z3F= Z2R
      Z3R= Z2R+ ZONE3
      NTOT= NZN1+ NZN2+NZN3
      TGT(ISOK,26)=1.*NTOT
      TGT(ISOK,24)= SLAT
      TGT(ISOK,25)= ZONE1+ZONE2+ZONE3
      TGT(ISOK,27)= TGT(ISOK,26)/(TGT(ISOK,25)*TGT(ISOK,24))
      EVLIST(I,18)= 1.*NTOT
      DO 1100 N= 1,NTOT
      CALL UGEN(SLATL,SLATR,TDES(IA,N,1))
1100  CONTINUE
C
C     DO ZONE 1
C
      DO 1101 N= 1,NZN1
```

```
      CALL UGEN(Z1F,Z1R,TDES(IA,N,2))                                   MD 03670
1101  CONTINUE                                                          MD 03680
C                                                                       MD 03690
C     DO ZONE 2                                                         MD 03700
C                                                                       MD 03710
      DO 1102 N= 1,NZN2                                                 MD 03720
      CALL UGEN(Z2F,Z2R,TDES(IA,(NZN1+N),2))                            MD 03730
1102  CONTINUE                                                          MD 03740
C                                                                       MD 03750
C     DO ZONE 3                                                         MD 03760
C                                                                       MD 03770
      DO 1103 N= 1,NZN3                                                 MD 03780
      CALL UGEN(Z3F,Z3R,TDES(IA,(NZN1+NZN2+N),2))                       MD 03790
1103  CONTINUE                                                          MD 03800
      GO TO 6000                                                        MD 03810
C                                                                       MD 03820
C     TARGET IS SIZE CAT II                                             MD 03830
C                                                                       MD 03840
100   CALL UGEN(PRDATA(3,1,9,1),PRDATA(3,1,9,2),SNO)                    MD 03850
      CALL TNGEN(PRDATA(3,1,5,1),PRDATA(3,1,5,2),PRDATA(3,1,5,3),       MD 03860
     2PRDATA(3,1,5,4),SLAT)                                             MD 03870
      CALL TNGEN(PRDATA(3,1,6,1),PRDATA(3,1,6,2),PRDATA(3,1,6,3),       MD 03880
     2PRDATA(3,1,6,4),ZONE1)                                            MD 03890
      CALL TNGEN(PRDATA(3,1,7,1),PRDATA(3,1,7,2),PRDATA(3,1,7,3),       MD 03900
     2PRDATA(3,1,7,4),ZONE2)                                            MD 03910
      CALL TNGEN(PRDATA(3,1,8,1),PRDATA(3,1,8,2),PRDATA(3,1,8,3),       MD 03920
     2PRDATA(3,1,8,4),ZONE3)                                            MD 03930
      TGT(ISOK,23)= 2.0                                                 MD 03940
      NPERS= SNO                                                        MD 03950
      GO TO 5000                                                        MD 03960
6000  RETURN                                                            MD 03970
      END                                                               MD 03980


      SUBROUTINE TOANAL                                                 ME 00010
C                                                                       ME 00020
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,         ME 00030
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),  ME 00040
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                   ME 00050
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,   ME 00060
     2XTLETH ,STAT(20,4)                                                ME 00070
C                                                                       ME 00080
      DIMENSION PROF(3)                                                 ME 00090
      NEV=1                                                             ME 00100
      IQ=0                                                              ME 00110
      IKV=0                                                             ME 00120
C                                                                       ME 00130
C     GET BASIC DATA                                                    ME 00140
```

```
C
      ITT=CEVENT(21)
      IUNIT=CEVENT(8)
      ISUN=CEVENT(9)
      INT=CEVENT(4)
      IS=IROW
      DO 1000 I=1,3
 1000 PROF(I)=0.0
      DO 1650 J=1,3
      IF(ARDATA(J,7,2) .EQ. 1 .AND. RANGE(CEVENT(6),CEVENT(7),J) .LT.
     2RMAX) PROF(J)= 1.0
 1650 CONTINUE
      WRITE(6,10402) PROF
C
C     CHECK TO SEE IF TARGET IS TARGET OF OPPORTUNITY
C
      IF(ITT .NE. 1) GO TO 6100
C
C     TARGET IS TARGET OF OPPORTUNITY
C
C     CHECK TO SEE IF ADJUSTMENT WILL BE CONDUCTED
C
      CALL UNIF(RNNR)
      IF(RNNR .GE. .3) GO TO 1290
C
C     WILL FIRE FOR EFFECT IMMEDIATELY
C
C     COMMIT ALL UNITS
C
      ICHK=0
      DO 3150 I=1,3
      IF(PROF(I) .EQ. 0) GO TO 3150
      ICHK= ICHK+1
      ARDATA(K,7,2)= 2.0
      ARDATA(K,7,14)= 1.0
      EVLIST(IROW,(37+K))= 1.0
 3150 CONTINUE
      IF(ICHK .EQ. 0) GO TO 6000
C
C     UNITS ARE AVAILABLE AND HAVE BEEN COMMITTED
C
      CALL STRAT(PROF,1,5)
      EVLIST(IROW,16)= 1.0
C
C     DETERMINE THE TARGET ANALYSIS TIME
C
      CALL TNGEN(PRDATA(2,4,4,1),PRDATA(2,4,4,2),PRDATA(2,4,4,3),
     2PRDATA(2,4,4,4),AC)
```

```
C
C     DETERMINE THE TIME FOR THE FDC TO SELECT MASS POINT
C
      CALL TNGEN(PRDATA(2,4,8,1),PRDATA(2,4,8,2),PRDATA(2,4,8,3),
     2PRDATA(2,4,8,4),AMP)
      CALL TNGEN(PRDATA(2,4,9,1),PRDATA(2,4,9,2),PRDATA(2,4,9,3),
     2PRDATA(2,4,9,4),APR)
      EVLIST(IROW,1)= CTIME+AC+AMP+APR
      EVLIST(IROW,2)= 2.
      RETURN
1290  CONTINUE
      TGT(INT,30)= 1.0
C
C     SEE IF CENTER BATTERY IS AVAILABLE
C
100   IF(PROF(2) .NE. 1) GO TO 1700
C
C     BATTERY IS AVAILABLE
C
      IBAT=2
      GO TO 2000
C
C     CENTER BATTERY IS NOT AVAILABLE
C
C     CHECK THE BATTERY ON UNIT SIDE OF THE BATTLE ZONE
C
1700  CONTINUE
      IF(IUNIT .GT. 2) ISIDE=3
      IF(IUNIT .GT. 2) IOPP=1
      IF(IUNIT .LE. 2) ISIDE=1
      IF(IUNIT .LE. 2) IOPP=3
      IF(PROF(ISIDE) .NE. 1) GO TO 1710
      IBAT=ISIDE
      GO TO 2000
C
C     CHECK UNIT ON OPPOSITE SIDE IF NECESSARY
C
1710  CONTINUE
      IF(PROF(IOPP) .NE. 1) GO TO 6000
      IBAT=IOPP
C
C     UNIT "IBAT" IS AVAILABLE AND IN RANGE
C     COMMIT THE ARTILLERY BATTERY FOR THE ADJUSTMENT
C
2000  EVLIST(IROW,9)= 1.*IBAT
      EVLIST(IROW,34)= 1.*IBAT
      TGT(INT,28)= 1.*IBAT
      TGT(INT,29)= RANGE(CEVENT(6),CEVENT(7),IBAT)
```

```
C
C      COMMIT ALL UNCOMMITTED UNITS IN RANGE
C
       DO 2010 K=1,3
       IF(PROF(K) .EQ. 0) GO TO 2010
       ARDATA(K,7,2)= 2.0
       ARDATA(K,7,14)= 1.0
       EVLIST(IROW,(37+K))= 1.0
2010   CONTINUE
C
C      DETERMINE TARGET ANALYSIS TIME.
C
       CALL TNGEN(PRDATA(2,4,4,1),PRDATA(2,4,4,2),PRDATA(2,4,4,3),
     2PRDATA(2,4,4,4),ANTIME)
C
C      DETERMINE TIME FOR ADJUSTING UNIT TO PREPARE AND FIRE THE INITIAL
C      VOLLEY IN ADJUSTMENT
C
       CALL TNGEN(PRDATA(2,4,5,1),PRDATA(2,4,5,2),PRDATA(2,4,5,3),
     2PRDATA(2,4,5,4),TO)
C
C      SET UP THE ADJUSTMENT SEQUENCE
C
       EVLIST(IROW,1)= CTIME+ANTIME+TO
       EVLIST(IROW,(IBAT+9))= 2.0
       EVLIST(IROW,2)= 2.
       RETURN
C
C      NO UNITS ARE AVAILABLE, SEE IF SUPPORTING UNIT IS AVAILABLE
C
6000   CONTINUE
       IF(SUP(1) .NE. 0) GO TO 1709
       CALL SGAGE
       RETURN
C
C      SUPPORTING UNIT NOT AVAILABLE
C
1709   IQ=1
       CALL QUE(IQ)
       RETURN
C
C      SEE IF TARGET IS PREP TARGET
C
6100   CONTINUE
       IF(ITT .NE. 2) GO TO 8000
C
C      TARGET IS PREP TARGET
C
```

```
C       SEE IF TARGET IS IN AREA
C
        CALL UNIF(RNNR)
        IF(RNNR .GT. .3) GO TO 4150
C
C       TARGET EXISTS
C
        CALL DARRAY(I)
        EVLIST(IROW,5)= 1.*I
        CALL DESTGT(I,INT,IS)
        GO TO 3900
C
C       TARGET DOES NOT EXIST
C
4150    EVLIST(IROW,5)= 100.
3900    CONTINUE
C
C       SEE IF SCHEDULED UNIT IS AVAILABLE
C
        KSTAT= ARDATA(ISUN,7,2)
        GO TO (4100,4200,4200),KSTAT
C
C       UNIT IS AVAILABLE
C
4100    ARDATA(ISUN,7,2)= 2.0
        ARDATA(ISUN,7,14)= 2.0
        EVLIST(IROW,34)= 1.*ISUN
        EVLIST(IROW,(37+ISUN))= 1.0
        TGT(INT,11)= 1.*ISUN
        TGT(INT,37)= CTIME
        TGT(INT,31)= 1.0
        TGT(INT,32)= 1.0
        IST=2
        CALL STRAT(PROF,ISUN,IST)
        RETURN
C
C       UNIT IS NOT AVAILABLE, SEE IF ANOTHER IS AVAILABLE
C
4200    ISUN=0
        DO 4250 K=1,3
        IF(PROF(K) .NE. 1) GO TO 4250
        ISUN=K
4250    CONTINUE
        IF(ISUN .NE. 0) GO TO 4100
        IQ=2
        IF(SUP(1) .NE. 0) GO TO 4260
        CALL SGAGE
        RETURN
```

```
4260  CALL QUE(IQ)
      RETURN
C
C     TARGET IS SCHEDULED
C
C     SEE IF SCHEDULED UNIT IS AVAILABLE
C
8000  CONTINUE
      IF(PROF(ISUN) .NE. 1) GO TO 8011
C
C     UNIT IS AVAILABLE
C
      IBAT=ISUN
      GO TO 8050
C
C     UNIT IS NOT AVAILABLE CHOOSE ONE OF OTHER UNITS
C
8011  CONTINUE
8010  DO 8060 J=1,3
      IF(PROF(J) .EQ. 1) GO TO 8075
8060  CONTINUE
C
C     NO UNIT AVAILABLE, CHECK SUPPORTING UNIT
C
      IF(SUP(1) .EQ. 1) GO TO 8401
C     SUPPORTED UNIT IS AVAILABLE
      CALL SGAGE
      RETURN
8075  IBAT=J
C
C     SEE IF SAFE TO FIRE
C
8050  IF(CEVENT(7) .GT. GDATA(IUNIT,13)) GO TO 8097
C
C     TARGET IS UNSAFE
C
      CALL WD400(INT)
      RETURN
C     TARGET IS SAFE
C
C     SEE IF THERE IS A TARGET THERE
C
8097  CALL UNIF(RNNR)
      TGT(INT,37)= CTIME
      IF(RNNR .GT. .3) GO TO 8096
C
C     TARGET EXISTS
C
```

```
      CALL DARRAY(I)
      EVLIST(IROW,5)= 1.*I
      CALL DESTGT(I,INT,IS)
      GO TO 8400
C
C     TARGET DOES NOT EXIST
C
8096  EVLIST(IROW,5)= 100.
8400  IF(IKV .EQ. 0) GO TO 8300
C
C     TARGET GOES TO THE QUE
C
8401  IQ=4
      NEV=1
      CALL QUE(IQ)
      RETURN
8300  ARDATA(IBAT,7,2)= 2.
      ARDATA(IBAT,7,14)= 4.
      EVLIST(IROW,(9+IBAT))= 1.0*NGUNS
      EVLIST(IROW,34)= 1.*IBAT
      EVLIST(IROW,(37+IBAT))= 1.0
      IST=4
      TGT(INT,11)= 1.*IBAT
      CALL STRAT(PROF,IBAT,IST)
9000  RETURN
      END


      SUBROUTINE ADJUST
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      DIMENSION PROF(3)
C
      IR= EVLIST(IROW,4)
      DO 100 J=1,3
100   PROF(J)= 0.0
      IUN= EVLIST(IROW,34)
      DO 1050 J=1,3
      IF(RANGE(CEVENT(6),CEVENT(7),J) .LE. RMAX .AND. EVLIST(IROW,
     2(37+J)) .EQ. 1) PROF(J)= 1.0
1050  CONTINUE
C
C     SEE IF ADJUSTMENT WILL CONTINUE
C
```

