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COSAGE USER'S MANUAL

VOLUME II - INPUT/OUTPUT GUIDE

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13 ABSTRACT (Maximum 200 words)

The Combat Sample Generator (COSAGE) Input/Output Guide provides detailed documentation on all inputs required by the simulation and all outputs produced by the simulation. This third revision is the most complete, up-to-date input/output guide available for COSAGE. It has updates on such minor changes as serial number identifiers within the system data input file and also addresses such major changes as the incorporation of the USAF bomb effects input format under the aircraft munitions data file (ACMUNS). Chapters 12 and 13 offer insights into specific COSAGE outputs which, in turn, can be used for analysis. Chapter 12 illustrates the routines from COSAGE which specifically identify the varying types and kinds of output data available. Chapter 13 is also new and details for the first time all output postprocessors.

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VOLUME II - INPUT/OUTPUT GUIDE

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CHAPTER 11

INPUT DATA FOR COSAGE*

11-1. INTRODUCTION

a. This guide describes the input data for the COSAGE Model. There are 35 separate input files, each described in its own section. The sections describe all of the input parameters, options, and specifications required to run the model. The possible modes of the data items are real (R), integer (I), and alpha (A). The range of a variable is given where appropriate. Some of the data inputs are limited by storage constraints set by the model.

b. All of the data files are, in some way, interconnected. A change in one file will force changes in several other files. Be sure to carefully research any proposed change and study all of the coordinating requirements in other files.

11-2. AIR DEFENSE SENSOR DATA. The model air defense sensor (MADS) data file identifies and describes the air defense sensors.

a. Data Format

(1) The first data set begins with N.MODEL.AD.SENSOR, the integer number of different AD sensors to be modeled. The following data items are repeated once for each MADS.

(a) MADS.SEQ.NUM (I) - the sequence number of the AD sensor.

(b) MADS.NAME (A) - the name of the sensor, up to six characters with no embedded blanks.

(c) MADS.DELAY.TIME (I) - the delay time, in seconds, between target detection and firing for weapons associated with this sensor.

(d) MADS.PW.DEGRADE (I) - the poor weather degradation factor, expressed as an integer percentage, of this sensor type.

(e) MADS.FCM (I) - fire control method of this sensor:

1 = Shoot-look-shoot   2 = Ripple   3 = Salvo

(f) MADS.RIPL (I) - the time delay, in seconds, between shots for either ripple or salvo fire for weapons associated with this sensor type.

(g) MADS.WPN.RELOAD.TIME (I) - the time, in minutes, to reload weapons associated with this sensor type.

(h) MADS.RESUP.TIME (I) - the time, in minutes, required to resupply an air defense site from an ammo supply point.

---

*Third Revision

(i) MADS.RDY.RDS. (I) - the number of rounds available on site which are not loaded on the launchers.

(j) MADS.XMIT.PCT (I) - the percentage of time that sensors of this type transmit and are thus capable of detecting aircraft.

(k) MADS.DETECT (I) - a switch indicating if the AD sensor's detection capability is reduced to 120° toward the opposing forces, where 0 = no and 1 = yes.

(l) MADS.NIGHT.FIRE (I) - switch to indicate if the AD sensor is capable of firing at night, where 1 = yes 2 = no.

(m) N.MADS.RH.SET (I) - the number of range hacks defined for this AD sensor.

The following data items (n) through (p) are repeated once for each range hack defined.

(n) MRH.RANGE (I) - the range, in decameters, of this range hack.

(o) MRH.MIN.ALT (I) - the minimum altitude, in decameters, at which aircraft can be detected in this range hack.

(p) MRH.PD (I) - the probability of detection, expressed as an integer percent, associated with this range hack.

b. Coordinating Requirements

(1) Type Sensor Data File. The sensors with ST.NAME equal to AD refer to sensors described in the Air Defense Sensor data file.

(2) Sensor Data File. For sensors with ST.NAME equal to AD, the SENS.MODEL refers to the sequence number of the air defense sensors.

Air Defense Sensor data file:

```
2
1  USENSR  20   50   1   3   20   60    2    50   0   1
            3
            375     3    25
            525     6    25
           4500   300    25

2  RSENSR  17   37   3   4   15   30    8    25   0   1
            3
            338     3    20
            488     6    20
           3000   100    20
```

11-3. AIRCRAFT MUNITIONS DATA

a. References. COSAGE Input Guide, August 1989, and FM 101-50-1, Basic Air to Surface Effects JMEM.

b. Background. In the past, the effects of bombs in COSAGE were calculated by a relatively simple algorithm which had no provision for cluster munitions. In order to model the effects of cluster munitions and to improve the modeling of ordinary, noncluster bombs, COSAGE has been modified to incorporate two algorithms from Chapter 4 of FM 101-50-1: Method 3, Stick Delivery Against a Unitary Target, Area of Unitary Targets, or Narrow Linear Targets, for ordinary bombs; and Method 5, Cluster Munitions Against a Unitary Target or an Area Target, for cluster munitions. These algorithms are more detailed than the algorithm previously used and consequently require more input data. As a result, the Aircraft Munitions (ACMUNS) input file has been completely revised. There has also been a change in the meaning of one of the fields in the Unit file.

c. Format of the Aircraft Munitions File. The file is composed of seven segments: weapon parameters; aircraft release and trajectory parameters; cluster weapon trajectory parameters; weapon effectiveness against nonpersonnel targets; weapon effectiveness against personnel; environmental effects against nonpersonnel targets: and environmental effects against personnel. The fuze employed is not explicitly required by the model but is implicit in several of the data items. The format of each segment is described in detail below. Sources are indicated for most of the data items. When no source is shown, the source is either "obvious" (for example, the name of the weapon) or depends on Air Force doctrine and tactics (for example, the aircraft dive angle).

(1) Weapons Parameters. The following data items (a) through (j) are repeated for each weapon.

(a) AM.NAME (alpha) - the name of the weapon. Must match the name of the weapon in the Type Weapon data (TW.NAME).

(b) AM.CLUS (alpha) - "C" or "N," indicating a cluster weapon or a noncluster weapon, respectively (entered without the quotes).

(c) AM.SIGMA.B (real) - ballistic error, mils. Enter 0.0 for cluster munitions with captive dispensers. Source: FM 101-50-1, Appendix A, Section V.

(d) AM.REL (real) - for a noncluster weapon, enter weapon reliability, in the range 0.0 to 1.0. Enter 0 for cluster bombs.

(e) AM.BURY (integer) - for impact-fuzed general purpose bombs, the percent of the bomb buried when impacting soil. Must be one of the following: 0. 10, 25, or 50. Enter 0 for other types of bombs. Source: FM 101-50-1, Appendix B.

(f) AM.DISPENSE (alpha) - one of the following letters:

C - cluster munition with captive dispenser
R - releasable cluster munition
N - noncluster munition

(g) AM.N.SUBMUN (integer) - number of submunitions per dispenser, for cluster munitions. Enter 0 if noncluster. Source: FM 101-50-1, Appendix A, Section V.

(h) AMDSP.REL (real) - dispenser reliability, in the range 0.0 to 1.0. Enter 0.0 for noncluster munitions. Source: FM 101-50-1, Appendix A, Section V.

(i) AM.SUB.REL (real) - submunition reliability, in the range 0.0 to 1.0, for cluster munitions. Enter 0.0 for noncluster munitions. Source: FM 101-50-1, Appendix A, Section V.

(j) AM.ROCKEYE (integer) - if this munition is Rockeye or APAM, enter 1; otherwise, enter 0.

The end of the segment is marked by entering the word "END" (without quotes).

(2) Aircraft Release and Trajectory Parameters. The following data items (a) through (o) are repeated for each aircraft/munition combination, regardless of whether the munition is a cluster munition or not.

(a) AR.AC.NAME (alpha) - name of the aircraft.

(b) AR.AM.NAME (alpha) - name of the munition.

(c) AR.SPEED (real) - air speed at release, knots air speed (KTAS).

(d) AR.DIVE.ANG (real) - dive angle, degrees.

(e) AR.N.PULSE (integer) - number of release pulses.

(f) AR.N.PER.PULSE (integer) - number of weapons per release pulse.

(g) AR.INTERVAL (real) - aircraft intervalometer value, seconds.

(h) AR.Y.N (real) - release altitude of last weapon, feet.

(i) AR.IMPACT.ANG (real) - impact angle, degrees. Source: FM 101-50-1, Appendix A, Section III; for cluster munitions, see also Chapter 4, Releasable Cluster Munition Worksheet.

(j) AR.STICK.WIDTH (real) - stick width, feet. Source: FM 101-50-1, Appendix A, Section IV.

(k) AR.SLANT.RANGE (real) - slant range of first weapon, feet. Source: FM 101-50-1, Appendix A, Section III; for cluster munitions, see also Chapter 4, Releasable Cluster Munition Worksheet.

(l) AR.CEP.N (real) - circular error probable in the normal plane, mils. Source: FM 101-50-1, Appendix A, Section II (noncluster munitions) or Section III (cluster munitions).

(m) AR.DEL.REL (real) - delivery reliability, in the range 0.0 to 1.0. Source: FM 101-50-1, Appendix A, Section II.

(n) AR.TOF (real) - enter time of flight, seconds, for fixed sight delivery with high drag weapons. Enter 0.0 for all other delivery modes. Source: FM 101-50-1, Appendix A, Section III.

(o) AR.ACCELERATED (integer) - enter 1 for accelerated dive-toss, 0 for unaccelerated dive.

(3) Cluster Munition Trajectory Parameters. This segment provides additional information on cluster munition trajectories. The following data items (a) through (h) are repeated for each aircraft/cluster munition combination.

(a) ACM.AC.NAME (alpha)- name of the aircraft.

(b) ACM.MUN.NAME (alpha) - name of the munition.

(c) ACM.DISP.INT (real) - for munitions with captive dispensers, the dispenser intervalometer setting, seconds. Enter 0.0 for releasable clusters.

(d) ACM.SDP.LENGTH (real) - for munitions with captive dispensers, the single dispenser pattern length, feet. Enter 0.0 for releasable clusters. Source: FM 101-50-1, Appendix A, Section III, and Chapter 4, Releasable Cluster Munitions Trajectory Worksheet.

(e) ACM.SDP.WIDTH (real) - for munitions with captive dispensers, the single dispenser pattern width, feet. Enter 0.0 for releasable clusters. Source: FM 101-50-1, Appendix A, Section III, and Chapter 4, Releasable Cluster Munitions Trajectory Worksheet.

(f) ACM.FUN.TIME (real) - for releasable clusters, the functioning time, seconds. Enter 0.0 for captive dispensers. Source: FM 101-50-1, Appendix A, Section III.

(g) ACM.OUT.RAD (real) - for releasable clusters, the single dispenser pattern outer radius, feet. Enter 0.0 for captive dispensers. Source: FM 101-50-1, Appendix A, Section III, and Chapter 4, Releasable Cluster Munitions Trajectory Worksheet.

(h) ACM.IN.RAD (real) - for releasable clusters, the single dispenser pattern inner radius, feet. Enter 0.0 for captive dispensers. Source: FM 101-50-1, Appendix A, Section III, and Chapter 4, Releasable Cluster Munitions Trajectory Worksheet.

The end of the segment is marked by entering the word "END" (without quotes).

(4) Weapon Effectiveness Against Nonpersonnel Targets. The following data items (a) through (e) are repeated for each aircraft/munition/target type combination. No entry is required if the weapon effectiveness is zero for a particular combination.

(a) AME.AC.NAME (alpha) - name of the aircraft

(b) AME.MUN.NAME (alpha) - name of the munition.

(c) AME.TGT.TE.NAME (alpha) - name of the target type equipment.

(d) AME.EI.TYPE (alpha) - effectiveness index type. Enter one of the following:

MAEF - mean area of effects for fragmenting weapons.
MAEB - mean area of effects for blast.

VAN - vulnerable area in the normal plane.

(e) AME.EI (real) - effectiveness index, square feet.

The end of the segment is marked by entering the word "END" (without quotes).

(5) **Weapon Effectiveness Against Nonpersonnel Targets.** The following data items (a) through (e) are repeated for each aircraft/munition/target type combination. No entry is required if the weapon effectiveness is zero for a particular combination.

(a) AME.AC.NAME (alpha) - name of the aircraft.

(b) AME.MUN.NAME (alpha) - name of the munition.

(c) AME.TGT.TE.NAME (alpha) - name of the target type equipment.

(d) AME.EI.TYPE (alpha) - effectiveness index-type. Enter one of the following:

MAEF - mean area of effects for fragmenting weapons.
MAEB - mean area of effects for blast.
VAN - vulnerable area in the normal plane.

Source: FM 101-50-1, Appendix B.

(e) AME.EI (real) - effectiveness in[illegible] square feet. Source: FM 101-50-1, Appendix B.

The end of the segment is marked by entering the word "END" (without quotes).

(6) **Weapon Effectiveness Against Personnel.** The following data items (a) through (f) are repeated for each aircraft/munition. No entry is required if the weapon effectiveness against personnel is zero for a particular combination.

(a) AMP.AC.NAME (alpha) - name of the aircraft

(b) AMP.MUN.NAME (alpha) - name of the munition.

(c) AMP.EI.TYPE (alpha) - effectiveness index type. Enter one of the following:

MAEF - mean area of effects for fragmenting weapons.
MAEB - mean area of effects for blast.
VAN - vulnerable area in the normal plane.

Source: FM 101-50-1, Appendix B.

(d) AMP.EI(standing) (real) - effectiveness index against standing personnel, square feet. Source: FM 101-50-1, Appendix B.

(e) AMP.EI(prone) (real) - effectiveness index against prone personnel, square feet. Source: FM 101-50-1, Appendix B.

(f) AMP.EI(foxhole) (real) - effectiveness index against personnel in foxholes, square feet. Source: FM 101-50-1, Appendix B.

The end of the segment is marked by entering the word "END" (without quotes).

(7) Environmental Effects for Nonpersonnel Targets. The following data items (a) through (h) are repeated for each munition/environment combination. Items (c) through (h) consist of three pairs of (x,y) values, where x is the expected fractional coverage of the munition in the open, and y is the expected fractional coverage in the stated environment. The pairs must be entered in order of increasing x; x must not be zero. Intermediate values are interpolated. Source: FM 101-50-1, Appendix B. (Note: as of this date, no source is known for environmental effects data when the environment is "towns.")

(a) AMEV.MUN.NAME (alpha) - name of the munition.

(b) AMEV.ENV (alpha) - environment; one of the following:

W - woods
T - towns

(No environmental correction is necessary for targets in the open.)

(c) AMEV.FCO(1) (real) - expected fractional coverage in the open, at the first of three points.

(d) AMEV.FC(1) (real) - expected fractional coverage in the stated environment, at the first of three points.

(e) AMEV.FCO(2) (real) - expected fractional coverage in the open, at the second of three points.

(f) AMEV.FC(2) (real) - expected fractional coverage in the stated environment, at the second of three points.

(g) AMEV.FCO(3) (real) - expected fractional coverage in the open, at the third of three points.

(h) AMEV.FC(3) (real) - expected fractional coverage in the stated environment, at the third of three points.

The end of the segment is marked by entering the word "END" (without quotes).

(8) Environmental Effects for Personnel. The following data items (a) through (i) are repeated for each munition/environment/personnel posture combination. Items (d) through (i) consist of three pairs of (x,y) values, where x is the expected fractional coverage of the munition against personnel in this posture in the open, and y is the expected fractional coverage in the stated environment. The pairs must be entered in order of increasing x. Intermediate values are interpolated. Source: FM 101-50-1, Appendix B.

(a) AMEP.MUN.NAME (alpha) - name of the munition.

(b) AMEP.ENV (alpha) - environment; one of the following:

W - woods
T - towns

(No environmental correction is necessary for targets in the open.)

(c) AMPE.POST (alpha) - posture; one of the following:

S - standing
P - prone
F - foxhole

(d) AMEP.FCO(1) (real) - expected fractional coverage in the open, at the first of three points.

(e) AMEP.FC(1) (real) - expected fractional coverage in the stated environment, at the first of three points.

(f) AMEV.FCP(2) (real) - expected fractional coverage in the open, at the second of three points

(g) AMEP.FC(2) (real) - expected fractional coverage in the stated environment, at the second of three points.

(h) AMEP.FCO(3) (real) - expected fractional coverage in the open, at the third of three points.

(i) AMEP.FC(3) (real) - expected fractional coverage in the stated environment, at the third of three points.

The end of the segment is marked by entering the word "END" (without quotes).

(9) Changes to the Unit File. In the past, the field named HC.WPN.TYPE (which is entered only when the unit is a FARP or airfield) contained the sequence number of a bomb in the Aircraft Munitions file when the equipment being described was an aircraft. This field is no longer used for aircraft, but, in order to retain compatibility with existing data sets, some value should be entered. (When the unit is a FARP, the HC.WPN.TYPE is still used for helicopter weapons.)

Aircraft Munitions data file:

```
UMK90  N  13    0.95   0   N    0  0        0     0
UMK98  C   6.4  0      0   R  247  0.98     0.97  1
END
UACA56  UMK90  500   10   6   1   0.18  1000  46   40  2950  19   1.0   0   0
UACA14  UMK90  500   10   6   1   0.18  1000  46   40  2950  19   1.0   0   0
UACA56  UMK98  450   10   6   1   0.20   800  33   40  2950  19   1.0   0   0
UACA14  UMK98  450   10   6   1   0.20   800  33   40  2950  19   1.0   0   0
END
UACA56  UMK98  0   0   0  1.2  75  0
UACA14  UMK98  0   0   0  1.2  75  0
END
UACA56  UMK98  MH-ARM VAN  15
UACA10  UMK98  MH-ARM VAN  15
END
UACA56 UMK90  MAEF  23847  23847  23847
UACA10 UMK90  MAEF  23847  23847  23847
END
UMK98  W   .1  .1  .2  .2  .3  .3
UMK98  T   .1  .1  .2  .2  .3  .3
END
UMK90  W S   .1  .1  .2  .2  .3  .3
UMK90  T S   .1  .1  .2  .2  .3  .3
UMK90  W P   .1  .1  .2  .2  .3  .3
UMK90  T P   .1  .1  .2  .2  .3  .3
UMK90  W F   .1  .1  .2  .2  .3  .3
UMK90  T F   .1  .1  .2  .2  .3  .3
END
```

11-4. BATTERY DATA. The Battery Data file identifies which units are the artillery battalion headquarters, which units are their subordinate batteries, and what type of batteries they are. All equipment which has been defined as artillery in the type equipment file must be present in this file. This requirement includes non firing artillery, i.e., target acquisition radars.

a. Data Format

(1) The first data set begins with N.FA.BN, the integer number of battalions headquarters. The following data is repeated for each battalion headquarters.

- F.B.MISSION (A) - the mission of each the battalion headquarters, either DS (direct support) or GS (general support).

(2) The second data set begins with N.BTRY, the integer number of batteries to be modeled. This is the total number of all batteries assigned. Each battery must be assigned to one (and only one) battalion. The following data items (a) through (c) are repeated for each battalion, N.FA.BN times.

(a) FA.BN.UNIT (I) - the unit number of the unit which is the battalion headquarters for the following batteries (this is one of the N.FA.BN battalion headquarters). Items (b) and (c) are repeated for each battery or target acquisition radar in the battalion. A 999 flag indicates the end of this list.

(b) BY.TYPE (I) - the sequence number of the battery type (from the Type Battery data file) which describes the battery.

(c) BY.UNIT (I) - the unit number of the unit which owns the battery.

b. Coordinating Requirements

(1) Unit data file. The BY.UNIT must be a valid unit number from the Unit data file, the FA.BN.UNIT may be a dummy unit.

(2) Type Battery data file. The BY.TYPE must be the sequence number of a type of battery described in the Type Battery data file.

(3) Fire Direction Center data file. The FA.UNIT.NO references battalion headquarters, FA.BN.UNIT, by their unit number.

Battery data file:

```
3
DS GS DS

10
11001
        1  11001
        1  11002
        1  11003
        2  11004
        2  11005            999
11011
        1  11012
        2  11013            999
51001
        3  51002
        3  51003
        3  51004            999
```

11-5. CATEGORY TYPE UNIT DATA. The Category Type Unit data file defines the categories of units and the type of units that belong to them. Categories of units aggregate characteristics common to a number of types of units, types of units aggregate characteristics common to a number of units.

a. Data Format. This data file consists of two parts--first the description of the categories of types of units and second the description of the types of units.

(1) The first data set begins with N.CATEGORY, the integer number of categories to be modeled. The following data items (a) through (c) are repeated for each category.

(a) CT.NAME (A) - the name of the category, up to six characters, with no embedded blanks.

(b) CT.MIN.FEBA (I) - the minimum distance, in decameters, behind the FEBA that units of this category will normally be found, expressed in the range 0 to 262,143.

(c) CT.GROUP (I) - the grouping to which the category belongs.

1 = Maneuver
2 = Artillery
3 = Support
4 = Combat Aviation

(2) The next data set begins with N.TYPE.UNIT, the integer number of type units to be modeled. The following data items (a) through (p) are repeated for each type of unit.

(a) TU.SEQ.NO (I) - the sequence number of the unit type.

(b) TU.LEVEL (A) - the name of the unit type, up to six characters with no embedded blanks.

(c) TU.CAT (I) - the sequence number of the category of unit, given above, to which the type unit belongs.

(d) TU.MIL.WORTH (I) - the military worth of the unit type, applied consistently to both sides, expressed in the range 0 to 2,047.

(e) TU.MOV.RATE (I) - the speed at which the unit type moves, in hexadecameters per hour (1 hexadecameter = 16 meters).

(f) TU.PRIN.TE (I) - the sequence number of a type of equipment. The principal type of equipment belonging to this type of unit. This is used in the selection of artillery munitions based upon computed lethal areas versus this type of equipment.

(g) TU.RADIUS (I) - the radius of this type of unit, in meters, expressed in the range 0 to 2,047.

(h) TU.SIDE (I) - the side to which this type of unit belongs, where 1 = Red or 2 = Blue.

(i) TU.SUP.PRIORITY (I) - a value used to compute the priority of a force requesting helicopter support expressed in the range 0 to 2,047.

(j) TU.OPP.PRIORITY (I) - a value, applicable to the opposing force, used to compute the priority for helicopter support, expressed in the range 0 to 2,047.

(k) TU.MF.FACTOR (I) - a multiplier used in determining the delay caused by mines. A base delay is computed, then multiplied by this value to adjust the delay based on the type of unit encountering the mines, expressed in the range 0 to 2,047.

(l) TU.ATK.AC (I) - the sequence number of the preferred aircraft to attack this type of unit, from the Tactical Aircraft data file.

(m) TU.AC.PER.MSN (I) - number of the preferred aircraft to attack this type of unit.

Items (n) through (p) are repeated for each type of equipment assigned to the this type of unit. A 999 flag indicates the end of the list of equipment types allocated to this type of unit.

(n) TU.TE.ID (I) - the sequence number of a type of equipment to be assigned to this type of unit.

(o) TU.TE.QUANT (I) - the number of this type of equipment, TU.TE.ID, assigned to this type of unit, expressed in the range 0 to 2,047.

(p) TU.CRITICAL.EQUIP.INDIC (I) - a switch indicating if this type of equipment is critical to the operation of this type of unit, where 1 = yes and 2 = no. Used to compute current strength for comparison to various threshold values.

If some pieces of a type equipment are critical while other pieces of the same type of equipment are not critical, multiple entries can be made for this type of equipment. For example, if there are 15 critical personnel and 20 noncritical personnel in a given type of unit, then personnel can be listed twice.

The last record for the type of unit is repeated for each type of equipment not assigned to this type of unit. A 999 flag is used to end the list.

(q) TU.NTE.ID (I) - the sequence number of a type of equipment that is not in this type of unit.

b. Coordinating Requirements

(1) Equipment data file. The TU.PRIN.TE, TU.TE.ID, and TU.NTE.ID are the sequence numbers of the equipment types from the Equipment data file.

(2) Posture Environment and Mission data file. The records reference the sequence of the categories of units.

(3) Rules of Engagement data file. The CDT.MAX.VOLS and the CDI.USAGE.INDICATOR records refer to the sequence of the unit categories. The DT.MAX.BATS records refer to the sequence of the unit type.

(4) Smart Munitions data file. The SMM.TU.NAME refers to the names of the types of units.

(5) Unit data file. The UNIT.NAME refers to the level names of types of units. The UNIT.RADIUS refers to the radii of the types of units. The UE.QUANT of the equipments with the same TE.NAME must sum to the TU.TE.QUANT of the unit type. Maneuver units have the CT.GRUP equal to 1 or the CT.NAME equal to CBTAVN or AIRDEF of the category of unit describing them.

(6) Tactical Aircraft data file. The TU.ATK.AC refers to the sequence of the aircraft defined in the Tactical Aircraft data file.

Category Type Unit data file:

```
      6
      ARMOR       0   1
      ARTY      150   2
      HQ        250   3
      CBTAVN    100   4
      AIRDEF    500   3
      INF         0   1

      18
   1  UDIVHQ  3     500    4200   1    300    2    0    0    1    3    2
              1      8   1                                            999
              2   3   4   5   6   7                                   999

   2  UTANK1  1     200    3800   2    300    2   10   20    1    4    3
              2      4   1                                            999
              1   3   4   5   6   7                                   999

   3  UARTY1  2     200    3000   3    450    2    0    0    2    3    2
              3      6   1
              1     12   1                                            999
              2   4   5   6   7                                       999

   4  UINF1   6     100    2500   1    450    2    5    5    3    3    2
              1     20   1                                            999
              2   3   4   5   6   7                                   999

   5  UFARP   4     450    3000   5    400    2    0    0    1    4    6
              5     12   1                                            999
              1   2   3   4   5   7                                   999

   6  UAFLD   4     600    3000   4    700    2    0    0    1    4    7
              4     16   1                                            999
              1   2   3   5   6   7                                   999

   7  URPV    4     110    5000   6     50    2    0    0    1    3    2
              6      1   1                                            999
              1   2   3   4   5   7                                   999

   8  UFO     6     200    300    6    300    2   10    5    1    3    2
              6      3   1                                            999
              1   2   3   4   5   7                                   999

   9  RDIVHQ  3     500    4200   1    300    2    0    0    1    3    2
              1      8   1                                            999
              2   3   4   5   6   7                                   999

  10  RTANK1  1     200    3800   2    300    2   10   20    1    4    3
              2      4   1                                            999
              1   3   4   5   6   7                                   999
 (Not all types of units shown)
```

11-6. COUNTERFIRE RADAR DATA. The counterfire radar (CFR) or Radar data file establishes the characteristics of each CFR along with the range bands which determine its probabilities and accuracies of detection.

a. Data Format

(1) The first data items:

- N.CFR.RNG.HACK (I) - the total number of range hacks used by all the CFRs. Each CFR may have a different number of range hacks, but the total number of range hacks for all CFRs must add up to N.CFR.RNG.HACK.

(2) The next data set begins with N.MODEL.CFR, the integer number of CFRs to be modeled. The following data items (a) through (j) are repeated for each CFR.

(a) MCFR.NAME (A) - the name of the CFR, up to six characters, with no embedded blanks.

(b) MCFR.EQ.ID (I) - the sequence number of the equipment which owns this CFR.

(c) MCFR.MIN.OFF (I) - the minimum amount of time, in tenths of minutes, that the CFR must be off before being restarted, expressed in the range of 0 to 262,143.

(d) MCFR.MAX.ON (I) - the maximum amount of time, in tenths of minutes, that the CFR may be on before being switched off, expressed in the range of 0 to 262,143.

(e) MCFR.SWEEP.ANGLE (I) - the width, in degrees, of the radar beam, expressed in the range of 0 to 360.

(f) MCFR.SEARCH.WIDTH (I) - the width, in kilometers, of the area of responsibility of the CFR, expressed in the range of 0 to 4,095.

(g) NUM.RH (I) - the number of range hacks used by the CFR.

The following data items (h) through (j) are repeated once for each range hack defined for this CFR. The range hacks must be listed in order of increasing values of CFR.RH.RANGE.

(h) CFR.RH.RANGE (I) - the maximum range, in meters, that is contained in this range hack expressed in the range of 0 to 65,520.

(i) CFR.DET.PROB (I) - the probability, expressed as an integer percentage, of the CFR detecting a target within this range hack, expressed in the range of 0 to 100.

(j) CFR.CIR.ERROR (I) - the expected circular error, in meters, when the CFR estimates the location of a detected target within this range hack, expressed in the range of 0 to 2,047.

b. Coordinating Requirement

(1) Equipment data file. The MCFR.EQ.ID must be the sequence number of a valid equipment from the Equipment data file.

(2) Type Sensor data file. The sensors with ST.NAME equal to CB or CM refer to sensors described in the Type Sensor data file.

(3) Sensor data file. For sensors with ST.NAME equal to CB or CM, the SENS.MODEL refers to the sequence number of the counterfire radar sensors.