```
      IF(EVLIST(IROW,16) .EQ. 1) GO TO 1000
C
C     ADJUSTMENT CONTINUES
C
      TGT(IR,30)= TGT(IR,30)+1
      IF(RANGE(CEVENT(6),CEVENT(7),IUN) .GT. RMAX) GO TO 1199
C
C     DETERMINE TIME FOR FO TO MAKE ADJUSTMENT CORRECTION AND TRANSMIT
C     TO FDC
C
5100  CONTINUE
      CALL TNGEN(PRDATA(2,4,6,1),PRDATA(2,4,6,2),PRDATA(2,4,6,3),
     2PRDATA(2,4,6,4),AT)
C
C     DETERMINE TIME FOR FDC TO COMPUTE NEW FIRING DATA AND
C     TRANSMIT TO UNIT
C
      CALL TNGEN(PRDATA(2,4,7,1),PRDATA(2,4,7,2),PRDATA(2,4,7,3),
     2PRDATA(2,4,7,4),AC)
C
C     DETERMINE TIME FOR UNIT TO PREPARE AND FIRE ROUNDS
C
      CALL TNGEN(PRDATA(2,4,5,1),PRDATA(2,4,5,2),PRDATA(2,4,5,3),
     2PRDATA(2,4,5,4),AF)
      EVLIST(IROW,1)= EVLIST(IROW,1)+AT+AC+AF
      EVLIST(IROW,2)= 2.
      GO TO 6000
C
C     ADJUSTMENT IS FINISHED
C
1000  CALL STRAT(PROF,1,1)
      GO TO 6000
C
C     FIND ANOTHER UNIT TO CONTINUE THE ADJUSTMENT
C
1199  CONTINUE
1200  IF(CEVENT(6) .GE. GDATA(5,3) .AND. CEVENT(6) .LE. GDATA(5,5))
     2GO TO 1210
      ISIDE= 3
      GO TO 1220
1210  ISIDE= 1
1220  IF(PROF(ISIDE) .EQ. 1 .AND. ISIDE .NE. IUN) GO TO 1250
      IF(ISIDE .EQ. 1) NSIDE= 3
      IF(ISIDE .EQ. 3) NSIDE= 1
      IF(PROF(NSIDE) .EQ. 1 .AND. NSIDE .NE. IUN)GO TO 1260
C
C     NO UNIT AVAILABLE
C
```

```
      IF(SUP(1) .EQ. 1) GO TO 1699
      CALL SGAGE
      RETURN
1699  CONTINUE
1700  DO 1230 J=1,3
      IF(EVLIST(IROW,(37+J)) .EQ. 0) GO TO 1230
      EVLIST(IROW,(9+J))= 0.0
      ARDATA(J,7,2)= 1.0
      ARDATA(J,7,14)= 0.0
1230  CONTINUE
      EVLIST(IROW,34) = 0.0
      IK=1
      NEV=1
      CALL QUE(IK)
      GO TO 6000
1250  EVLIST(IROW,34)= ISIDE*1.
      EVLIST(IROW,(9+IUN))= 0.0
C     EVLIST(IROW,(9+ISIDE))= 2.0
      PROF(IUN)= 0.0
      GO TO 5000
1260  EVLIST(IROW,34)= NSIDE*1.
      EVLIST(IROW,(9+IUN))= 0.0
      EVLIST(IROW,(9+NSIDE))= 2.0
      PROF(IUN)= 0.0
5000  EVLIST(IROW,1)= EVLIST(IROW,1)+60.
      GO TO 5100
6000  RETURN
      END


      SUBROUTINE STRAT(PROF,IBAT,ITYPE)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      DIMENSION PROF(3)
C
      INT= EVLIST(IROW,4)
      NCOL=10
      GO TO (100,200,6000,400,500),ITYPE
200   J=IBAT+21
      EVLIST(IROW,J)= 0.0
      EVLIST(IROW,1)= CTIME+60
      EVLIST(IROW,(9+IBAT))= 1.*NGUNS
      EVLIST(IROW,2)= 2.
      GO TO 6000
```

```
100   CALL EVENT(10,NCOL,NVOL)
      TGT(INT,32)= 1.*NVOL
      DO 110 J=1,3
      IF(PROF(J) .NE. 1) GO TO 110
      EVLIST(IROW,(21+J))= NVOL*1.
      EVLIST(IROW,(9+J))= 1.*NGUNS
      ARDATA(J,7,2)=2.0
      ARDATA(J,7,14)= 1.
110   CONTINUE
      CALL EVENT(11,NCOL,ISTRAT)
      TGT(INT,31)= 1.*ISTRAT
      EVLIST(IROW,25)= ISTRAT*1.
C
C     DETERMINE TIME FOR FO TO MAKE CORRECTIONS
C
      CALL TNGEN(PRDATA(2,4,6,1),PRDATA(2,4,6,2),PRDATA(2,4,6,3),
     2PRDATA(2,4,6,4),AC)
C
C     DETERMINE TIME FOR FDC TO COMPUTE FIRING DATA AND TRANSMIT TO UNI
C
      CALL TNGEN(PRDATA(2,4,8,1),PRDATA(2,4,8,2),PRDATA(2,4,8,3),
     2PRDATA(2,4,8,4),AT)
C
C     DETERMINE THE TIME FOR UNIT TO PREPARE AND FIRE THE INITIAL VOLLE
C
      CALL TNGEN(PRDATA(2,4,9,1),PRDATA(2,4,9,2),PRDATA(2,4,9,3),
     2PRDATA(2,4,9,4),AF)
      EVLIST(IROW,1)= CTIME+AC+AT+AF
      EVLIST(IROW,2)= 2.
      GO TO 6000
400   J= IBAT+21
      CALL EVENT(12,NCOL,NVOL)
      TGT(INT,32)= 1.*NVOL
      EVLIST(IROW,J)= 1.*NVOL
      EVLIST(IROW,(IBAT+9))= 1.*NGUNS
      CALL EVENT(13,NCOL,ISTRAT)
      TGT(INT,31)= 1.*ISTRAT
      EVLIST(IROW,25)= 1.*ISTRAT
      EVLIST(IROW,1)= CTIME+60
      EVLIST(IROW,2)=2.
      GO TO 6000
500   CALL EVENT(10,NCOL,NVOL)
      DO 220 J=1,3
      IF(PROF(J) .NE. 1) GO TO 220
      EVLIST(IROW,(21+J))= NVOL*1.
      EVLIST(IROW,(9+J))= 1.*NGUNS
      ARDATA(J,7,2)= 2.0
      ARDATA(J,7,14)= 1.0
```

```
220     CONTINUE
        CALL EVENT(11,NCOL,ISTRAT)
        EVLIST(IROW,25)= ISTRAT*1.
        TGT(INT,31)= 1.*ISTRAT
        TGT(INT,32)= 1.*NVOL
        EVLIST(IROW,32)= EVLIST(IROW,6)
        EVLIST(IROW,33)= EVLIST(IROW,7)
6000    RETURN
        END


        SUBROUTINE ENGAGE
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
        DIMENSION PROF(3)
C
C       GET BASIC DATA
C
        ISTRAT= CEVENT(25)
C
C       SEE IF MISSION IS COMPLETED
C
        DO 100 J=22,24
        IF(EVLIST(IROW,J) .NE. 0) GO TO 110
100     CONTINUE
C
C       MISSION IS COMPLETE
C
        IF(EVLIST(IROW,21) .EQ. 1) GO TO 101
        IF(EVLIST(IROW,21) .NE. 1) GO TO 102
101     CALL WD100
        GO TO 1000
102     CALL WD200
        GO TO 1000
C
C       MISSION CONTINUES, GET NEW AIMPOINT
C
110     DIFE= PRDATA(3,2,ISTRAT,1)/2
        DIFN= PRDATA(3,2,ISTRAT,2)
        SLB1= CEVENT(32)-DIFE
        SLB2= CEVENT(32)+DIFE
        DB1= CEVENT(33)
        DB2= CEVENT(33)+ DIFN
        CALL UGEN(SLB1,SLB2,EVLIST(IROW,6))
```

```
      CALL UGEN(DB1,DB2,EVLIST(IROW,7))
C
C     PERFORM A RANGE CHECK
C
      ICOUNT=0
      DO 200 I=1,3
      IF(RANGE(EVLIST(IROW,6),EVLIST(IROW,7),I) .LT. RMAX
     2 .AND. EVLIST(IROW,(37+I)) .EQ. 1) GO TO 300
      EVLIST(IROW,(9+I))= 0.0
      GO TO 200
300   EVLIST(IROW,(9+I))= 1.*NGUNS
      ICOUNT=ICOUNT+1
200   CONTINUE
      IF(ICOUNT .EQ. 0) GO TO 110
      IF(ISTRAT .EQ. 1) GO TO 500
C
C     AIMPOINT CHANGES
C
C
C     DETERMINE THE TIME FOR FDC TO SELECT NEW AIM POINT, COMPUTE FIRIN
C     DATA AND TRANSMIT FIRE COMMANDS TO FIRE UNITS
C
      CALL TNGEN(PRDATA(2,4,8,1),PRDATA(2,4,8,2),PRDATA(2,4,8,3),
     2PRDATA(2,4,8,4),AT)
C
C     DETERMINE TIME FOR FIRE UNITS TO PREPARE AND FIRE THE VOLLEY
C
      CALL TNGEN(PRDATA(2,4,9,1),PRDATA(2,4,9,2),PRDATA(2,4,9,3),
     2PRDATA(2,4,9,4),AF)
      EVLIST(IROW,1)= CTIME+AT+AF
      EVLIST(IROW,2)= 2.
      GO TO 8000
C
C     AIMPOINT DOES NOT CHANGE
C
C     DETERMINE TIME FOR FIRE UNIT TO PREPARE AND FIRE ANOTHER VOLLEY
C
500   CALL TNGEN(PRDATA(2,4,10,1),PRDATA(2,4,10,2),PRDATA(2,4,10,3),
     2PRDATA(2,4,10,4),TDIF)
      EVLIST(IROW,1)= CTIME+TDIF
      EVLIST(IROW,2)= 2.
8000  CONTINUE
      RETURN
C
C     CHECK THE QUEUE
C
1000  DO 1100 J=1,4
      IF(Q(J) .EQ. 0) GO TO 1100
```

```
      CALL DQUE(J)
      GO TO 6000
1100  CONTINUE
6000  RETURN
      END


      SUBROUTINE SHOOT
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      DIMENSION TOF(3)
      INT= EVLIST(IROW,4)
      DO 500 I=1,3
500   TOF(I)= 0.0
      DO 100 I=1,3
      IF(EVLIST(IROW,(21+I)) .GT. 0) EVLIST(IROW,(21+I))= EVLIST(IROW,
     2(21+I))-1
      RAN= RANGE(CEVENT(6),CEVENT(7),I)
      CALL FIPAR(RAN,EVLIST(IROW,(25+I)),EVLIST(IROW,(28+I)),TOF(I))
100   CONTINUE
      EVLIST(IROW,1)= CTIME+AMAX1(TOF(1),TOF(2),TOF(3))
      EVLIST(IROW,2)= 3.0
      DO 300 I=1,3
300   ARDATA(I,7,13)= ARDATA(I,7,13)+ EVLIST(IROW,(9+I))
      DO 400 I=10,12
400   EVLIST(IROW,35)= EVLIST(IROW,35)+ EVLIST(IROW,I)
      GO TO 6000
6000  DO 1000 I=10,12
1000  TGT(INT,13)= TGT(INT,13)+EVLIST(IROW,I)
      RETURN
      END


      SUBROUTINE FIPAR(RAN  ,RERROR,DERROR,TOF)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      INDEX= RAN/500
C
```

```
C       FIND MIN RANGE ERROR VARIATION                                  MF 03010
C                                                                       MF 03020
        SMRE= 500.                                                      MF 03030
        DO 100 I=1,NCHGS                                                MF 03040
        RER= FD105(I,INDEX,1)+(RAN  -INDEX*500)*(FD105(I,(INDEX+1),1)-FD1MF 03050
     205(I,INDEX,1))/500                                                MF 03060
        IF (RER .GT. SMRE) GO TO 100                                    MF 03070
        SMRE= RER                                                       MF 03080
        ICHG= I                                                         MF 03090
100     CONTINUE                                                        MF 03100
        RERROR= (SMRE/1.414)**2                                         MF 03110
C                                                                       MF 03120
C       FIND DEF ERROR VARIATION                                        MF 03130
C                                                                       MF 03140
        DER= FD105(ICHG,INDEX,2)+(RAN  -INDEX*500)*(FD105(ICHG,(INDEX+1),MF 03150
     22)-FD105(ICHG,INDEX,2))/500                                       MF 03160
        DERROR= (DER/1.414)**2                                          MF 03170
C                                                                       MF 03180
C       FIND TOF                                                        MF 03190
C                                                                       MF 03200
        TOF= FD105(ICHG,INDEX,3)+(RAN  -INDEX*500)*(FD105(ICHG,(INDEX+1),MF 03210
     3 3)-FD105(ICHG,INDEX,3))/500                                      MF 03220
        RETURN                                                          MF 03230
        END                                                             MF 03240


        SUBROUTINE DAMAGE                                               MF 03250
C                                                                       MF 03260
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,       MF 03270
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),  MF 03280
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                   MF 03290
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH, MF 03300
     2XTLETH ,STAT(20,4)                                                MF 03310
        INTEGER HB,HF,H                                                 MF 03320
C                                                                       MF 03330
        IF(CEVENT(5) .EQ. 100 ) GO TO 2000                              MF 03340
        SMBN= 0.0                                                       MF 03350
        SMBE= 0.0                                                       MF 03360
        INT= EVLIST(IROW,4)                                             MF 03370
        DO 100 I=1,3                                                    MF 03380
        IF (CEVENT(9+I) .EQ. 0) GO TO 100                               MF 03390
        NR= CEVENT(9+I)                                                 MF 03400
        ARG= (CEVENT(6)-ARDATA(I,7,7))/(CEVENT(7)-ARDATA(I,7,8))        MF 03410
        GTA= ATAN(ARG)                                                  MF 03420
        TRANGE= RANGE(CEVENT(6),CEVENT(7),I)                            MF 03430
        IF(NR.EQ.2) GO TO 150                                           MF 03440
        IF(NR.EQ.4) GO TO 151                                           MF 03450
        IF(NR.EQ.6) GO TO 152                                           MF 03460
```

```
150     HB=3
        HF=4
        GO TO 210
151     HB=2
        HF=5
        GO TO 210
152     HB=1
        HF=6
210     DO 1700 J=HB,HF
        CALL BPNT(TRANGE,GTA,I,J,BLOCE,BLOCN)
        IF (NR .NE. 2) GO TO 700
        SMBN= SMBN+BLOCN
        SMBE= SMBE+ BLOCE
700     HO= CEVENT(5)
        NUM= CEVENT(18)
        DO 3000 H=1,NUM
        IF(TDES(HO,H,1) .EQ. 0 .AND. TDES(HO,H,2) .EQ. 0) GO TO 3000
        ENT= DIST(BLOCE,BLOCN,TDES(HO,H,1),TDES(HO,H,2))
        IF(ENT .GT. 250) GO TO 3000
171     PKILL=EXP(-(ENT**2/XLETH**2))
        CALL UNIF(RNNR)
        IF(RNNR .GT. PKILL) GO TO 3000
        EVLIST(IROW,13)= EVLIST(IROW,13)+1
        TGT(INT,14)= TGT(INT,14)+1
        TDES(HO,H,1)= 0.0
        TDES(HO,H,2)= 0.0
3000    CONTINUE
1700    CONTINUE
100     CONTINUE
C
C       HAVE NOW FINISHED ASSESSING THE ROUNDS
C
        IF(EVLIST(IROW,16) .EQ. 1) GO TO 2000
        SE= SMBE/2
        SN= SMBN/2
        CALL NAIMPT(SE,SN)
        CALL ADJUST
        GO TO 6000
2000    CALL ENGAGE
6000    RETURN
        END


        SUBROUTINE BPNT(TRANGE,GTA,I,J,BLOCE,BLOCN)
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
```

```
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      CALL NGEN(0.0,CEVENT(25+I),ERNG)
      CALL NGEN(0.0,CEVENT(28+I),ERDEF)
C
C     DETERMINE BURST LOCATION IN WEAPON COORDINATE SYSTEM
C
      APTE= ARDATA(I,J,3)+TRANGE*SIN(GTA)
      APTN= ARDATA(I,J,4)+TRANGE*COS(GTA)
C     TRANSFORM COORDINATES TO BASE COORDINATE SYSTEM
C
      BLOCE= ERDEF*COS(GTA)+ERNG*SIN(GTA)+APTE
      BLOCN= ERNG*COS(GTA)-ERDEF*SIN(GTA)+APTN
6000  RETURN
      END


      SUBROUTINE SHIFT(RE,DE,ME,MN)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      REAL ME,MN
C
      IF (RE .GT. 800) MN= 1000.
      IF (RE .GT. 600 .AND. RE .LE. 800) MN= 800.
      IF (RE .GT. 400 .AND. RE .LE. 600) MN= 600.
      IF (RE .GT. 200 .AND. RE .LE. 400) MN= 400.
      IF (RE .GT. 100 .AND. RE .LE. 200) MN= 200.
      IF (RE .GT. 50 .AND. RE .LE. 100) MN= 100.
      IF (RE .LE. 50) MN=0.0
      I= DE/10
      ME= I*10
      IF (RE .LT. 50 .AND. DE .LT. 50) GO TO 100
      GO TO 6000
100   EVLIST(IROW,16)= 1.0
      EVLIST(IROW,32)= CEVENT(6)
      EVLIST(IROW,33)= CEVENT(7)
6000  RETURN
      END
```

```
      SUBROUTINE NAIMPT(SE,SN)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      REAL ME,MN
      REAL GTA
C
      IR= CEVENT(4)
      TLN= TGT(IR,4)
      TLE= TGT(IR,3)
      NUNIT= EVLIST(IROW,8)
C
C     DETERMINE THE ERROR IN DETERMINING THE APPARANT LOCATION OF THE
C     ROUNDS
C
      ARG= (SE-GDATA(NUNIT,12))/(SN-GDATA(NUNIT,13))
      GTA= ATAN(ARG)
      RAN= DIST(TLN,TLE,GDATA(NUNIT,13),GDATA(NUNIT,12))
      VARDEF= PRDATA(2,5,4,1)+RAN*PRDATA(2,5,4,2)
      VARRNG= PRDATA(2,5,5,1)+RAN*PRDATA(2,5,5,2)
      CALL TNGEN(0.0,VARDEF,-PRDATA(2,5,4,4),PRDATA(2,5,4,4),TE)
      CALL TNGEN(0.0,VARRNG,-PRDATA(2,5,5,4),PRDATA(2,5,5,4),TN)
C
C     TRANSFORM THE COORDINATES
C
      ERE= TE*COS(GTA)+TN*SIN(GTA)
      ERN= TN*COS(GTA)-TE*SIN(GTA)
      ABE= SE+ERE
      ABN= SN+ERN
C
C     DETERMINE TARGET LOCATION IN FO COORDINATE SYSTEM
C
      TL1E= TLE-GDATA(NUNIT,12)
      TL1N= TLN-GDATA(NUNIT,13)
      GTA= EVLIST(IROW,43)
      TLEFO= TL1E*COS(GTA)-TL1N*SIN(GTA)
      TLNFO= TL1N*COS(GTA)+TL1E*SIN(GTA)
C
C     DETERMINE COORDINATES OF APPARANT LOCATION OF BURST IN FO
C     COORDINATE SYSTEM
C
      AB1E= ABE-GDATA(NUNIT,12)
      AB1N= ABN-GDATA(NUNIT,13)
      ABEFO= AB1E*COS(GTA)-AB1N*SIN(GTA)
      ABNFO= AB1N*COS(GTA)+AB1E*SIN(GTA)
```

```
C
C      DETERMINE THE SHIFT REQUIRED
C
       DE= ABS(TLEFO-ABEFO)
       RE= ABS(TLNFO-ABNFO)
       CALL SHIFT(RE,DE,ME,MN)
       IF(ABEFO .GT. TLEFO) GO TO 110
       XE= ME
       GO TO 120
110    XE=-ME
120    IF(ABNFO .GT. TLNFO) GO TO 130
       XN= MN
       GO TO 500
130    XN=-MN
C
C      TRANSFORM NEW AIMPOINT IN FO COORDINATE SYSTEM TO BASE
C      COORDINATE SYSTEM
C
500    CONTINUE
       SEB= XE*COS(GTA)+XN*SIN(GTA)
       SNB= XN*COS(GTA)-XE*SIN(GTA)
       EVLIST(IROW,6)= EVLIST(IROW,6)+ SEB
       EVLIST(IROW,7)= EVLIST(IROW,7)+SNB
6000   RETURN
       END


       SUBROUTINE NGEN (R,S,RESULT)
C
       REAL GDATA, PRDATA, TGT
       COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
       COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
       SUM=0.0
       DO 1000 I=1,12
       CALL UNIF (RN)
1000   SUM=SUM+RN
       RINT= SUM-6
       RESULT= RINT*SQRT(S)+R
       RETURN
       END
```

```
      SUBROUTINE TNGEN(SMN,SVAR,SLFT,SRGHT,SRES)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
100   CALL NGEN(SMN,SVAR,S)
      IF(S .GE. SLFT .AND. S .LE. SRGHT) GO TO 200
      GO TO 100
200   SRES=S
      RETURN
      END


      SUBROUTINE UNIF (RN)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      REAL GDATA, PRDATA, TGT
      REAL MOD
C
      MOD=2**31
      NR=129*NU+1
      RN= NR/MOD
      IF (RN.LT.0.0)RN=-RN
      NU=NR
      RETURN
      END


      SUBROUTINE UGEN(SLO,SAP,RESULT)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      REAL GDATA, PRDATA, TGT
C
      CALL UNIF (RNNR)
      RESULT= SLO+((SAP-SLO)*RNNR)
      RETURN
      END
```

```
      SUBROUTINE EVENT (NUNIT,ICOL,IRESLT)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      REAL GDATA, PRDATA, TGT
      DIMENSION ARY(8)
C
      DO 1700 I=1,8
1700  ARY(I)= 0.0
      SUM= 0.0
      DO 100 I=1,8
      IF(NUNIT .NE. 10) GO TO 90
      SUM= SUM+ PRDATA(3,2,10,I)
      ARY(I)= SUM
      GO TO 100
90    CONTINUE
      IF(NUNIT .NE. 11) GO TO 91
      SUM= SUM+PRDATA(3,2,9,I)
      ARY(I)= SUM
      GO TO 100
91    CONTINUE
      IF(NUNIT .NE. 12) GO TO 92
      SUM= SUM+PRDATA(3,2,12,I)
      ARY(I)= SUM
      GO TO 100
92    CONTINUE
      IF(NUNIT .NE. 13) GO TO 93
      SUM= SUM+PRDATA(3,2,14,I)
      ARY(I)= SUM
      GO TO 100
93    SUM= SUM+PRDATA(1,NUNIT,ICOL,I)
      ARY(I)= SUM
100   CONTINUE
      CALL UNIF(RNNR)
      IRESLT=0
      IF(RNNR .GE. ARY(1)) GO TO 200
      IRESLT=1
      GO TO 400
200   CONTINUE
      DO 201 I=1,7
      IF(RNNR .GE. ARY(I) .AND. RNNR .LT. ARY(I+1)) GO TO 202
      IF(ARY(I+1) .EQ. 1) GO TO 202
201   CONTINUE
```

```
      GO TO 400
202   IRESLT= I+1
400   IF(NUNIT .NE. 10) GO TO 600
      IN= IRESLT
      IRESLT= PRDATA(3,2,11,IN)
      RETURN
600   CONTINUE
      IF( NUNIT .NE. 12) GO TO 610
      IN= IRESLT
      IRESLT= PRDATA(3,2,13,IN)
      RETURN
610   CONTINUE
      IF(NUNIT .GT. 7) RETURN
      IF(ICOL .NE. 6 .AND. ICOL .NE. 7) RETURN
      IF(ICOL .EQ. 6) IR= 18
      IF(ICOL .EQ. 7) IR=19
      IN= IRESLT
      IRESLT= PRDATA(1,NUNIT,IR,IN)
      RETURN
      END

      SUBROUTINE TNE
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      SMIN= 1000000.
      DO 1000 I=1,250
      IF (EVLIST(I,50) .EQ. 0) GO TO 1000
      IF (EVLIST(I,1) .LT. SMIN) GO TO 1100
1000  CONTINUE
      GO TO 1300
1100  SMIN= EVLIST(I,1)
      IROW= I
      GO TO 1000
1300  DO 1200 J=1,50
1200  CEVENT(J)= EVLIST(IROW,J)
      RETURN
      END
```

```
      SUBROUTINE SETUP
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
      DIMENSION CFLL(2)
C
      CTIME=0.0
      TINC=0.0
      TOPT=0.0
      ITGT=0
      SHOUR=0.0
      IROW=0
      J100= 1
      J200= 1
      DO 2501 I=1,7
      DO 2501 J=1,20
 2501 GDATA(I,J)= 0.0
      DO 1100 I=1,250
      DO 1100 J=1,40
 1100 TGT(I,J)= 0.0
      DO 1101 I=1,10
      DO 1101 J=1,300
      DO 1101 K=1,4
 1101 TDES(I,J,K)= 0.0
      DO 1102 I=1,50
 1102 CEVENT(I)=0.0
      DO 6310 I=1,250
      DO 6310 J=1,50
 6310 EVLIST(I,J)=0.0
      DO 1103 I=1,7
 1103 GDATA(I,2)= 1.0
      DO 1104 I=1,4
      DO 1104 J=1,7
      DO 1104 K=1,16
 1104 ARDATA(I,J,K)= 0.0
      DO 1201 J=1,10
 1201 SUP(J)= 0.0
      DO 2733 I=1,4
      DO 2733 J=1,20
      DO 2733 K=1,50
 2732 Q(I)=0.0
 2733 QUES(I,J,K)= 0.0
      DO 1215 I=1,20
      DO 1215 J=1,4
 1215 STAT(I,J)= 0.0
```

```
C
C     LOCATE UNITS ON THE FEBA AND DEFINE THE OBJECTIVES
C
      DO 999 I=1,2
      CALL TNGEN(PRDATA(1,1,2,1),PRDATA(1,1,2,2),PRDATA(1,1,2,3),
     2PRDATA(1,1,2,4),CFLL(I))
999   CONTINUE
      CALL TNGEN(PRDATA(1,5,2,1),PRDATA(1,5,2,2),PRDATA(1,5,2,3),
     2PRDATA(1,5,2,4),BFL)
      CALL TNGEN(PRDATA(1,7,2,1),PRDATA(1,7,2,2),PRDATA(1,7,2,3),
     2PRDATA(1,7,2,4),BDFL)
      GDATA (7,5) =BDFL
      GDATA(4,5)= BDFL
      GDATA (1,5)= CFLL(1)
      GDATA (3,5)= BFL+ CFLL(2)
      GDATA (2,5)= BFL
      GDATA(5,5)= BFL
      GDATA (6,5)= BDFL
      GDATA (2,3)= GDATA (1,5)
      GDATA (3,3)= BFL
      GDATA (4,3)= GDATA (3,5)
      GDATA (6,3)= BFL
      DO 1105 I=1,4
1105  EVLIST(I,50)= 1.0
      GDATA(1,1)=1.0
      GDATA(2,1)=2.0
      GDATA(3,1)=3.0
      GDATA(4,1)=4.0
      GDATA(5,1)=5.
      GDATA(6,1)=6.0
      GDATA(7,1)=7.0
C
C     LOCATE OBJECTIVE CENTERS AND FIREPLANNING CENTER
C
C     LOCATE OBJECTIVES CENTERS
C
      DO 200 I=1,7
      GDATA (I,12)= (GDATA (I,3)+GDATA(I,5))/2
      GDATA (I,13)= (GDATA (I,4)+GDATA(I,6))/2
      CALL TNGEN(PRDATA(1,I,3,1),PRDATA(1,I,3,2),PRDATA(1,I,3,3),
     2PRDATA(1,I,3,4),DIS)
      GDATA (I,8)= (GDATA (I,4)+GDATA(I,6))/2+ DIS
      GDATA(I,19)= GDATA(I,8)
      CALL TNGEN(GDATA(I,12),PRDATA(1,I,17,2),GDATA(I,3),
     2GDATA(I,5),GDATA(I,7))
200   CONTINUE
C
C     DEFINE ATTITUDE AND AXIS LENGTH FOR EACH OBJECTIVE
```