Counterfire Radar data file:

```
14
 4
 UTPQ36   54   300   10   90   13
            3
             3000   60   36
            12000   60   39
            20000   60   44

 UTPQ37   55   450   10   90   18
            4
             3000   68   10
            12000   68   42
            25000   68   88
            35000   68  105

 RFYAWN  111   300   10   90    13
            3
             3000   60   36
            12000   60   39
            15000   60   44

 RBFRDF  112   450   10   90    18
            4
             3000   68   10
            12000   68   42
            25000   68   88
            30000   68  105
```

11-7. DECISION DATA. The decision information define control values for maneuver unit missions.

a. Data Format

(1) The first data set:

(a) N.COLOR (I) - the number of colors or sides. This value must be 2.

(b) N.MISSION (I) - the number of mission types. This value must be 6.

(2) The following data items are repeated for each of the missions: PATROL, PROBE, ATTACK, DELAY, DEFEND, and AMBUSH, in that order.

(a) DECISION(Red) (I) - the minimum integer percentage of critical equipment a maneuver unit must have onhand in order to execute its mission.

(b) SUP.MISSION.PRIORITY(Red) (I) - a value used in deciding the priority of a request for helicopter support by a force with this mission, expressed in the range 0 to 262,143.

(c) WD.DIST(Red) (I) - the minimum distance, in meters, that an enemy is allowed to approach a defending or delaying unit with this mission. If the enemy comes closer, the unit begins to withdraw.

(3) The following data items are repeated for each of the missions: PATROL, PROBE, ATTACK, DELAY, DEFEND, and AMBUSH, in that order.

(a) DECISION(Blue) (I) - the minimum integer percentage of critical equipment a maneuver unit must have onhand in order to execute its mission.

(b) SUP.MISSION.PRIORITY(Blue) (I) - a value used in deciding the priority of a request for helicopter support by a force with this mission, expressed in the range 0 to 262,143.

(c) WD.DIST(Blue) (I) the minimum distance, in meters, that an enemy is allowed to approach a defending or delaying unit with this mission. If the enemy comes closer, the unit begins to withdraw.

b. Coordinating Requirements

- Category Type Unit data file. Critical items of equipment are described there.

Decision data file:

```
 2  6
    85  1  1000
    75  2   050
    60  3   050
    85  3  1500
    75  4   050
    60  5   050

    85  1  1000
    75  2   050
    60  3   050
    85  3  1500
    75  4   050
    60  5   050
```

11-8. EQUIPMENT DATA. The equipment data file describes the various equipment such as tanks, APCs, and helicopters. The equipments are the targets in the model. The equipment are also aggregated into types of equipment which have data that apply to every equipment in the class. The types are such things as troops, light artillery, heavy artillery, and light aircraft.

a. Data Format

(1) The first data set begins with N.TYPE.EQUIPMENT,the integer number of types of equipment to be modeled. The following data items (a) through (i) are repeated for each type of equipment.

(a) TE.NAME (A) - the name of the type of equipment, up to six characters, with no embedded blanks. The first type equipment must describe personnel.

(b) TE.PROJECTED.AREA (I) - the average area, in square meters, on the ground covered by one of this type of equipment, expressed in the range 0 to 262,143.

(c) TE.MIN.MF.LOSS (I) - the minimum quantity of this type of equipment that will be lost when a unit having this type of equipment encounters a minefield, expressed in the range 0 to 63.

(d) TE.MAX.MF.LOSS (I) - the maximum quantity of this type of equipment that will be lost when a unit having this type of equipment encounters a minefield, expressed in the range 0 to 63.

(e) TE.MIN.ADMF.LOSS (I) - the minimum of this type of equipment that may be lost when a unit containing this type of equipment encounters an artillery delivered minefield.

(f) TE.MAX.ADMF.LOSS (I) - the maximum of this type of equipment that may be lost when a unit containing this type of equipment encounters an artillery delivered minefield.

(g) TE.DELTA.T (R) - the absolute temperature difference between a piece of this type of equipment and its environment measured in degrees Centigrade, expressed in the range 0 to 2,047.

(h) TE.HEIGHT. (R) - the critical, or largest,dimension of this type equipment, measured in meters, expressed in the range of 0 to 2,047. The dimension most critical to causing a type equipment to be seen may be the height, for a tank, or the length, for an aircraft.

(i) TE.DEAD.TGT.TIME (I) - the time, in seconds, that this type of equipment is available to be shot at as a dead target once killed.

(2) The sum of the following two numbers must be the total number of items of equipment being modeled, N.EQUIPMENT (i.e., Blue + Red).

(a) N.BLUE.TYPE.EQP (I) - the number of different items of equipment that belong to the Blue side.

(b) N.RED.TYPE.EQP (I) - the number of different items of equipment that belong to the Red side.

(3) The following data items (a) through (k) are repeated for each equipment.

(a) EQ.SEQ.NO (I) - the sequence number of the equipment.

(b) EQ.NAME (A) - the equipment name, up to six characters, with no embedded blanks.

(c) EQ.TE.PTR (I) - the sequence number of the type of equipment describing this equipment.

(d) EQ.MAX.SPEED (I) - the maximum speed of this equipment, in kilometers per hour, expressed in the range 0 to 2,047. This value only has meaning for helicopters and aircraft, but must be present for all equipments.

(e) EQ.PERSONNEL.LOAD (I) - the number of people carried as crew or passengers, expressed in the range 0 to 2,047. Data item (f) is present only if CALP.ON = 1 in the System data file.

(f) EQ.PAX.KILL.RATE (R) - the expected fraction of the total personnel in a vehicle to be killed if the vehicle is killed.

(g) EQUIP.PK.PTR (I) - the column number of the PK vector matrix which represents this equipment.

(h) EQ.AD.INDICATOR (I) - a switch that indicates if the equipment is capable of performing as an air defense system, where 0 = no and 1 = yes.

(i) EQ.DETECT.TIME (I) - the time, in seconds, between when this equipment detects a target and the first shot is fired.

(j) EQ.STA.P.EN (I) - the probability that this equipment while stationary will become a firer in a direct fire battle in which it is engaged.

(k) EQ.MOV.P.EN (I) - the probability that this equipment, while moving, will become a firer in a direct fire battle in which it is engaged.

b. Coordinating Requirements

(1) Probability of Kill data file. The EQUIP.PK.PTR must be the sequence number of the column representing this equipment as a target in the exposed firer-target matrix and defilade firer-target matrix.

(2) Aircraft Munitions data file. The AMET.LA.EQUIP references the types of equipment by their sequence.

(3) Category Type Unit data file. The TU.PRINC.TE, TU.TE.ID, and TU.NTE.ID reference the types of equipment by their sequence.

(4) Counterfire Radar data file. The MCFR.EQ.ID references the equipment by sequence.

(5) Forward Area Rearming Point data file. SCT.HC and ATK.HC reference the scout and attack helicopter equipment names.

(6) Forward Observer data file. The MFO.EQ.ID refers to the sequence of the equipments. The MNMTR.PROB.DETECT set refers to the sequence of the types of equipment.

(7) High Explosive Lethal Area data file. The RTEF.LA.EQUIP refers to the sequence of the types of equipment.

(8) Mine data file. The TMF.NAME and the TMF.KILLER.NAME refer to the mine equipment names.

(9) Passive Detection Base data file. The MPDB.EQ.ID refers to the sequence of the equipments.

(10) Phased Offline Attrition data file. The FIRING.EQUIP and the TARG.EQUIP refer to the names of equipment.

(11) Remotely Piloted Vehicle data file. The TRPV.NAME refers to equipment names.

(12) Smart Munitions data file. The LG.TGT.EQP.NAME refers to equipment names. The PG.TE.NAME refers to the names of types of equipments.

(13) Submunitions data file. The lethal area records refer to the sequence of the type of equipment.

(14) Tactical Aircraft data file. The SM.TANK.TE refers to the names of types of equipment.

(15) Target Report data file. The TR.DET.TE refers to the names of the types of equipment.

(16) Unit data file. The EQ.NAME refers to the name of the equipment.

Equipment data file:

```
          7
       TROOPS             1    0    5     0    5    8.        1.     5
       HVYARM            28    0    3     0    2    1.10      3.    60
       ARTY              20    0    0     0    0    8.        3.     0
       LTACFT            20    0    0     0    0    2.        2.     0
       HELO              20    0    0     0    0    0.70      1.     0
       RPV-FO            20    0    0     0    0    0.05      0.50   0
       MINES              0    0    0     0    0    0.        0.     0

       15   15

  1    UM1        3       0       4      1       0     10     90     60
  2    U60A3      3       0       4      2       0     10     90     60
  3    RPV       10     145       0      3       0     10      5     50
  4    UHC58D     9     360       2      4       0     10    100    100
  5    UHCH64     9     360       2      4       0     10    100    100
  6    UACA10     8     556       1      5       0     10    100    100
  7    UACF16     8     927       2      6       0     10    100    100
```

8	UINTP	1	0	1	7	0	10	50	50
9	UOPART	1	0	1	7	0	10	75	50
10	UH105A	5	0	5	8	0	10	5	50
11	UH155A	5	0	12	8	0	10	5	50
12	UMLRS	6	0	3	8	0	10	5	50
13	UFISTV	2	0	2	9	0	10	50	50
14	FASCAM	11	0	0	10	0	10	80	50
15	MINEFD	11	0	0	10	0	10	80	50
16	RT80B	3	0	0	11	0	10	90	60
17	RT72	3	0	0	11	0	10	90	60
18	RT55/4	3	0	4	12	0	10	90	60
19	RHIPE	9	360	0	13	0	10	100	100
20	RHINDE	9	360	0	13	0	10	100	100
21	RSU24	4	650	1	14	0	10	100	100
22	RSU25	4	875	2	14	0	7	0	100
23	RINTP	1	0	1	15	0	10	50	50
24	ROPART	1	0	1	15	0	10	75	50
25	RH152Z	6	0	0	16	0	10	90	60
26	RH152A	5	0	0	16	0	10	5	50
27	RL122V	4	0	0	16	0	10	5	50
28	RFO	2	0	0	17	0	10	75	50
29	MINEFD	11	0	0	18	0	10	80	50
30	RDSCAM	11	0	0	18	0	10	100	100

11-9. FIRE DIRECTION CENTER DATA. The FDC (fire direction center) data file establishes the relationships between battalions and FDCs, details FDC attributes, and identifies FDC leaders.

a. Data Format

(1) The first data set begins with N.FDC, the integer number of FDCs. The following data items (a) through (f) are repeated for each FDC.

(a) FD.UNIT (I) - the unit number of the unit acting as the FDC.

(b) FD.PARENT (I) - the unit number of the FDC which controls this FDC. If there is no controlling FDC, then the FDC is an FDC leader and a zero is entered.

(c) FD.MIN.TIME (I) - the minimum time, in tenths of minutes, required for the FDC to process a fire mission, expressed in the range of 0 to 2,047.

(d) FD.MAX.TIME (I) - the maximum time, in tenths of minutes, required for the FDC to process a fire mission, expressed in the range of 0 to 2,047.

(e) FD.TOT.THRESHOLD (I) - the minimum military worth of a target required before the FDC will set up a time on target fire mission, expressed in the range of 0 to 262,143. This value is not currently used by the model. The next data item is repeated once for each field artillery battalion assigned to the FDC. A 999 flag is used to end this list.

(f) FA.UNIT.NO (I) - the unit number of a field artillery battalion unit assigned to the FDC. This value must be a valid FA.BN.UNIT value as described in the battery data.

b. Coordinating Requirements

(1) Unit data file. The FA.UNIT.NO must be a valid BN unit number from the Battery data file; the FD.UNIT and FD.PARENT do not have to be valid units.

(2) Battery data file. The FA.UNIT.NO must be a valid artillery battalion described in the Battery data file.

(3) Sensor data file. The SENSOR.FDC refers to the unit numbers of FDCs.

(4) Target Report data file. The TR.FDC refers to the unit number of FDCs.

Fire Direction Center data file:

```
 3
 11001        0   10   20   3000   11001                               999
 12001    11001   10   20   3000   11011                               999
 50001        0   12   18   1000   51001                               999
```

11-10. FORWARD AREA REARMING AND REFUELING POINT DATA. The FARRP (forward area rearming and refueling point) data identify the FARRP units and give parameters for helicopter sorties.

a. Data Format

(1) The first data set:

(a) HC.SWITCH (I) - a variable indicating if helicopters are to be modeled, where 0 = no and 1 = yes. If the value is zero, there must be no further data in the FARRP File.

(b) N.SCOUT.CONFIGURATIONS (I) - the number of different scout helicopters to be modeled.

(c) N.ATTACK.CONFIGURATIONS (I) - the number of different attack helicopters to be modeled.

The following data items (d) through (h) are repeated for each scout helicopter.

(d) SCT.HC (A) - the equipment name of the equipment which represents the scout helicopter.

(e) TH.MIN.NP.RANGE (I) - the minimum standoff range, in meters, for this type of scout helicopter when not paired with an attack helicopter.

(f) TH.MAX.NP.RANGE (I) - the maximum standoff range, in meters, for this type of scout helicopter when not paired with an attack helicopter.

(g) TH.MIN.P.RANGE (I) - the minimum standoff range, in meters, for this type of scout helicopter when paired with an attack helicopter.

(h) TH.MAX.P.RANGE (I) - the maximum standoff range, in meters, for this type of scout helicopter when paired with an attack helicopter.

The following data items (i) and (n) are repeated for each attack helicopter.

(i) ATK.HC (A) - the equipment name of the equipment which represents an attack helicopter.

(j) TH.MIN.NP.RANGE (I) - the minimum standoff range, in meters, for this type of attack helicopter when not paired with a scout helicopter.

(k) TH.MAX.NP.RANGE (I) - the maximum standoff range, in meters, for this type of attack helicopter when not paired with a scout helicopter.

(l) TH.MIN.P.RANGE (I) - the minimum standoff range, in meters, for this type of attack helicopter when paired with a scout helicopter.

(m) TH.MAX.P.RANGE (I) - the maximum standoff range, in meters, for this type of attack helicopter when paired with a scout helicopter.

(n) PRINC.HC.WPN (A) - the name of the attack helicopter's principal weapon.

(o) SEC.AMMO.FIRE (R) - the fraction of the ammunition of each secondary weapon system on attack helicopters which must be fired before leaving the battle because of munition level. (In addition, all of the ammunition of the primary weapon system must be expended.)

(2) The next data set:

(a) PRINT.SWITCH (I) - a switch indicating whether the FARRP data is to be printed out, where 0 = no and 1 = yes.

(b) HC.DEBUG (A) - a switch indicating whether debugging statements are to be printed whenever helicopters perform an action, where 0 = no and 1 = yes. A yes is only used to test helicopter functions.

(3) The next data set:

(a) MAX.FL.TIME(Blue) (I) - the maximum allowed flight time of a round trip for a Blue helicopter, in minutes, between a FARRP and a battle.

(b) MAX.FL.TIME(Red) (I) - the maximum allowed flight time of a round trip for a Red helicopter, in minutes, between a FARRP and a battle.

(c) HC.SPACING(Blue) (I) - the spacing, in meters, between members of a team of Blue helicopters which are positioned at a battle.

(d) HC.SPACING(Red) (I) - the spacing, in meters, between members of a team of Red helicopters which are positioned at a battle.

(e) MIN.NO.SUP.UNITS (I) - the minimum number of units for a force to request helicopter support. This value is only used by the Blue side.

(4) The next data set defines Blue handoff times.

(a) MIN.HANDOFF.TIME(Blue) (R) - the minimum time, in seconds, required for a Blue scout helicopter to hand off a target to its attack helicopter.

(b) MAX.HANDOFF.TIME(Blue) (R) - the maximum time, in seconds, required for a Blue scout helicopter to hand off a target to its attack helicopter.

(5) The next data set is for Red handoff times.

(a) MIN.HANDOFF.TIME(Red) (R) - the minimum time, in seconds, required for a Red scout helicopter to hand off a target to its attack helicopter.

(b) MAX.HANDOFF.TIME(Red) (R) - the maximum time, in seconds, required for a Red scout helicopter to hand off a target to its attack helicopter.

(6) The next data set defines Blue mask times. A random draw on a uniform distribution is made between the two values.

(a) MIN.MASK.TIME(Blue) (R) - the minimum time, in seconds, that a Blue helicopter will remain masked.

(b) MAX.MASK.TIME(Blue) (R) - the maximum time, in seconds, that a Blue helicopter will remain masked.

(7) The next data set defines Red mask times. A random draw on a uniform distribution is made between the two values.

(a) MIN.MASK.TIME(Red) (R) - the minimum time, in seconds, that a Red helicopter will remain masked.

(b) MAX.MASK.TIME(Red) (R) - the maximum time, in seconds, that a Red helicopter will remain masked.

(8) The next data defines unmask times for Blue. A random draw on a uniform distribution is made between the two values.

(a) MIN.UNMASK.TIME(Blue) (R) - the minimum time, in seconds, that a Blue helicopter will remain unmasked.

(b) MAX.UNMASK.TIME(Blue) (R) - the maximum time, in seconds, that a Blue helicopter will remain unmasked.

(9) The next data defines unmask times for Red. A random draw on a uniform distribution is made between the two values.

(a) MIN.UNMASK.TIME(Red) (R) - the minimum time, in seconds, that a Red helicopter will remain unmasked.

(b) MAX.UNMASK.TIME(Red) (R) - the maximum time, in seconds, that a Red helicopter will remain unmasked.

(10) The next data set defines the Blue operational readiness of helicopters and in-flight abort for mechanical failures prior to reaching the target area.

(a) ATK.FAIL.PROB(Blue) (R) - the percent of Blue attack helicopters that will be lost during a sortie for noncombat reasons.

(b) SCT.FAIL.PROB(Blue) (R) - the percent of Blue scout helicopters that will be lost during a sortie for noncombat reasons.

(11) The next data set defines the Red operational readiness of helicopters and in-flight abort for mechanical failures prior to reaching the target area.

(a) ATK.FAIL.PROB(Red) (R) - the percent of Red attack helicopters that will be lost during a sortie for noncombat reasons.

(b) SCT.FAIL.PROB(Red) (R) - the percent of Red scout helicopters that will be lost during a sortie for noncombat reasons.

(12) The next data set begins with NO.OF.FARRPS, the integer number of units which will serve as FARRPs. The following data items are repeated for each FARRP.

(a) FP.UNIT (I) - the unit number of the unit serving as a FARRP.

(b) REFUEL.TIME (I) - the amount of time, in minutes, that this FARRP needs to refuel one helicopter, expressed in the range 0 to 262,143.

(c) REARM.TIME. (I) - the amount of time, in minutes, that this FARRP needs to rearm one helicopter, expressed in the range 0 to 262,143.

(d) REFUEL.CAP (I) - the number of helicopters this FARRP can refuel simultaneously, expressed in the range 0 to 4,095.

(e) REARM.CAP (I) - the number of helicopters this FARRP can rearm simultaneously, expressed in the range 0 to 4,095.

b. Coordinating Requirements

(1) Equipment data file. The SCT.HC and ATK.HC must be valid equipments in the Equipment data file.

(2) Unit data file. The FP.UNIT must be a valid combat aviation unit from the Unit data file.

Forward Area Rearming and Refueling Point data file:

```
1
1  1
UHC58D  500   1000   200   1000
UHCH64  200    500   100    500    UHELFH    .5

1 NO

120     90     150     150     1

  1     5
  1     5
```

```
 20     40
 20     40

 20     25
 20     25

.02    .02
.02    .02

10
17501  5     15     6     6
17502  5     15     6     6
17601  5     15     6     6
17203  5     15     6     6
17301  5     15     6     6
61401  5     15     6     6
61423  5     15     6     6
61402  5     15     6     6
61403  5     15     6     6
61411  5     15     6     6
```

11-11. FORWARD OBSERVER DATA. The forward observer (FO) data file establishes the characteristics of each FO. It defines the range bands in which the FO operates and their associated probabilities and accuracies of detection.

a. Data Format. The file is divided into three sections: system data, FO data and smart munitions list, and detection probabilities.

(1) The first data set is system information.

(a) N.MODEL.FO (I) - the number of FOs to be modeled.

(b) N.FO.RANGE.BAND (I) - the total number of range hacks used by all the FOs. Each FO may have a different number of range hacks, but the total number of range hacks for all FOs must add up to N.FO.RANGE.BAND.

(2) The next data set describes the FOs. The following data items (a) through (j) are repeated once for each FO.

(a) MFO.NAME (A) - the name of the FO, up to six characters, with no embedded blanks.

(b) MFO.EQ.ID (I) - the sequence number of the equipment which owns the FO.

(c) MFO.SEARCH.RATE (I) - the search rate, in square meters per minute, of the FO, expressed in the range of 0 to 26,214,300.

(d) MFO.OPTIC.SENSOR (I) - A variable indicating if the FO has optical sensor capability, where 0 = no and 1 = yes.

(e) NUM.RH (I) - the number of range hacks defined for the FO.

The following data items (f) through (h) are repeated NUM.RH times, once for each range hack.

(f) FO.RB.RANGE (I) - the maximum range, in meters, that is contained in this range hack expressed in the range of 0 to 4,194,288.

(g) FO.VISIBILITY (I) - the probability that the FO will have visibility to a target within this band, expressed as a percentage in the range of 0 to 100.

(h) FO.CIR.ERROR (I) - the expected error, in meters, in the FO's determination of a detected target's location within this band expressed in the range of 0 to 262,143.

The following data items form a list of smart munitions targetable by the FO. Data items (i) and (j) are repeated once per munition. The list is terminated by the key word END.

(i) FML.TYPE.NAME (A) - the type of the smart munition, which must be either LGM or PGM.

(j) FML.MUN.NAME (A) - the name of the smart munition.

NOTE: If the FO cannot target any smart munitions omit items (i) and (j) and terminate the empty list with the key word END.

(3) Each FO has one data set for each type of equipment (except for MINES) (N.TYPE.EQUIPMENT - 1) sets. Each data set has four records, one for each of the possible day/night-moving/stationary combinations. Each record gives the probability of target detection, expressed as an integer percentage, for each of the range hacks defined for the FO (NUM.RH values). The following data sets are repeated for each FO, and the following records are repeated for each type of equipment except for MINES. The records are composed of data items (a), (b), (c), and (d) repeated for each of the range hacks defined for the FO. Item (a) is repeated for each range hack defined for this FO.

(a) MNMTR.PROB.DETECT(day,moving) (I) - the FO's probability of detecting this type equipment as a target, during the day when the target is moving, expressed as an integer percentage.

Item (b) is repeated for each range hack defined for this FO.

(b) MNMTR.PROB.DETECT(day,stationary) (I) - the FO's probability of detecting this type of equipment as a target, during the day when the target is stationary, expressed as an integer percentage.

Item (c) is repeated for each range hack defined for this FO.

(c) MNMTR.PROB.DETECT(night,moving) (I) - the FO's probability of detecting this type of equipment as a target, at night while the target is moving. Expressed as an integer percentage.

Item (d) is repeated for each range hack defined for this FO.

(d) MNMTR.PROB.DETECT(night,stationary) (I) - the FO's probability of detecting this type of equipment as a target, at night while the target is stationary, expressed as an integer percentage.

b. Coordinating Requirements

(1) Equipment data file. The MFO.EQ.ID must be the sequence number of a valid equipment from the Equipment file data. The number of data sets in the target detection section must be equal to the number of types of equipments minus 1 (for mines).

(2) Smart Munitions data file. The FML.TYPE.NAME and the FML.MUN.NAME must agree with entries in the Smart Munitions data file.

(3) Type Sensor data file. The sensors with ST.NAME equal to FO refer to sensors described in the Forward Observer data file.

(4) Sensor data file. For sensors with ST.NAME equal to FO, the SENS.MODEL refers to the sequence number of the forward observer.

Forward Observer data file:

```
3    7

UFISTV     13   525000   1   2
                             2000    75      5
                             4000    38      5

           LGM  CUHD
           END

RPV         3   300000   1   3
                             2000    75      5
                             4000    38      5
                             5000    38      5
           PGM  SADRM
           END

RFO        28   525000   1   2
                             2000    75    100
                             4000    38    250
           PGM  RSADRM
           END
   99 99        99 76        51  0          0  0
   99 99        99 99        88  0         44  0
   99 99        99 99        88  0         44  0
   99 99        99 76        70  0         35  0
   99 99        99 91        64  0         32  0
   99 99        99 91        64  0         32  0

99 99 99     99 99 76     51  0  0       0  0  0
99 99 99     99 99 99     99 88 15      90 44  0
99 99 99     99 99 99     99 88 15      90 44  0
99 99 99     99 99 76     99 70 10      73 35  0
```

```
99 99 99     99 99 91     99 64 15     74 32  0
99 99 99     99 99 91     99 64 15     74 32  0

   99 99        99 76        51  0         0  0
   99 99        99 99        88  0        44  0
   99 99        99 99        88  0        44  0
   99 99        99 76        70  0        35  0
   99 99        99 91        64  0        32  0
   99 99        99 91        64  0        32  0
```

11-12. HIGH EXPLOSIVES LETHAL AREA DATA. The high explosives lethal area (HELA) data file describes the lethal areas for all combinations of HE munition, fuze, posture, environment, and range band.

a. Data Format. The file is divided into two sections: HELA data for personnel and HELA data for types of equipment.

(1) The first portion of the HELA data file describes HELAs for personnel. The following data set is repeated N.HE.MUNITION times (see munition input), once for each HE munition. Each of the next six records contains the following: one field for each of the two range hacks in each of the three environments, for a total of six fields each. The records are constructed as follows: a value for each of the two range hacks in the open environment, a value for each of the two range hacks in the woods environment, and a value for each of the two range hacks in the town environment. The records appear in the following fuze-posture combination order. Note that PD is a fuze setting which means point detonating. Likewise, VT implies variable time.

(a) REPF.LA.PERS(PD,Standing) (I) - the lethal area record, in square meters, for this munition used with a point detonating fuze against personnel in the standing posture.

(b) REPF.LA.PERS(PD,Prone) (I) - the lethal area record, in square meters, for this munition used with a point detonating fuze against personnel in the prone posture.

(c) REPF.LA.PERS(PD,Foxhole) (I) - the lethal area record, in square meters, for this munition used with a point detonating fuze against personnel in the foxhole posture.

(d) REPF.LA.PERS(VT,Standing) (I) - the lethal area record, in square meters, for this munition used with a variable time fuze against personnel in the standing posture.

(e) REPF.LA.PERS(VT,Prone) (I) - the lethal area record, in square meters, for this munition used with a variable time fuze against personnel in the prone posture.

(f) REPF.LA.PERS(VT,Foxhole) (I) - the lethal area record, in square meters, for this munition used with a variable time fuze against personnel in the foxhole posture.

NOTE: the HELA data must appear in the same order as the HE munitions appear in the Munition data file. The range hack information is also defined in the Munitions data file.

NOTE: a range hack divides the distance between a battery and its target into segments, with the first set of HELA data used from 0 to the first range hack, and the second set of HELA data used from the first range hack to the second.

(2) The final portion of the HELA data file describes HELAs for types of equipment. The following data set is repeated N.HE.MUNITION times, once for each HE munition. Each of the following six records contains a pair of data values for each type of equipment (except for personnel and mines), a total of two fields for each equipment type. In other words, there must be N.TYPE.EQUIPMENT--two pairs of data values referencing equipment types in the same order as they appear in the type of equipment portion of the Equipment data file (ignoring personnel and mines). The pair of values is made up of one HELA for the type of equipment in each of the two range hacks.

(a) RTEF.LA.EQUIP(PD,Open) (I) - the lethal areas, in tenths of square meters, for this munition used with a point detonating fuze against this type of equipment in an open environment for each range hack.

(b) RTEF.LA.EQUIP(PD,Woods) (I) - the lethal areas, in tenths of square meters, for this munition used with a point detonating fuze against this type of equipment in a woods environment for each range hack.

(c) RTEF.LA.EQUIP(PD,Town) (I) - the lethal areas, in tenths of square meters, for this munition used with a point detonating fuze against this type of equipment in a town environment for each range hack.

(d) RTEF.LA.EQUIP(VT,Open) (I) - the lethal areas, in tenths of square meters, for this munition used with a variable time fuze against this type of equipment in an open environment for each range hack.

(e) RTEF.LA.EQUIP(VT,Woods) (I) - the lethal areas, in tenths of square meters, for this munition used with a variable time fuze against this type of equipment in a woods environment in each range hack.

(f) RTEF.LA.EQUIP(VT,Town) - the lethal areas, in tenths of square meters, for this munition used with a variable time fuze against this type of equipment in a town environment for each range hack.

NOTE: the HELA data must appear in the same order as the HE munitions in the Munition data file.

NOTE: a range hack divides the distance between a battery and its target into segments, with the first set of HELA data used from 0 to the first range hack, and the second set of HELA data used from the first range hack to the second. At distances further than the second range hack, the munition is considered to be ineffective and will not be fired.

b. Coordinating Requirements

(1) Munitions data file. The number of HE munitions described here must match the number, and order, of the He munitions described in the HE portion of

the Munitions data file. The range hacks and fuzes are defined in more detail in the Munitions data file.

(2) Type Equipment & Equipment data file. The number of types of equipment used must agree with the number of types of equipment, and their order, in the Equipment data file.

High Explosive Lethal Area data file:

```
 314  355       144  186       190  210
  99  121       122  140       183  201
  11   26        11   20         0    0
 400  422         6   46         0    0
 200  300        43   76         0    0
  31   36         0    5         0    0

 182  264       144  186       188  232
  99  121       122  140       183  201
  87   89        45   57        21   50
 321  321       100  120        76   89
 100  120         0    0         0    0
   0    0         0    0         0    0

 271  349       174  233       170  248
  90  134       125  134       120  170
   1    2        15   10        16   18
 340  497         0    0         0    0
 241  340         0    0         0    0
  31   36         0    0         0    0
   300   320     0     0  1870  2390   210   220   200   300

   370   350   460   780  4240  5600  4560  4900  4060  4600

   333   270     0     0  1690  2595  1690  2595     0     0
```

11-13. ILLUMINATION DATA. The illumination data file describes the illumination munitions and the rules for their use.

a. Data Format

(1) The first data set is system information.

(a) ILLUM.SWITCH (I) - a switch indicating if illumination munitions are to be modeled, where 0 = no and 1 = yes. If the switch is set to zero, no further data is required.

(b) ILLUM.DEBUG (I) - a switch to print debug statements when illumination munitions are used, to allow the flow of the procedure to be followed in detail, where 0 = no and 1 = yes.

(2) The next data set begins with N.ILLUM.MUNITION, the integer number of illumination munitions to be modeled. The following data items are to be repeated for each munition.

(a) ILLUM.ID (A) - the name of the munition, up to six characters, with no embedded blanks.

(b) ILLUM.RADIUS (I) - the radius, in meters, of the area illuminated by a volley of this munition, expressed in the range of 0 to 2,047.

(c) ILLUM.MAX.RANGE (I) - the maximum range, in decameters, that this munition can be fired, expressed in the range of 0 to 3,275.

(d) ILLUM.DURATION (I) - the length of time, in minutes, the illumination will last, expressed in the range of 0 to 2,047.

(e) ILLUM.RND.WT (I) - the weight, in pounds, of the munition.

(3) The next data set defines the illumination use rules for Red. The rule options are:

0 = Illumination is not to be employed.
1 = An attacking force will call for illumination over the defending force.
2 = An attacking unit will call for illumination over itself.
3 = A defending unit will call for illumination over the nearest attacking unit.

(a) ILLUM.SIDE.NAME(Red) (A) - the side color name, Red, must be entered here.

The following data items (b) and (c) are repeated once for each mission.

(b) NM.NAME (A) - the mission name, from the list of allowable missions in the appropriate order.

(c) ILLUM.RULE(Red) (I) - the illumination use rule describing how the missions will be allowed to use illumination munitions. The value may be either 0, 1, or 2 for the missions PATROL, PROBE, and ATTACK; or either 0 or 3 for the missions DELAY, DEFEND, and AMBUSH.

(4) The next data set defines the illumination use rules for Blue. The rule options are:

0 = Illumination is not to be employed.

1 = An attacking force will call for illumination over the defending force.

2 = An attacking unit will call for illumination over itself.

3 = A defending unit will call for illumination over the nearest attacking unit.

(a) ILLUM.SIDE.NAME(Blue) (A) - the side color name, Blue, must be entered here. The following data items (b) and (c) are repeated once for each mission.

(b) NM.NAME (A) - the mission name, from the list of allowable missions in the appropriate order.

(c) ILLUM.RULE(Blue) (I) - the illumination use rule describing how the missions will be allowed to use illumination munitions. The value may be either 0, 1, or 2 for the missions PATROL, PROBE, and ATTACK; or either 0 or 3 for the missions DELAY, DEFEND, and AMBUSH.

b. Coordinating Requirements

(1) Posture Environment & Mission data file. The NM.NAME must be a valid mission name from this file; currently, the six names are hard-coded.

(2) Type Battery data file. When illumination rounds are referenced in the Type Battery data file, they are referenced by the key word ILLUM and a sequence number referring to the order of the munition in this file.

Illumination data file:

```
1  0

4
    M314A2  620 1400    1   75
    M485A2  670 1800    2  120
    XM853   620  538    1   40
    XM930   670  720    2   75

 RED
    PATROL  1
    PROBE   1
    ATTACK  1
    DELAY   3
    DEFEND  3
    AMBUSH  3
 BLUE
    PATROL  1
    PROBE   1
    ATTACK  1
    DELAY   3
    DEFEND  3
    AMBUSH  3
```

11-14. MINE DATA. The information in the mine data file is used to define the characteristics of various killing and nonkilling barriers. These barriers can be emplaced minefields, artillery delivered or reseeded minefields (FASCAM), or other barriers. Barriers of all kinds are modeled as nonkilling mines. FASCAM munitions, accessed in the Type Battery data file, are described here. Note that FASCAM is used to denote a generic artillery delivered mine and does not necessarily refer to Blue FASCAM.

a. Data Format. The data file is divided into four sections: types of minefields (or barriers) and their characteristics, FASCAM munitions, FASCAM use rules, and emplaced minefields.

(1) The first data set is system information.

(a) MF.SWITCH (I) - a switch indicating if mines are to be modeled, where 0 = no and 1 = yes. If the switch is set to off, no further data is required.

(b) MF.DEBUG (I) - a switch to indicate if detailed statements concerning the use of mines in the model should be printed, where 0 = no and 1 = yes.

(c) MF.PRINT (I) - a switch to indicate if minefield data should be echoed where 0 = no and 1 = yes.

(2) The second data set begins with N.TYPEMINE.FIELD, the integer number of types of minefields and/or barriers to be defined. The following data items (a) through (i) are repeated for each type of minefield.

(a) TMF.NAME (A) - the name of this type of minefield, up to six characters, with no embedded blanks.

(b) TMF.SIDE (I) - the owner of the minefield, where 1 = Red and 2 = Blue.

(c) TMF.ARTY.DEL (I) - a switch indicating if this type of minefield, was initially delivered by artillery, where 0 = no and 1 = yes. Once a minefield has been reseeded by artillery, it is treated as if it was initially placed by artillery.

(d) TMF.ARTY.RESEED (I) - a switch indicating if this type of minefield should be reseeded by artillery after it has been breached, where 0 = no and 1 = yes.

(e) TMF.RESEED.TIME (I) - the time delay, in minutes, for this type of minefield to be reseeded automatically by the model after it has been breached. A 9999 is used to indicate that the model should not reseed the minefield. If the artillery reseed has been selected, then the TMF.RESEED.TIME should be set to off (i.e., 9999) and vice versa.

(f) TMF.KILLER.NAME (A) - the name of the equipment under which kills scored by this type of minefield should be recorded under in the killer/ victim scoreboard. Enter NONE if this type minefield only delays.

The next set of records describes the delay times that units entering this type of minefield must suffer for three range hacks from the FEBA. The first and second record contain all three data items, the third contains only (g) and (h), item (i) is omitted for the third record. The following data items are repeated three times, as described above.

(g) MFB.MIN.DELAY (I) - the minimum delay, in minutes, that a unit encountering this type of minefield will suffer.

(h) MFB.MAX.DELAY (I) - the maximum delay, in minutes, that a unit encountering this type of minefield will suffer.

(i) MFB.MAX.RANGE (I) - the maximum range, in meters, in this range hack. Note that the final range record has no maximum range because in encompasses all ranges in excess of the second.

(3) The third data set defines the FASCAM parameters.

(a) MAX.WD.FASCAM (I) - the maximum number of FASCAM volleys that may be directed against a withdrawing unit during a battle.

(b) MAX.ATT.FASCAM (I) - the maximum number of FASCAM volleys that may be directed against an attacking unit during a battle.

(c) MIN.FASCAM.RANGE (I) - the minimum distance, in decameters, that is allowed between opposing forces for FASCAM to be requested from an FDC.

(d) MAX.FASCAM.RANGE (I) - the maximum distance, in decameters, allowed between opposing forces if FASCAM is to be requested from an FDC.

(e) FASCAM.VOLLEYS (I) - the number of volleys that will be fired in a FASCAM artillery mission.

(4) The data set begins with N.FASCAM.MUNITION, the integer number of types of FASCAM munitions being defined. The data items (a) through (d) are repeated for each type of FASCAM munition.

(a) FMM.ID (A) - the name of this type of FASCAM, up to six characters, with embedded blanks. This name is the arbitrary name of a round of this munition, not the name of the type of minefield that it creates when fired.

(b) FMM.MAX.RANGE (I) - the maximum range, in decameters, of this type of FASCAM.

(c) FMM.RND.WT (I) - the weight, in pounds, of one round of this munition.

(d) FMM.TMF.NAME (A) - the name of the type of minefield created when this round is fired. This name must be the name of a type of minefield listed above.

NOTE: when referring to these FASCAM munitions in the Type Battery file, refer to the first as FASCAM 1, the second as FASCAM 2, etc. Take care not to assign a Red battery a Blue FASCAM munition. It is acceptable to have more FASCAM munition types defined then are assigned in the Type Battery file.

(5) The next data set defines the FASCAM use rules. One record is present for each of the six missions. The names of the six mission types: PATROL, PROBE, ATTACK, DELAY, DEFEND, and AMBUSH, must appear in that order.

The values of the use rule switches are:

0 = FASCAM will not be requested.

1 = An attacking force will request that FASCAM be placed behind a defender when it starts to withdraw.

2 = A defending force will call for FASCAM to be placed in front of the closest attacker.

3 = A defender starting to withdraw will call for FASCAM to be placed in front of the nearest attacker. If the attacker is closer than

MIN.FASCAM.RANGE distance, the defender will employ MOPMS, if it has them.

(a) NM.NAME (A) - the mission name.

(b) MINE.USE.RULE (I) - the FASCAM use rule describing how the missions will be allowed to use FASCAM. The value must be either 0 or 1 for the missions PATROL, PROBE, and ATTACK, and either 0 or 2 for the missions DELAY, DEFEND, and AMBUSH. Data item (c) is present only for DELAY, DEFEND, and AMBUSH.

(c) MINE.WD.RULE (I) - the FASCAM use rule describing how DELAY, DEFEND, and AMBUSH missions will be allowed to use FASCAM upon withdrawal, the value is only present for these three missions and must be either 0 or 3.

(6) The final data set describes the emplaced barrier minefields. The data set begins with N.MINEFIELD, the integer number of barriers that will follow. If no barriers are to be used, a zero must be entered. The following data items are repeated for each barrier.

(a) MF.ID (A) - the identifier for the minefield with up to six characters and no embedded blanks.

(b) MF.SIDE (A) - the name of the side deploying the minefield, either Red or Blue. A unit from the same side is presumed to be able to cross the minefield safely.

(c) MF.TYPE (I) - type of minefield:

1 = VOLCANO Minefield
2 = GEMMS Minefield
3 = CONVENTIONAL Minefield
4 = Nonkilling
5 = Red Minefield

(d) MFP.X.COORD (I) - the X coordinate describing the starting point of the minefield, in decameters, expressed in the range of -131,071 to 131,071.

(e) MFP.Y.COORD (I) - the Y coordinate describing the starting point of the minefield, in decameters, expressed in the range of -131,071 to 131,071.

(f) MFP.X.COORD (I) - the X coordinate describing the end point of the minefield, in decameters, expressed in the range of -131,071 to 131,071.

(g) MFP.Y.COORD (I) - the Y coordinate describing the end point of the minefield, in decameters, expressed in the range of -131,071 to 131,071.

b. Coordinating Requirements

(1) Equipment data file. The TMF.NAME and the TMF.KILLER.NAME must be valid equipments.

(2) Posture, Environment, and Mission data file. The NM.NAME must be a valid mission name, which are hard-wired.

Mine data file:

```
1 1 0 4 VOLCANO 2 0 1 20 MINEFD
  10 30  3000
  10 30  6000
  10 30 GEMMS   2 0 1 20 MINEFD
  10 30  3000
  10 30  6000
  10 30 FASCAM  2 1 1 20 FASCAM
  10 30  3000
  10 30  6000
  10 30 RDSCAM  1 1 1 20 RDSCAM
  10 30  3000
  10 30  6000
  10 30

1  1   55  200  1

2
RAAM-A  1600  295 FASCAM
RDRAAM  2200  250 RDSCAM

RED
  PATROL  0
  PROBE   0
  ATTACK  0
  DELAY   0  0
  DEFEND  0  0
  AMBUSH  0  0

BLUE
  PATROL  0
  PROBE   0
  ATTACK  1
  DELAY   2  3
  DEFEND  2  3
  AMBUSH  2  3

9  MNFD01 BLUE  1  19750 11989   19750 11929
   MNFD02 BLUE  1  19750 11826   19750 11766
   MNFD03 BLUE  1  19750 11626   19750 11566
   MNFD04 BLUE  1  19800 11626   19800 11566
   MNFD05 BLUE  1  19800 12000   19800 12050
   RDFD01  RED  5   9000 11050    9500 11050
   RDFD02  RED  5   9250 11000    9500 11000
   RDFD03  RED  5   9750 12000    9750 12250
   RDFD04  RED  5  10000 12050   10000 12250
```

11-15. MUNITIONS DATA. The Munitions data file establishes the characteristics of the high explosive (HE) and improved conventional (IC) munitions and their associated circular probable errors.

a. Data Format. The file is divided into three sections: system information, HE munition information, and IC munitions information.

(1) The first data set is system information.

(a) N.HE.MUNITION (I) - the number of high explosive (HE) munitions to be modeled.

(b) N.IC.MUNITION (I) - the number of improved conventional (IC) munitions to be modeled.

(c) N.FUZE (I) - the number of fuzes that each HE munition will be defined for. A value of 2 must be entered.

The following data item (d) is repeated for each fuze defined.

(d) FZ.NAME (A) - the name of the fuze. The first fuze must PD, point detonating, and the second must be VT, variable time.

(2) The next data set describes the HE munitions. The following data items (a) through (l) are repeated for each HE munition.

(a) HE.ID (A) - the name of the HE munition, up to six characters with no embedded blanks.

(b) HE.MIN.MARG.EFF (I) - minimum marginal effectiveness of the HE munition. This value is expressed in hundredths of a percent and is used in determining whether or not to fire a volley of this munition.

(c) HE.WEIGHT (I) - the weight, in pounds, of a round of the munition, expressed in the range of 0 to 2,047.

(d) HE.COST (I) - the cost, in dollars, per round of the munition, expressed in the range of 0 to 2,047.

(e) HE.VOLLEY.RAD (I) - the effective bursting radius, in meters, of a volley of the munition, expressed in the range of 0 to 2,047.

(f) HE.ROUND.RAD (I) - the effective bursting radius, in meters, of a round of the munition, expressed range of 0 to 2,047.

(g) HE.VOL.DUST.RAD (I) - the radius, in meters, of the dust cloud raised by a volley of the munition, expressed in the range of 0 to 32,752.

(h) HE.DUST.DURATION (I) - the period of time, in minutes, that the dust cloud raised by the munition will block line of sight between two units on either side of it, expressed in the range of 0 to 2,047.

The following data item (i) must be repeated once for each of the fuzes defined.

(i) FZ.HE.RELY (I) - the reliability of the fuze, as an integer percentage, on this munition.

The next portion of the HE munition information set for this munition describes the circular probable errors (CPEs). There are two records, one for each range hack, given for each type battery that has the HE munition assigned to it as indicated in the Type Battery data file, that make up one CPE set. The order of the CPE sets refer to the order of the type batteries that have the munition assigned. In other words, the first CPE set refers to the first type battery that has this munition assigned to it (not the first type battery appearing).

Each CPE set is repeated for each type battery that has this HE munition assigned to it.

The following data items (j) through (l) are repeated for each of the two range hacks to form one CPE set.

(j) HE.RH.RANGE (I) - the distance, in decameters, of the range hack, expressed in the range of 0 to 6,552.

(k) HE.RH.TOTAL.CPE (I) - the CPE, in meters, for a volley of the munition at this range hack when fired by the type battery being considered, expressed in the range of 0 to 2,047.

(l) HE.RH.ROUND.CPE (I) - the CPE, in meters, for a round of this munition at this range hack when fired by the type battery being considered, expressed in the range of 0 to 2,047.

NOTE: a range hack divides the distance between a battery and its target into segments, with the first set of CPEs used from 0 to the first range hack, and the second set of CPEs used from the first range hack to the second. At distances further than the second range hack, the munition is considered to be ineffective.

NOTE: the Type Battery data file refers to the HE munitions with the key word HE followed by the position the munition holds in the list of HE munitions defined above.

(3) The next data set describes the IC munitions. The following data items (a) through (m) are repeated for each HE munition.

(a) IC.ID (A) - the name of the IC munition, up to six characters, with no embedded blanks.

(b) IC.MIN.MARG.EFF (I) - minimum marginal effectiveness of the IC munition. This value is expressed in hundredths of a percent and is used in determining whether or not to fire a volley of this munition.

(c) IC.WEIGHT (I) - the weight, in pounds, of a round of the munition, expressed in the range of 0 to 2,047.

(d) IC.COST (I) - the cost, in dollars, for each round of the munition, expressed in the range of 0 to 262,143.

(e) IC.RELIABILITY (I) - the reliability of the munition, expressed as a percentage in the range of 0 to 100.

(f) IC.SUBM.INDEX (I) - the index number of the submunition used by this IC munition from the Submunitions data file.

(g) IC.VOLLEY.RAD (I) - the effective bursting radius, in meters, of a volley of the munition expressed in the range of 0 to 2,047.

(h) IC.N.SUBM (I) - the number of the submunitions contained in one round of the munition expressed in the range of 0 to 131,071.

1. The next record for this IC munition's information block describes the slope and intercept information and the CPE information made up from data items (i) through (m).

2. This record is repeated for each battery type that has this IC munition assigned to it as indicated in the Type Battery data file. The order of the records, made up of the slope, intercept, and CPE information, refers to the order of the battery types that have this munition assigned (not the order of all battery types).

Items (i) and (j) make up the slope and intercept portion of the record. The equation used is:

$$\text{Pattern Radius} = (\text{Slope} * \text{Range}) + \text{Intercept}$$

(pattern radius is in meters and the range to the target is in kilometers)

(i) IC.TB.SLOPE (R) - the slope of the submunition dispersement curve for this IC munition expressed in meters per kilometer.

(j) IC.TB.INTERCEPT (R) - the intercept of the submunition dispersement curve for this IC munition, expressed in meters.

The CPE portion of the record is made up of data items (k) through (m) repeated for the first range hack, and then for the second.

(k) IC.RH.RANGE (I) - the distance, in decameters, of the range hack, expressed in the range of 0 to 6,552.

(l) IC.RH.TOTAL.CPE (I) - the CPE, in meters, for a volley of this munition at this range hack when fired by the type battery being considered, expressed in the range of 0 to 2,047.

(m) IC.RH.ROUND.CPE (I) - the CPE, in meters, for a round of the munition at this range hack when fired by the type battery being considered, expressed in the range of 0 to 2,047.

NOTE: a range hack divides the distance between a battery and its target into segments, with the first set of CPEs used from 0 to the first range hack, and the second set of CPEs used from the first range hack to the second. At distances further than the second range hack, the munition is considered to be ineffective.

NOTE: the Type Battery data file refers to the IC munitions with the key word ICM followed by the position the munition holds in the list of IC munitions defined above.

b. Coordinating Requirements

(1) Submunitions data file. The IC.SUBM.INDEX must the sequence number of a valid submunition.

(2) Type Battery data file. The CPE values for the munitions must appear in the order corresponding to the order of the battery types assigned the munition.

(3) High Explosive Lethal Area data file. The REPF.LA.PERS and RTEF.LA.EQUIP refer to the HE fuzes and HE munitions by their sequence.

(4) Rules of Engagement data file. The CDI.USAGE.INDICATOR refers to the sequence of the IC munitions.

Munitions data file:

```
  4   2   2

  PD  VT

M1      1  42   174  41  15   41    1        99   98
                        470   66   19      1400   99   41
                        500   65   20      1500  100   50

UM123   1  38   155  41  15   41    1        95   95
                        400   50   15      1050   75   30

XM913   1  45   259  41  15   41    1        99   98
                       1480   88   41      1950  123   63


XM915   1  45   174  95   1   41   42       1.4   40.0
                        450   48   19      1400   92   43

M483    1 103   174  95   2   56   88       0.7   38.0
                        600   26   16      1800   35   33
```

11-16. ORDERS DATA. The orders data file defines the order sets for the maneuver units and identifies task forces of subordinate units operating under the same order set as a superior. Orders are given only for maneuver units, as indicated by the value CT.GROUP described in the section Category Type Unit data file. If a unit is a subordinate, as indicated by its UN.PARENT field in the Unit data file, then only the superior unit may be given orders. The subordinate units will follow the orders of the parent unit.

a. Data Format. There are five types of orders: attack, defend, move to a given set of coordinates, move a given distance along an azimuth, and reinforce; they are referred to by the abbreviations ATK, DEF, MOVCOR, MOVDIS, and REINF. The flag 9999 indicates the end of the data file. The sequence numbers of an order refers to the sequence that it appears in within a unit's orders definition list. The format of the five order types is described below.

(1) Each order set begins:

(a) UNIT.NUMBER (I) - the UNIT.NOS of the unit being given orders.

(b) The first order must be a DEF order. The key word LAST indicates the end of a unit's order list. Any combination of orders may be issued within a unit's orders definition list.

(2) An attack order is started by the keyword ATK and has the following data:

(a) ENEMY.DO (I) - the sequence number of the next order to be executed if the attack is successful, i.e., the enemy is withdrawing.

(b) OWN.DO (I) - the sequence number of the next order to be executed if the attack fails, i.e., this unit breaks off the attack.

(3) A defend order is started by the keyword DEF and has the following data:

(a) REINF.THRESH (I) - the critical equipment threshold value, expressed as an integer percentage of the unit's critical equipment. When the percentage of critical equipment falls below this value, reinforcements will be requested.

(b) ORD.MISSION (I) - one of three possible values corresponding to the unit's mission, where 4 = delay, 5 = defend, and 6 = ambush.

(c) EN.DIS.OP (I) - the sequence number of the next order to be executed if the defense is successful, i.e., the disabled attacking unit breaks off.

(d) OWN.DIS.OP (I) - the sequence number of the next order to be executed if the defense fails, i.e., the defending unit is forced to withdraw.

(4) A move to coordinates order is started by the keyword MOVCOR and has the following data:

(a) MOVE.TIME (R) - the time, in decimal 48-hour clock time, at which this order is to be executed. A value of zero is entered if this order follows another order.

(b) DESTIN.X (I) - the X-coordinate of the destination, in decameters, expressed in the range of -131,071 to 131,071.

(c) DESTIN.Y (I) - the Y-coordinate of the destination, in decameters, expressed in the range of -131,071 to 131,071.

(d) MOV.MISSION (I) - the mission associated with the move, where 1 = patrol, 2 = probe, 3 = attack, 4 = delay, 5 = defend, and 6 = ambush.

(e) TYPE.MOVE (A) - the type of the order, either administrative or tactical, referred to by ADMIN and TACTIC, respectively. If the TYPE.MOVE is ADMIN then the unit cannot become engaged in a direct fire battle.

NOTE: when constructing order sets for preplanned air vehicle flight paths (e.g., RPVs), always set the orders to ADMIN-type movements.

(f) THRESH.REIN (I) - the critical equipment threshold value, expressed as an integer percentage of the unit's critical equipment. When this unit is executing this order and comes into close proximity to an enemy, it checks its percent of critical equipment onhand against this value. If the percent onhand is greater than the threshold, the unit executes NX.ORD.ABOVE. If less than the threshold, the unit executes NX.ORD.BELOW.

(g) NX.ORDER (I) - the sequence number of the next order to be executed if this order is successfully completed. It must not be the same as the MOVCOR order being executed or the sequence number of an ATK order.

(h) NX.ORDER.ABOVE (I) - the sequence number of the next order to be executed if the percent of critical equipment is above the threshold value and the unit is in close proximity to an enemy unit. The order must be an ATK, DEF, or MOVDIS order (does not apply to RPV units).

(i) NX.ORD.BELOW (I) - the sequence number of the next order to be executed if the percent of critical equipment is under the threshold value and the unit is in close proximity to an enemy unit. The order must be an ATK, DEF, or MOVDIS order (does not apply to RPV units).

(5) A move distance order is started by the keyword MOVDIS and has the following data:

(a) DIR.OF.MOVE (A) - the direction of move, either ADVANC, for advance, or WITHDR, for withdraw. When moving under this order, a unit's Y-coordinate does not change. It is recommended that the MOVDIS order be used only for withdraw.

(b) DIST.MOVED (I) - the distance, in meters, to be moved, expressed in the range of 0 to 262,143.

(c) TYPE.MOVE (A) - the type of the order, either administrative or tactical, referred to by ADMIN and TACTIC, respectively.

(d) ORD.NEXT (I) - the sequence number of the next order to be executed after this one has been completed.

(6) A reinforce order is started by the keyword REINF. It should not be a next order option for any of the other orders except MOVCOR, where it may be a NX.ORD.ABOVE or NX.ORD.BELOW. It has the following data:

(a) SUC.REINF.OP (I) - the sequence number of the order to be executed when a reinforcing unit arrives.

(b) UNSUC.REINF.OP (I) - the sequence number of the order to be executed if no unit is available to reinforce this one.

b. Coordinating Requirements

(1) Unit data file. The UNIT.NUMBER must be a UNIT.NOS as appearing in the Unit data file. The critical equipment indicators are found in the Unit data file.

(2) Category Type Unit data file. The type of unit describing this unit, UNIT.NUMBER, must be a maneuver unit.

(3) System data file. The MOV.TIME value must be within the simulation time defined in the System data file. The DESTIN.X and DESTIN.Y coordinates and the DIST.MOVE must be within the battlefield.

Orders data file:

```
10000   DEF  60 4  2  2
        MOVDIS  WITHDR  5000  ADMIN  1
        LAST 10010   DEF  60 5  3  2
        MOVDIS  WITHDR  5000  ADMIN  1
        ATK  3  2
        LAST 10020   DEF  60 5  3  2
        MOVDIS  WITHDR  5000  ADMIN  1
        MOVCOR  00.00  25000  9000  2  TACTIC~ 75  4  5  4
        DEF  60 5  5  2
        ATK  4  2
        LAST
 9999
```

11-17. PASSIVE DETECTION BASE DATA. The passive detection base (PDB) data file establishes the characteristics of each PDB along with the range hacks in which it operates and their associated probabilities and accuracies of detection.

a. Data Format. The file is divided into two sections: system data and PDB description data.

(1) The first data set is system information.

(a) N.PDB.RNG.HACK (I) - the total number of range hacks used by all the PDBs. Each PDB may have a different number of range hacks, but the total number of range hacks for all PDBs must add up to N.PDB.RNG.HACK.

(b) N.MODEL.PBD (I) - the number of PDBs to be modeled.

(2) The next data set describes the PDBs. The following data items (a) through (i) are repeated for each PDB.

(a) MPDB.NAME (A) - the name of the PDB, up to six characters, with no embedded blanks.

(b) MPDB.EQ.ID (I) - the sequence number of the equipment which owns the PDB.

(c) MPDB.KEY.TIME (I) - the maximum time, in tenths of minutes, that the PDB needs to turn on a counterfire radar.

(d) NUM.RH (I) - the number of range hacks defined for the PDB.

The following data items (e) through (i) are repeated for each range hack, NUM.RH times.

(e) PDB.RH.RANGE (I) - the maximum range, in meters, that is contained in this range hack.

(f) MPDB.DET.PROB(day) (I) - the probability, expressed as an integer percentage in the range of 0 to 100, of the PDB detecting a target within this range hack during daylight.

(g) MPDB.CIR.ERROR(day) (I) - the expected circular error, in meters, of PDB's estimate of the location of a target's position within this range hack during daylight expressed in the range of 0 to 262,143.

(h) MPDB.DET.PROB(night) (I) - the probability, expressed as an integer percentage in the range of 0 to 100, of the PDB detecting a target within this range hack during night.

(i) MPDB.CIR.ERROR(night) (I) - the expected circular error, in meters, of PDB's estimate of the location of a target's position within this range hack during night expressed in the range of 0 to 262,143.

b. Coordinating Requirements

(1) Equipment data file. The MPDB.EQ.ID must be the sequence number of a valid equipment from the Equipment data.

(2) Type Sensor data file. The sensors with ST.NAME equal to SD or FL refer to sensors described in the Passive Detection Base data file.