```
C
      DO 300 I=1,7
      CALL TNGEN(PRDATA(1,I,4,1),PRDATA(1,I,4,2),PRDATA(1,I,4,3),
     2PRDATA(1,I,4,4),GDATA(I,9))
      CALL TNGEN(PRDATA(1,I,5,1),PRDATA(1,I,5,2),PRDATA(1,I,5,3),
     2PRDATA(1,I,5,4),GDATA(I,10))
      CALL UGEN(-.528,.528,GDATA(I,11))
      GO TO 300
302   GDATA (I,11)= ANGLE
300   CONTINUE
C
C     LOCATE BASE LINES FOR UNITS
C
      DO 9500 I=1,7
9500  GDATA(I,17)= GDATA(I,12)
C
C     DO INITIAL FIRE PLANNING
C
      DO 1600 NUNIT= 1,7
      CALL FIPLAN (NUNIT)
1600  CONTINUE
      CALL IALOC
      CALL FIALOC(CTIME)
      CALL START
      CALL IPROUT
      RETURN
      END


      SUBROUTINE EXPON(RTIME)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      CALL UNIF(RNNR)
      RTIME= -ALOG(RNNR)*EXMN
      RETURN
      END


      SUBROUTINE RDPAR
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
```

```
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
C     ZERO ALL ARRAYS
C
      DO 2500 I=1,3
      DO 2500 IA=1,7
      DO 2500 IB=1,20
      DO 2500 IC=1,10
2500  PRDATA(I,IA,IB,IC)= 0.0
      DO 2506 I= 1,4
      DO 2506 J=1,50
      DO 2506 K= 1,3
2506  FD105(I,J,K)= 0.0
      DO 1702 I=1,7
1702  GDATA (I,2)= 1.0
C
C     READ IN MANEUVER ELEMENT GEOMETRICAL AND MOVEMENT PARAMETERS
C
      READ(5,100) ((PRDATA(1,1,J,K),K=1,4),J=2,5)
      READ(5,100) ((PRDATA(1,5,J,K),K=1,4),J=2,5)
      READ(5,100) ((PRDATA(1,7,J,K),K=1,4),J=2,5)
      READ(5,100) (PRDATA(1,1,16,K),K=1,2)
      READ(5,100) PRDATA(1,1,17,2),PRDATA(1,5,17,2),PRDATA(1,7,17,2)
C
C     READ IN THE FIREPLANNING PARAMETERS
C
      J=1
1000  READ(5,101) (PRDATA(1,J,18,K),K=1,8),(PRDATA(1,J,6,K),K=1,8),
     2(PRDATA(1,J,19,K),K=1,8),(PRDATA(1,J,7,K),K=1,8),
     3((PRDATA(1,J,K,L),L=1,8),K=8,15)
      IF(J .EQ. 1) IN=5
      IF(J .EQ. 5) IN=7
      IF(J .EQ. 7) GO TO 1100
      J=IN
      GO TO 1000
1100  DO 1200 J=2,4
      DO 1200 K=2,20
      DO 1200 L=1,10
1200  PRDATA(1,J,K,L)= PRDATA(1,1,K,L)
      DO 1250 K=2,20
      DO 1250 L=1,10
1250  PRDATA(1,6,K,L)=PRDATA(1,5,K,L)
      DO 1260 I=2,7
      DO 1260 J=1,2
1260  PRDATA(1,I,16,J)= PRDATA(1,1,16,J)
C
C     READ IN ARTILLERY PARAMETERS
```

```
C
      READ(5,100) ((PRDATA(2,1,I,J),J=1,4),I=4,15)
      READ(5,100) ((PRDATA(2,4,I,J),J=1,4),I=2,13)
      READ(5,100) ((PRDATA(2,5,I,J),J=1,4),I=2,5)
      DO 1300 I=2,3
      DO 1300 J=4,15
      DO 1300 K=1,10
 1300 PRDATA(2,I,J,K)= PRDATA(2,1,J,K)
      READ(5,101) ((PRDATA(3,2,I,J),J=1,8),I=2,14)
C
C     READ IN THE BALLISTIC PARAMETERS
C
      READ(5,102) NCHGS,NRINC
      READ(5,100) RMAX
      DO 1400 I=1,NCHGS
      DO 1400 J=1,3
 1400 READ(5,101) (FD105(I,K,J),K=1,NRINC)
      READ(5,102) NU,NGUNS
C
C     READ THE TARGET DESCRIPTION PARAMETERS
C
      READ(5,100) PRDATA(3,1,11,1)
      READ(5,100) ((PRDATA(3,1,I,J),J=1,4),I=1,10)
C     READ IN MISCELLANEOUS PARAMETERS
      READ(5,103) EXMN,XLETH
      RETURN
  100 FORMAT(4F10.2)
  101 FORMAT(8F10.2)
  102 FORMAT(2I10)
  103 FORMAT(F10.3)
      END


      SUBROUTINE EARRAY(IOPEN)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      DO 100 I=6,250
      IF (EVLIST(I,50) .EQ. 0) GO TO 200
  100 CONTINUE
      CALL TERM(1,1)
      CALL EXIT
  200 IOPEN=I
      EVLIST(I,50)= 1.0
```

```
      RETURN                                                            MH 01120
      END                                                               MH 01130

      SUBROUTINE HARRAY(IR)                                             MH 01140
C                                                                       MH 01150
C     THIS SUBROUTINE LOCATES AN EMPTY STORAGE LOCATION IN THE TARGET   MH 01160
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,         MH 01170
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),  MH 01180
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                   MH 01190
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,   MH 01200
     2XTLETH ,STAT(20,4)                                                MH 01210
C                                                                       MH 01220
      DO 100 I=1,250                                                    MH 01230
      IF (TGT(I,40) .EQ. 0) GO TO 200                                   MH 01240
  100 CONTINUE                                                          MH 01250
      CALL TERM(2,1)                                                    MH 01260
      CALL EXIT                                                         MH 01270
  200 IR=I                                                              MH 01280
      TGT(I,40)= 1.0                                                    MH 01290
      TGT(I,39)= 1.0                                                    MH 01300
      RETURN                                                            MH 01310
      END                                                               MH 01320

      SUBROUTINE DARRAY(IS)                                             MH 01330
C                                                                       MH 01340
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,         MH 01350
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),  MH 01360
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                   MH 01370
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,   MH 01380
     2XTLETH ,STAT(20,4)                                                MH 01390
C                                                                       MH 01400
      DO 100 I=1,10                                                     MH 01410
      IF (TDES(I,300,1) .EQ. 0) GO TO 200                               MH 01420
  100 CONTINUE                                                          MH 01430
      CALL TERM(3,1)                                                    MH 01440
      CALL EXIT                                                         MH 01450
  200 IS=I                                                              MH 01460
      TDES(I,300,1)= 1.0                                                MH 01470
      RETURN                                                            MH 01480
      END                                                               MH 01490
```

```
      SUBROUTINE IPROUT
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
C     PRINT PART I
C
C     PRINT SECTION I
C
      WRITE(6,100)
      WRITE(6,101)
      WRITE(6,102) ((PRDATA(1,7,J,K),K=1,4),J=2,5),((PRDATA(1,7,K,J),
     2J=1,2),K=16,17)
      WRITE(6,103)
      WRITE(6,102) ((PRDATA(1,5,J,K),K=1,4),J=2,5),((PRDATA(1,5,K,J),J=
     21,2),K=16,17)
      WRITE(6,104)
      WRITE(6,102) ((PRDATA(1,1,J,K),K=1,4),J=2,5),((PRDATA(1,1,K,J),
     2J=1,2),K=16,17)
      WRITE(6,110)
C
C     PRINT SECTION II
C
      WRITE(6,100)
      WRITE(6,105)
      WRITE(6,106)
      WRITE(6,107) (PRDATA(1,7,18,J),J=1,8),(PRDATA(1,7,6,J),J=1,8),
     2((PRDATA(1,7,K,J),J=1,3),K=8,14,2)
      WRITE(6,108)
      WRITE(6,107) (PRDATA(1,7,19,J),J=1,8),(PRDATA(1,7,7,J),J=1,8),
     2((PRDATA(1,7,K,J),J=1,3),K=9,15,2)
      WRITE(6,100)
      WRITE(6,103)
      WRITE(6,106)
      WRITE(6,107) (PRDATA(1,5,18,J),J=1,8),(PRDATA(1,5,6,J),J=1,8),
     2((PRDATA(1,5,K,J),J=1,3),K=8,14,2)
      WRITE(6,108)
      WRITE(6,107) (PRDATA(1,5,19,J),J=1,8),(PRDATA(1,5,7,J),J=1,8),
     2((PRDATA(1,5,K,J),J=1,3),K=9,15,2)
      WRITE(6,100)
      WRITE(6,104)
      WRITE(6,106)
      WRITE(6,107) (PRDATA(1,1,18,J),J=1,8),(PRDATA(1,1,6,J),J=1,8),
```

```
     2((PRDATA(1,1,K,J),J=1,3),K=8,14,2)
      WRITE(6,108)
      WRITE(6,107) (PRDATA(1,1,19,J),J=1,8),(PRDATA(1,1,7,J),J=1,8),
     2((PRDATA(1,1,K,J),J=1,3),K=9,15,2)
      WRITE(6,100)
C
C     PRINT SECTION III
C
      WRITE(6,111) ((PRDATA(2,1,J,K),K=1,2),J=4,5),((PRDATA(2,1,J,K),K=
     21,4),J=6,8),(PRDATA(2,1,9,K),K=1,2)
      DO 36 J=1,6
      L=J+9
36    WRITE(6,1110) J,(PRDATA(2,1,L,K),K=1,4)
      WRITE(6,1111)
      WRITE(6,100)
C
C     PRINT SECTION IV
C
      WRITE(6,112) ((PRDATA(2,4,J,K),K=1,4),J=2,7)
      WRITE(6,1120) ((PRDATA(2,4,J,K),K=1,4),J=8,9)
      WRITE(6,1121) ((PRDATA(2,4,J,K),K=1,4),J=10,13),((PRDATA(2,5,J,K)
     2,K=1,2),J=2,5)
      WRITE(6,100)
C
C     PRINT SECTION V
C
      WRITE(6,113)
      WRITE(6,114)
      WRITE(6,192) (PRDATA(3,1,10,J),J=1,2),((PRDATA(3,1,J,K),K=1,2),
     2J=2,4),(PRDATA(3,1,1,K),K=1,2)
      WRITE(6,116)
      WRITE(6,192) (PRDATA(3,1,9,J),J=1,2),((PRDATA(3,1,J,K),K=1,2),
     2J=6,8),(PRDATA(3,1,5,K),K=1,2)
      WRITE(6,100)
C
C     PRINT SECTION VI
C
      WRITE(6,117)
      SUM=0.0
      DO 1200 I=1,8
      SUM=SUM+PRDATA(3,2,9,I)
      WRITE(6,118) I,(PRDATA(3,2,I,J),J=1,2)
      IF(SUM .EQ. 1) GO TO 1201
1200  CONTINUE
1201  CONTINUE
      WRITE(6,119) (PRDATA(3,2,11,J),J=1,8),(PRDATA(3,2,10,J),J=1,8)
      WRITE(6,120) (PRDATA(3,2,13,J),J=1,8),(PRDATA(3,2,12,J),J=1,8)
      WRITE(6,121)
```

```
      WRITE(6,122) (PRDATA(3,2,9,J),J=1,8)
      WRITE(6,123)
      WRITE(6,122) (PRDATA(3,2,14,J),J=1,8)
      WRITE(6,124)
      WRITE(6,100)
C
C     PRINT SECTION VII
C
      WRITE(6,125)
      DO 1210 I=1,NCHGS
      WRITE(6,126) I
      WRITE(6,127)
      DO 1209 J=1,NRINC
      ISK=500*J
 1209 WRITE(6,128) ISK,(FD105(I,J,K),K=1,3)
      WRITE(6,1281)
      WRITE(6,100)
 1210 CONTINUE
C
C     PRINT SECTION VIII
C
      WRITE(6,129)
      DO 1300 I=2,40,2
      XKL=I*1.
      XKI=EXP(-((I*1.)**2/XLETH**2))
 1300 WRITE(6,130) XKL,XKI
      DO 1301 I=50,300,10
      XKL=I*1.
      XKI=EXP(-((I*1.)**2/XLETH**2))
 1301 WRITE(6,130) XKL,XKI
      WRITE(6,131) XLETH
      WRITE(6,100)
C
C     PRINT PART II
C
C     PRINT SECTION I
C
      WRITE(6,132)
      IN=7
      IM=7
 1399 CONTINUE
      DO 1400 I=IN,IM
      IF(I .LE. 4) WRITE(6,135) I
      IF(I .EQ. 5 .OR. I .EQ. 6) WRITE(6,134) I
      IF( I .EQ. 7) WRITE(6,133)
      WRITE(6,136) (GDATA(I,J),J=3,5,2),(GDATA(I,J),J=7,10),(GDATA(I,J)
     2,J=12,13)
      WRITE(6,100)
```

```
1400   CONTINUE
       IF(IN .NE. 7) GO TO 1401
       IN=5
       IM=6
       GO TO 1399
1401   IF(IN .NE. 5) GO TO 1402
       IN=1
       IM=4
       GO TO 1399
1402   CONTINUE
C
C      PRINT SECTION II
C
       WRITE(6,137)
       DO 1500 I=1,3
       WRITE(6,138) I
       IF(ARDATA(I,7,6) .LT. 0) ARDATA(I,7,6)= 6.28-ABS(ARDATA(I,7,6))
       SBAT= 6400.*ARDATA(I,7,6)/(2*3.14)
       WRITE(6,139) (ARDATA(I,7,J),J=3,4),(ARDATA(I,7,J),J=7,10),
     2SBAT,(J,(ARDATA(I,J,K),K=3,4),J=1,6)
       WRITE(6,100)
1500   CONTINUE
C
C      PRINT PART III
C
       WRITE(6,140)
       K=0
       DO 1600 I=1,ITGT
       IF( TGT(I,7) .EQ. 1 .AND. TGT(I,11) .EQ. 0) GO TO 1600
       WRITE(6,141) K,(TGT(I,J),J=1,2)
       K=K+1
       IF(TGT(I,5) .EQ. 1) WRITE(6,142)
       IF(TGT(I,6) .EQ. 1) WRITE(6,143)
       IF(TGT(I,7) .EQ. 1) WRITE(6,144)
       WRITE(6,145) (TGT(I,J),J=3,4),TGT(I,11)
       IF(TGT(I,6) .EQ. 1) GO TO 1600
       WRITE(6,146) TGT(I,8)
1600   CONTINUE
       WRITE(6,100)
       RETURN
100    FORMAT(1H1)
101    FORMAT(T63,'PART I'//T61,'SECTION I'//T49,'BASIC MANEUVER ELEMENT
     2 PARAMETERS'////T7,'DESCRIPTION',T35,'TYPE OF DISTRIBUTION',T70,
     3'MEAN',T85,'VARIANCE',T100,'LOWER',T115,'UPPER'/T100,'LIMIT',
     4T115, 'LIMIT'///T60,'BRIGADE DATA'////)
102    FORMAT(1X,'WIDTH OF FRONT',T37,'TRUNCATED NORMAL',T65,F10.2,
     2T84,F10.2,T98,F10.2,T113,F10.2//1X,'DISTANCE TO OBJECTIVE',T37,
     3'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2//
```

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      51X,'LENGTH OF OBJ MAJ AXIS',T37,'TRUNCATED NORMAL',T65,F10.2,       MI 01910
      6T84,F10.2,T98,F10.2,T113,F10.2//1X,'LENGTH OF OBJ MIN AXIS',        MI 01920
      7T37 ,'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2//MI 01930
      8  1X,'MOVEMENT RATE (KM/HR)',T37,'UNIFORM',T98,F10.2,T113,          MI 01940
      2F10.2//1X,'LATERAL DISPLACEMENT OF UNIT',T37,'TRUNCATED NORMAL',    MI 01950
      2T65,F10.2,T84,F10.2,T98,'SEE NOTE'/1X,'OBJECTIVE ABOUT UNIT'/1X,'CMI 01960
      2ENTER LINE'/)                                                       MI 01970
103   FORMAT(T59,'BATTALION DATA'///)                                     MI 01980
104   FORMAT(T60,'COMPANY DATA'///)                                       MI 01990
105   FORMAT(T61,'SECTION II'//T54,'FIREPLANNING PARAMETERS'///           MI 02000
      2T60,'BRIGADE DATA'///)                                              MI 02010
106   FORMAT(T56,'FIREPLANNING STATE 1'/T56,'--------------------'//)     MI 02020
107   FORMAT(1X,'VALUES FOR NUMBER OF TARGETS UNIT WILL',T80,8F6.2/1X,    MI 02030
      2'PLAN IN THE FIREPLANNING PROCESS'//1X,'PROBABILITIES ASSOCIATED WMI 02040
      3ITH THE ABOVE VALUES',T80,8F6.2//1X,'PROBABILITY THAT A RANDOM TARMI 02050
      4GET IS A',T80,3F6.2/1X,'PREPARATORY TARGET, SCHEDULED TARGET'/1X, MI 02060
      3'OR AN ON CALL TARGET'//1X,'PROBABILITY THAT A RANDOM PREPARATORY MI 02070
      4TARGET',T80,3F6.2/1X,'IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN THMI 02080
      5E'/1X,'LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE'/1X,'OR BMI 02090
      7EYOND THE UNIT OBJECTIVE'//1X,'PROBABILITY THAT A RANDOM SCHEDULEDMI 02100
      8', T80,3F6.2/1X,'TARGET IS LOCATED ON THE UNIT OBJECTIVE, BETWEEN MI 02110
      9THE'/1X,'LINE OF DEPARTURE(OR FEBA) AND THE UNIT OBJECTIVE'//      MI 02120
      31X,'PROBABILITY THAT A RANDOM ON CALL TARGET',T80,3F6.2/1X,         MI 02130
      3'IS LOCATED ON THE UNIT OBJECTIVE,BETWEEN THE'/1X,'LINE OF DEPARTUMI 02140
      4RE(OR FEBA) AND THE UNIT OBJECTIVE'/1X,'OR BEYOND THE UNIT OBJECTIMI 02150
      5VE'/////)                                                           MI 02160
108   FORMAT(T56,'FIREPLANNING STATE 2'/T56,'--------------------'//)     MI 02170
110   FORMAT(///10X,'NOTES'//10X,'(1) ALL DISTANCE MEASUREMENTS ARE IN MI 02180
      2METERS'/10X,'(2) BOUNDS ON THE LATERAL DISPLACEMENT OF THE UNIT OBMI 02190
      3JECTIVES'/14X,'ARE FUNCTIONS OF THE RESPECTIVE UNIT LEFT AND RIGHTMI 02200
      4 BOUNDARIES')                                                       MI 02210
111   FORMAT(T60,'SECTION III'//T53,'ARTILLERY UNIT PARAMETERS'//////     MI 02220
      2T7,'DESCRIPTION',T35,'TYPE OF DISTRIBUTION',T70,'MEAN',T85,         MI 02230
      3'VARIANCE',T100,'LOWER',T115,'UPPER'/T100,'LIMIT',T115,'LIMIT'//   MI 02240
      41X,'BATTERY LATERAL DISPLACEMENT',T37,'TRUNCATED NORMAL',T65,       MI 02250
      5F10.2,T84,F10.2,T98,'SEE NOTES'/1X,'ABOUT THE CENTER LINE'/1X,      MI 02260
      6'OF THE SUPPORTED UNIT'//1X,'BATTERY DEPTH DISPLACEMENT',T37,       MI 02270
      6'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,'SEE NOTES'/             MI 02280
      61X,                                                                 MI 02290
      6'BEHIND THE FRONT LINE'/1X,'OF THE SUPPORTED UNIT'//1X,'MARCH ORDEMI 02300
      7R TIME (SEC)',T37,'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,           MI 02310
      8T98,F10.2,T113,F10.2//1X,'MOVEMENT RATE(KM/HR)',T37,                MI 02320
      9'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2//       MI 02330
      21X,'UNIT EMPLACEMENT TIME (SEC)',T37,'TRUNCATED NORMAL',T65,F10.2,MI 02340
      3T84,F10.2,T98,F10.2,T113,F10.2//1X,'POSITION ERROR COMPONENT',T37,MI 02350
      4'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,'SEE NOTE'////           MI 02360
      4T55,'DISPERSION OF WEAPONS'//,T55,'UNIFORM DISTRIBUTIONS'//         MI 02370
      4T10,'WEAPON',T50,'DEPTH DISPERSION',T100,'LATERAL DISPERSION'//T40MI 02380
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     4,'LOWER LIMIT',T65,                                               MI 02390
     7'UPPER LIMIT',T90,'LOWER LIMIT',T118,'UPPER LIMIT'/)               MI 02400
1110   FORMAT(T12,I2,T42,F6.1,T67,F6.1,T92,F6.1,T120,F6.1)              MI 02410
1111   FORMAT(                          ///10X,'NOTES'//10X,'(1) BOUNDS ON LAMI 02420
     8TERAL DISPLACEMENTS ARE THE LATERAL BOUNDARIES OF THE SUPPORTED UNMI 02430
     9IT'//10X,'(2) BOUNDS ON THE DEPTH DISPLACEMENT ARE THE FRONT LINE MI 02440
     2 AND A POINT MAX RANGE BEHIND THE FRONT LINE'//10X,'(3) LATERAL BOMI 02450
     3UNDS ON THE ERROR COMPONENT ARE FUNCTIONS OF THE BOUNDS IN (1) ANDMI 02460
     4 (2) ABOVE'//10X,'(4) DISTANCE MEASURES ARE IN METERS'//           MI 02470
     610X,'(5) TIME MEASURES ARE IN SECONDS'/)                           MI 02480
112    FORMAT(T61,'SECTION IV'//T49,'FIRE MISSION PROCESSING PARAMETERS'MI 02490
     2///  T7,'DESCRIPTION',T35,'TYPE OF DISTRIBUTION',T70,'MEAN',T85,   MI 02500
     3'VARIANCE',T102,'LOWER',T117,'UPPER'/T102,'LIMIT',T117,'LIMIT'/// MI 02510
     51X,'TIME FOR THE FO TO PREPARE',T37,'TRUNCATED NORMAL',T65,F10.2,TMI 02520
     684,F10.2,T98,F10.2,T113,F10.2/1X,'THE FIRE MISSION FOR A'/1X, 'TARMI 02530
     6GET OF OPPORTUNITY'//1X,'TIME FOR THE FO TO TRANSMIT',T37,'TRUNCATMI 02540
     7ED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2/2X,'THE REQUESMI 02550
     8T FOR FIRE TO'/1X,'THE FDC'//1X,'TIME REQUIRED TO CONDUCT THE',T37MI 02560
     6,'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2/1X,   MI 02570
     6'ANALYSIS OF THE TARGET'//1X,'TIME REQUIRED FOR THE ADJUSTING',T37MI 02580
     6,'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2/1X,   MI 02590
     6'UNIT TO PREPARE AND FIRE'/1X,'A VOLLEY IN THE ADJUSTMENT'//1X,    MI 02600
     6'TIME FOR THE FO TO MAKE',T37,'TRUNCATED NORMAL',T65,F10.2,T84,F10MI 02610
     6.2,T98,F10.2,T113,                                                 MI 02620
     5F10.2/1X,'ADJUSTMENT CORRECTIONS AND'/1X,'TRANSMIT THEM TO FDC'//1MI 02630
     7X,'TIME FOR FDC TO COMPUTE',T37,'TRUNCATED NORMAL',T65,F10.2,T84, MI 02640
     6F10.2,T98,F10.2,T113,F10.2/1X,'NEW ADJUSTING FIRING DATA AND')     MI 02650
1120   FORMAT(1X,'TRANSMIT IT TO THE ADJUSTING UNIT'//1X,'TIME FOR FDC TMI 02660
     2O SELECT A',T37,'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,  MI 02670
     3T113,F10.2/1X,'MASS POINT IN THE FIRE FOR'/1X,'EFFECT PHASE,COMPUTMI 02680
     4E THE DATA,'/1X,'AND TRANSMIT IT TO THE FIRING'/1X,'UNITS'//       MI 02690
     51X,'TIME REQUIRED FOR A FIRING',T37,'TRUNCATED NORMAL',T65,F10.2,TMI 02700
     584,F10.2,T98,F10.2,T113,F10.2/                                     MI 02710
     61X,'UNIT TO PREPARE AND FIRE A'/1X,'VOLLEY IN FIRE FOR EFFECT WHENMI 02720
     5'/1X,'THE DATA IS DIFFERENT FROM'/1X,'THAT USED IN THE PREVIOUS') MI 02730
1121   FORMAT(1X,'VOLLEY'//1X,'TIME REQUIRED FOR A FIRING',T37,'TRUNCATEMI 02740
     2D NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2/1X,'UNIT TO PREMI 02750
     3PARE AND FIRE A'/1X,'VOLLEY IN FIRE FOR'/1X,'EFFECT WHEN THE FIRINMI 02760
     3G DATA'                                                            MI 02770
     7/1X,'IS UNCHANGED'//1X,'TIME FOR THE REINFORCING UNIT',T37,'TRUNCAMI 02780
     7TED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,T113,F10.2/1X,'TO SHOOT MI 02790
     7A TARGET OF OPPORTUNITY'/1X,'MISSION'//1X,'TIME FOR THE REINFORCINMI 02800
     8G UNIT',T37,'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,      MI 02810
     9T113,F10.2/1X,'TO SHOOT A SCHEDULED MISSION'//1X,'TIME FOR REINFORMI 02820
     2CING UNIT',T37,'TRUNCATED NORMAL',T65,F10.2,T84,F10.2,T98,F10.2,   MI 02830
     4T113,F10.2/1X,'TO SHOOT A PREP MISSION'///  T55,'BASIC ERROR PARAMMI 02840
     3ETERS'//T28,'PARAMETERS FOR LINEAR FUNCTIONS REPRESENTING VARIANCEMI 02850
     2 AS A FUNCTION OF RANGE'//T7,'DESCRIPTION',T33,'INTERCEPT',        MI 02860
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      2T53,'SLOPE'//                                                    MI 02870
      61X,'EASTING COMPONENT OF TARGET',T32,F10.4,T48,F10.4/1X,'LOCATION MI 02880
      6ERROR'//1X,'NORTHING COMPONENT OF TARGET',T32,F10.4,T48,F10.4/1X, MI 02890
      3'LOCATION ERROR'//1X,'DEFLECTION COMPONENT OF',T32,F10.4,T48,F10.4MI 02900
      7/1X,'BURST LOCATION ERROR'//1X,'RANGE COMPONENT OF',T32,F10.4,    MI 02910
      5T48,F10.4/1X,'BURST LOCATION ERROR'/)                            MI 02920
113     FORMAT(T61,'SECTION V'//T50,'TARGET CHARACTERISTIC PARAMETERS'//)MI 02930
114     FORMAT(T57,'CATEGORY I TARGET'///)                              MI 02940
116     FORMAT(///T57,'CATEGORY II TARGET'///)                          MI 02950
117     FORMAT(T61,'SECTION VI'//T55,'ENGAGEMENT STRATEGIES'//T10,'STRATEMI 02960
      2GY NUMBER',T82,'LENGTH',T102,'DEPTH'//)                          MI 02970
118     FORMAT(T15,I1,T78,F10.2,T98,F10.2/)                             MI 02980
119     FORMAT(///T35,'DISTRIBUTION OF NUMBER OF VOLLEYS IN THE FIRE FOR MI 02990
      2EFFECT PHASE'/T52,'FOR A TARGET OF OPPORTUNITY'///T10,'NUMBER OF VMI 03000
      3OLLEYS',T30,8F10.0//T10,'PROBABILITY',T30,8F10.2///)             MI 03010
120     FORMAT(//T35,'DISTRIBUTION OF NUMBER OF VOLLEYS IN THE FIRE FOR EMI 03020
      2FFECT PHASE'/T55,'FOR A SCHEDULED TARGET'///T10,'NUMBER OF VOLLEYSMI 03030
      3',T30,8F10.0//T10,'PROBABILITY',T30,8F10.2///)                   MI 03040
121     FORMAT(T27,'PROBABILITY DISTRIBUTION ON THE ATTACK STRATEGIES FORMI 03050
      2 A TARGET OF OPPORTUNITY'//)                                     MI 03060
122     FORMAT(T10,'STRATEGY NUMBER',T30,'1',T40,'2',T50,'3',T60,'4',T70,MI 03070
      2'5',T80,'6',T90,'7',T100,'8'//T10,'PROBABILITY',  T29,F3.2,T39,F3.MI 03080
      32,T49,F3.2,T59,F3.2,T69,F3.2,T79,F3.2,T89,F3.2,T99,F3.2///)      MI 03090
123     FORMAT(T31,'PROBABILITY DISTRIBUTION ON THE ATTACK STRATEGIES FORMI 03100
      2 A SCHEDULED TARGET'//)                                          MI 03110
124     FORMAT(T10,'NOTES'//T10,'LENGTH AND WIDTH FOR THE ATTACK STRATEGIMI 03120
      2ES PEFER TO THE DIMENSIONS OF THE BOX WHICH IS SUPERIMPOSED OVER TMI 03130
      4HE TARGET AREA')                                                 MI 03140
125     FORMAT(T60,'SECTION VII'//T54,'ARTILLERY BALLISTIC DATA'//)     MI 03150
126     FORMAT(T62,'CHARGE',1X,I1///)                                   MI 03160
127     FORMAT(T20,'RANGE',T50,'PER',T71,'PED',T91,'TOF'//)             MI 03170
128     FORMAT(T19,I6,T45,F8.2,T65,F10.2,T85,F10.2)                     MI 03180
129     FORMAT(T60,'SECTION VIII'//T57,'LETHALITY FUNCTION'/////T27,    MI 03190
      2'MISS DISTANCE',T85,'PROBABILITY OF BECOMING A CASUALTY'//)      MI 03200
130     FORMAT(T30,F8.0,T98,F8.7)                                       MI 03210
131     FORMAT(T10,'NOTE: VALUES ARE BASED ON LETHALITY PARAMETER OF',  MI 03220
      2F10.3)                                                           MI 03230
132     FORMAT(T62,'PART II'//T53,'INITIAL UNIT DISPOSITIONS'//T62,     MI 03240
      2'SECTION I'//T57,'MANEUVER ELEMENTS'//)                          MI 03250
133     FORMAT(T62,'BRIGADE'/////)                                      MI 03260
134     FORMAT(T60,'BATTALION',1X,I1/////)                              MI 03270
135     FORMAT(T61,'COMPANY',1X,I1/////)                                MI 03280
136     FORMAT(T58,'UNIT BOUNDARIES'///T32,'LEFT',T99,'RIGHT'///T26,    MI 03290
      2F10.3,1X,'EAST',T94,F10.3,1X,'NORTH'///T59,'OBJECTIVE DATA'///T28,MI 03300
      2'DESCRIPTION',T64,'EAST',T99,'NORTH'//T20,'OBJECTIVE CENTER',T60, MI 03310
      2F10.2,T97,F10.2//T20,'LENGTH OF MAJOR AXIS',T60,F10.2,2X,'METERS'/MI 03320
      2       /T20,'LENGTH OF MINOR AXIS',T60,F10.2,2X,'METERS'////T56,   MI 03330
      2'FIREPLANNING CENTER'//T40,'EAST',T85,'NORTH'///T36,F10.3,T83,    MI 03340
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      2F10.3///)                                                        MI 03350