(3) Sensor data file. For sensors with ST.NAME equal to SD or FL, the SENS.MODEL refers to the sequence number of the passive detection base.

Passive Detection Base data file:

```
6
2
UPDB      55   5
           3
          3000   0  500   0  500
         12000   0  500   0  500
         30000   0  500   0  500

RPZKFS   113   5
           3
          3000  90   30  90   30
         12000  40  120  40  120
         30000  30  250  30  250
```

11-18. PHASED OFFLINE ATTRITION DATA. Fire can be time-phased into the battle by COSAGE as external events based on offline analysis (POLA). POLA shots will be introduced into the battle in time ascending order.

a. Data Format

(1) Each shot record must begin with the keyword PHASED.OFF.LINE. ATTRITION which identifies the type of external event for the model. Each record will have the following entries.

(2) TIME (R) - the time the shot is to occur expressed in decimal hours.

(3) UNIT.NOS (I) - the unit number of the target unit.

(4) TARG.EQUIP (A) - the name of the target equipment.

(5) QUANTITY (I) - the number of target equipments that will be destroyed.

(6) FIRING.EQUIP (A) - the name of the equipment mounting the weapon system firing.

(7) WEAPON (A) - the name of the weapon firing.

(8) DISTANCE (I) - the range that the engagement will occur in meters.

(9) SSPK (R) - the original SSPK used in calculating the adjusted SSPK.

(10) ADJ.SSPK (R) - the adjusted SSPK due to terrain and movement factors.

(11) RND.QTY (I) - the number of rounds fired to achieve the specified number of destroyed equipment.

(12) POLA.TERM (A) - an asterisk to terminate the record.

b. Coordinating Requirements

(1) Unit data file. The UNIT.NOS, the target unit number, must be a valid unit number from the Unit data file.

(2) Equipment data file. The FIRING.EQUIP, the equipment mounting the WEAPON, and the TARG.EQUIP, the target equipment, must be a valid equipment name from the Equipment data file.

(3) Weapon data file. The WEAPON, the firing weapon, must be a valid weapon name from the Weapon data file.

Phased Offline Attrition data file:

```
OFF.LINE.ATTRITION  3.45  13400  UM1    6  PRSHNG
                    MISSLE  5000  .45  .32  1      *
```

11-19. POSTURE, ENVIRONMENT, AND MISSION DATA. The posture, environment, and mission (PEM) data file describes the distribution of the personnel in a unit among the postures and environments, the distribution of equipment among the environments, and the percentage of personnel that are warned/unwarned before incoming HE indirect fire. (All personnel are warned when ICM are fired.) These values modify the effectiveness of indirect fire. The postures, for personnel only, are: standing, prone, and foxhole; the environments are: open, woods, and town.

a. Data Format. The data file is in three sections: the posture, environment, and mission specification; the fractional locations of types of units; and the fraction of warned and unwarned personnel.

(1) The first record is the specification.

(a) N.POSTURE (I) - the number of postures to be modeled. This value must be 3.

The next data item (b) is repeated once for each of the postures.

(b) PT.NAME (A) - the name of the posture, up to six characters, with no embedded blanks. The names must be: STAND, PRONE, and FXHOLE.

(c) N.ENVIRONMENT (I) - the number of environments to be modeled. This value must be 3.

The next data item (d) is repeated once for each of the environments.

(d) EN.NAME (A) - the name of the environment, up to six characters, with no embedded blanks. The names must be: OPEN, WOODS, and TOWN.

(e) N.MISSION (I) - the number of unit missions to be defined. This value must be 6.

The next data item (f) is repeated once for each of the missions.

(f) NM.NAME (A) - the mission name, up to six characters, with no embedded blanks. The names must be: PATROL, PROBE, ATTACK, DELAY, DEFEND, and AMBUSH.

(2) The next record set defines the fractional locations within the environments for each of the categories of units. Each of the environments has one data value for every unit category. The following data items are repeated for each of the environments. The following data item is repeated for each of the categories of units.

(a) EC.FRACT (I) - the integer percentage of this unit category that will be in this environment.

NOTE: the sum of the percentages for a category over all environments must be 100.

(3) The final record set defines the fraction of personnel warned/ unwarned of incoming indirect fire. There are N.CATEGORY data sets; each set contains N.MISSION records, and each record contains N.ENVIRONMENT pairs of data. The following data sets are repeated once for each unit category. The following data records are repeated once for each mission. The following two data items are repeated once for each posture.

(a) CPM.WARNED.FRACT (I) - the integer percentage of personnel, in this unit category, in this posture performing this mission, which will be warned of incoming indirect fire. The sum of the CPM.WARNED.FRACT percentages, for each category and mission combination, over the three postures must equal 100.

(b) CPM.UNWARNED.FRACT (I) - the integer percentage of personnel, in this unit category, in this posture performing this mission, which will be unwarned of incoming indirect fire. The sum of the CPM.UNWARNED.FRACT percentages, for each category and mission combination, over the three postures, must equal 100.

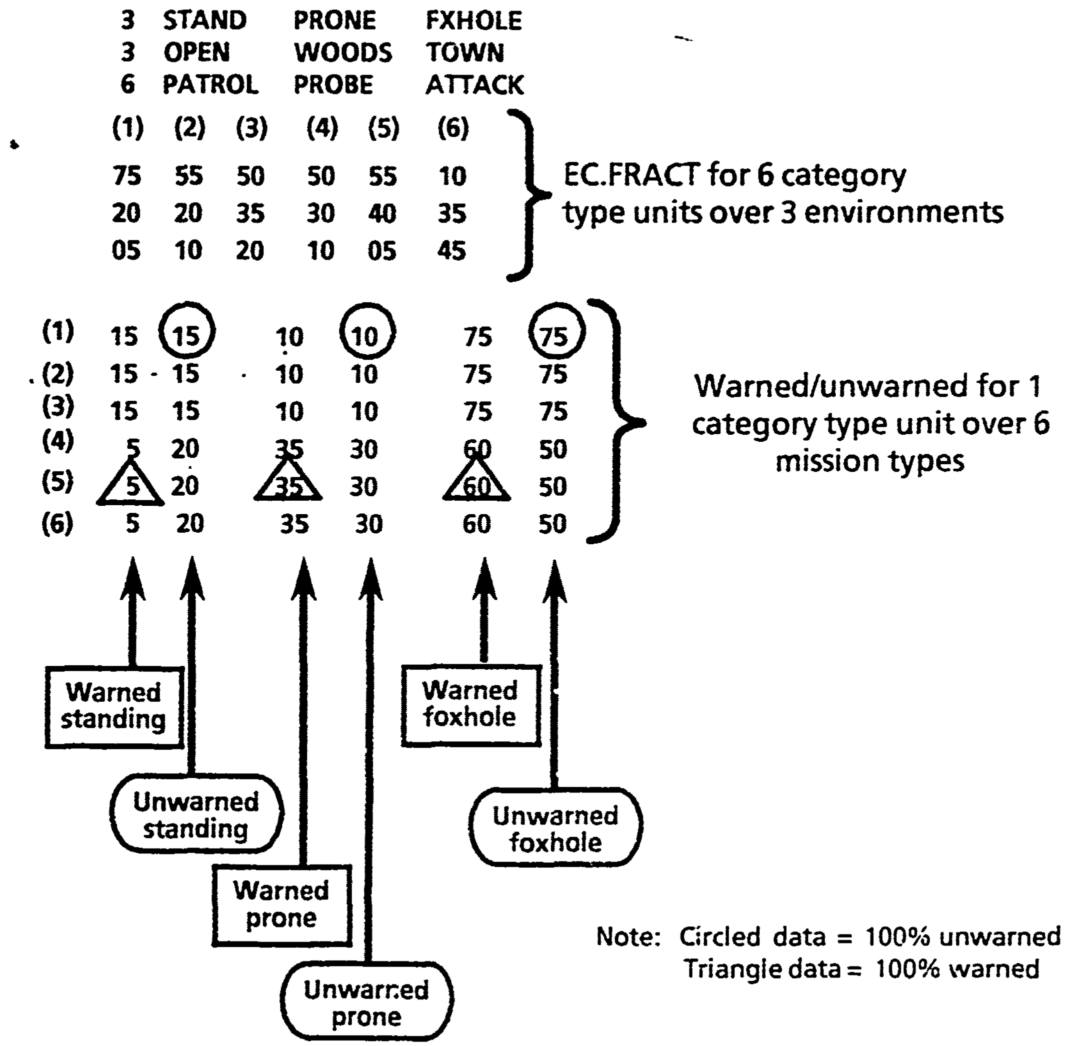
NOTE· posture and mission data must appear in the same order in which it was defined.

b. Coordinating Requirements

(1) Category Type Unit data file. The order of input and number of data sets involving unit categories must correspond to the order of, and number of, the unit categories in the Category Type Unit data file

(2) Terrain data file. The EC.FRACT will be used only if the TER.W.INC is set to 1.

Posture Environment & Mission data file:


3 STAND PRONE FXHOLE
3 OPEN WOODS TOWN
6 PATROL PROBE ATTACK
(1) (2) (3) (4) (5) (6)
75 55 50 50 55 10
20 20 35 30 40 35
05 10 20 10 05 45
EC.FRACT for 6 category type units over 3 environments
(1) 15 15 10 10 75 75
(2) 15 15 10 10 75 75
(3) 15 15 10 10 75 75
(4) 5 20 35 30 60 50
(5) 5 20 35 30 60 50
(6) 5 20 35 30 60 50
Warned/unwarned for 1 category type unit over 6 mission types
Warned standing
Unwarned standing
Warned prone
Unwarned prone
Warned foxhole
Unwarned foxhole

Note: Circled data = 100% unwarned
Triangle data = 100% warned

11-20. PROBABILITY OF KILL DATA. This data is discussed in greater detail in CAA-TP-92-3, COSAGE Probability of Kill Methodology - Basic Data Requirements.

a. The probability of kill (PK) data file establishes range hacks over which the probabilities of a mobility and/or fire power kill given a shot will be specified. The values are for a specific weapon firing at a specific equipment. Modifiers are given to allow for a moving firer or target. An indicator is given to indicate if a weapon is able to fire at a specific target while the weapon is moving.

b. Data Format. The PK data file is divided into sections: PK vector matrix, exposed firer-target matrix, defilade firer-target matrix, moving target degradation factor matrix, moving firer degradation factor matrix, and moving target engagement matrix.

(1) The PK vector matrix is a combination of the PK vectors, which make up the rows, and the PK range bands, which make up the the columns. A PK vector defines a probability of kill curve over a weapon's range. The curve is divided into 10 equal range bands which gives 11 range band points. There are as many PK vectors as are needed to describe all of the desired probability of kill curves. A weapon may use several PK vectors, and a PK vector can be used by several weapons. Each PK vector has one value for each of the range band points. Each of these values is the associated probability of kill for that vector at that range. One PK vector is made up of the 11 values. The matrix begins with setup values.

(a) PK.IDENTIFIER (A) - an alphanumeric serial number and/or comments (with no embedded blanks) which links the following PK data to a particular study.

(b) N.PK.VECTOR (I) - the number of unique PK vectors to be defined.

(c) N.PK.BAND (I) - the number of PK range bands; 11 must be entered.

(d) PK.BAND.RNG (I) - the identifier of each PK range band. There must be 11 values starting at 0 and incrementing to 10. The following data vector is repeated for each PK vector. The following data item (d) is repeated 11 times, once for each of the range bands, to form one PK vector.

(e) PK.PROB (I) - a probability of kill, expressed as an integer percentage, for this PK range band for this PK vector.

(2) The exposed firer-target matrix determines which of the PK vectors will be used when a given weapon is firing at a given exposed target equipment. The weapons are grouped into a category called firers, which make up the rows, and the target equipments are grouped into a category called targets, which make up the columns. The rows are firer vectors, one for each of the firers, containing one data value for each of the targets. Each firer-target combination gives the sequence number of the PK vector to be used in this situation.

(a) NUM.FIRERS (I) - the number of firers into which the weapons are grouped.

(b) NUM.TARGETS (I) - the number of targets into which the equipments are grouped. The following firer record is repeated for each firer. The following data item (c) is repeated NUM.TARGETS times to make up one firer record.

(c) PK.VECTOR.POINTER(Exposed) (I) - the sequence number of the PK vector desired to describe the PK curve of this firer firing on this target, while it is exposed. A zero indicates the firer cannot kill the target. There must be NUM.FIRERS records each with NUM.TARGETS values.

(3) The defilade firer-target matrix determines which of the PK vectors will be used when a given weapon is firing at a given target equipment in defilade. The weapons are grouped into a category called firers, which make up the rows, and the target equipments are grouped into a category called targets, which make up the columns. The rows are firer vectors, one for each of the firers, containing one data value for each of the targets. Each firer-target combination gives the sequence number of the PK vector to be used in this situation.

(a) NUM.FIRERS (I) - the number of firers into which the weapons are grouped.

(b) NUM.TARGETS (I) - the number of targets into which the equipments are grouped.

The following firer record is repeated for each firer. The following data item (c) is repeated NUM.TARGETS times to make up one firer record. Figure 11-1 illustrates an example of the PK pointer system.

(c) PK.VECTOR.POINTER(Defilade) (I) - the sequence number of the N.PK.VECTOR desired to describe the PK curve of this firer firing on this target, while it is exposed. A zero indicates the firer cannot kill the target. There must be NUM.FIRERS records each with NUM.TARGETS values.

(4) The PK moving target degradation factor matrix gives degradation factors when a target is moving. The range from a firer to a target is divided into bands, the number and size of which are user defined. Within each band, there is a degradation factor which will be multiplied by the probability of kill determined from the appropriate PK vector A degradation vector is made up of one data value for each of the range bands for the target.

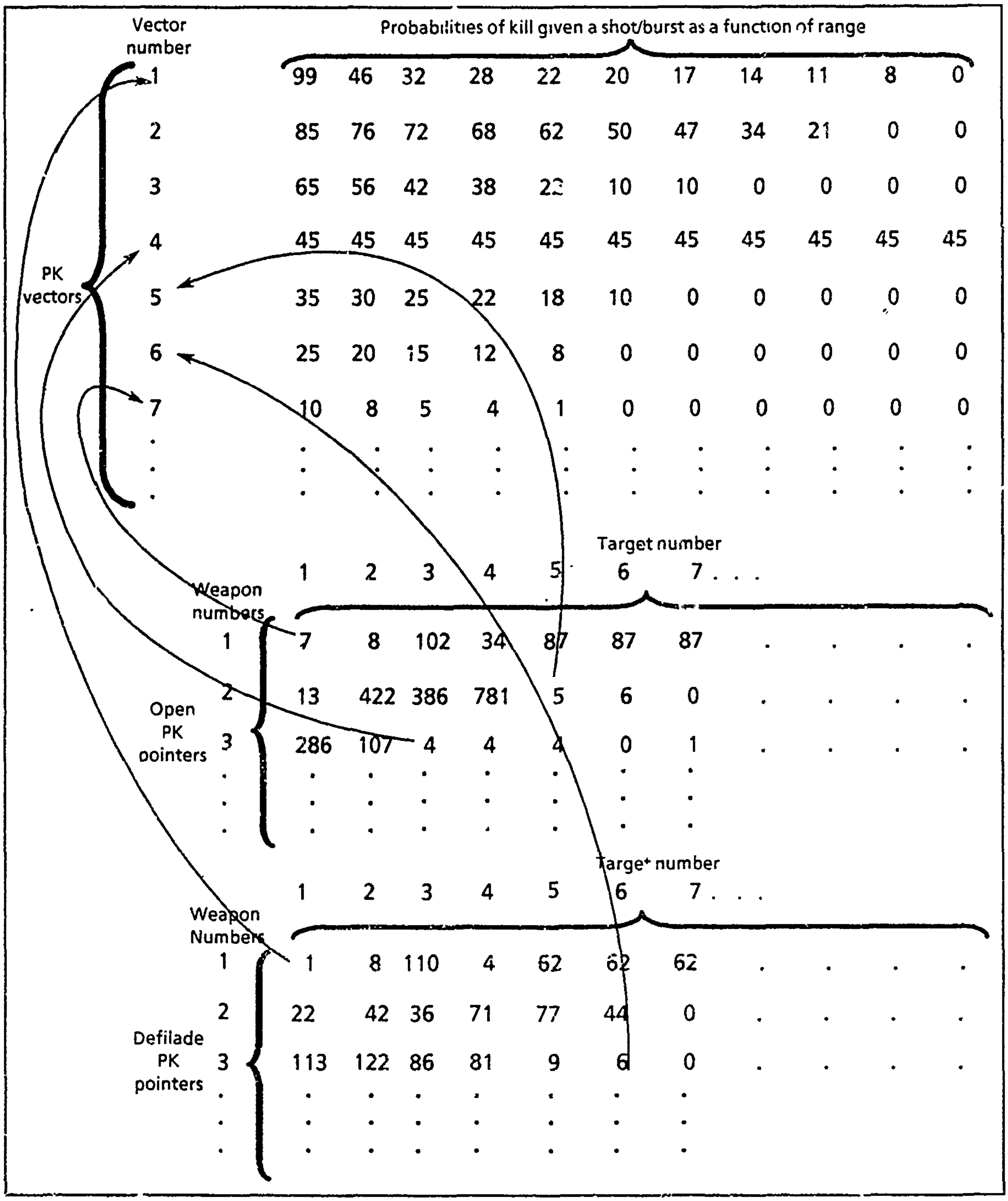
(a) N.PK.MOVE.FACTOR (I) - the number of degradation vectors to be defined, one for each target.

(b) N.PK.MOVE.BAND (I) - the number of bands into which the range from a firer to a target is divided.

The following data item (c) is repeated once for each range band.

(c) PK.MOV.RNG (I) - the maximum range, in meters, of each band. This is not the range contained in each band, but rather the range contained in this band plus the maximum range of the last band. The following degradation vector is repeated for each target. The following data item (d) is repeated once for each range band defined to make one degradation vector.

(d) PK.MOV.FAC (R) - a degradation factor, expressed as a fraction between 0 and 1, to be applied to the selected PK vector if the target is moving.



PK vectors

Vector number	Probabilities of kill given a shot/burst as a function of range										
1	99	46	32	28	22	20	17	14	11	8	0
2	85	76	72	68	62	50	47	34	21	0	0
3	65	56	42	38	22	10	10	0	0	0	0
4	45	45	45	45	45	45	45	45	45	45	45
5	35	30	25	22	18	10	0	0	0	0	0
6	25	20	15	12	8	0	0	0	0	0	0
7	10	8	5	4	1	0	0	0	0	0	0
.	.	.	.	.	.	.	.	.	.	.	.

Open PK pointers

Weapon numbers	Target number 1	2	3	4	5	6	7 . . .				
1	7	8	102	34	87	87	87	.	.	.	.
2	13	422	386	781	5	6	0	.	.	.	.
3	286	107	4	4	4	0	1	.	.	.	.
.	.	.	.	.	.	.	.				

Defilade PK pointers

Weapon Numbers	Target number 1	2	3	4	5	6	7 . . .				
1	1	8	110	4	62	62	62	.	.	.	.
2	22	42	36	71	77	44	0	.	.	.	.
3	113	122	86	81	9	6	0	.	.	.	.
.	.	.	.	.	.	.	.				

Figure 11-1. PK Structure

(5) The PK moving firer degradation factor matrix gives degradation factors when a target is moving. The range bands used are the same as in the moving target degradation factor matrix defined above, and are not repeated here. Within each band, there is a degradation factor which will be multiplied by the probability of kill

determined from the appropriate PK vector. A degradation vector is made up of one data value for each of the range bands for the target.

(a) N.PK.F.MOVE.FACTOR (I) - the number of degradation vectors to be defined. This must be the same as N.PK.MOVE.FACTOR from above. The following degradation vector is repeated for each target. The following data item (b) is repeated once for each range band defined to make one degradation vector.

(b) PK.F.MOV.FAC (R) - a degradation factor, expressed as a fraction between 0 and 1, to be applied to the selected PK vector if the firer is moving.

(6) The next data set is the moving target engagement matrix, which indicates if a firer can engage a given target when the target is moving. The following data item (a) is repeated once for each of the possible firer-target combinations, in the form: first firer to each target, second firer to each target, etc.

(a) FIRE.OTM (I) - a switch indicating if this firer can engage this target while the target is moving; 0 = no and 1 = yes.

(7) The next data set is the moving firer engagement matrix, which indicates if a firer can engage a given target when the firer is moving. The following data item (a) is repeated once for each of the possible firer-target combinations, in the form: first firer to each target, second firer to each target, etc.

(a) TGT.OTM (I) - a switch indicating if this firer can engage this target while the firer is moving, 0 = no and 1 = yes.

c. Coordinating Requirements

(1) Equipment data file. The EQUIP.PK.PTR refers to the sequence of the vectors in the exposed firer-target matrix and the defilade firer-target matrix.

(2) Weapon data file. The TW.PK.PTR refer to the sequence of the rows in the exposed firer-target matrix and the defilade firer-target matrix. The TW.FIRE.OTM.PTR refer to the sequence of the rows in the moving target engagement matrix.

Probability of Kill data file:

```
AIMS-KOREA-1999-HIGH-TECH
   11  11   0   1   2   3   4   5   6   7   8   9  10

           99  79  58  33  17   6   3   1   0   0   0
           17  12   8   3   1   0   0   0   0   0   0
           45  33  21   8   3   2   1   1   1   0   0
           99  91  75  44  23   8   4   2   1   0   0
           39  29  19   9   4   1   1   0   0   0   0
           64  55  46  37  29  21  15  11   8   5   3
           34  28  21  14   9   6   4   3   2   1   0
           61  53  44  36  28  20  15  11   8   5   3
           32  26  19  13   9   6   4   3   2   2   1
           99  90  76  53  34  15   9   4   2   1   0
            0   0   0   0   0   0   0   0   0   0   0

  11    30
```

```
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   6
8   8   3   6   0   0   7   9   3   3   9   2  11  11
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   9
5   3   7   4   0   0   4   7   8   8   1   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   1
4   4   3   3   2   2   7   7   5   5   3   9   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
0   0   5   9   6   6   8   8  11  11  11   2  11  11
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   4
4  10   8   5   2   2   2   7   7   7   9   0  11  11
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0  11
      11  11   0   0   7   9   6   6   0   0   0   8   4   2
   9   7   1   6  11  11   4   2   2   6   6  11   5  11  11   0
       0   0   0   0   0   0   0   0   0   0   0   0   0   0
7   7   3   6   6  11  11   4   4   7   7   2   3   2  11   0
       0   0   0   0   0   0   0   0   0   0   0   0   0   0
11  11   6   8   8  10  10   3   3   6   6   0   2   0   0   0
       0   0   0   0   0   0   0   0   0   0   0   0   0   0
   3   3   7   9   7   0   0   2   2   4   4   2   6   0   0   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   1   1   0   0   0   0   0   1   0   6   0
0   0   0   0   0   0   0   0   0   0   0   0   0   0


  10 6   500      1000      1500      2000      3000      6000
         1.       1.        1.        1.        1.        1.
         1.       1.        1.        1.        1.        1.
         1.       1.        1.        1.        1.        1.
         0.80     0.80      0.80      0.80      0.        0.
         0.80     0.80      0.80      0.80      0.80      0.
         0.80     0.80      0.80      0.80      0.        0.
         1.       0.98      0.82      0.68      0.66      0.50
         0.80     0.80      0.80      0.80      0.80      0.
         0.50     0.50      0.        0.        0.        0.
         0.96     0.86      0.78      0.74      0.74      0.74

  10
       1.      1.      1.      1.      1.      1.
       1.      1.      1.      1.      1.      1.
       1.      1.      1.      1.      1.      1.
       0.60    0.60    0.60    0.60    0.60    0.60
       0.60    0.60    0.60    0.60    0.60    0.60
       0.60    0.60    0.60    0.60    0.60    0.60
       0.75    0.50    0.36    0.32    0.30    0.15
       0.60    0.60    0.60    0.60    0.60    0.60
       0.30    0.30    0.      0.      0.      0.
       0.83    0.60    0.48    0.42    0.42    0.42
```

Probability of Kill data file continued

```
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

11-21. RULES OF ENGAGEMENT DATA. The rules of engagement direct the usage of artillery munitions based on the unit category of the target and the battery type that is firing.

a. Data Format. The file is divided into four sections: range information, category distance ICM usage set, maximum volleys set, and maximum batteries set.

(1) The first data set begins with N.DIST.FROM.FEBA.BAND, the integer number of range bands into which the distance between a target and the FEBA is broken into. The following data item is repeated for each range band.

(a) DFFB.MAX.RANGE (I) - the maximum range, in hexadecameters, from the FEBA contained within a band. This is not the range contained in each band, but rather the range contained in this band plus the maximum range of the last band (1 hexadecameter = 16 meters).

(2) The next data set is the category distance ICM (CDI) usage matrix. The following CDI record is repeated once for each category of unit, N.CATEGORY records. The CDI records are ordered to correspond with the sequence of the unit categories. The following data set is repeated once for each range band, N.DIST.FROM.FEBA.BAND sets, to create one CDI record. The following data item (a) is repeated for each IC munition, N.IC.MUNITION values, to create one data set. The order of the values corresponds to the sequence of the munitions.

(a) CDI.USAGE.INDICATOR (I) - a switch indicating if this IC munition can be fired at a target of this unit category in this range band, 0 = no and 1 = yes.

(3) The next data set is the maximum volleys matrix. The following maximum volley record is repeated for each category of unit, N.CATEGORY records. The maximum volley records are ordered to correspond with the sequence of the unit categories. The following data set is repeated for each range band, N.DIST.FROM.FEBA.BAND sets, to create one maximum volley record. The following data item (a) is repeated for each battery type, N.TYPE.BTRY values, to create one data set. The order of the values corresponds to the sequence of the battery types.

(a) CDT.MAX.VOLS (I) - the maximum number of volleys that this battery type can fire at a target of this unit category in this range band.

(4) The final data set is the maximum batteries matrix. The following maximum battery record is repeated for each range band, N.DIST.FROM.FEBA.BAND sets, to create one maximum battery record. The following data item (a) is repeated for each unit type, N.TYPE.UNIT values, to create one maximum battery record. The order of the values corresponds to the sequence of the unit types.

(a) DT.MAX.BATS (I) - the maximum number of batteries that can be massed to fire at a unit type in this band.

b. Coordinating Requirements

(1) Category Type Unit data file. The DT.MAX.BATS records refer to unit types in the sequence they appear in the Category Type Unit data file. The CDT.MAX.VOLS records and the CDI.USAGE.INDICATOR records refer to unit categories in the sequence they appear in the Category Type Unit data file.

(2) Type Battery data file. The CDT.MAX.VOLS records refer to battery types in the sequence they appear in the Type battery file.

(3) Munitions data file. The CDI.USAGE.INDICATOR records refer to IC munitions in the sequence they appear in the IC munition portion of the Munitions data file.

Rules of Engagement data file:

```
5    1000   3000   5000   7000   9000

     1 1    1 1    1 1    1 0    0 0
     1 1    1 1    1 1    1 1    1 1
     1 1    1 1    1 0    1 0    0 0
     1 1    1 1    1 1    1 1    1 1
     1 1    1 1    1 1    1 1    1 1
     1 1    1 1    1 1    1 1    1 1

     8 8 8   8 8 8   7 7 8   7 6 7   6 6 7
     8 8 8   8 8 8   7 7 8   7 6 7   6 6 7
     8 8 8   8 8 8   7 7 8   7 6 7   6 6 7
     8 8 8   8 8 8   7 7 8   7 6 7   6 6 7
     8 8 8   8 8 8   7 7 8   7 6 7   6 6 7
     8 8 8   8 8 8   7 7 8   7 6 7   6 6 7
```

```
9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
```

11-22. SENSOR DATA. The Sensor data file assigns sensors to units and specifies the FDCs to which the sensors report.

a. Data Format. The data file is in two sections: the assignment of a sensor list to a unit and RPV sortie information. The list of units owning sensors continues until the flag 99999 is entered.

(1) SENS.UNIT.NO (I) - the unit number of the unit to which the sensor is being assigned.

(2) SENS.TYPE (I) - the sequence number of the type of sensor which describes this sensor.

(3) SENSOR.MODEL (I) - the sequence number of the model sensor which describes this sensor. The correct file of model sensors is determined by the sensor type.

(4) NUM.SENSOR (I) - the number of this model sensor being assigned to a unit.

(5) SENSOR.FDC (I) - the unit number of an FDC unit to which this sensor will report.

If the sensor is a forward observer, as indicated by the ST.NAME pointed to by the SENS.TYPE, then data item (6) must be present and repeated for each sensor assigned.

(6) FO.FST.INDIC (I) - a switch indicating if there is a fire support team associated with this unit, where 0 = no and 1 = yes. If the sensor is a passive detection base, as indicated by the ST.NAME pointed to by the SENS.TYPE, then data item (7) must be present.

(7) NUM.KEYED.SENSORS (I) - the number of keyed sensors belonging to this sensor.

The following data items (a) and (b) are repeated for each keyed sensor.

(a) KS.TYPE.SENSOR (I) - the sequence number of the sensor type of this keyed sensor.

(b) SENS.UN.NO (I) - the unit number of the unit owning this keyed sensor. This unit must be in the list of units that own sensors, SENS.UNIT. NO. The sensor data for each unit must be ended by the flag 99999 indicating the end of data for this unit.

(8) The final values are the RPV sortie information. Entered after the 99999 flag to end the list of units owning sensors has been entered. These values are not used by the model but have been retained for compatibility with earlier versions.

(a) NUM.AO.SORTIE.PER.SECTOR.PER.DAY (I) - the number of RPVs which will be sent into each sector in each day for Red.

(b) NUM.AO.SORTIE.PER.SECTOR.PER.DAY (I) - the number of RPVs which will be sent into each sector in each day for Blue.

b. Coordinating Requirements

(1) Unit data file. The SENS.UNIT.NO must be a valid unit number from the Unit data file.

(2) Fire Direction Center data file. The SENSOR.FDC must be a valid FD.UNIT from the FDC data file.

(3) Type Sensor data file. The SENS.TYPE and the KS.TYPE.SENSOR are the sequence numbers of the ST.NAME from the Type Sensor data file. The SENSOR.MODEL is the sequence number of the model sensor in the appropriate file indicated by the SENS.TYPE.

(4) Target Report data file. The TR.REP.UNIT must own the TR.SENSOR.TYPE which must be linked to the TR.FDC.