137     FORMAT(T61,'SECTION II'//T61,'ARTILLERY'///)                    MI 03360
138     FORMAT(////T61,'BATTERY',1X,I1///////)                          MI 03370
139     FORMAT(T10,'ACTUAL BATTERY CENTER',T60,F10.2,2X,'EAST',T90,F10.2,MI 03380
      22X,'NORTH'//T10,'ASSIGNED BATTERY CENTER',T60,F10.2,2X,'EAST',   MI 03390
      2T90,F10.2,2X,'NORTH'//T10,'POSITION ERROR',T60,F10.2,2X,'EAST',  MI 03400
      2T90,F10.2,2X,'NORTH'//T10,'AZIMUTH OF LAY',T60,F10.2,2X,'MILS'////MI 03410
      2T58,'WEAPON LOCATIONS'//T31,'WEAPON',T64,'EAST',T99,'NORTH'//    MI 03420
      26(T32,I1,T60,F10.2,T96,F10.2/))                                  MI 03430
140     FORMAT(T62,'PART III'//T58,'INITIAL FIRE PLAN'////T12,'LINE',   MI 03440
      2T25,'TARGET',T40,'ORIG',T54,'TYPE',T79,'TARGET LOCATION',        MI 03450
      3T107,'UNIT SCHD',T120,'TIME SCHD'/T11,'NUMBER',T25,'NUMBER',T40,'UMI 03460
      4NIT',T53,'TARGET',T68,'EAST',T96 ,'NORTH'//)                     MI 03470
141     FORMAT(T14,I2,T27,F3.0,T40,F2.0)                                MI 03480
142     FORMAT('+',T54,'SCHD')                                          MI 03490
143     FORMAT('+',T54,'ON CALL')                                       MI 03500
144     FORMAT('+',T54,'PREP')                                          MI 03510
145     FORMAT('+',T65,F10.2,T93,F10.3,T102,F10.2)                      MI 03520
146     FORMAT('+',T117,F10.2)                                          MI 03530
192     FORMAT(T10,'DESCRIPTION',T50,'DISTRIBUTION',T74,'LOWER LIMIT',  MI 03540
      2T94,'UPPER LIMIT'//T10,'NUMBER OF TGT ELEMENTS',T52,'UNIFORM',   MI 03550
      2T72,F10.0,T92,F10.0//T10,'DEPTH OF ZONE 1',T52,'UNIFORM',T72,F10.0MI 03560
      2,T92,F10.0//T10,'DEPTH OF ZONE 2',T52,'UNIFORM',T72,F10.0,T92,   MI 03570
      2F10.0//T10,'DEPTH OF ZONE 3',T52,'UNIFORM',T72,F10.0,T92,        MI 03580
      2F10.0//T10,'LATERAL WIDTH',T52,'UNIFORM',T72,F10.0,T92,F10.0//)  MI 03590
1281    FORMAT(////10X,'NOTE: A PER EQUAL TO 1000. INDICATES THE RANGE ISMI 03600
      2 NOT ACHIEVABLE WITH THIS CHARGE')                               MI 03610
        END                                                             MI 03620
```

```
      SUBROUTINE RESET(I)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      GO TO (100,200,300,400,500,600,700),I
100   J=1
      K=1
      GO TO 1000
200   K=2
      J=2
      GO TO 1000
300   K=3
      J=3
      GO TO 1000
400   K=4
      J=4
      GO TO 1000
500   K=1
      J=2
      GDATA(5,2)= 2.0
      GO TO 1000
600   K=3
      J=4
      GDATA(6,2)= 2.0
      GO TO 1000
700   K=1
      J=4
      GDATA(5,2)= 2.0
      GDATA(6,2)= 2.0
      GDATA(7,2)= 2.0
1000  DO 1100 N=K,J
      GDATA(N,15)= 0.0
      GDATA(N,14)= CTIME
1100  GDATA(N,2)= 2.0
      DO 1200 N=1,50
1200  EVLIST(IROW,N)= 0.0
      RETURN
      END
```

```
      SUBROUTINE EXTGT                                                  MJ 00430
C                                                                       MJ 00440
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,         MJ 00450
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),  MJ 00460
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                   MJ 00470
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,   MJ 00480
     2XTLETH ,STAT(20,4)                                                MJ 00490
C                                                                       MJ 00500
      DO 100 I=1,250                                                    MJ 00510
      IF(TGT(I,9) .NE. 0) GO TO 100                                     MJ 00520
      IF(TGT(I,4) .NE. 0 .AND. TGT(I,4) .LT. GDATA(7,13)) CALL WD400(I)MJ 00530
  100 CONTINUE                                                          MJ 00540
      EVLIST(3,1)= CTIME+1200
      RETURN                                                            MJ 00560
      END                                                               MJ 00570


      SUBROUTINE START                                                  MJ 00580
C                                                                       MJ 00590
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,         MJ 00600
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),  MJ 00610
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                   MJ 00620
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,   MJ 00630
     2XTLETH ,STAT(20,4)                                                MJ 00640
C                                                                       MJ 00650
C     EVENT SET UP FOR REOCCURRING EVENTS                               MJ 00660
C                                                                       MJ 00670
C     SET UP FIRST TARGET OF OPPORTUNITY                                MJ 00680
C                                                                       MJ 00690
      CALL EXPON(TOPT)                                                  MJ 00700
      TINC= TOPT                                                        MJ 00710
      CALL EARRAY(I)                                                    MJ 00720
      EVLIST(I,1)= TOPT                                                 MJ 00730
      EVLIST(I,2)= 12.                                                  MJ 00740
C                                                                       MJ 00750
C     SET UP FIRST MAIN DECISON EVENT                                   MJ 00760
C                                                                       MJ 00770
      EVLIST(1,1)= 600.                                                 MJ 00780
      EVLIST(1,2)= 7.                                                   MJ 00790
C                                                                       MJ 00800
C     SET UP DECISION EVENT (SPECIAL CYCLE)                             MJ 00810
C                                                                       MJ 00820
      EVLIST(4,1)= TOPT-1
      EVLIST(4,2)= 7.
C                                                                       MJ 00850
C     SET UP THE ARTILLERY MOVE DECISION                                MJ 00860
C                                                                       MJ 00870
      EVLIST(2,1)= 660.                                                 MJ 00880
```

```
      EVLIST(2,2)= 8.
C
C     SET UP CLEAR UNFIRED TARGETS
C
      EVLIST(3,1)= 1800.
      EVLIST(3,2)= 13.
C
C     SET FLAGS FOR START
C
      CALL EARRAY(I)
      EVLIST(I,1)= 0.0
      EVLIST(I,2)= 14.
      EVLIST(I,3)= 7.
C
C     SET UP THE CONVERSION CYCLE FOR ON CALL TARGETS
C
      CALL EARRAY(I)
      CALL EXPON(VT)
      EVLIST(I,1)= VT
      EVLIST(I,2)= 5.0
C
C     SET UP THE QUEUE SAMPLING EVENT
C
      CALL EARRAY(I)
      EVLIST(I,1)= 10.
      EVLIST(I,2)= 6.0
      RETURN
      END


      SUBROUTINE DISGE
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      NUNIT= CEVENT(3)
      IF(NUNIT .EQ. 100) GO TO 50
      GDATA(NUNIT,16)= 0.0
      GDATA(NUNIT,18)= 0.0
      GDATA(NUNIT,14)= CTIME
50    SUP(1)= 0.0
      DO 100 I= 1,50
100   EVLIST(IROW,I)= 0.0
      RETURN
      END
```

```
      SUBROUTINE WD100
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      IR= CEVENT(4)
      JR= CEVENT(5)
      NUNIT= TGT(IR,2)
      GDATA(NUNIT,16)= 0.0
     TGT(IR,13)= CEVENT(35)
      TGT(IR,12)= CTIME
      IF (TGT(IR,11) .EQ. 100) GO TO 850
      TGT(IR,11) = 4.0
850   TGT(IR,14)= CEVENT(13)
      DO 700 I=1,3
      IF(CEVENT(I+37) .EQ. 0) GO TO 700
      ARDATA(I,7,2)= 1.0
      ARDATA(I,7,14)= 0.0
700   CONTINUE
      IF(TGT(IR,26) .EQ. 0) TGT(IR,33)= 0.0
      IF(TGT(IR,26) .NE. 0) TGT(IR,33)= TGT(IR,14)/TGT(IR,26)
      IF(TGT(IR,14) .EQ. 0) TGT(IR,34)= 0.0
      IF(TGT(IR,14) .NE. 0) TGT(IR,34)= TGT(IR,13)/TGT(IR,14)
      TGT(IR,35)= CTIME-TGT(IR,10)
      IF(TGT(IR,35) .EQ. 0) TGT(IR,36)= 0.0
      IF(TGT(IR,35) .NE. 0) TGT(IR,36)= TGT(IR,14)/TGT(IR,35)
C
C     GATHER CUMMULATIVE ROUNDS/KILL INFORMATION ON THE
C     TARGETS OF OPPORTUNITY
C
      STAT(10,1)= STAT(10,1)+ TGT(IR,13)
      STAT(10,2)= STAT(10,2)+ TGT(IR,14)
      STAT(10,3)= STAT(10,3)+1
C
C     GATHER CUMMULATIVE KILL RATE INFORMATION
C
      STAT(9,1)= STAT(9,1)+ TGT(IR,14)
      STAT(9,2)= STAT(9,2)+ TGT(IR,35)
      STAT(9,3)= STAT(9,3)+1
      DO 600 I=1,50
600   EVLIST(IROW,I)= 0.0
      WRITE(10,1275) (TGT(IR,IV),IV=1,40)
      DO 1700 I=1,40
```

```
1700  TGT(IR,I)= 0.0
      DO 800 I= 1,300
      DO 800 J=1,2
800   TDES(JR,I,J)= 0.0
      RETURN
1275  FORMAT(40F10.2)
      END

      SUBROUTINE WD200
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      IR= EVLIST(IROW,4)
      JR= EVLIST(IROW,5)
      TGT(IR,12)= CTIME
      DO 700 I=1,3
      IF(CEVENT(I+9) .EQ. 0) GO TO 700
      ARDATA(I,7,2)= 1.0
      ARDATA(I,7,14)= 0.0
700   CONTINUE
      DO 600 I=1,50
600   EVLIST(IROW,I)= 0.0
      WRITE(20,1275) (TGT(IR,IV),IV=1,40)
      DO 1700 I=1,40
1700  TGT(IR,I)= 0.0
      IF(JR .EQ. 0) RETURN
      DO 800 I=1,300
      DO 800 J=1,2
800   TDES(JR,I,J)= 0.0
      RETURN
1275  FORMAT(40F10.2)
      END

      SUBROUTINE WD300
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      I= EVLIST(IROW,4)
```

```
      J= EVLIST(IROW,5)
      TGT(I,11)= 100.
      TGT(I,12)= EVLIST(IROW,14)
      TGT(I,10)= EVLIST(IROW,19)
      DO 100 M=1,50
100   EVLIST(IROW,M)=0.0
      IF(J .EQ. 100) GO TO 250
      DO 200 K=1,300
      DO 200 L=1,2
200   TDES(J,K,L)= 0.0
250   WRITE(30,1275) (TGT(I,J),J=1,40)
      DO 300 J=1,40
300   TGT(I,J)= 0.0
      RETURN
1275  FORMAT(40F10.2)
      END


      SUBROUTINE WD400(I)
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      IS= TGT(I,20)
      WRITE(40,1275) (TGT(I,IV),IV=1,40)
C
C     ZERO THE ARRAY ROW IN THE TARGET HISTROY ARRAY
C
      DO 100 J=1,40
      TGT(I,J)= 0.0
100   CONTINUE
C
C     ZERO THE EVLIST ENTRIES
C
      IF(IS .EQ. 0) RETURN
      DO 150 J=1,50
150   EVLIST(IS,J)= 0.0
      RETURN
1275  FORMAT(40F10.2)
      END
```

```
      SUBROUTINE SET(QHOUR,R1,R2)                                        MJ 02660
C                                                                        MJ 02670
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,          MJ 02680
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),   MJ 02690
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                    MJ 02700
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,    MJ 02710
     2XTLETH ,STAT(20,4)                                                 MJ 02720
C                                                                        MJ 02730
      CALL EARRAY(IX)                                                    MJ 02740
      EVLIST(IX,1)= QHOUR-900                                            MJ 02750
      EVLIST(IX,2)= 10.                                                  MJ 02760
      EVLIST(IX,3)= R1                                                   MJ 02770
      EVLIST(IX,4)= QHOUR                                                MJ 02780
      CALL EARRAY(IY)                                                    MJ 02790
      EVLIST(IY,1)= QHOUR                                                MJ 02800
      EVLIST(IY,2)= 14.                                                  MJ 02810
      EVLIST(IY,3)= R2                                                   MJ 02820
      RETURN                                                             MJ 02830
      END                                                                MJ 02840


      SUBROUTINE SUMRY                                                   MK 00010
C                                                                        MK 00020
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,          MK 00030
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),   MK 00040
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN                    MK 00050
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,    MK 00060
     2XTLETH ,STAT(20,4)                                                 MK 00070
      DIMENSION ROW(40),LINE(40),EVTR(50)                                MK 00080
C                                                                        MK 00090
      REWIND 10                                                          MK 00100
      REWIND 20                                                          MK 00110
      REWIND 25                                                          MK 00120
      REWIND 30                                                          MK 00130
      REWIND 40                                                          MK 00140
      IF(SUP(3) .EQ. 0) WRITE(6,10)                                      MK 00150
C                                                                        MK 00160
C     PRINT SECTION I                                                    MK 00170
C                                                                        MK 00180
      WRITE(6,100)                                                       MK 00190
      DO 110 I=1,1000                                                    MK 00200
      READ(25,1600,END=1000) (EVTR(J),J=1,50)                            MK 00210
      WRITE(6,1613) (EVTR(J),J=1,50)                                     MK 00220
      DO 110 K=12,1000,12                                                MK 00230
      IF(I .EQ. K) WRITE(6,69)                                           MK 00240
110   CONTINUE                                                           MK 00250
C                                                                        MK 00260
C     PRINT SECTION II                                                   MK 00270
```