```
Sensor data file:

12010  1   4   1   12010  0              99999 9
12020  1   6   1   12020  0              99999 9
12030  1   5   1   12030  2      3   13010        3    13020       99999
9
12040  2   1   2   12040  1      1                   99999 9
13010  1   3   1   13010  0              99999 9
13020  1   3   1   13020  0              99999 9
67002  1   2   1   60100  0              99999 9      99999      5     10
```

11-23. SMART MUNITIONS DATA. The smart munitions are made up of LGMs (laser-guided munitions) such as the COPPERHEAD, and PGMs (precision-guided munitions) such as the SADARM. This data file defines all of the valid munitions, their capabilities, and a priority list. The priority list indicates, for each type of unit, which of the smart munitions should be fired against it.

a. Data Format. The data is divided into three sections: LGM input, PGM input, and the smart munitions priority list. Take note that LGMs and PGMs require different information to be input.

(1) The first data set begins with N.LGM, the integer number of LGMs to be modeled. The following data items are repeated once for each LGM.

(a) LG.NAME (A) - the name of the LGM, up to six characters, with no embedded blanks.

(b) LG.RELIABILITY (R) - the reliability of one round of this munition, expressed in the range of 0 to 1.

(c) LG.MAX.RANGE (I) - the maximum range of the round in meters.

(d) LG.MAX.ROUNDS (I) - the maximum number of rounds that can be fired at a single target in a single fire mission.

(e) LG.MIL.WORTH (I) - the military worth to be assigned a target of this munition.

(f) LG.WEIGHT (I) - the weight, in pounds, of one round of this munition.

(g) LG.WEATHER.PROB (R) - the probability that the weather will be suitable for the firing of this round, expressed in the range of 0 to 1.

(h) LG.MIN.PREP.TIME (I) - the minimum preparation time, in seconds, for a fire mission to use this munition.

(i) LG.MAX.PREP.TIME (I) - the maximum preparation time, in seconds, for a fire mission to use this munition.

(j) LG.N.RH (I) - the number of range hacks that are defined for this munition.

Data items (k) through (o) are repeated once for each range hack defined for this munition. The range hack information must be listed in order of increasing values of LG.RH.RANGE.

(k) LG.RH.RANGE (I) - the range, in meters, from the target designator to the target.

(l) LG.PH(Moving,Defilade) (R) - the probability of hitting a moving target in defilade at this range, expressed in the range of 0 to 1.

(m) LG.PH(Moving,Exposed) (R) - the probability of hitting an exposed moving target at this range, expressed in the range of 0 to 1.

(n) LG.PH(Stationary,Defilade) (R) - the probability of hitting a stationary target in defilade at this range, expressed in the range of 0 to 1.

(o) LG PH(Stationary,Exposed) (R) - the probability of hitting an exposed stationary target at this range, expressed in the range of 0 to 1.

(p) LG.N.TGTS (I) - the number of target equipments for which PK data is provided.

Data items (q) through (u) are repeated once for each target equipment.

(q) LG.TGT.EQ.NAME (A) - the name of a target equipment.

(r) LG.PK(Moving,Defilade) (R) - the probability of a kill given a hit on a moving target in defilade, expressed in the range of 0 to 1.

(s) LG.PK(Moving,Exposed) (R) - the probability of a kill given a hit on an exposed moving target, expressed in the range of 0 to 1.

(t) LG.PK(Stationary,Defilade) (R) - the probability of a kill given a hit on a stationary target in defilade, expressed in the range of 0 to 1.

(u) LG.PK(Stationary,Exposed) (R) - the probability of a kill given a hit on an exposed stationary target, expressed in the range of 0 to 1.

(v) LG.N.TOF (I) - the number of time of flight range hacks defined.

Data items (w) through (x) are repeated once for each time of flight range hack defined.

(w) LGTL.RANGE (I) - the range, in meters, from the firing battery to the target.

(x) LGTL.TOF (I) - the time of flight, in seconds, for this range.

(2) The second data set begins with N.PGM, the integer number of PGMs to be modeled. The following data items are repeated once for each PGM.

(a) PG.NAME (A) - the name of the PGM, up to six characters, with no embedded blanks.

(b) PG.RELIABILITY (R) - the reliability of one round of this munition, expressed in the range of 0 to 1.

(c) PG.MAX.RANGE (I) - the maximum range of the round in meters.

(d) PG.MIN.FO.RANGE (I) - the minimum range, in meters, a target unit must be from the reporting forward observer in order to fire the munition.

(e) PG.MIN.TGTS (I) - the minimum number of targets that must be detected in the target unit before it is deemed worthwhile to fire this munition.

(f) PG.N.SUBMUN (I) - the number of submunitions contained with in a single round of the munition.

(g) PG.FTPRT (R) - the footprint area of the submunition in square meters.

(h) PG.RAA (I) - the round area of authority for the round in square meters. This value represents the area covered by the total submunitions in the round.

(i) PG.VOLLEY.FACTOR (R) - the factor used to compute the number of volleys to fire at a target unit. The volley factor is computed with the following formula:

$$v = t/(f * n * r)$$

where

v = the number of volleys to fire

t = the number of eligible targets detected (target eligibility discussed below) f = the PG.VOLLEY.FACTOR

n = the number of guns in the firing battery, N.BY.HOW.SET

r = the number of rounds fired per gun per volley in the firing battery, TB.RND.PER.LAUNCH

The result is reduced to the maximum number of volleys that can be fired, as discussed below, if necessary.

(j) PG.MAX.VOLLEYS (I) - the maximum number of volleys that can be fired against a target in a single fire mission.

(k) PG.MIL.WORTH (I) - the military worth to be assigned a target of this munition when prioritizing fire missions.

(l) PG.SUBMUN.REL (open) (R) - the reliability of a-single submunition when fired at a target in the open, expressed in the range of 0 to 1.

(m) PG.SUBMUN.REL (woods) (R) - the reliability of a single submunition when fired at a target in the woods, expressed in the range of 0 to 1.

(n) PG.WEIGHT (I) - the weight of one round of this munition in pounds.

(o) PG.MIN.PREP.TIME (I) - the minimum preparation time, in seconds, for a fire mission using this munition.

(p) PG.MAX.PREP.TIME (I) - the maximum preparation time, in seconds, for a fire mission using this munition.

Data items (q) through (t) are repeated for each battery type that may fire the munition. The word END is used to indicate the end of the list of types of batteries.

(q) PG.TBTRY.NAME (A) - the name of a battery type that may fire this munition.

For each battery type that is capable of firing this munition, data items (r) through (t) are repeated twice, once for each of two range hacks.

(r) PG.RH.RANGE (I) - the range, in decameters, associated with this range hack.

(s) PG.RH.ROUND.CPE (I) - the round circular probable error, in meters, at this range.

(t) PG.RH.SUBMUN.CPE (I) - the submunition circular probable error, in meters, at this range.

Data items (u) through (y) are repeated once for each type of equipment eligible as a target. The word END is used to end the list of eligible type of equipment.

(u) PG.TE.NAME (A) - the name of the target type of equipment. This must be a valid name in the Type Equipment data file.

(v) PG.USE (stationary) (I) - a switch to indicate whether or not this round may be fired at this type of equipment when the equipment is stationary, where 1 = yes and 0 = no.

(w) PG.USE (moving) (I) - a switch to indicate whether or not this round may be fired at this type of equipment when the equipment is moving, where 1 = yes and 0 = no.

(x) PG.PK (open) (R) - the PK of a submunition against this type of equipment when the equipment is in the open, expressed in the range of 0 to 1.

(y) PG.PK (woods) (R) - the PK of a submunition against this type of equipment when the equipment is in the woods, expressed in the range of 0 to 1.

(3) The third data set. The following data items are repeated for each type of unit that may be targeted by smart munitions. The word ENDLIST is used to indicate that no more types of units can be targeted by smart munitions.

(a) SMM.TU.NAME (A) - the name of a type of unit. The data items (b) and (c) are repeated once for each smart munition that may be used against this type of unit when the unit is stationary. The munitions must be listed in order of priority from highest to lowest. The word END is used to indicate the end of the smart munitions priority list to be used against this type of unit when it is stationary. If no smart munitions are to be used against this type of unit when it is stationary, simply terminate the list with the word END.

(b) SMM.MUN.TYPE (stationary) (A) - the type of smart munition to be used, either PGM or LGM.

(c) SMM.MUN.NAME (stationary) (A) - the name of the smart munition of the above type, SMM.MUN.TYPE, to be used. This must be a valid smart munition from the list of smart munitions defined earlier in this file. The data items (d) and (e) are repeated once for each smart munition that may be used against this type of unit when the unit is moving. The munitions must be listed in order of priority from highest to lowest. The word END is used to indicate the end of the smart munitions priority list to be used against this type of unit when it is moving. If no smart munitions are to be used against this type of unit, simply terminate the list with the word END.

(d) SMM.MUN.TYPE (moving) (A) - the type of smart munition to be used, either PGM or LGM.

(e) SMM.MUN.NAME (moving) (A) - the name of the smart munition of the above type, SMM.MUN.TYPE, to be used. This must be a valid smart munition from the list of smart munitions defined earlier in this file.

b. Coordinating Requirements

(1) Equipment data file. The LG.TGT.EQP.NAME must be a valid equipment type. The PG.TE.NAME must be a valid type of equipment.

(2) Type Battery data file. The PG.TBTRY.NAME must be a valid type of battery.

(3) Category Type Unit data file. The SMM.TU.NAME must be a valid type of unit.

(4) Forward Observer data file. FML.TYPE.NAME references the names of types of smart munitions. FML.MUN.NAME refers to the name of a smart munition.

Smart Munitions data file:

```
1 CUHD    0.83  30000  8  2001   1    0.80    60    90
      3
      1000    0.38    0.89     0.40     0.02
      3000    0.32    0.72     0.01     0.65
      5000    0.28    0.85     0.48     0.08
      2
      RT80B   0.50    0.52     0.54     0.56
      RT72    0.50    0.52     0.54     0.56
      3
       8500     31
      14500     54
      30000     90

2 SADRM   0.95  22500  6000   2   2    17671    30000  1.16    16
1999   0.97  0.95    1  10       30

        UTBY1   800     49   15
                2250   112   55
        END

        ARMOR   1   0   0.20    0.30
        END

RSADRM  0.94  38000  6000    3    6    17671   106666  1.16    16
        1999    0.97  0.95   1  10        30

        RTBY1   2500   110   175
                3800   241   444
        END

        ARMOR   1   0   0.20    0.30
        END

UTANK1
PGM RDSADRM END
PGM RDSADRM END

RTANK1
LGM CUHD  PGM SADRM END
PGM SADRM           END

ENDLISTS
```

11-24. SMOKE DATA. The smoke data file describes the smoke munitions and the rules for their use.

a. Data Format. The file is divided into four sections: system information, smoke munitions information, smoke munitions definition section, and the smoke munitions use rules.

(1) The first data set is system information.

(a) SMK.SWITCH (I) - a switch indicating if smoke is to be modeled, where 0 = no and 1 = yes. If the value is zero, no further data is required.

(b) SMK.DEBUG (I) - a debug switch indicating if debug statements are to be printed when smoke is used to allow the flow of the procedure to be examined in detail, where 0 = no and 1 = yes.

(2) The next data set is as follows.

(a) N.SMOKE.MUNITION (I) - the number of smoke munitions to be modeled.

(b) SMOKE.MIN.RANGE (I) - the doctrinal minimum range, in meters, that smoke munitions may be fired.

(3) The following data items (a) through (e) are repeated once for each smoke munition defined.

(a) SMK.ID (A) - the name of the munition, up to six characters, with no embedded blanks.

(b) SMK.WIDTH (I) - the width, in meters, of the area covered by a volley of this munition, expressed in the range of 0 to 2,047.

(c) SMK.MAX.RANGE (I) - the maximum range, in decameters, that this munition can be fired, expressed in the range of 0 to 2,047.

(d) SMK.BURN.TIME (I) - the length of time, in minutes, that this munition can block line of sight between two units, expressed in the range of 0 to 2,047.

(e) ROUND.WEIGHT (I) - the weight, in pounds, of one round of this munition.

(4) The final data set defines the rules of use for smoke munitions first for Red and then for Blue. The five rule values are:

0 - Smoke is not to be employed.

1 - An attacking force will call for smoke to screen its advance from the opposing force.

2 - An attacking force will call for smoke to screen it from the closest defender.

3 - A defending force will call for smoke to screen it from all but the closest attacker.

4 - A defending unit will call for smoke to screen itself when it starts to withdraw.

(a) SIDE.NAME (A) - the name of the side with these rules. Red is defined first, then Blue.

(b) MISSION.NAME (A) - one of the six possible missions in the order: PATROL, PROBE, ATTACK, DELAY, DEFEND, and AMBUSH.

The following data items (c) and (b) are present for the PATROL, PROBE, and ATTACK missions.

(c) USE.RULE(Day) (I) - the rule to be used for a force with this mission during the day. The possible values are 0, 1, and 2.

(d) SMK.USE.RULE(Night) (I) - the rule to be used for a force with this mission during the night. The possible values are 0, 1, and 2.

The following data items (e) through (h) are present for the DELAY, DEFEND, or AMBUSH missions.

(e) SMK.USE.RULE(Day) (I) - the rule to be used by a force with this mission during the day. The possible values are 0 and 3.

(f) SMK.USE.RULE(Night) (I) - the rule to be used by a force with this mission during the night. The possible values are 0 and 3.

(g) SMK.WD.RULE(Day) (I) - the rule to be used by a force with this mission when it begins to withdraw during the day. The possible values are 0 and 4.

(h) SMK.WD.RULE(Night) (I) - the rule to be used by a force with this mission when it begins to withdraw during the night. The possible values are 0 and 4.

b. Coordinating Requirements

(1) Type Battery data file. When a battery is assigned this munition, the TB.TM.CLASS is set to SMOKE, and the TB.TM is set to the sequence number of the munition in this list of munitions.

Smoke data file:

```
    1  0
       3       50
       M84B1    250 1400    4   70
       M825    2047 1800    4  150
       XM819    130  538    4   40


    RED
       PATROL  0  0
       PROBE   0  0
       ATTACK  2  0
       DELAY   3  0  4  0
       DEFEND  3  0  4  0
       AMBUSH  3  0  4  0
    BLUE
       PATROL  0  0
       PROBE   0  0
       ATTACK  2  0
       DELAY   3  0  4  0
       DEFEND  3  0  4  0
       AMBUSH  3  0  4  0
```

11-25. SUBMUNITIONS DATA. The submunitions data file describes the submunitions which make up the improved conventional munitions.

a. Data Format. The file is divided into four sections: submunition definition section, reliability, lethal areas for personnel, and lethal areas for equipment.

(1) The first data set begins with N.SUBMUNITION, the integer number of submunitions to be modeled. The following data item is repeated once for each submunition.

(a) SM.NAME (A) - the name of the submunition, up to six characters, with no embedded blanks.

(2) The next data set defines the reliability of the submunitions in each of the environments. The following data items (a) through (c) are repeated once for each submunition.

(a) SM.REL(Open) (I) - the reliability, expressed as an integer percentage, of this submunition in the open environment.

(b) SM.REL(Woods) (I) - the reliability, expressed as an integer percentage, of this submunition in the woods environment.

(c) SM.REL(Town) (I) - the reliability, expressed as an integer percentage, of this submunition in the town environment.

(3) The next data set defines the lethal areas for personnel. The following personnel lethal area records are repeated once for each submunition. The following data items (a) through (c) are repeated once for each of the three environments, in the order open, woods, and town, to form one personnel lethal area data record.

(a) EPS.LA.PERS(Standing) (I) - the lethal area, in tenths of square meters, for this submunition in this environment against personnel in the standing posture.

(b) EPS.LA.PERS(Prone) (I) - the lethal area, in tenths of square meters, for this submunition in this environment against personnel in the prone posture.

(c) EPS.LA.PERS(Foxhole) (I) - the lethal area, in integer tenths of square meters, for this submunition in this environment against personnel in the foxhole posture.

(4) The final section defines the lethal areas of the submunitions against equipment. The following equipment lethal area sets are repeated once for each submunition. The following data records are repeated once for each of the three environments, in the order open, woods, and town, to form one equipment lethal area set. The following data item is repeated once for each type of equipment (except for mines and personnel) to form one data record.

(a) TES.LA.EQUIP (I) - the lethal area, in tenths of square meters, for this submunition in this environment against this type of equipment.

b. Coordinating Requirements

- Equipment Data File. The order of the lethal areas corresponds to the sequence in which the equipment types appear in the Equipment data file. Personnel and mines are excluded.

```
Submunitions data file:

  2     105ICM  152ICM

        97 95 92
        97 95 92

        630  350  123     213  175  156     630  310  176
        960  446   10     819  254   10     899  615  148

         23   13  430  147  165  144  267  135
         21   23  102  154   13  154  134  134
         34  111  263   32  120  212  142  154

         50   45  630   13   20  190  150  112
         34   23  422   15   13  157  122  146
```

11-26. SYSTEM DATA. The system data file provides general information which controls the model, such as debug switches, simulation time, battlefield descriptors, terrain factors, etc.

a. Data Format. The file is divided into eight sections: system switch information, artillery options, simulation time specifications, battlefield parameters, approximation parameters, update parameters, movement specifications, and battle parameters.

(1) The system switches follow.

(a) DEBUG (I) - (Omitted from data, but included in runstream) a switch to indicate if debugging information will be printed with the normal output, where 0 = off and 1 = on. The runstream generator will set this switch.

(b) RN.SEED (I) - (Omitted from data, but included in runstream) the random number seed to be used by the simulation. A value between 1 and 100. The runstream generator will set this value.

(c) CASE.ID (A) - an alphanumeric serial number which identifies the specific combat sample data indigenous to the particular scenario being gamed.

(d) NUM.POSITION.REPORT (I) - the number of position reports to be output during a 24 hour period. A position report contains a list of units and unit locations that are written to output unit 3. This file is designed to be used as the input file for a graphics module to produce a plot of the battlefield locations of all units over time.

(e) CALP.ON (I) - a switch indicating if passenger kills are being computed where 0 = no and 1 = yes.

(f) ANALYSIS (I) - a set of six switches which control the generation of specific output files used in analysis, where 0 = off and 1 = on. The switches control the outputs as shown:

1st Analysis - SIMU42 Artillery Movement and Status Report
2d Analysis - SIMU43 Target Reports
3d Analysis - Not used set to 1
4th Analysis - Not used set to 1
5th Analysis - SIMU55 Direct fire shot list
6th Analysis - Not used set to 1

For normal operation, all output files are required, and all switches should be set to 1.

(2) The nex set defines artillery options. The following data items are entered once for Red and then repeated for Blue.

(a) COST.CRITERIA (I) - a switch indicating if the cost per round or weight per round will be used as a factor in choosing between high explosive or improved conventional munitions when either munition could be used, where 0 = weight and 1 = cost.

(b) ARTY.DECIMATE (I) - the integer percentage of artillery crewmen below which an artillery unit cannot shoot.

(c) ARTY.DEGRADE (I) - the integer percentage of artillery crewmen below which an artillery unit's sustained rate of fire will be degraded.

(d) BREAK.POINT (I) - the integer percentage of the critical unit equipment that must be operational for a unit to be considered combat effective.

(e) REQ.EFF.MOVING (I) - the integer percentage of principal type equipment that an artillery unit should try to kill when firing on a moving unit.

(f) REQ.EFF.STA (I) - the integer percentage of principal type equipment that an artillery unit should try to kill when firing on a stationary unit.

(3) The next data set specifies the simulation time parameters.

(a) STOP.SIMULATION.TIME (R) - the duration of the simulation in decimal hours.

(b) BMNT (R) - the time that BMNT (begin morning nautical twilight) occurs, expressed in decimal hours in 24-hour clock time.

(c) EENT (R) - the time that EENT (end evening nautical twilight) occurs, expressed in decimal hours in 24-hour clock time.

(4) The next record defines battlefield descriptors.

(a) N.SECTOR (I) - the number of sectors to be played across the FEBA. Sector width is determined by dividing the FEBA width by the number of sectors, making each sector equal in width.

(b) FEBA.WIDTH (I) - the width of the battlefield, in decameters. This value must be the same as INIT.Y.FEBA.

(c) FRONT.DEPTH (I) - the depth of the battle area to be played, in decameters.

(d) INIT.X.FEBA (I) - the X coordinate, in decameters, to be used for initialization of the battlefield. This value is used to describe the center topmost point of the battlefield grid.

(e) INIT.Y.FEBA (I) - the Y coordinate, in decameters, to be used for initialization of the battlefield. This value must be set equal to the FEBA.WIDTH. It is used to describe the center topmost point of the battlefield grid.

(5) The next data set defines approximation parameters.

(a) NUM.RAD.INCREMENTS (I) - (not currently used) the number of segments to divide a radius for estimating an area using numerical integration. The larger the number, the more accurate the calculation, but the more computer time and memory used.

(b) NUM.ANG.INCREMENTS (I) - (not currently used) the number of increments into which the angle, formed by the gun-target line and a line from the guns to the center of an actual volley impact, will be divided for calculating, using numerical integration, the target coverage achieved. The larger the number, the more accurate the calculation, but the more computer time and memory that is used.

(c) TERRAIN.PAR (I) - the code indicating the types of terrain to be used during the simulation. Terrain parameter codes are 1 through N.TERRAIN.TYPE (from the Terrain data file, normal input is 11) and are defined to represent different terrains. A constant terrain can be played by entering one of the codes (1 through N.TERRAIN.TYPE). One of the following preset random selection codes may be used:

21 Random selection to represent the Fulda Gap (chosen from terrain parameters 1 through 5)

22 Random selection to represent the North German Plain (chosen from terrain parameters 6 through 11)

23 Random selection from terrain parameters 1 through 11

(d) TIME.BETWEEN.ARTY.MOVE (R) - the maximum time, in minutes, that an artillery unit will remain in position before being evaluated for repositioning.

(6) The next data set defines the update parameters.

(a) LOC.UPDATE.FREQ (R) - the distance, in meters, that a unit moves before its location is updated.

(b) TR.DUR.STA (R) - the time, in hours, that a target report will remain active when the target is stationary.

(c) TR.DUR.MOV (R) - the time, in hours, that a target report will remain active when the target is moving.

(7) The next data set defines movement factors.

(a) TAC.MOV.FAC (R) - a fractional scaling factor which modifies the nonengaged, daytime terrain movement rates, MOV.FAC, to reflect movement rates for tactical moves.

(b) NITE.MOV.FAC (R) - a fractional scaling factor which modifies the nonengaged, daytime terrain movement rates, MOV.FAC, to reflect movement rates at night.

(8) The file data set defines battle parameters.

(a) ACT.BATTLE.RANGE (I) - the opening engagement range, in meters, between maneuver units. A part of the battle decision logic, this range minus the radius of the unit being attacked must be achieved before direct fire weapons with sufficient range will begin to fire, assuming they have line of sight.

(b) REIN.PROX (I) - the maximum distance, in meters, from a unit needing reinforcement that another unit may be in order to be considered available to reinforce.

(c) REIN.THRESH (I) - the percent of critical equipment a unit must have onhand to be considered capable of reinforcing another unit.

(d) REIN.DELAY (I) - the delay, in minutes, for a unit to prepare to move when ordered to reinforce another unit.

(e) ATK.DELAY (I) - the delay, in minutes, required for a unit to regroup before it can resume an attack that has been broken off due to the defending force withdrawing.

b. Coordinating Requirements

- Terrain data file. The TERRAIN.PAR selects one of the terrain codes defined in the Terrain data file. The range is 1 through N.TERRAIN.TYPE.

System data file:

```
     24    0
     A-C01A01R01B01=IC-US_ROK_WAR_PLAN_1999
      1          1          1          1          1          1

      0          20         80         25         10         30
      0          20         80         30         10         30

      24.00      5.50       17.50

      75         15000      40000      20100      15000

      10         40         23         30.