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C                                                                          MK 00280
1000   WRITE(6,200)                                                        MK 00290
       DO 220 I=1,1000                                                     MK 00300
       DO 205 LT=1,1000,2                                                  MK 00310
       IF(I .EQ. LT) WRITE(6,95)                                           MK 00320
205    CONTINUE                                                            MK 00330
       READ(10,201,END=1100) (EVTR(J),J=1,40)                              MK 00340
       WRITE(6,500) EVTR(1),(EVTR(K),K=3,4),(EVTR(K),K=21,27),EVTR(10),    MK 00350
      2EVTR(2),(EVTR(K),K=28,32),(EVTR(K),K=13,14),(EVTR(K),K=33,36)      MK 00360
       DO 220 L=2,1000,2                                                   MK 00370
       IF(I .EQ. L) WRITE(6,69)                                            MK 00380
220    CONTINUE                                                            MK 00390
C                                                                          MK 00400
C      PRINT SECTION III                                                   MK 00410
C                                                                          MK 00420
1100   WRITE(6,305)                                                        MK 00430
       DO 300 I=1,1000                                                     MK 00440
       DO 296 L=1,1000,4                                                   MK 00450
       IF(I .EQ. L) WRITE(6,96)                                            MK 00460
296    CONTINUE                                                            MK 00470
       READ(20,201,END=1200) (EVTR(J),J=1,40)                              MK 00480
       WRITE(6,600) EVTR(1),EVTR(5),EVTR(7),EVTR(2),EVTR(8),EVTR(37),      MK 00490
      2EVTR(11),(EVTR(K),K=31,32),EVTR(13),EVTR(26),EVTR(14)              MK 00500
       DO 300 K=4,1000,4                                                   MK 00510
       IF(I .EQ. K) WRITE(6,69)                                            MK 00520
300    CONTINUE                                                            MK 00530
C                                                                          MK 00540
C      PRINT SECTION IV                                                    MK 00550
C                                                                          MK 00560
1200   WRITE(6,401)                                                        MK 00570
       DO 400 I=1,1000                                                     MK 00580
       DO 360 L=1,1000,5                                                   MK 00590
       IF(I .EQ. L) WRITE(6,96)                                            MK 00600
360    CONTINUE                                                            MK 00610
       READ(30,201,END=1300) (EVTR(J),J=1,40)                              MK 00620
       WRITE(6,700) EVTR(1),EVTR(5),EVTR(7),EVTR(9),EVTR(11),EVTR(10)      MK 00630
      2,EVTR(37),EVTR(35)                                                  MK 00640
       DO 400 L=5,1000,5                                                   MK 00650
       IF(I .EQ. L) WRITE(6,69)                                            MK 00660
400    CONTINUE                                                            MK 00670
C                                                                          MK 00680
C      PRINT SECTION V                                                     MK 00690
C                                                                          MK 00700
1300   WRITE(6,800)                                                        MK 00710
       DO 820 I=1,10                                                       MK 00720
       EVTR(I)=0.0                                                         MK 00730
       IF(STAT(I,2) .EQ. 0) GO TO 820                                      MK 00740
       EVTR(I)= STAT(I,1)/STAT(I,2)                                        MK 00750
```

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820     CONTINUE                                                              MK 00760
        WRITE(6,801) (EVTR(K),K=1,10)                                         MK 00770
        RETURN                                                                MK 00780
10      FORMAT(2X,'FINAL OBJECTIVE WAS SECURED'//)                            MK 00790
69      FORMAT(1H1)                                                           MK 00800
95      FORMAT(//////////)                                                    MK 00810
96      FORMAT(///////)                                                       MK 00820
100     FORMAT(1H1/T56,'EVENT VECTOR LISTING'/)                               MK 00830
200     FORMAT(1H1/T51,'TARGETS OF OPPORTUNITY ENGAGED'//)                    MK 00840
201     FORMAT(40F10.2)                                                       MK 00850
305     FORMAT(1H1/T46,'SCHEDULED AND PREPARATORY TARGETS ENGAGED'//)         MK 00860
401     FORMAT(1H1/T54,'REINFORCING UNIT TARGETS'//)                          MK 00870
1600    FORMAT(50F10.2)                                                       MK 00880
1613    FORMAT(5(10X,10F10.3/))                                               MK 00890
500     FORMAT(2X,'TARGET NUMBER',T40,F10.2/2X,'LOCATION',T40,F10.2,          MK 00900
     22X,'EAST',T60,F10.2,2X,'NORTH'/2X,'FO ERROR',T40,F10.2,2X,'EASTINGMK 00910
     2',T60,F10.2,'NORTHING'/2X,'TARGET CATEGORY',T40,F10.2/2X,'LATERAL MK 00920
     3LENGTH',T40,F10.2,2X,'METERS'/2X,'DEPTH',T40,F10.2,2X,              MK 00930
     4'METERS'/2X,'NUMBER OF TARGET ELEMENTS',T40,F10.2/2X,'TARGET DENSIMK 00940
     5TY',T40,F10.6/2X,'TIME GENERATED',T40,F10.2/2X,                     MK 00950
     7'UNIT BEING SUPPORTED',T40,F10.2/2X,'ADJUSTING UNIT',T40,           MK 00960
     8F10.2/2X,'INITIAL ENGAGEMENT RANGE',T40,F10.2,2X,'METERS'/          MK 00970
     92X,'NUMBER OF VOLLEYS IN ADJUSTMENT',T40,F10.2/2X,'STRATEGY USED IMK 00980
     2N FFE',T40,F10.2/2X, 'NUMBER OF VOLLEYS IN FFE',T40,F10.2/          MK 00990
     32X,'TOTAL ROUNDS FIRED ON TARGET',T40,F10.2/2X,'NUMBER OF CASUALTIMK 01000
     3ES INFLICTED',T40,F10.2/2X,'PERCENT CASUALTIES INFLICTED',T40,      MK 01010
     4F10.2/2X,'ROUNDS/CASUALTY',T40,F10.2/2X,'TOTAL ENGAGEMENT TIME',    MK 01020
     5T40,F10.2,2X,'SECONDS'/2X,'KILL RATE',T40,F10.3,2X,                 MK 01030
     6'CASUALTIES/SECOND'///)                                             MK 01040
600     FORMAT(2X,'TARGET NUMBER',T40,F10.2/2X,'TARGET TYPE',T40,             MK 01050
     2F10.2,2X,'SCHD',T60,F10.2,'PREP'/2X,'UNIT ORIGINATING',T40,F10.2/   MK 01060
     32X,'TIME SCHEDULED',T40,F10.2/2X,'TIME FIRED',T40,F10.2/2X,         MK 01070
     3'UNIT FIRED',T40,F10.2/2X,'STRATEGY USED',T40,F10.2/2X,             MK 01080
     4'NUMBER OF VOLLEYS IN FFE',T40,F10.2/2X,'TOTAL ROUNDS FIRED',T40,   MK 01090
     5F10.2/2X,'TOTAL TARGET ELEMENTS',T40,F10.2/2X,'TOTAL CASUALTIES INMK 01100
     6FLICTED',T40,F10.2/////)                                            MK 01110
700     FORMAT(2X,'TARGET NUMBER',T40,F10.2/2X,'TARGET TYPE',T40,F10.2,       MK 01120
     22X,'SCHD',T60,F10.2,2X,'PREP',T80,F10.2,2X,'TGT OPP'/ 2X,           MK 01130
     3'UNIT SCHEDULED TO FIRE',T40,F10.2/2X,'TIME SCHEDULED OR ORIGINATEMK 01140
     4D'T40,F10.2/2X,'TIME FIRED',T40,F10.2/2X,'TOTAL ENGAGEMENT TIME',   MK 01150
     5T40,F10.2/////)                                                     MK 01160
800     FORMAT(1H1,T60,'SUMMARY DATA'///)                                     MK 01170
801     FORMAT(2X,'AVERAGE QUEUE LENGTH BY QUEUE'//T20,'1',T40,'2',T60,'3MK 01180
     2',T80,'4'//T16,F10.7,T36,F10.7,T56,F10.7,T76,F10.7//2X,'AVERAGE TIMK 01190
     3ME TARGET IN QUEUE(BY QUEUE)'//T20,'1',T40,'2',T60,'3',T80,'4'//    MK 01200
     4T16,F10.2,T36,F10.2,T56,F10.2,T76,F10.2//2X,'AVERAGE KILL RATE FORMK 01210
     5 A TARGET',T60,F10.7,2X,'CASUALTIES/SECOND OF ENGAGEMENT TIME'/     MK 01220
     22X,'OF OPPORTUNITY'///2X,'AVERAGE ROUNDS / CASUALTY FOR',T60,       MK 01230
```

```
      3F10.6,2X,'ROUNDS / CASUALTY'/2X,'TARGET OF OPPORTUNITY'///)
        END
        REAL FUNCTION DIST(A,B,C,D)
C
        DIST= SQRT((A-C)**2+(B-D)**2)
        RETURN
        END
        REAL FUNCTION RANGE(ET,SN,I)
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
      2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
      3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
      2XTLETH ,STAT(20,4)
C
        RANGE= SQRT((ET-ARDATA(I,7,7))**2+ (SN-ARDATA(I,7,8))**2)
        RETURN
        END


        SUBROUTINE WEVENT
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
      2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
      3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
      2XTLETH ,STAT(20,4)
C
        WRITE(25,1275) (EVLIST(IROW,J),J=1,50)
1275    FORMAT(50F10.2)
        RETURN
        END


        SUBROUTINE FIOBJ(NUNIT,KRES)
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
      2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
      3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
      2XTLETH ,STAT(20,4)
C
        KRES=0
        GO TO(100,100,100,100,200,200,1000),NUNIT
100     IF(NUNIT .LE. 2) J=5
        IF(NUNIT .GT. 2) J=6
        IF(GDATA(NUNIT,20) .EQ. 1 .AND. GDATA(J,20) .EQ. 1) KRES=1
        GO TO 1000
```

```
200     IF(GDATA(NUNIT,20) .EQ. 1) KRES=1
1000    RETURN
        END

        SUBROUTINE QUE(I)
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
        DIMENSION PROF(3)
C
        Q(I)= Q(I)+1
        DO 1000 J=1,20
        IF(QUES(I,J,50) .NE. 0) GO TO 1000
        IJ=J
        QUES(I,J,50)= 1.0
        GO TO 1200
1000    CONTINUE
C
C       NO ROOM IN THE QUEUE
C
        CALL TERM(4,I)
        STOP
1200    DO 1250 J=1,50
        QUES(I,IJ,J)= EVLIST(IROW,J)
1250    EVLIST(IROW,J)= 0.0
        RETURN
        END

        SUBROUTINE DQUE(J)
C
        COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
        COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
        DIMENSION PROF(3)
C
        TMIN= 10.**6.
        DO 100 K= 1,20
        IF(QUES(J,K,1) .GT. TMIN) GO TO 100
        IF(QUES(J,K,50) .EQ. 0) GO TO 100
        TMIN= QUES(J,K,1)
        IS=K
```

```
100    CONTINUE
       STAT(J+4,1)= STAT(J+4,1) + CTIME - QUES(J,IS,1)
       STAT(J+4,2)= STAT(J+4,2)+1
       CALL EARRAY(IX)
       DO 200 I=1,50
       EVLIST(IX,I)= QUES(J,IS,I)
       QUES(J,IS,I)= 0.0
200    CONTINUE
       EVLIST(IX,1)= CTIME+120
       EVLIST(IX,2)= 1.
       Q(J)= Q(J)-1
       RETURN
       END


       SUBROUTINE CKQUE
C
       COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
       COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
       DO 100 J= 1,4
       IF(Q(J) .EQ. 0) GO TO 100
       GO TO 200
100    CONTINUE
       GO TO 1000
200    CALL DQUE(J)
1000   DO 1100 J=1,50
1100   EVLIST(IROW,J)= 0.0
       RETURN
       END


       SUBROUTINE SGAGE
C
       COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
       COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
       INT= EVLIST(IROW,4)
       TGT(INT,37)= CTIME
C
C      ENGAGE THE SUPPORTING UNIT
C
```

```
      SUP(1)= 1.0
C
C     DETERMINE HOW LONG THE ENGAGEMENT WILL BE
C
      IF(EVLIST(IROW,21) .EQ. 1) IS=11
      IF(EVLIST(IROW,21) .EQ. 4) IS=12
      IF(EVLIST(IROW,21) .EQ. 2) IS=13
      CALL TNGEN(PRDATA(2,4,IS,1),PRDATA(2,4,IS,2),PRDATA(2,4,IS,3),
     2PRDATA(2,4,IS,4),STME)
      TGT(INT,35)= STME
C
C     SET UP THE DISENGAGEMENT
C
      CALL EARRAY(IX)
      EVLIST(IX,1) = CTIME+STME
      EVLIST(IX,2)= 15.
      IF(EVLIST(IROW,21) .GT. 1) EVLIST(IX,3)= 100.
      IF(EVLIST(IROW,21) .EQ. 1) EVLIST(IX,3)= EVLIST(IROW,8)
      EVLIST(IROW,14)= CTIME+STME
      CALL WD300
C
C     SET UP EVENT TO SEARCH THE QUEUES WHEN MISSION TERMINATED
C
      CALL EARRAY(IX)
      EVLIST(IX,1)= CTIME+STME+60.
      EVLIST(IX,2)= 4.0
      RETURN
      END


      SUBROUTINE CONV
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      K=0
      DO 100 I=1,250
      IF(TGT(I,6) .EQ. 0) GO TO 100
      IF((TGT(I,4)-GDATA(7,13)) .GT. 1000) GO TO 100
      IF(TGT(I,4) .LT. GDATA(7,13)) GO TO 100
      K=K+1
100   CONTINUE
      IF(K .EQ. 0) GO TO 5000
      CALL UGEN(1.0,1.*K,S)
      IT=S
```

```
      K=0
      DO 200 I=1,250
      IF(TGT(I,6) .EQ. 0) GO TO 200
      IF((TGT(I,4)-GDATA(7,13)) .GT. 1000) GO TO 200
      K=K+1
      IF(K .EQ. IT) GO TO 300
200   CONTINUE
C
C     TARGET HAS BEEN IDENTIFIED
C
300   IST=I
C
C     SEE IF TARGET WILL BE CLASSIFIED AS TARGET OF OPPORTUNITY
C     OR A SCHEDULED TARGET
C
      IF(TGT(IST,2) .GT. 4) GO TO 1000
      CALL UNIF(RNNR)
      IF(RNNR .GE. .5) GO TO 1000
C
C     TARGET BECOMES A TARGET OF OPPORTUNITY
C
      TGT(IST,6)=0.0
      TGT(IST,7)= 1.0
      TGT(IST,9)=1.0
      CALL EARRAY(IX)
      EVLIST(IX,1)= CTIME+10.
      EVLIST(IX,2)= 1.0
      EVLIST(IX,3)= TGT(IST,1)
      EVLIST(IX,4)= 1.*IST
      TGT(IST,10)=CTIME
      TGT(IST,20)= IX*1.
      CALL DARRAY(IA)
      EVLIST(IX,5)= 1.*IA
      EVLIST(IX,6)= TGT(IST,3)
      EVLIST(IX,7)= TGT(IST,4)
      IF(TGT(IST,2) .GT. 4) GO TO 600
      EVLIST(IX,8)= TGT(IST,2)
600   CONTINUE
      DO 1100 I=1,4
      IF(TGT(IST,3) .GE. GDATA(I,3) .AND. TGT(IST,3) .LE. GDATA(I,5))
     2NUNIT=I
1100  CONTINUE
      EVLIST(IX,8)= 1.*NUNIT
1101  CONTINUE
      TGT(IST,2)= 1.*NUNIT
      EVLIST(IX,17)= 1.0
      EVLIST(IX,19)= CTIME
      EVLIST(IX,21)= 1.0
```

```
      EVLIST(IX,36)= TGT(IST,3)
      EVLIST(IX,37)= TGT(IST,4)
      EVLIST(IX,41)= TGT(IST,3)
      EVLIST(IX,42)= TGT(IST,4)
C
C     COMPUTE THE ANGLE FROM THE FPC TO THE TARGET
C
      ARG= (TGT(IST,3)-GDATA(NUNIT,12))/(TGT(IST,4)-GDATA(NUNIT,13))
      EVLIST(IX,43)= ATAN(ARG)
      CALL DESTGT(IA,IST,IX)
      GDATA(NUNIT,16)= 1.0
      GDATA(NUNIT,18)= CTIME
      GO TO 5000
C
C     TARGET IS SCHEDULED
C
1000  CALL EARRAY(IX)
      TGT(IST,5)= 1.0
      TGT(IST,6)=0.0
      EVLIST(IX,1)= CTIME+60.
      EVLIST(IX,2)= 1.
      EVLIST(IX,3)= TGT(IST,1)
      EVLIST(IX,4)= 1.*IST
      EVLIST(IX,6)= TGT(IST,3)
      EVLIST(IX,7)= TGT(IST,4)
      EVLIST(IX,8)= TGT(IST,2)
      IF(TGT(IST,2) .EQ. 5) EVLIST(IX,9)=1.0
      IF(TGT(IST,2) .EQ. 6) EVLIST(IX,9)= 3.0
      IF(TGT(IST,2) .EQ. 7) EVLIST(IX,9)=2.0
      EVLIST(IX,16)= 1.0
      EVLIST(IX,17)= 1.0
      EVLIST(IX,21)= 4.0
      EVLIST(IX,32)= TGT(IST,3)
      EVLIST(IX,33)= TGT(IST,4)
      EVLIST(IX,36)= TGT(IST,3)
      EVLIST(IX,37)= TGT(IST,4)
      TGT(IST,10)= CTIME
      TGT(IST,20)= IX*1.
C
C     SET UP THE NEXT TARGET
C
5000  CALL EXPON(XTME)
      EVLIST(IROW,1)= CTIME+XTME
      RETURN
      END
```

```
      SUBROUTINE ASTAT
C
      COMMON NU,PRDATA(3,7,20,10),GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      DO 100 J=1,4
      STAT(J,1)= STAT(J,1)+Q(J)
100   STAT(J,2)= STAT(J,2)+1
      EVLIST(IROW,1)= CTIME+10.
      RETURN
      END


      SUBROUTINE TERM(I,K)
C
      COMMON NU,PRDATA(3,7,20,10).GDATA(7,20),TGT(250,40),ITGT,
     2EVLIST(250,50),ARDATA(4,7,16),IROW,TDES(10,300,4),FD105(4,50,3),
     3CEVENT(50),J100,J200,CTIME,TINC,TOPT,SHOUR,EXMN
      COMMON SUP(10),RMAX,NGUNS,Q(4),QUES(4,20,50),NCHGS,NRINC,XLETH,
     2XTLETH ,STAT(20,4)
C
      SUP(3)=1.0
      WRITE(6,99)
      GO TO (100,200,300,500),I
100   WRITE(6,101)
      GO TO 400
200   WRITE(6,202)
      GO TO 400
300   WRITE(6,303)
      GO TO 400
500   WRITE(6,404) K
      WRITE(6,405)
400   CALL SUMRY
      RETURN
99    FORMAT(2X,'FINAL OBJECTIVE NOT SECURED')
101   FORMAT(2X,'EVLIST IN OVERFLOW CONDITION')
202   FORMAT(2X,'TARGET HISTORY ARRAY IN OVERFLOW CONDITION')
303   FORMAT(2X,'TARGET DESCRIPTION ARRAY IN OVERFLOW CONDITION')
404   FORMAT(2X,'QUEUE',2X,I1,1X,'IS IN OVERFLOW CONDITION')
405   FORMAT(/////)
      END
```

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29 December 1970

Major Lowell L. Martin (71193), US Army
HHC 4th Infantry Division (WAJZAA)
APO, San Francisco 96262

Dear Major Martin:

In a review of your thesis, it was discovered that either page 224 is missing or page 225 and on through page 230 are misnumbered. Your advisor, Professor Taylor, tells me that the master copy reflects the same condition and that he is unable to reconcile.

Since it is very likely that you do not have a copy of your thesis with you at your present duty station, I am enclosing a copy of pages 223 and 225. All material from page 226 on consists of references, distribution list, etc., and does not, therefore, bear on the question. Can you, from the enclosures, enlighten me?

Sincerely

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P. 224

```
//GO.FT06F001 DD SPACE=(CYL,20)
//GO.SYSUDUMP DD SYSOUT=A,SPACE=(CYL,(8,1))
//GO.FT10F001 DD UNIT=SYSDA,DISP=(NEW,DELETE),DSN=&TEMP1,
//   SPACE=(CYL,5),DCB=(RECFM=FB,LRECL=400,BLKSIZE=4000)
//GO.FT20F001 DD UNIT=SYSDA,DISP=(NEW,DELETE),DSN=&TEMP2,
//   SPACE=(CYL,5),DCB=(RECFM=FB,LRECL=400,BLKSIZE=4000)
//GO.FT25F001 DD UNIT=SYSDA,DISP=(NEW,DELETE),DSN=&TEMP3,
//  SPACE=(CYL,10),DCB=(RECFM=FB,LRECL=500,BLKSIZE=2500)
//GO.FT30F001 DD UNIT=SYSDA,DISP=(NEW,DELETE),DSN=&TEMP4,
//   SPACE=(CYL,5),DCB=(RECFM=FB,LRECL=400,BLKSIZE=4000)
//GO.FT40F001 DD UNIT=SYSDA,DISP=(NEW,DELETE),DSN=&TEMP4,
//   SPACE=(CYL,5),DCB=(RECFM=FB,LRECL=400,BLKSIZE=4000)
//GO.SYSIN DD *
```

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ABSTRACT

A probablistic event store computer simulation of the artillery direct fire support system at brigade level is presented. The prupose of the model is to serve as a tool in evaluating changes in artillery fire support system effectiveness as system and battlefield parameters are varied. Parameters which are variable in the model pertain to the geometric configuration of the battlefield, artillery weapon employment configurations, artillery weapon ballistic parameters, weapon lethality, target configuration and vulnerability, artillery system time parameters, weapon position accuracy parameters, and target location accuracy parameters. A description of the model and a FORTRAN IV program listing are provided.

KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Artillery simulation						