      1875       0.500      0.167

      0.50       0.60

      1600       10000      75         15          60
```

11-27. TACTICAL AIRCRAFT DATA. The Tactical Aircraft data file describes the types of aircraft, their weapon systems, various mission/aircraft constraints, and a list of preplanned missions.

a. Data Format. The information is divided into five data sets. The first sets the flags, the second and third describe threshold data for Red and Blue, the fourth describes aircraft types, and the fifth set describes preplanned missions.

(1) The first data set is the flags.

(a) TACAIR.FLAG (I) - a switch indicating if air defense or TACAIR is being played, where 0 = no, 1 = yes, and 2 = print TACAIR data report.

(b) CAS.MSN.RPT.FLAG (I) - a switch to indicate whether or not a summary report is required for each TACAIR mission where 0 = no and 1 = yes.

(c) TACAIR.DEBUG (I) - a switch indicating if debugging output is desired where 0 = no and 1 = yes.

(2) The second data set describes constraint parameters for Red.

(a) TACAIR.SIDE.NAME (A) - the name of the side being described; RED must be entered.

(b) UNIT.NOS (I) - the unit number of the SD.AIRFIELD.

(c) SD.MAX.SORTIE.TP(Red) (I) - the maximum number of Red sorties that may be flown in a time period of length SD.TP.SORTIE(Red).

(d) SD.TP.SORTIE(Red) (I) - a time period, in minutes, to control the number of sorties flown.

(e) SD.ASC.MAX.SORTIE(Red) (I) - the maximum number of Red sorties that may be active within a radius of SD.ASC.RADIUS(Red).

(f) SD.ASC.RADIUS(Red) (I) - the constraint radius, in decameters, for Red sorties.

(g) SD.NO.FLY.VIS(Red) (I) - the threshold visibility, in decameters, that prevents new missions from taking off. If the visibility is below this value, no new missions will take off, but active missions will continue under degraded conditions.

(h) SD.POOR.FLY.VIS(Red) (I) - the threshold visibility, in decameters, to impose degraded conditions on missions. If the visibility is below this value the effectiveness of aircraft against ground targets is reduced.

(i) SD.CAS.BRKPT(Red) (I) - the breakoff point for Red CAS missions. If the target unit has less than this amount of critical equipment onhand, the aircraft will break off the attack.

(3) The next data set describes the threshold values for the generation of oncall close air support (CAS) missions to support a force in a specific mission. The following data items (a) through (d) are repeated once for each mission in the order: PATROL, PROBE, ATTACK, DELAY, DEFEND, and AMBUSH.

(a) SM.TANK.TE(Red) (A) - this type of equipment will be used in calculating the critical equipment ratio.

(b) SM.MIN.TANK.RATIO(Red) (R) - this ratio is the low threshold for calling CAS. If the critical equipment ratio is less than this value, CAS will not be called.

(c) SM.MAX.TANK.RATIO(Red) (R) - this ratio is the highest threshold for calling CAS. If the ratio is greater than this value, CAS will not be called.

(d) SM.MIN.CEQ(Red) (I) - CAS will not be called if the opposing force has less than this number of critical items of equipment.

(4) The next data set describes constraint parameters for Blue.

(a) TACAIR.SIDE.NAME (A) - the name of the side being described; BLUE must be entered.

(b) UNIT.NOS (I) - the unit number of the SD.AIRFIELD.

(c) SD.MAX.SORTIE.TP(Blue) (I) - the maximum number of Blue sorties that may be flown in a time period of length SD.TP.SORTIE(Blue).

(d) SD.TP.SORTIE(Blue) (I) - a time period, in minutes, to control the number of sorties flown.

(e) SD.ASC.MAX.SORTIE(Blue) (I) - the maximum number of Blue sorties that may be active within a radius of SD.ASC.RADIUS(Blue).

(f) SD.ASC.RADIUS(Blue) (I) - the constraint radius, in decameters, for Blue sorties.

(g) SD.NO.FLY.VIS(Blue) (I) - the threshold visibility, in decameters, that prevents new missions from taking off. If the visibility is below this value, no new missions will take off, but active missions will continue under degraded conditions.

(h) SD.POOR.FLY.VIS(Blue) (I) - the threshold visibility, in decameters, to impose degraded conditions on missions. If the visibility is below this value, the effectiveness of aircraft against ground targets is reduced.

(i) SD.CAS.BRKPT(Blue) (I) - the breakoff point for Blue CAS missions. If the target unit has less than this amount of critical equipment onhand, the aircraft will break off the attack.

(5) The next data set describes the threshold values for the generation of oncall CAS missions to support a force in a specific mission. The following data items (a) through (d) are repeated once for each mission in the order: PATROL, PROBE, ATTACK, DELAY, DEFEND, and AMBUSH.

(a) SM.TANK.TE(Blue) (A) - this type of equipment will be used in calculating critical equipment ratios.

(b) SM.MIN.TANK.RATIO(Blue) (R) - this ratio is the low threshold for calling CAS. If the critical equipment ratio is less than this value, CAS will not be called.

(c) SM.MAX.TANK.RATIO(Blue) (R) - this ratio is the highest threshold for calling CAS. If the ratio is greater than this value, CAS will not be called.

(d) SM.MIN.CEQ(Blue) (I) - close air support will not be called if the opposing force has less than this number of critical items of equipment.

(6) The next data set begins with N.AC.TYPE, the integer number of aircraft being played. The following data items (a) through (l) are repeated for each aircraft.

(a) ACT.SEQ.NUM (I) - sequence number of the aircraft.

(b) ACT.NAME (A) - the name of the aircraft, up to six characters, with no embedded blanks.

(c) ACT.SUBSTITUTE (A) - the name of the aircraft to be substituted if the aircraft specified by the ACT.NAME is required but not available.

(d) ACT.WEATHER.DEGRADE (I) - the effectiveness of this aircraft in poor visibility conditions.

(e) ACT.MIN.ALT (I) - the minimum altitude, in decameters, for this aircraft.

(f) ACT.NORM.ALT (I) - the normal altitude, in decameters, for this aircraft.

(g) ACT.BAI.TA.DELAY (I) - the target acquisition delay time, in minutes, for this aircraft when forward air controller (FAC) is not available, i.e., when the mission is not preplanned.

(h) ACT.MAX.ALOFT (I) - the maximum number of minutes that this aircraft can remain aloft.

(i) ACT.PROB.SORTIE.ABORT (I) - the probability, expressed as an integer percentage, that a sortie of this aircraft will be aborted due to causes other than ground-based air defense, i.e., aircraft operational readiness.

(j) ACT.MIN.PREP (I) - the minimum preparation time, in minutes, for this aircraft.

(k) ACT.MAX.PREP (I) - the maximum preparation time, in minutes, for this aircraft. The actual preparation delay will be uniformly distributed between the minimum and the maximum.

(l) AC.NITE.FLY (I) - a switch indicating if this aircraft can fly at night, where 0 = day only and 1 = day or night. The following data items (m) through (p) are repeated for each weapon that is assigned to this type of aircraft. After all weapons have been described the list is terminated with the key word END.

(m) ACTP.TW.NAME (A) - the weapon for this aircraft for which this path data is relevant.

(n) P1.COORD(x,y,z) (I) - the x, y, and z coordinates, entered in decameters relative to the target position, of the first point of the three-point attack profile.

(o) P2.COORD(x,y,z) (I) - the x, y, and z coordinates, entered in decameters relative to the target position, of the second point of the three-point attack profile.

(p) P3.COORD(x,y,z) (I) - the x, y, and z coordinates, entered in decameters relative to the target position, of the third point of the three-point attack profile.

(7) The final data set begins with NUM.MSNS, the integer number of preplanned missions. The following data items (a) through (e) are repeated once per mission defined.

(a) PPM.ID (A) - for clarity, a preplanned mission identifier.

(b) ATK.TIME (R) - the attack time in decimal hours

(c) TARGET.UNIT (I) - the unit number of the target unit.

(d) ACT.NAME (A) - the name of the aircraft required for the attack.

(e) NUM.AC (I) - the number of aircraft to be included in the mission.

b. Coordinating Requirements

(1) Unit data file. The SD.AIRFIELD must be the unit number of a valid airfield from the Unit data file. The TARGET.UNIT must be a valid unit. The quantity of each equipment in the airfield must be equal to or greater than the number of sorties available.

(2) Equipment data file. The SM.TANK.TE must be a valid equipment type from the Equipment data file.

(3) Aircraft Munitions data file. The ATM.DELIV.CEP references the number of aircraft defined.

(4) Category Type Unit data file. The TU.ATK.AC refers to sequence numbers of the aircraft.

Tactical Aircraft data file:

```
1  1  1

RED    61500    9  480   11   500  0160   0400   01
       ARMOR    00.01   99.99  010
       ARMOR    00.25   04.00  010
       ARMOR    00.25   04.00  010
       ARMOR    00.01   99.99  010
       ARMOR    00.01   99.99  010
       ARMOR    00.25   04.00  010

BLUE   17400    14  480   16   500  0160   0400   01
       ARMOR    00.01   99.99  010
       ARMOR    00.01   99.99  010
       ARMOR    00.25   04.00  010
       ARMOR    00.01   99.99  010
       ARMOR    00.25   04.00  010
       ARMOR    00.25   04.00  010

2
1  UACA10  UACF16   30     3     3   2  234   1  300  360  0
     UM65AC
       -960      0  0015
       -400      0  0035
       -600    020  0006
     UC30AC
```

```
        -300      0  0015
        -060      0  0035
         010   -340  0006
      END

  2  RSU25   RSU24    30       6      6   2   192    1   360   480   0
      RC30AC
        -250    250  0030
        -037    037  0055
         000    250  0009
      END

 9
 BLU01    3.92    31104   UACF4G   002
 BLU02    3.93    31304   UACF4G   002
 BLU03    3.94    23401   UACF4G   002
 BLU04    3.96    31401   UACF4G   002
 BLU05    4.08    61500   UACF16   008
 RED03    5.04    10001   RSU24G   002
 RED04    5.06    10004   RSU24G   002
 RED05    5.08    17400   RMIG27   010
 RED06    5.10    17400   RMIG27   010
```

11-28. TARGET REPORT DATA. The target report data file defines the parameters for the external target report processes, which are used to schedule fire missions; the scheduling process is handled internally.

a. Data Format

(1) The external process record must begin with the key word TARGET.REPORT. The following data items are repeated for each external target report.

(a) TIME (R) - the time this target report is to occur, in decimal 48-hour clock time.

(b) TR.FDC (I) - the unit number of the fire direction center which controls the sensor reporting this target.

(c) TR.SENSOR.TYPE (A) - the name of the type of sensor reporting the target.

(d) TR.REP.UNIT (I) - the unit number of the unit owning the sensor which is making the target report.

(e) TR.TGT.UNIT (I) - the unit number of the target unit being reported.

(f) TR.MOVE (I) - a switch indicating if the target is moving, where 0 = no and 1 = yes.

(g) TR.EST.X (I) - the estimated X coordinate of the target, in decameters.

(h) TR.EST.Y. (I) - the estimated Y coordinate of the target, in decameters.

(i) TR.CEP (I) - the circular error probable, in meters, in the estimate of the target's location. The follow data items (j) through (l) are repeated once for each equipment type detected by the sensor reporting the target. A 999 flag is used to end the list of detected equipments.

(j) TR.DET.TE (I) - the sequence number of the type equipment which was detected.

(k) TR.DET.ELEM.PROB (I) - the probability, in integer tenths of a percent, that the equipment type being detected will be recognized correctly as the type equipment it is.

(l) TR.DET.QUANT (I) - the number of this equipment type belonging to the target that the sensor reports.

The end of one external process is indicated with the flag.* (an asterisk).

b. Coordinating Requirements

(1) Fire Direction Center data file. The TR.FDC must be the sequence number of an FDC from the Fire Direction Center data file properly linked in the Sensor data file.

(1) Type Sensor data file. The TR.SENSOR.TYPE must be a valid type of sensor from the Type Sensor data file.

(2) Unit data file. The TR.REP.UNIT and the TR.TGT.UNIT must be a valid unit from the Unit data file

(3) Sensor data file. The TR.REP.UNIT must own the sensor indicated by the TR.SENSOR.TYPE which must be linked to TR.FDC.Equipment data file. The TR.DET.TE must be the sequence number of a type of equipment in the Equipment data file.

Target Report data file:

```
TARGET.REPORT  3.57  11010  URADAR  13050  0  12000  9000  15
    2  750  10
    5  800  12    999      *
```

11-29. TERRAIN DATA. The terrain data file describes the battlefield terrain factors. Each terrain type is described by line of sight (LOS) bands with associated probabilities and other parameters.

a. Data Format. The data file is divided into three sections: range band definition, line of sight probabilities, and terrain parameter definition.

(1) The first data set is range band definition.

(a) TER.W.INC (I) - a multiplier for the LOS scale parameters for use in the Weibull distribution.

25 for Europe 1 for Southwest Asia 1 for Northeast Asia.

If TER.W.INC = 1, the values of EC.FRACT supplied in the PEM file will be used. Any other value causes the model to override those values of EC.FRACT.

(b) N.TERRAIN.TYPE (I) - the number of terrain types to be modeled.

(c) N.LOS.BAND (I) - the number of LOS bands to be modeled.

The following data item (d) is repeated once for each LOS band defined.

(d) BAND.RANGE (I) - the maximum range, in meters, of each LOS band. The first band extends from 0 to the first value given, the second band from the first value to the second, and so on, expressed in the range of 0 to 2,097,136.

(2) The next data set is the probability of achieving line of sight matrix. The following LOS record is repeated once for each terrain type, N.TERRAIN.TYPE times. The following data item (a) is repeated once for each range band defined to form one LOS record.

(a) LOS.PROB (I) - the probability of achieving line of sight, expressed as an integer percentage, for this terrain type and this range band.

(3) The final data set describes each of the terrain types. The following data items (a) through (j) are repeated for each terrain type.

(a) TT.LOS.SHAPE (R) - the shape parameter of a Weibull distribution that will be used to determine the distance a unit can move along its movement path and maintain LOS with an opposing unit.

(b) TT.NLOS.SHAPE (R) - the shape parameter for another Weibull distribution that will determine the distance a unit will move before it regains lost LOS with an opposing unit.

(c) TT.LOS.SCALE (R) - the scale parameter to be used in conjunction with TT.LOS.SHAPE in determining the distance a unit will move with LOS.

(d) TT.NLOS.SCALE (R) - the scale parameter to be used in conjunction with TT.NLOS.SHAPE in determining the distance a unit will move without LOS.

(e) TT.STATIONARY.LOS.BREAK (I) - the range, in meters, at which two stationary opposing units will always have LOS. They may or may not have a break in LOS outside this range, expressed in the range of 0 to 65,520.

(f) TT.MOVING.LOS.BREAK (I) - the range, in meters, at which two moving opposing units will always have LOS. They may or may not have a break in LOS outside this range, expressed in the range of 0 to 65,520.

(g) TT.M.S.LOS.BREAK (I) - the range, in meters, at which one moving versus one stationary unit will always have LOS. They may or may not have a break in LOS outside this range, expressed in the range of 0 to 65,520.

(h) MOVE.FIRE.DIST (I) - the range between opposing units, in meters, within which an attacking unit would prefer to fire on the move rather than stop to shoot, expressed in the range of 0 to 32,752.

(i) DEFILADE.DIST (I) - the range, in meters, between opposing units within which an attacker will have speed, rather than cover, as the dominant consideration and outside of which an attacker will attempt to move in defilade. expressed in the range of 0 to 32,752. This range must coordinate with MOVE.FIRE.DIST.

(j) MOV.FAC (R) - a factor which is used as a multiplier for the movement rate of a unit while on this terrain.

Coordinating Requirements

(1) System data file. The TERRAIN.PAR selects which of the terrain types to

(2) Posture Environment and Mission data file. If the TER.W.INC = 1 in this file, then the EC.FRAC values will be used in the Posture Environment and Mission data file.

Terrain data file:

```
1   11   6
       1000      1500      2000      2500      3000      5000
         28        35        26        35        31        18
         70        64        50        30        30        41
         49        48        38        23        20        24
         75        63        30        07        36        24
         39        32        12        19        01        03
         68        35        20        17        20        42
         24        07        25        29        07        09
         55        15        03        02        01        00
         22        04        00        00        00        00
         38        01        00        00        00        00
         29        07        02        02        00        00

0.9458  0.7865  290.5    369.75  1500 0500 1000 3000 3000    1.0
0.9912  0.7425  550.0    508.5   1800  700 1200 3000 3000    1.1
1.1969  0.6678  418.5    475.75  1000  300  700 2500 2500    0.6
0.8584  0.7451  507.75   650.25  1800  700 1200 3000 3000    1.1
0.9057  0.7585  290.25   501.5    900  200  600 2500 2500    0.5
0.8667  0.6249  396.75   370.75   900  200  600 2500 2500    0.6
0.8590  0.6207  126.75   330.00  1700  600 1100 3000 3000    1.2
0.8011  0.5605  157.25   459.75  1200  500  900 3000 3000    0.7
0.9542  0.5563   85.50   767.75  1800  700 1200 3000 3000    1.2
0.7857  0.8462  110.00   762.0      0  200  500 2000 2000    0.5
1.0246  1.0495  306.75   977.75     0  200  500 2000 2000    0.5
```

11-30. TYPE BATTERY DATA. The type battery information defines the indirect fire systems, the munitions they will use, and their fire mission priority scheme. The type batteries are used to aggregate characteristics common to a number of batteries so that those values need not be given for each individual battery. Artillery units without firing systems such as FDCs, target acquisition radars, battalion headquarters, etc., are defined here.

a. Data Format. The file is broken into three sections: type battery definition, munitions list, and threshold list.

(1) The first data item.

(a) N.TYPE.BTRY (I) - the number of types of batteries being modeled.

The following three data sections (2) through (4) (description section, munitions list, and threshold values) are repeated for each battery type.

(2) The battery type description record.

(a) TB.SEQ.NO (I) - the sequence number of the battery type.

(b) TB.NAME (A) - the name of the battery type, up to six characters, with no embedded blanks.

(c) TB.MAX.FM (I) - a value indicating the maximum number of missions that a battery of this type may fire in a single location before moving. An entry of zero indicates that batteries of this type will move only in response to FEBA movement.

(d) HOW.NAME (A) - the name of the firing system. This name is the tube's equipment name. For artillery units without firing systems such as FDCs, target acquisition radars, battalion headquarters, etc., this name must be the name of an equipment in the unit.

(e) TB.RNDS.PER.LAUNCH (I) - the number of rounds fired in one volley by each tube in this battery type when a fire mission is launched, expressed in the range of 0 to 63.

(f) TB.MIN.HOW (I) - the minimum number of tubes, of the firing system HOW.NAME, that must be operational before this battery type may be assigned to a fire mission, expressed in the range of 0 to 63.

(g) TB.SUST.FIRE.RATE (I) - the sustained rate of fire in rounds per one thousand minutes, expressed in the range of 0 to 131,071.

(h) TB.MAX.RANGE (I) - the maximum range, in decameters, of the firing system, HOW.NAME, expressed in the range of 0 to 131,071. This value must be no greater than the largest range hack value (HE.RH.RANGE or IC.RH.RANGE) of any high explosive or improved conventional munitions assigned to the type battery.

(i) TB.MAX.RAP.RANGE (I) - the maximum range, in decameters, of the firing system, HOW.NAME, when using a rocket assisted projectile, expressed in the range of 0 to 262,243. This value must be no greater than the largest range hack value (HE.RH.RANGE or IC.RH.RANGE) of any high explosive or improved conventional munitions assigned to the type battery.

(j) TB.SFAIL.MEAN.RDS (I) - (not currently used) the mean number of rounds fired by the firing system, HOW.NAME, between short-term failures of the tube, expressed in the range of 0 to 4,095.

(k) TB.LFAIL.MEAN.RDS (I) - (not currently used) the mean number of rounds fired by the firing system, HOW.NAME, between long-term failures of the tube, expressed in the range of 0 to 4,095.

(l) TB.SFAIL.REPAIR (I) - (not currently used) the amount of time, in tenths of hours, required to repair a short-term tube failure, expressed in the range of 0 to 4.095.

(m) TB.LFAIL.REPAIR (I) - (not currently used) the amount of time, in tenths of hours, required to repair a long-term tube failure, expressed in the range of 0 to 4,095.

(n) TB.SUPPRESS.TIME (I) - the number of minutes the battery type will be suppressed and unable to fire after receiving counterbattery artillery fire, expressed in the range of 0 to 4,095.

(o) TB.MIN.PREP (I) - the shortest amount of time, in tenths of minutes, required to prepare for a fire mission once the order has been received, expressed in the range of 0 to 4,095.

(p) TB.MAX.PREP (I) - the greatest amount of time, in tenths of minutes, required to prepare for a fire mission once the order has been received, expressed in the range of 0 to 4,095.

(q) TB.MIN.FEBA (I) - the minimum distance, in decameters, allowed between the FEBA and the battery type, expressed in the range of 0 to 131,071. If the distance to the FEBA is less then this value, this battery type is given an order to move.

(r) TB.MAX.FEBA (I) - the maximum distance, in decameters, allowed between the FEBA and the battery type, expressed in the range of 0 to 131,071. If the distance to the FEBA is more than this value, this battery type is given an order to move.

(s) TB.MARCH.ORDER (I) - the number of minutes required to begin to move after receiving an order to move, expressed in the range of 0 to 4,095.

(t) TB.OCCUPY (I) - the number of minutes required to occupy a position and become operational after arriving at a new location, expressed in the range of 0 to 4,095.

(u) TB.MN.FASCAM.SUPP (I) - the minimum number of minutes the type battery will be suppressed after receiving a volley of artillery delivered mines, expressed in the range of 0 to 63.

(v) TB.MX.FASCAM.SUPP (I) - the maximum number of minutes the type battery will be suppressed after receiving a volley of artillery-delivered mines, expressed in the range of 0 to 63.

(3) The next data set describes the munitions list assigned to the battery type. Some battery types do not have munitions, FDCs, radars, etc. The following data items (a) through (c) are repeated for each munition in the battery type munitions list.

(a) TB.TM.RAP (I) - a switch indicating if the munition is a rocket assisted projectile (RAP), where 1 = yes and 2 = no.

(b) TB.TM.CLASS (A) - the name of the type of munition and the file in which it is found:

HE	Munitions data file.
ICM	Munitions data file.
LGM	Smart Munitions data file.
PGM	Smart Munitions data file.
FASCAM	Mine data file.
ILLUM	Illumination data file.
SMOKE	Smoke data file.

(c) TB.TM (I) - the sequence number of the munition in its description list in the files indicated above. A 9 9 9 flag is used to end the munitions list for a battery type.

NOTE: that the sequence number of the munition refers to its actual position in its description list, ignoring the separation of Red and Blue munitions in that list.

NOTE: FASCAM refers to artillery-delivered mines for both Red and Blue.

(4) The final data set describes the threshold values for adding targets to the target queue for the battery type.

(a) TB.MW.THRESHOLD(first) (I) - the minimum military worth a target must have to be placed first in the target queue.

(b) TB.MW.THRESHOLD(second) (I) - the minimum military worth a target must have to be placed second in the target queue.

(c) TB.MW.THRESHOLD(third) (I) - the minimum military worth a target must have to be placed third in the target queue.

(d) TB.MW.THRESHOLD(fourth) (I) - the minimum military worth a target must have to be placed fourth in the target queue.

(e) TB.MW.THRESHOLD(fifth) (I) - the minimum military worth a target must have to be placed fifth or higher in the target queue.

b. Coordinating Requirements

(1) Equipment data file. The HOW.NAME must be a valid equipment name.

(2) Munitions data file. The TB.MAX.RANGE is limited to the maximum value among the HE.RH.RANGE and IC.RH.RANGE values for the range hacks of the HE and IC munitions assigned to the type battery. The TB.TM refers to the sequence of HE and IC munitions.

(3) Smart Munitions data file. The PG.TBTRY.NAME refers to the names of the battery types. The TB.TM refers to the sequence of PGMs and LGMs.

(4) Mine data file. The TB.TM refers to the sequence number of a munition in the FASCAM portion of the file.

(5) Illumination data file. The TB.TM refers to the sequence of the illumination munition.

(6) Battery data file. BY.TYPE refers to the sequence of the battery types.

(7) Rules of Engagement data file. The CDI.MAX.VOLS refers to the sequence of the battery types.

Type Battery data file:

```
  3
  1  UTBY1  0  UH105A   1    2    3000    1400    1950    200    5002  35    2    10      50    650   1150
                       10    5      5      60
2   HE       1 1   HE       2 2    ICM      1 2   ILLUM    2 2   SMOKE  1        9 9 9
                      000   000    005   2002   2002


  2 UTBY2   0  UH155A   1    1     30    3000    3000  2000   2000
                       13   30      2      10      30  1000   1500 3   8      5      60
2   HE       1 1   LGM      1 1    PGM      1 1   FASCAM   1         9 9 9

                      002  2002   2002   2002   2002


  3 RTBY1   1  RH152Z   1    1     150   1500    2000  2000   2000
                       13   30      15     10      30   500   1000 3   8      5      60
2   HE       3 1   ICM      2 1    ILLUM    3 1   SMOKE    3 1   PGM     2 2   FASCAM   2     9 9 9
```

002 2002 2002 2002 2002

11-31. TYPE BATTLEFIELD DATA (NOT YET IMPLEMENTED). The Type Battlefield data file defines universal factors and limitations for the simulation. Included are maximum distances of unit withdrawal or attack and headquarters unit setback distance from the FEBA. Stylized battlefields are described.

a. Data Format. The file is divided into three sections: an information section, battlefield description section, and a description of movement paths.

(1) The information section.

(a) HQ.SET.BACK (I) - the distance, in meters, behind the FEBA that a front line maneuver unit headquarters will be located.

(b) DIS.WITH.DRAW (I) - the distance, in meters, a defender may withdraw during a small unit battle.

(c) DIS.ATTACK (I) - the distance, in meters, an attacker may advance during a small unit battle.

(d) R.WIDTH.UNIT (I) - the FEBA frontage, in meters, assigned to the smallest Red maneuver unit being played, such as a Red company.

(e) B.WIDTH.UNIT (I) - the FEBA frontage, in meters, assigned to the smallest Blue maneuver unit being played, such as a Blue platoon.

NOTE: all zeros must be entered for the following fields.

(2) The battlefield description section begins with N.TYPE.BATTLEFIELD, the integer number of specialized battlefields that will be defined. COSAGE currently models only one type battlefield. The COSAGE Model will use attributes of type battlefield number 1. The following data items will be repeated once for each battlefield.

(a) TBF.NO.BL.UNITS(Blue) (I) - the number of Blue units to be played on this type battlefield.

(b) TBF.BL.MISSION(Blue) (I) - code representing the mission of the Blue units on this type battlefield. The codes are:

1 = patrol
2 = probe
3 = attack
4 = delay
5 = defend
6 = ambush

(c) TBF.BL.ARMOR.UNITS(Blue) (I) - the number of Blue armored maneuver units to be played on this type battlefield.

(d) TBF.BL.MECH.UNITS(Blue) (I) - the number of Blue mechanized infantry units to be played on this type battlefield.

(e) TBF.BL.INF.UNITS(Blue) (I) - the number of Blue infantry units to be played on this type battlefield.

(f) TBF.BL.HQ.UNITS(Blue) (I) - the number of Blue headquarters to be played on this type battlefield.

Total Blue units being played must equal the sum of the armor, mechanized, infantry, and headquarters units.

(g) TBF.NO.BL.UNITS(Red) (I) - the number of Red units to be played on this type battlefield.

(h) TBF.BL.MISSION(Red) (I) - code representing the mission of the Red units on this type battlefield. The codes are:

1 = patrol
2 = probe
3 = attack
4 = delay
5 = defend
6 = ambush

(i) TBF.BL.ARMOR.UNITS(Red) (I) - the number of Red armored maneuver units to be played on this type battlefield.

(j) TBF.BL.MECH.UNITS(Red) (I) - the number of Red mechanized infantry units to be played on this type battlefield.

(k) TBF.BL.INF.UNITS(Red) (I) - the number of Red infantry units to be played on this type battlefield.

(l) TBF.BL.HQ.UNITS(Red) (I) - the number of Red headquarters to be played on this type battlefield.

Total Red units being played must equal the sum of the armor, mechanized, infantry, and headquarters units.

(m) TBF.WIDTH (I) - the width in meters, of this type battlefield, expressed in the range of 0 to 262,143.

(3) The movement path description section. A total of TBF.NO.BL.UNITS + TBF.NO.RD.UNITS paths must be given, in the order of entry above: Blue (armor, mechanized, and infantry) then Red (armor, mechanized, and infantry). The following data items are repeated once for each type of battlefield.

(a) NO.PATH.POINTS (I) - the number of points used to describe the path.

The following data items (b) and (c) are repeated for each path point.

(b) PP.X.POINT (I) - the X coordinate, in meters, giving the unit's path.

(c) PP.Y POINT (I) - the Y coordinates, in meters, giving the unit's path.

b. Coordinating Requirements. None.

Type Battlefield data file:

```
500  4000  3500   700   250
1
0   0   0   0   0   0
0   0   0   0   0   0
0
```

11-32. TYPE SENSOR DATA. The sensor type data file defines types of sensors to which each sensor belongs. Each type of sensors has general information which is used by each sensor of this type. There are also model sensors, which are the characteristics that describe specific sensors, that are defined in separate files.

a. Data Format

(1) The data set begins with N.SENSOR.TYPE, the integer number of different sensor types to be modeled. The following data items (a)through (e) are repeated once for each sensor type.

(a) ST.NAME (A) - the name of the type sensor. The valid names are: CB, CM, FO, AD, SD, and FL, referring to counterbattery radar, countermortar radar, forward observer, air defense, sound, and flash, respectively.

(b) ST.MIN.XMIT (I) - the minimum amount of time, in tenths of minutes, required for the sensor to transmit a target report to its controlling fire direction center, expressed in the range of 0 to 262,143.

(c) ST.MAX.XMIT (I) - the maximum amount of time, in tenths of minutes, required for the sensor to transmit a target report to its controlling fire direction center, expressed in the range of 0 to 262,143.

(d) ST.TE.PTR (I) - sensor type equipment (see Equipment file).

(e) ST.MAX.RANGE (I) - the maximum range, in decameters, of the sensor, expressed in the range of 0 to 262,143.

b. Coordinating Requirements

(1) Sensor data file. The SENS.TYPE and the KS.TYPE.SENSOR refer to the sequence of the sensor names. SENS.MODEL refers to the sequence number of the model sensor in the description list in the file pointed to by the ST.NAME of the sensor. The files that the ST.NAME will point to are as follows:

CB sensors are defined in the Counterfire Radar data file.
CM sensors are defined in the Counterfire Radar data file.
FO sensors are defined in the Forward Observer data file.
AD sensors are defined in the Air Defense data file.
SD sensors are defined in the Passive Detection Base data file.
FL sensors are defined in the Passive Detection Base data file.

(2) Target Report data file. The TR.SENSOR.TYPE refers to the name of the sensor types.

Type Sensor data file:

```
6
FO          10   20   2   4000
CM           5   15   4   1500
CB           5   18   4   3500
SD           7    7   4   6000
FL          20   30   4   5000
AD          10   20   4   8000
```

11-33. UNIT DATA. The unit data file lists all of the units to be modeled, their hierarchies, assigned equipment and weapons, and initial locations. This file must be closely coordinated with the Equipment data file and the Category Type Unit data file.

a. Data Format. The file is made up of a collection of data sets each describing a unit. Within the data set, there is the unit description record and the unit equipment list. Items (a) through (i) make up the description record, items (j) through (r) make up the equipment list.

(1) The data file begins with N.UNIT, the integer number of units to be modeled. It is customary for the Blue units to appear first, followed by the Red units. The following data items are repeated once for each unit.

(a) UNIT.SEQ.NO (I) - the sequence number of the unit.

(b) UNIT.NOS (I) - a unique identification number in the range of 0 to 262,143. It is customary to establish a numbering convention for the unit numbers describing the color and type of unit.

(c) UNIT.NAME (A) - the name of the unit type which describes this unit. (**NOTE:** units that are airfields must have "AFLD" in the unit name.)

(d) UN.X.COORD (I) - the initial X coordinate, in decameters, of the unit, expressed in the range of -131,071 to 131,071.

(e) UN.Y.COORD (I) - the initial Y coordinate, in decameters, of the unit expressed in the range of 0 to 262,143.

(f) UN.PARENT (I) - the UNIT.NOS of the parent or task force leader of the unit. If none, a zero must be entered.

(g) UN.COLOR (I) - the side to which the unit belongs, either 1 (Red) or 2 (Blue). The color of the unit must match the TU.SIDE of the type unit describing this unit.

(h) UN.RADIUS (I) - the radius in meters of the unit type which describes this unit.

The following data item (i) is given only for maneuver units.

(i) MU.REINF.IND (I) - a switch indicating if this unit can reinforce another unit, where 1 = yes and 2 = no.
Following the unit description record, data items (j) through (p) describe the unit's equipment and weapon list. Each equipment assigned to the unit is described by three values. In addition, if the unit is a maneuver, then weapons may be assigned to each equipment. The following data items (j) through (r) are repeated until a 999 flag appears ending the list of equipments assigned to this unit; this flag is independent of the similar end of weapon flag mentioned below.

(j) EQ.NAME (A) - the name of the equipment to be assigned. Equipment assignments are limited to those equipments belonging to the types of equipment assigned to this type of unit.

(k) UE.QUANT (I) - the number of this equipment to be assigned to the unit expressed in the range of 0 to 2,047. The number of equipments assigned to a unit of a given type of equipment must sum to the amount of that type of equipment assigned to this type of unit (TU.TE.QUANT).

(l) UE.CRITICAL.EQUIP.INDIC (I) - a switch indicating if this equipment is critical to a unit's performance, where 1 = yes and 2 = no. A unit's strength is determined by the percent of critical equipment remaining. This value only has meaning for maneuver units, but must be present for all units. For maneuver units, the following data items (m) through (p) are repeated until a 999 flag appears, indicating the end of the list of weapons assigned to this equipment (this flag is in addition to the flag indicating the end of the equipment list). Only maneuver units may have weapons assigned to their equipments. If no weapons are assigned to a maneuver unit, the weapon list for the equipment must still be terminated with the 999 flag. If the unit is not a maneuver unit, then the weapon list portion, including the end of weapon list flag, must be omitted.

(m) TW.NAME (A) - the name of a weapon system to be assigned to this equipment.

(n) WPN.STATUS (I) - an arbitrary value which is not presently used in the code.

(o) WPN.QUANTITY (I) - the number of this weapon system to be assigned, expressed in the range of 0 to 262,143. For example, the VULCAN cannon has six barrels, but each VULCAN is one weapon system.

Data item (p) is present only if the unit being described is a FARP or an airfield.

(p) HC.WPN.TYPE (I) - a variable indicating the type of weapon. For a helicopter (i.e., FARP), enter 1 = HELLFIRE, or 0 = anything else. For aircraft (i.e., airfield and X-FLOT helicopters), this number is not used by the model but has been retained for compatibility with previous versions.

NOTE: a unit is a maneuver unit if the CT.GROUP for the unit is 1, or its CT.NAME is CBTAVN or AIRDEF.

NOTE: because sensors are located on weapons, scout helicopters must be given weapons in order to be able to detect targets.

b. Coordinating Requirements

(1) Category Type Unit data file. Maneuver units must have their CT.GROUP equal to 1 or their CT.NAME equal to CBTAVN or AIRDEF. The UNIT.NAME must match the TU.LEVEL of the unit type describing it. The UN.RADIUS must match the TU.RADIUS of the unit type describing it. The sequence number of the TE.NAME of the EQ.NAME must be in the list of TU.TE.IDs assigned to the type unit describing this unit. The sum of the UE.QUANTs for all equipments of the same type, i.e., with the same TE.NAME sequence number, must equal the TU.TE.QUANT of the type unit describing this unit for the type equipment in question.

(2) Equipment data file. The EQ.NAME must be a valid equipment from the Equipment data file. The TW.NAME must be a valid weapon name from the Weapon data file.

(3) Battery data file. The BY.UNIT and FA.BN.UNIT refer to artillery unit numbers.

(4) Fire Direction Center data file. The FA.UNIT.NO refers to artillery unit numbers.

(5) Forward Area Rearming Point data file. The FP.UNIT refers to the unit numbers of combat aviation units.

(6) Orders data file. The orders sets refer to the unit numbers.

(7) Phased Offline Attrition data file. The UNIT.NOS, of target units, refers to the unit numbers assigned in the Unit data.

(8) Target Report data file. The TR.TGT.UNIT refers to the unit number of the target unit.

(9) Sensor data file. The SENS.UNIT.NO refers to the unit numbers of units which are sensor owners.

(10) Tactical Aircraft. The SD.AIRFIELD refers to the unit numbers of units that are airfields.

Unit data file:

```
    200

    1   10000 UDIVHQ    16000    10900        0  2  300
              UINTP    8  1  UM16A2  1  1  UM203  1  1    999  999

    2   10010 UTANK1    16100     9000    10000  2  300
              UM1A1    4  1  UM1105  1  1                 999  999
    3   10011 UTANK1    15900     9000    10000  2  300
              UM60A3   2  1  UM1105  1  1                 999
              UM1A1    2  1  UM1105  1  1                 999  999
    4   10020 UARTY1    16078     9265        0  2  450

              U105A    2  0
              U155A    4  1
              UOPART  12  1                               999

    5   10030 UINF1     16600    10150        0  2  450
              UINF1    5  1  UM16A2  1  1  UM203  1  1    999
              UINF1   15  1  UM16A2  1  1                 999  999

    6   10040 UFARP1    15500    10250        0  2  400
              UHAH64   8  1  UHELFH  1  8  2  U275R  1  38  0  999
              UHC58D   4  0  UHELFH  0  0  2                   999  999

    7   10050 UAFLD     18200    11700        0  2  700
              UACA10  12  1  UMK82  1  6  1                   999
              UACF16   4  0  UMK82  1  8  1                   999 999

    8   10060 URPV      18200    10070        0  2   50
              RPV      6  1                                   999
```

(Additional units not shown)

11-34. UNMANNED AIR VEHICLES. This file defines the types of unmanned air vehicles (UAVs) and their characteristics.

a. Data Format

(1) N.TYPE.UAV (I) - the number of type UAVs described below. Data items (2) through (7) are repeated for each type UAV.

(2) TUAV.NAME (A) - the name of the type UAV, up to six characters with no embedded blanks.

(3) TUAV.SIDE (I) - the side owning the UAV, where 1 = Red and 2 = Blue.

(4) TUAV.ALTITUDE (I) - the flight altitude, in meters, of the UAV.

(5) TUAV.DEEP (I) - a switch indicating if this UAV penetrates deep behind enemy lines, where 0 = no and 1 = yes. Deep penetration is used in the determination of the range from the UAV to the target when designating laser-guided munitions. If the deep penetration switch has been set to 1, turned on, then include data items (6) and (7). If deep penetration has not been set, enter zero for data items (6) and (7).

(6) TUAV.MIN.TD.RANGE (I) - the minimum distance, in meters, from the UAV to the target during target designation.

(7) TUAV.MAX.TD.RANGE (I) - the maximum distance, in meters, from the UAV to the target during target designation.

b. Coordinating Requirements

- Equipment data file. The TUAV.NAME must be a valid equipment in the Equipment data file.

Unmanned air vehicle data file:

```
1
RPV        2     750     1    200    2000
```

11-35. VISIBILITY DATA. The visibility data file allows the visibility ranges to vary over time to model varying weather conditions.

a. Data Format

(1) The first record.

(a) NITE.VIS.PCT (I) - the integer percentage of the visibility contrast (TE.CONTRAST) of a targeted equipment to be used by an optical sensor at night. Note that infrared sensors are not degraded due to day-night changes.

The following list of range visibilities and the time they are effective is repeated until the key word END is entered to terminate the list of visibility changes.

(b) VISIBILITY (I) - the current visibility to the unaided eye in meters. Note that the definition of visibility is independent of whether it is day or night. Visibility only changes due to weather.

(c) TIME (R) - the time, in decimal 48-hour clock time, that this visibility range is to become effective. The first value must be 0 to initialize the visibility.

b. Coordinating Requirements. None.

Visibility data file:

```
28

2000     0.
2000     2.
2000     4.
7500     6.00
7500     9.
8000    12.00
8000    14.00
7500    16.
5000    18.
2500    20.
```

```
2500    27.1
END
```

11-36. WEAPON DATA. The weapon data file defines the characteristics of the weapons. Each weapon assigned to an equipment points back to this file. The sensors used by weapons are also described here.

a. Data Format

(1) N.B.WPN.TYPE (I) - the number of Blue direct fire weapons.

(2) N.R.WPN.TYPE (I) - the number of Red direct fire weapons.

The following data items (3) through (22) are repeated for each weapon.

(3) TW.SEQ.NO (I) - the sequence number of the weapon.

(4) TW.NAME (A) - the name of the weapon with up to six characters and no embedded blanks. The weapon name should not be confused with the equipment. For example, a 105mm gun is a weapon, while an M60A3 tank is a piece of equipment, with several type weapons mounted on it.

(5) TW.RATE.OF.FIRE (I) - the sustained rate of fire for the weapon, in tenths of rounds per minute, expressed in the range of 0 to 2,047.

(6) TW.ROF.AIR (I) - the sustained rate of fire for the weapon versus aircraft, in tenths of round per minute.

(7) TW.NO.SENSORS (I) - the number of onboard sensors for the weapon, in the range 0 to 63. Sensors refer to the number of people or sensing equipment that can independently detect targets for the given the weapon.

(8) TW.ROUND.VELOCITY (I) - the average round velocity, in meters per second, expressed in the range 0 to 2.047. Since only one round per type direct fire weapon is played, a representative round should be chosen and its velocity used here. (Note that this parameter should be neither muzzle velocity nor terminal velocity, but an average velocity.)

(9) TW.RND.WEIGHT (R) - the average round weight, in pounds, for this type weapon, expressed in the range 0 to 2.621.43.

(10) TW.MAX.RANGE (I) - the maximum effective range, in meters, of the weapon, expressed in the range 0 to 2,097,136.

(11) TW.MIN.RANGE (I) - the minimum effective range, in meters, of the weapon, expressed in the range 0 to 2,097,136. If the weapon has no minimum range, zero must be entered.

(12) TW.BASIC.LOAD (I) - the number of rounds a helicopter with this weapon will have when leaving its forward rearming point. This value only has meaning for helicopter, air defense, and aircraft weapons, but a value must be entered for all weapons.

(13) TW.PK.PTR (I) - the row number of the PK vector matrix to be used when the weapon engages each target. Several weapons can be given the same TW.PK.PTR number if they can or should be aggregated as a single "type firer" (given the same PK vectors).

(14) TW.NITE.FACTOR (R) - (set to 1) the degradation factor that will be applied against the weapons PK when it is being fired at night, expressed in the range 0 to 1.

(15) TW.FIRE.OTM.PTR (I) - the row number, in the moving target engagement matrix, that contains the moving target engagement vector for this weapon.

(16) TW.TYPE.OF.SENSOR (I) - a switch indicating the type of sensor, where 1 = visual and 2 = thermal or infrared.

(17) TW.SPECTRUM (I) - a switch indicating the spectrum of the weapon's sensor, where 1 = 3 to 5 microns and 2 = 8 to 12 microns (not used).

(18) TW.HFOV (R) - the horizontal field of view, in degrees, of the sensor, expressed in the range 0 to 2047.

(19) TW.VFOV (R) - the vertical field of view, in degrees, for the sensor, expressed in the range 0 to 2047.

(20) TW.HFOS (I) - the horizontal field of scope, in degrees, for the sensor, expressed in the range 0 to 2.047. This field is the width of the sector over which the sensor will search.

(21) TW.VFOS (I) - the vertical field of scope, in degrees, for the sensor, expressed in the range 0 to 2,047. This field is the height of the sector over which the sensor will search.

(22) TW.AC.DET.TIME (I) - time, in seconds, for the weapon to detect an aircraft making an attack pass.

b. Coordinating Requirements

(1) Probability of Kill data file. The TW.PK.PTR must be the sequence number of the row representing the proper firer in the exposed firer-target matrix and the defilade firer-target matrix. The TW.FIRE.OTM.PTR must be the sequence of the row representing the proper firer in the moving target engagement matrix.

(2) Phased Offline Attrition data file. The WEAPON refers to the names of the weapons.

Weapon data file:

```
   6   5

 1 UM1105      40   40   1   1173   68.5    4000   0   63    1
0.89    1   2        1   24.5         5   90    5   15

 2 UHELFH      20   20   1    500   48.5    5000   0    8    2
0.99    2   2        2   40.         30  120   30   15

 3 U275R       30   30   1   1500   14.0    6000   0    3    3
1.      3   2        2    3.3         2   60    2   15

 4 UM16A2     200  600   1   1000    0.1    1000   0  600    4
0.80    4   1        1   24.5         5   90    5   15

 5 UM203       40   40   1     71    1.0     300   0   18    5
0.67    5   1        1   24.5         5   90    5   15

 6 USTNGG       1   10   2    600   20.9    5500   0    3    6
0.90    6   1        1  120.0        46   90    5    7

 7 RT120       40   40   1   1173   68.5    4000   0   63    7
0.89    7   2        1   24.5         5   90    5   15

 8 RT105       20   20   1    500   48.5    5000   0    8    8
0.99    8   2        2   40.         30  120   30   15

 9 R5INR       30   30   1   1500   14.0    6000   0    3    9
1.      9   2        2    3.3         2   60    2   15

10 RAK47      200  600   1   1000    0.1    1000   0  600   10
0.80   10   1        1   24.5         5   90    5   15

11 RRPG16      30   30   1    120    4.6     700   0    6   11
0.80   11   1        1   24.5         5   90    5   15
```

CHAPTER 12

COSAGE OUTPUT GUIDE

12-1. INTRODUCTION. This guide describes the output data for the COSAGE Model. There are 20 output files produced by the model, 19 of which are explained here. The only one which is not explained is the breakpoint file, because its formats vary greatly and could only be described at great length. The output files, called SIMU files, are described in order of number. Each file description contains the routine name that creates the report, the condition under which the report is written, the purpose of the file, a format description, and a short example of output data (when possible). It may help to refer to Chapter 11 of this volume to explain where certain output originated in the input files.

12-2. OUTPUT FILES

Unit	**Description**
3	Unit array data
4	WARF data
7	Artillery summary report data
8	Stylized ammunition expenditure data
9	Red killer/Blue victim scoreboard
10	Blue killer/Red victim scoreboard
16	Indirect fire expenditures and hit records
40	Artillery ammunition expenditures and number PGM kills
42	Battery artillery status
43	Target report
47	Mine expenditures
48	Air defense vs aircraft and helicopter engagements
49	Aircraft sortie statistics
55	Direct fire expenditures and hit records
61	RPV and AHIP report
62	SADARM munitions effects and helicopter statistics
63	Effects of external target reports
64	Estimates expenditures for certain nonmodled munitions
65	Provides data for COSAGE/APP Interface File
66	Provides a skeleton for building the RALPH rollup file
BK	Contains information for all movements, engagements, and status of units during simulation for posture analysis

ROUTINES WRITING TO OUTPUT FILES

Routine name	Unit
AC$BOMB$EFF	4,16,48
AC$DF$EFFECT	48,55
AD$SHOOT	55
APP$OUT	65
AMMO$RPT	40
ARTY$ASSESS	16,62
ARTY$OCUPAT	42
AR$DETECTION	7
ASSESSMENTS	55
BTRY$EFFECTS	4,7,16,62,63
BTRY$FM$DEQ	42
BTRY$FM$ENQ	42
END$CAS$MISS	47
END$SIMULATI	49,62,64
FA$BN$MOVEME	42
FIRE$MISSION	16,47
HELICOPTER$F	55
KV$PRINT	8,9,10
KV$SCOREBOAR	62
MINE$ASSESS	55
MINE$EFFECTS	55
MINE$INPUT	47
OFF$LINE$ATT	55
OUTPUT$EXPEN	8
POSITION$OUT	3
RALPH$OUT	66
SHOOT$OUT	55
START$ARTY$M	42
STOP$ARTY$MO	42
TARGET$REPORT	43
UNIT$INPUT	16,55
WRITE48	48
WRITE55	55
WRITE61	61

OUTPUT FILE USERS

Unit	Users
3	Unit movement graphics
4	CALAPER (CAP)
7	CALAPER (COSCON)
8	Killer/victim Scoreboard Summary
9	Killer/victim Scoreboard Summary
10	Killer/victim Scoreboard Summary
16	CALAPER (COSCON) RP Shot Summary
40	Killer/victim Scoreboard Summary
42	Aerial analysis
43	Target Report Summary
47	Mine Summary, CALAPER (COSCON)
48	General analysis
49	RP Shot Summary
55	CALAPER (COSCON) RP Shot Summary
61	UAV Summary
62	HEL Summary, SADARM Summary
63	General analysis
64	CALAPER (COSCON)
65	CALAPER (COSCON)
66	pre-RALPH
BK	TACAIR Summary, AIR DEF Summary, general analysis

12-3. ROUTINE: POSITION$OUT (SIMU3)

a. Condition. Input specifies the number of reports desired over the a 24-hour period. A switch in the System Input File (NUM.POSITION.REPORT) allows the user to make this decision.

b. Purpose. This output file contains information about each unit's initial deployment and location changes over time. One record is written for each unit at the beginning of the simulation. Additional records are written for units having moved since the previous report was written. This data is used by a postprocessor to display the force's units over time. Also included is a third record type which represents every helicopter in the FARRP. Subsequent blocks include one record for each helicopter engaged in battle at the time of output. Unlike the other output files, the fields in each record (except the header) are variable in width, separated by blanks. This is done in order to reduce the size of the file, which is often bulky and is often transferred to another system for display.

HEADER RECORD : FIRST RECORD IN EACH BLOCK OF SIMU3 FILES

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	i 4	1-4	integer	Number of unit records in the block
	2	d(13,5)	5-17	real	TIME.v--simulation hour at which the report is produced
	3	i 4	18-21	integer	Number of helicopter records in the block

UNIT RECORD

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
2-4	1			integer	Unit number of moving unit
	2			integer	Pointer to the type unit
	3			integer	X-coordinate in hexa-decameters
	4			integer	Y-coordinate in hexa-decameters
	5			integer	Unit number of the parent
	6			integer	Unit side : 1=RED; 2=BLUE
	7			integer	TU.CAT number
	8			integer	Battle indicator : 1=YES ; 0=NO
	9			integer	Withdrawal indicator: 0 if the unit is not withdrawing, 1 if it is withdrawing because of attrition, 2 if withdrawing due to proximity of enemy units

```
                                HELICOPTER RECORDS
*****************************************************************************
 1543     1                  integer    Unit number of this helicopter's
                                        FARRP
          2                  integer    Side : 1=RED ; 2=BLUE
          3                   alpha     Equipment name of helicopter
          4                  integer    X-coordinate in hexadecameters
          5                  integer    Y-coordinate in hexadecameters
          6                  integer    Unit number of the leader of the
                                        task force that this helicopter
                                        is supporting in battle;
                                        otherwise, 0

EXAMPLE:

        1       1541  42.01234567   345
        2        10001 1 15000   10965  0  1  1  0  1
        3        10011 1 15000   9964  100001  1  3  1  0
        4        10021 1 1236   9920  10001  2  2  1  2
                          .
                          .
     1543       28021 1 UHC164  12220   10176  10001
     1544       28022 1 UHC264  9542  11484  0
     1545       28023 1 UHC60  8260  7456  10001

    **** NOTE:  HEL RECORDS START AT LINE (NUMBER OF UNIT RECORDS + 2)
                IN THIS CASE 1541 + 2 = 1543
    **** ALSO ALL FIELDS ARE CONDENSED, SO THERE IS ONLY ONE SPACE BETWEEN
         FIELDS (EXCEPT FOR HEADER RECORDS).  THE FORMAT ABOVE DESIGNATES
         THE MAXIMUM A FIELD CAN CONTAIN ****
```

12-4. ROUTINE: BTRY$EFFECTS (SIMU4)

a. Condition. No analysis switch used.

b. Purpose. This file contains a list of all fire missions shot during the simulation and is utilized by the CALAPER system. In addition, the COSAGE Attrition Postprocessor (CAP) uses this data to assess casualties against non-CEM items in the TOE of the target unit. There are two records per fire mission.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
ODD NUMBERED RECORDS					
ODD	1	d(7,4)	2-8	real	Simulation time at which fire mission was conducted
	2	i 1	15	integer	Side : Red=1 ; Blue=2
	3	i 6	23-28	integer	Identifier for fire plan of the mission
	4	i 5	33-37	integer	Range from battery to target in hexa-decameters
	5	i 6	39-44	integer	Number of volleys fired
	6	i 6	46-51	integer	Pointer to battery that fired volley
	7	i [illegible]	54-59	integer	Unit sequence number of the firing battery
	8	i 4	63-66	integer	Defines which type battery applies to the battery
	9	i 6	68-73	integer	Number of howitzers in the battery
	10	i 6	75-80	integer	Sequence number of target unit
	11	i 3	83-85	integer	Type unit index of target unit defined in the CATTU file
	12	i 2	88-89	integer	Category index of target unit defined in CATTU file
	13	a 5	93-97	alpha	Classification of munition (i.e., HE,PGM,LGM,ICM,FASCAM,SMOKE,ILLUM)
	14	i 3	99-101	integer	Munition type that was fired
	15	a 6	105-110	alpha	Name of the type round fired
	16	i 3	112-114	integer	Index number of the type fuze on the munition
EVEN NUMBERED RECORDS					
EVEN	1	i 4	8-12	integer	Specifies the range interval for the particular battery munition combination which specifies volley size and munition tube CEP (circular error probable)
	2	d(7,2)	18-22	real	Munition reliability
	3	i 5	25-29	integer	# of rounds fired (volleys*tubes)
	4	i 5	32-36	integer	Index of the sensor that called fire mission
	5	i 5	39-43	integer	Total number of HE rounds or ICM submunitions fired in fire mission
	6	d(4,2)	48-51	real	% of fractional volley coverage on target unit area
	7	d(5,2)	57-66	real	Measure of volley pattern area
	8	i 5	70-75	integer	Fire mission identifier
	9	i 5	78-82	integer	Total casualties in the target area
	10	i 5	85-89	integer	Index number of mission being performed by the target unit

EXAMPLE:

```
1.9236      1         0       719        5      122       609      19        6  42      39      7     HE      10
   H122HE     1
34     0.980      30       0       30     0.26       3421.19     116464  5       0
1.9703      1         4      1000        5      123       610      19        6  42      49      7     ICM      2
   H155CM     2
35     0.875      32       0       32     0.33       2874.11     114556   5       0
```

** NOTE THAT EXAMPLE HAS WRAP-AROUND LINES--COUNT FIELDS **

12-5. ROUTINE: BTRY$EFFECTS SUMMARY (SIMU7)

a. Condition. No analysis switch is used.

b. Purpose. Summarizes all artillery missions. Computation for fuzes and propellant charges. Categorizes who shot who and why, with what ammo type. Used by "end of replication" artillery summaries.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1-4	1	i 1	2	integer	Side : 1=Red ; 2=Blue
	2	i 2	4-5	integer	Defines which type battery data applies to the battery
	3	a 6	7-12	alpha	Name of the firing type battery
	4	a 6	14-19	alpha	Name of type unit of the target
	5	a 6	21-26	alpha	Name of the principal type equipment in this type unit
	6	d(4,2)	28-31	real	The percent of target unit which is in the open environment
	7	d(4,2)	33-36	real	The percent of target unit in a wooded environment
	8	d(4,2)	38-41	real	The percent of target unit in town environment
	9	i 1	43	integer	Specifies whether the unit is in a battle or not (1=YES ; 0=NO)
	10	i 1	45	integer	A target indicator: if flag=0 (not moving), if flag=1 (moving target)
	11	i 5	49-53	integer	Range of firing battery to target in meters
	12	a 6	55-60	alpha	Munition name of the round fired
	13	i 1	62	integer	Index number of the type fuze on the munition

14	i 1	65	integer	Number of volleys fired
15	i 2	68-69	integer	Number of rounds fired
16	d(5,2)	71-75	real	Simulation time at which fire mission was conducted
17	i 6	77-82	integer	Unit number of firer
18	i 3	84-86	integer	The number of the FDC responsible for this fire mission
19	t 6	88-93	text	The munition class: HE, ICM, LGM, PGM, SMOKE, ILLUM, or FASCAM
20	i 6	95-100	integer	Fire mission identifier
21	i 1	102	integer	Collateral damage flag; 1 if this record is due to collateral damage; 0 if the unit damaged was the original target unit
22	t 1	104	text	For FASCAM missions, this field identifies the type of mission: C for counterbattery, P for point minefield, R for reseed, and N if not FASCAM
23	T 6	106-111	text	Name of the gun firing the mission

EXAMPLE:

```
1  26  XL-SX4 UCVTR  MH-ARM 0.44 0.07 0.48 0 1    9376 L240HE  1  1   12   2.44  11834  123  HE
  675289  0  C  RH152Z
1  24  XL-BY2 UCVTR  MH-ARM 0.36 0.39 0.25 0 1   19040 L122HE  1  1  180   2.46  11823  472  HE
  47815  1  P  RH155A
2   4  UG-PL2 XL-SX4 TROOPS 0.37 0.63 0.    0 1   21712 M509    0  5   15  2.67  28611  42  PGM
  13762  0  N  RG132
2   4  UG-PL2 XL-SX4 TROOPS 0.33 0.67 0.    0 1   22096 M509    0  5   15  2.68  28612  1  SMOKE
  1471  0  R  RG180
```

12-6. ROUTINE: OUTPUT$EXPENDITURES (SIMU8)

a. Condition. No analysis switch is used

b. Purpose. This file is produced at the end of a simulation run. For each firer, the file contains a block of records giving expenditures by target type. Total expenditures for the side are then given by target type.

RECORD	FIELD	FORMAT	COLUMN	VARIABLE TYPE	DESCRIPTION
1	1	i 5	1-5	integer	Number of Red weapon types
	2	i 5	6-10	integer	Number of Blue weapon types
	3	i 5	11-15	integer	Number of Red type equipment
	4	i 5	16-20	integer	Number of Blue type equipment
2-6	1-10	10(a7)	10-80	alpha	Red equipment names (this format is continued until all names have been listed)
8	1	a 6	2-7	alpha	Weapon name of firer
8-12	2-10	9(i 7)	10-70	integer	Blue expenditures by target (same order as Red equipment names listed in records 2-6) with the last field being the Total Blue expenditures for all targets
20-25	1-10	10(a 7)	10-80	alpha	Blue equipment names (until all have been listed)
27	1	a 6	2-7	alpha	Weapon name of firer
27-32	2-11	10(i 7)	10-70	integer	Red expenditures by target (same order as Blue equipment names listed in records 20-25) with the last field being the Total Red expenditures for all targets

***** EXAMPLE ON NEXT PAGE *****

EXAMPLE:

```
 1  22   28   47    55
 2        XHQTRP   XINF    OPRPG   OPSAM   XM-TRP  XFATRP  XL-TRP
 3        XFO      XAO     XBINO   XLRRP   XAPC73  YAPC63  PT-76
 4        XC3-T    XTRUCK  XFDC-T  XART-T  L107T   L122T   L140T
 5        M120M    H122T   G076T   G122T   G130T   GH152T  H122S
 6        ZPU-4    ZU-23   B-10    ATGUN1  HOPLIT  MIG-27  MINEFD
 7
 8 M-16         0    431     0      0      0      0      0
 9              0      0     0      0      0      0      0
10              0      0     0      0      0      0      0
11              0      0     0      0      0      0      0
12              0      0     0      0      0      0      0   431
13
14 UM122        0    688   517     84      0      0      0
15              9      0     0      0      0      0      0
16              0      0     0      0      0      0      0
17              0      0     0      0      0      0      0
18              0      0     0      0      0      0      0    1298
19
20       UINFO    UINF1   UARTY   KARTY   UARTY1  UFO
21       UOPORG   UOPVIP  STING1  M113    ITV85   M57705
22       VULC1    M60A3   M60A1   M88     UC/M    UC/B
23       HMMV19   KTRUCK    RUCK  UARTV   KARTV   UGLLDT
24       H155T    KH155T     NS   H8INS   KH155S  H155S
25       UINTEL   RPV     [illegible]  MINEFD  FASCAM  F-16
26
27  MK47           0       56       0       0       0       0
28                 0        0       0       0       0       0
29                 0        0       0       0       0       0
30                 0        0       0       0       0       0
31                 0        0       0      13       0       0
32                 0        0       0       0       0       0     69
33
34   M6E1         53      211       0       0       0       0
35                14        0       0      89       0       0
36                 0        0       1       0       0       0
37                 0        0       0       0       0       0
38                 0        0       0       0       0       0
39                 0        0       0       0       0       0    368
```

12-7. ROUTINE: KV$PRINT (SIMU9 AND SIMU10)

a. Condition. No analysis switch is used.

b. Purpose. Killer/victim scoreboards for Red weapons killing Blue equipment (SIMU9) and Blue weapons killing Red equipment (SIMU10). In addition, the initial equipment densities and names for the victims and killers, the total hits by all killers against each victim, and the percentage of each equipment killed are given. These files summarize the kills recorded in the SIMU 16 and SIMU 55 files. The analyst uses the killer/victim scoreboards to gain an understanding of the munition effectiveness and allocation of fire as portrayed in the simulation.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	i 2	1-2	integer	Side of killer (1 = Red ; 2 = Blue)
	2	i 2	3-4	integer	Side of victim (1 = Red ; 2 = Blue)
	3	i 4	5-8	integer	Total number of equipments for killers
	4	i 4	9-12	integer	Total number of equipments for victims
2-6	1-10	10(i7)	20-90	integer	Equipment densities of targets
7-11	1-10	10(a6)	20-90	alpha	Equipment names of targets
13	1	a 6	2-7	alpha	Equipment name for killer
	2	i 7	8-14	integer	Initial equipment density of killer
13-18	3-12	10(i7)	20-90	integer	Total kills for each target equipment by killer (same order as equipment names in records 7-11)

EXAMPLE:

```
 1  2 1   55   47
 2          800  1266   213   27   288   1194   266    54    54    20
 3            0     0     4   27     0     10     3    21    10     0
 4           85    28    47   21    24      1     2     0    24    28
 5           48    25     5    9    24     18    12   144    12    36
 6            3     3     0    5    15      0     0
 7      XHQTRP  XINF*  OPRPG  OPSAM  XM-TRP  XFATRP  XL-TRP  XADTRP  XATTRP  XFO
 8      XAD  XBINO  XLRRP  XAPC73  YAPC63  PT-76  BTR60M  T-55   T-62    XC3-T
 9      XTRUCK  XFDC-T  XART-T  L107T  L122T  L140T  L240T  XSOUND  M082M  M120M
10      H122T  G076T  G122T  G130T  HG152T  H122S  GS152S  XTMMG*  TMAT4  ZPU-4
11       ZU-23  B-10  ATGUN1  HOPLIT  MIG-27  MINEFD  M39-60
12
13  UINFO     904      0     0     0     0     0     0     0     0     0     0
14                     0     0     0     0     0     0     0     0     0     0
15                     0     0     0     0     0     0     0     0     0     0
16                     0     0     0     0     0     0     0     0     0     0
17                     0     0     0     0     0     0     0     0     0     0
18                     0     0     0     0     0     0     0     0     0     0
```

12-8. ROUTINE: UNIT$INPUT, BTRY$EFFECTS, FIRE$MISSION (SIMU16)

a. Condition. No analysis switch is used.

b. Purpose. This output file contains the equipment names and initial densities played in COSAGE (UNIT$INPUT), a set of records for each unit giving initial density of that unit's equipment, and the artillery shot records (two records per firer/target equipment combination output by BTRY$EFFECTS and FIRE$MISSION). This file is used by CALAPER and RALPH.

1st group of data--equipment names and densities

****

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	a 39	1-39	alpha	COSAGE case identifier, for audit trail purposes
	2	i 3	41-43	integer	COSAGE Model version number
	3	i 3	45-47	integer	Random number stream for this replication
2-3	1	a 6	1-6	alpha	Name of COSAGE equipment
	2	i 5	9-13	integer	Initial density of equipment

****

2nd group of data--information about units of COSAGE

****

THE 1ST TWO RECORDS HAVE THE HEADINGS FOR THE 2ND DATA GROUP

4	1	i 5	1-5	integer	Unit number
	2	i 1	13	integer	Side of unit 1=Red ; 2=Blue
	3	i 5	17-21	integer	Radius of the unit, in meters
	4	i 5	25-29	integer	Pointer to a type unit defined in CATTU file
5-7	1	a 6	1-6	alpha	Equipment name in equipment list of unit
	2	i 1	8	integer	A value 0 (no) or 1 (yes) indicating whether the equipment is critical to performance of unit mission
	3	i 5	15-19	integer	Number of items of the equipment in unit
	4	i 3	21-23	integer	The area in sq meters occupied by the type equipment

```
*******************************************************************************
                             3d data group format
       This group begins after all units and their respective equipments
                               have been listed
*******************************************************************************
```

8,10	1	d(7,4)	2-8	real	Simulation time at which mission was conducted
	2	i 7	12-18	integer	Fire mission identifier
	3	i 1	26	integer	Side of firer 1=RED or 2=BLUE
	4	i 5	30-34	integer	Number of volleys fired
	5	i 5	38-42	integer	Number of tubes in the battery
	6	i 5	46-50	integer	total number of targets killed over all targets in the unit
	7	d(10,8)	54-63	real	Total number of targets killed/ quantity of equipments
	8	a 6	67-72	alpha	Equipment name of target
	9	a 6	74-79	alpha	Name of type equipment which describes the principal type unit
	10	i 5	83-87	integer	Category of target type equipment
9,11	1	a 6	1-6	alpha	Type munition (HE, ICM, etc.)
	2	a 6	8-13	alpha	Munition name
	3	a 6	17-22	alpha	Tube name as the firer
	4	a 6	26-31	alpha	Name of the type of battery in this fire mission
	5	i 5	34-38	integer	Number of this type equipment in the unit
	6	i 6	42-47	integer	Range from the battery to the target in meters
	7	i 6	49-54	integer	Unit number of the target unit
	8	a 12	56-67	alpha	This field denotes where fire mission was recorded--in BTRY EFFECTS or FIRE MISSION
	9	i 1	69	integer	1 if the target unit is in a mine-field at the time of the fire mission; 0 otherwise
	10	i 1	71	integer	Collateral damage flag; 1 if this record is due to collatgeral damage, 0 otherwise

```
* FASCAM missions are fired by the artillery as the last volley fired    *
* by that battery.  The targets are not known by these routines;         *
* therefore, for each FASCAM mission, the targeted equipment is labeled *
* as "NONE" and any fields associated with the target(s) are written as *
* zero.  The effects of the volley will be given in the direct fire shot*
* records (SIMU 55).                                                     *
```

EXAMPLE:

```
 1  A-C01A01R01B01=IC-US_KOR_WAR_PLANS_1999     003     1
 2  ZU-23        3
 3  B-10         3
    UNIT NUMBERS   UNIT COLOR    UNIT RADIUS   TYPE UNIT
    EQUIP NAME     CRIT EQUIP    EQUIP QUANT   PROJ AREA
 4  28021        2     30        6
 5  UTRUCK 0           4  19
 6  USOUND 1           1  19
 7  UARTY  0          12   1

 8  2.4400  87250    1    1    12    0    0.01194317   UTRUCK LT-VEH        4
 9  HE      L240HE   L240T    XL-SX4      4      9376  27110 BTRY EFFECTS 1 0
10  2.4400  87250    1    1    12    0    0.00658376   UFO     TROOPS       1
11  HE      L240HE   L240T    XL-SX4      6      9376  27110 BTRY EFFECTS 0 0
```

12-9. ROUTINE: AMMO$RPT (SIMU40)

a. Condition. No analysis switch.

b. Purpose. Gives ammo consumption for indirect fire weapons. An identical report is written to the BREAKPOINT file for each replication. SIMU40 is produced when the simulation terminates normally. The number of targets killed by each of the precision guided munitions played is recorded at the end of the file. Again, this is a snapshot of the artillery expenditures in the SIMU16 file but in a more abbreviated format.

RECORD.FIELD		FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1-4	1	i 5	1-5	integer	Pointer to type of battery firing mission
	2	a 6	9-15	alpha	Type battery name used to perform mission
	3	a 6	18-23	alpha	Equipment name of firer
	4	i 5	25-29	integer	Initial density of equipment
	5	a 6	31-36	alpha	Name of the munition class (HE, ICM, PGM, LGM, FASCAM, SMOKE, ILLUM.)
	6	a 6	38-43	alpha	Name of munition type
	7	i 6	48-53	integer	Number of rounds of the munition fired by the type battery
5-6	1	a 6	1-6	alpha	Type battery name
	2	a 3	8-10	alpha	Name of munition class; PGM or LGM
	3	a 6	12-17	alpha	Name of munition type
	4	a 7	19-25	alpha	Heading "KILLS ="
	5	i 4	31-34	integer	Number of kills by type battery

EXAMPLE:

```
1      1  UH-PL2   H155S      6  ILLUM    M485A2       4
2      1  UH-PL2   H155S      6  FASCAM   RAAM-A      24
3      2  UH-PL3   H155Z      3  SMOKE    M825        40
4      3  UH-PL4   H203A .    2  ICM      M483      7224
5   UH-PL2 PGM H155T    KILLS =       1
6   UH-PL4 PGM H203A    KILLS =      22
```

12-10. ROUTINE: ARTY$OCCUPAT, BTRY$FM$DEQ, BTRY$FM$ENQ, FA$BN$MOVEME, START$ARTY$M, STOP$ARTY$MO (SIMU42)

Purpose. Maintains a continuous record of all changes in status for all artillery batteries (see list below).

NEW STATUS	MEANING	RECORD WRITTEN BY ROUTINE
0	ready to fire	ARTY$OCCUPAT
1	performing occupation of position	STOP$ARTY$MOVE
2	moving to a new position	START$MOVE
3	conducting march orders	BTRY$FM$DEQ
8	idle; fire mission queue empty	BTRY$FM$GNQ
9	changing from idle to active	FA$BN$MOVE

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	a 14	1-14	alpha	Heading "UNIT.NOS(BTRY)"
	2	i 5	17-21	integer	Unit sequence number of the unit which owns the artillery battery
	3	a 19	23-41	alpha	Heading "CHANGES FROM STATUS"
	4	i 1	43	integer	Status of battery (explained above)
	5	a 10	45-53	alpha	Heading "TO STATUS"
	6	i 1	55	integer	New status of battery
	7	a 2	57-58	alpha	Heading "AT"
	8	d(8,5)	60-67	real	Simulation time for the change in status of battery

EXAMPLE:

```
1  UNIT.NOS (BTRY)  11137  CHANGES FROM STATUS 1 TO STATUS 0 AT  2.80563
2  UNIT.NOS (BTRY)  11111  CHANGES FROM STATUS 9 TO STATUS 8 AT  3.13613
3  UNIT.NOS (BTRY)  11111  CHANGES FROM STATUS 8 TO STATUS 9 AT  3.13673
4  UNIT.NOS (BTRY)  11111  CHANGES FROM STATUS 2 TO STATUS 3 AT  3.33333
5  UNIT.NOS (BTRY)  11111  CHANGES FROM STATUS 2 TO STATUS 1 AT  3.33333
6  UNIT.NOS (BTRY)  11111  CHANGES FROM STATUS 3 TO STATUS 2 AT 10.16725
```

12-11. ROUTINE: TARGET$REPORT (SIMU43)

a. Condition. If analysis switch 2 = true.

b. Purpose. The Target Report File contains a listing of the target reports which are created and equipment detections made. For those target reports which result in fire missions being created, the fire missions are reported to include the type battery to shoot the mission, the munition to be fired, and the number of volleys to be fired. A utility program is available to summarize these target reports to provide a listing of the target reports generated by every type sensor and every sensor model within each sensor. This summary also details target reports for those sensors which had no fire mission generated and, for those that caused fire missions, the types of batteries and munitions assigned the mission.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1-3	1	a 2	1-2	alpha	heading "TR "
	2	i 6	4-9	integer	target index pointer to target
	3	d(6,3)	11-16	real	simulation time at which target report was created
	4	i 2	18-19	integer	WD.NAME the sensor model name from the target report (AO, FO, CB, CM, SD, FL)***
	5	a 6	21-26	alpha	type of sensor making detection
	6	i 5	29-33	integer	unit number reporting the target unit
	7	i 6	35-40	integer	battle sequence number of the unit reporting the target report
	8	i 1	42	integer	side of the target unit : 1=RED ; 2=BLUE
	9	i 5	45-49	integer	unit number of the firer
	10	a 6	51-56	alpha	category type name
	11	d(6,3)	58-63	real	time in 24-hour clock time when report was received
	12	i 6	65-70	integer	battle sequence number for the target unit
	13	i 1	77	integer	index pointer to follow on target reports
	14	a 6	79-84	alpha	name of actual target type unit
	15	a 6	86-91	alpha	name of perceived type unit, as determined by the model's estimation algorithm, or "UNK" if no identification was possible
4-5	1	a 2	6-7	alpha	heading "FM "
	2	i 5	11-15	integer	fire mission identifier
	3	i 5	19-23	integer	unit number that has the fire mission
	4	i 3	26-28	integer	pointer to type battery conducting the fire mission
	5	i 3	31-33	integer	number of volleys fired
	6	a 5	36-40	alpha	type of munition (ICM,HE,SMOKE,PGM,LGM, FASCAM,ILLUM)
	7	i 2	43-44	integer	capability indicator for a rocket assisted projectile mission

***If WD.NAME is "KILLED", the sensor was hit or if WD.NAME. is "SR," a special report record is generated

EXAMPLE:

```
  TR  81942   2.379 FO JSTAR   19004    0 2  27110 MECH.   2.357     0      0
 NONE  NONE
  TR  81988   3.022 FO PPS-15  11041    0 2  23630 INF     2.993     0  81912
 PPR-RS  PPR-RS
  TR  81912   3.040 FO PPS-15  11041    0 2  23630 INF     2.993     0  82182
 PP6LK.  UNK
        FM    82209   28132    1    5 ICM     2
        FM    82186   28122    1    5 ICM     2
```

*** EXAMPLE RECORDS MAY WRAP AROUND TO NEXT LINE ***

12-12. ROUTINE: FIRE$MISSION, MINE$INPUT (SIMU47)

a. Condition. If analysis switch 6 = true.

b. Purpose. Mine expenditures report. Feeds the CALAPER system. Contains a listing of all permanent minefields and barriers. In addition, all fire missions where FASCAM munitions were employed are recorded in this file. From this information, the expenditures of mines by type are calculated by CALAPER.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	i 3	2-4	integer	N.MINEFIELD--number of minefields
2-N.MINES		i 1	13	integer	Side of minefield : 1=Red ; 2=Blue
	2	a 6	17-22	alpha	Name of type minefield
	3	i 5	26-30	integer	Starting X-coordinate for the minefield
	4	i 5	32-36	integer	Starting Y-coordinate for the minefield
	5	i 5	40-44	integer	Ending X-coordinate for the minefield
	6	i 5	46-50	integer	Ending Y-coordinate for the minefield
38-40	1	d(5,2)	5-9	real	Simulation time at which the fire mission was performed
	2	i 6	14-19	integer	Pointer to unit entity which is the target
	3	a 6	24-29	alpha	Type battery name
	4	i 4	34-37	integer	Rounds fired by battery
	5	i 2	42-43	integer	Mission of this firing unit--(1) PATROL; (2) ATTACK; (3) DEFEND
	6	i 1	49	integer	Side of firer: 1=Red ; 2=Blue

**** ALL COORDINATES ARE IN HEXADECAMETERS ****

EXAMPLE:

```
 1   36
 2         1   BY-SY6   20000    8800    20000    8700
 3         1   BY-SY7   20004    8637    20000    8900
 4         1   HR-BY2   20000    9100    20000    9000
 5         1   HR-BY4   20000   10000    20000    9900
                          .

                          .
37         2   RWWENE   11500   14000    11500   13975
38    5.41    208    UH-PL2         4        2    2
39    5.43    208    UH-PL2         4        2    2
40    5.44    208    UH-PL2         4        2    2
```

12-13. ROUTINE: AC$BOMB$EFF, AC$DF$EFFECT, WRITE48 (SIMU48)

a. Condition. If analysis switch 6 = true.

b. Purpose. First record records the results of an air defense engagement to include equipments destroyed and onboard and onsite rounds destroyed. This information supports the determination of system survivability and onsite losses of munitions due to enemy action. Second record records every shot fired by a helicopter to include equipments destroyed and rounds expended.

```
****************************************************************************
                           AIR DEFENSE RECORD
****************************************************************************
```

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1-4	1	a 1	1	alpha	0=MISS or 1=HIT
	2	d(7,4)	3-9	real	Simulation time of an aircraft mission
	3	i 5	12-16	integer	Unit number of supporting air defense unit
	4	a 6	19-24	alpha	Weapon name used by aircraft
	5	a 6	27-32	alpha	Target equipment name
	6	a 6	35-40	alpha	Munition used by aircraft **
	7	a [illegible]	42-45	alpha	Routine and code position identifier which recorded the shot

** Direct firer weapons do not have munitions; so a "NONE" is written.

```
******************************************************************************
                              HELICOPTER RECORD
******************************************************************************
 5-6    1      i 1     1   integer    Side of the helicopters : 1=Red ; 2=Blue
        2      i 6    4-9  integer    Pointer to the battle entity
        3      i 4  12-15 integer     Battle sequence number the helicopter
                                      team is supporting
        4      a 6  18-23  alpha      Equipment name of the firing helicopter
        5      a 6  26-31  alpha      Weapon used by firing helicopter
        6      i 6  34-39 integer     Number of rounds fired by the helicopter
        7      a 6  42-47  alpha      Equipment name of the target
        8    d(5,3) 50-54  real       Probability the helicopter will kill its
                                      target
        9      i 6  57-62 integer     Range in meters of the helicopter from
                                      its target
       10      i 6  65-70 integer     Address to the FARRP entity
       11      i 6  73-78 integer     Unit sequence number of the FARRP in the
                                      unit file
       12      i 6  81-86 integer     Number of helicopters in the team
       13      a 6  89-94  alpha      Hit or miss indicator
       14      i 1    96   integer    A debug code
```

EXAMPLE:

```
 0  3.7120  13000   MK82    T80   MK82 BE1
 0  3.7150  13250   MK85    M80   MK85 BE2
 0  3.8000  13200   RT80    M15   RT80 BE1
 0  3.8020  13000   MK82    T80   MK82 BE2
 2   13100     13   AH65  TOW3      3   T80   .3075    2750    27101     10000      3   MISS 2
 2   41400     21   RT64  RTOW     15   R82   .2025    4000    13100      9500      6   MISS 2
```

2-14. ROUTINE: END$SIMULATI (SIMU49)

a. Condition. No analysis switch used.

b. Purpose. Summarizes statistics on the number of sorties flown by each type of aircraft. The file contains two types of records: a single type C record containing audit trail information, and type T records containing the TACAIR sortie counts. The type C record is the first record in the file. Type T records are output only for those aircraft types that actually flew sorties. Each record type is described in detail below.

****

TYPE C RECORD

****

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	a 1	1	alpha	C; identifies this as a C type record
	2	a 39	3-41	alpha	COSAGE case identifier, for audit trail purposes
	3	i 3	43-45	integer	COSAGE Model version number
	4	i 3	47-49	integer	Random number stream for this replication
	5	i 2	51-52	integer	49 (used by postprocessors to identify the source of the input, i.e., file 49)

****

TYPE T RECORDS

****

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
2-4	1	a 1	1	alpha	T; identifies this as a T type record
	2	a 6	3-8	alpha	Name of the type aircraft
	3	i 6	10-15	integer	Number of sorties flown by this type aircraft

EXAMPLE:

```
C A-C01A01R01B01=IC-US_KOR_WAR_PLANS_1999 003    1 49
T UHCAH1    144
T UHCH64     57
T ULCH64    213
```

12-15. ROUTINE: UNIT$UNIT, HELICOPTER$F, OFF$LINE$ATT, SHOOT$OUT, MINE$EFFECTS, MINE$ASSESS, AD$SHOOT, AC$DF$EFFECT (SIMU55)

a. Condition. If analysis switch 5 = true.

b. Purpose. Contains shot records for direct fire engagements, one record per shot fired. Also contains a set of records giving initial equipment densities.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	a 39	1-39	alpha	COSAGE case identifier, for audit trail purposes
	2	i 3	41-43	integer	COSAGE Model version number
	3	i 3	45-47	integer	Random number stream for this replication

** EQUIPMENT AND DENSITY NUMBERS **

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
2-6	1	a 6	1-6	alpha	Equipment names Blue then Red
	2	i 5	9-13	integer	Initial density of equipments

** SHOT RECORD INFORMATION **

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
7-9	1	i 1	2	integer	Hit indicator : 1= HIT ; 0= MISS
	2	d(7,4)	4-10	real	Simulation time at which target report was reported
	3	i 5	12-16	integer	Ammunition onboard equipment
	4	a 6	18-23	alpha	Firer equipment name
	5	i 1	27	integer	Firer's equipment type pointer
	6	a 6	31-36	alpha	Weapon name on equipment
	7	a 6	40-45	alpha	Target equipment name
	8	i 1	49	integer	Type target equipment pointer
	9	i 6	53-58	integer	Range from firer to target in meters
	10	i 1	61	integer	indicates the target unit is in the open (0) or hidden from view (1)
	11	i 6	63-69	integer	Unit number of the firer unit
	12	i 6	71-76	integer	Unit number of the target unit
	13	i 1	79	integer	Side of firer : 1=Red ; 2=Blue
	14	d(5,3)	80-84	real	Initial probability (PK) of kill for that shooter and target combination
	15	d(5,3)	90-94	real	Computed PK (degraded) for that shooter/ target combination considering posture, range, terrain, etc.
	16	a 3	99-101	alpha	Routine and code position where record was recorded**
	17	i 8	104-111	integer	Battle sequence number
	18	i 1	113	integer	1 if the target unit is in a minefield at the time of the shot; 0 otherwise
	19	i 1	115	integer	1 if this shot is a hit on a dead target; 0 otherwise

** 16th Field clarification: this information is primarily used for debug. Each shot fired may come from any number of sources. Sources of round expenditures exist in a variety of routines throughout the model. This data defines the location of these sources. The location codes are:

AD$SHOOT:	"AD1"--miss "AD2"--hit
AD$DF$EFFECT:	"DF1"--hit "DF2"--miss
HELICOPTER$F:	"OH1"--miss 1 "OH2"--miss 2 "OH3"--hit 2 "OH4"--miss 3 "OH5"--miss 4
IF$KILL$EQ	"IF1"--LGM shot
MINE$ASSESS:	"1MA"--hit 1 "2MA"--hit 2 "3MA"--miss 1
MINE$EFFECTS:	"1ME"--hit 1 "2ME"--miss 1
OFF$LINE$ATT:	"OL1"--miss "OL2"--hit
SHOOT$OUT:	"OS1"--Battle ended; SO.DESTRUCT.IND set to yes "OS2"--Target killed; DROP.DEAD.IND set to yes "OS3"--FIRING.TABLE set to 0/; aircraft is invisible "OS4"--Target's list is empty; firing weapon set to zero "OS5"--No targets to fire at "OS6"--Target unit is unavailable "OS7"--Miss from routine assessment "OS8"--Hit on dead targets

EXAMPLE:

```
 1  A-C01A01R01B01=IC-US_KOR_WAR_PLANS_1999     003      1
 2  XSOUND     0
 3  M082M     24
 4  M120M     28
 5  H122T     48
 6  G076T     25
 7 1  6.8837    12 HMMVTW    4    TOW2    PT-76    2     1936   1    23640   11041   2
   0.200    0.100    OH1        1    1    0
 8 0  6.8840    12 HMMVTW    4    TOW2    PT-76    2     1936   1    23640   11041   2
   0.000    0.000    OH2        1    1    1
 9 0  6.8840    10 HMMRTV    5    TOW     PT-82    2     3000   1    23650   11041   2
   0.000    0.000    OS2        1    0    1
```

12-16. ROUTINE: WRITE61 (SIMU61)

a. Condition. Data will be written only if the type UAV input file has equipment names in it.

b. Purpose. This file contains the status of UAV flights. This file is used by a utility program which calculates average flight and loiter times for UAVs.

FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	a 35	1-35	alpha	Keyword--possible values; RESUME FLIGHT, BEGIN FIRST MOVE TO COORD, BEGIN LOITER, RETURN TO BASE, ACTIVATE MOVE TO COORD
2	d(7,4)	37-43	real	Simulation time
3	i 6	49-54	integer	Equipment unit ID
4	a 6	56-61	alpha	Equipment name
5	i 5	63-67	integer	X-coordinate of type unit in hexadecameters
6	i 5	70-74	integer	Y-coordinate of type unit in hexadecameters
7	i 6	77-82	integer	Target unit ID
8	i 5	84-88	integer	X-coordinate of target in hexadecameters
9	i 5	90-94	integer	Y-coordinate of target in hexadecameters
10	i 1	96	integer	LGM designation: 2 = COPPERHEAD, 0 otherwise
11	i 6	98-103	integer	Fire mission ID

EXAMPLE:

```
BEGIN FIRST MOVE TO COORD  4.      17002 UAV 10000 7439 11340 10000  7189 0  0
BEGIN FIRST MOVE TO COORD  4.      17007 UAV 10000 6688 11370 10000  6250 0  0
ACTIVATE MOVE TO COORD.    4.0310 17002 UAV 10000 7188 12500 12188  7189 0  0
ACTIVATE MOVE TO COORD.    4.0517 17007 UAV 10000 6250 13000 12188  6250 0  0
ACTIVATE MOVE TO COORD.    4.2758 17002 UAV 12188 7188 15550 12188  7438 0  0
ACTIVATE MOVE TO COORD.    4.2965 17007 UAV 12188 6250 16550 12188  6875 0  0
```

12-17. ROUTINE: ART$ASSESS, BTRY$EFFECTS, END$SIMULATI, KV$SCOREBOAR (SIMU62)

a. Condition. The file contains two sections. The first lists the names of all the smart munitions. The second contains the results of fire missions using smart munitions. One record is written for each equipment in the target unit which is an eligible target of the munition.

b. Purpose. To assist in the analysis of the effects of precision guided munitions (PGM).

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	i 3	1-3	integer	The number of smart munitions (N.LGM + N.PGM)
2-3	1	t 6	1-6	text	The name of a smart munition (LGM or PGM)
4-6	1	d(9-6)	1-9	real	Simulation time of the fire munition
	2	i 6	11-16	integer	Fire mission identifier
	3	t 3	18-20	text	Munition type (PGM or LGM)
	4	t 6	22-27	text	Munition name
	5	t 6	29-34	text	Name of target equipment
	6	i 5	36-40	integer	Number of equipments in target unit
	7	i 5	42-46	integer	Number of equipments which were selected astargets by submunitions
	8	i 5	48-52	integer	Number of kills by fire munition round
	9	i 4	54-57	integer	Number of projectiles attacking target equipment (rounds for LGM and submunitions for PGM)
	10	d(7,5)	59-65	real	PK of projectile against target equipment
	11	t 6	67-72	text	Name of type battery firing the mission
	12	i 6	74-79	integer	Range of the targeting forward observer from target (this is 0 for PGM)in meters
	13	i 5	81-85	integer	Number of hits on dead target equipment by PGM submunitions (this is 0 for LGM)
	14	i 1	87	integer	Collateral damage flag: 1 if record is due to collateral damage. 0 otherwise

EXAMPLE:

```
1    2
2    M714
3    M265
4     3.000025  146777  PGM  S47SDM  RG58U    4     1    1     3 0.66666
RH-G78     0       2       0
5     4.222567  345890  PGM  R55PGM  USMA1    6     2    2     7 0.22222
US-Y67     0       1       1
6     7.777777  876543  LGM  SSSLGM  RTANK    4     3    3     3 0.54321
RKDIV      88      0       1
```

12-18. ROUTINE: BTRY$EFFECTS (SIMU63)

a. Condition. One record is written to this file each time an indirect fire mission resulting from an externally generated target report is shot.

b. Purpose. This file is used to analyze the effects of externally generated target reports.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	d(9,6)	1-9	real	Time the fire mission was shot
	2	d(9,6)	11-19	real	Time the external target report was generated
	3	i 8	21-27	integer	Fire mission identifier
	4	i 5	30-34	integer	The FDC responsible for the mission
	5	a 6	36-41	alpha	Name of the type battery firing
	6	i 6	43-48	integer	Unit ID of the battery
	7	a 6	50-55	alpha	Name of the forward observer credited with generating the target report
	8	i 4	57-60	integer	Number of volleys fired
	9	i 4	62-65	integer	Number of rounds fired
	10	a 6	67-73	alpha	Name of the round fired
	11	i 6	75-80	integer	Unit ID of the target unit
	12	a 6	82-87	alpha	Name of the target unit's category
	13	i 4	89-92	integer	Number of casualties resulting

EXAMPLE:

```
  2.132141  2.000000  12411     17000    UH-BY5     10100 RPV  4     16      XM916
32100     LT-ARM     61
  2.132141  2.000000  12411     17000    UH-BY5     10100 RPV  4     16      XM916
32100     LT-ARM     61
  2.132141  2.000000  12411     17000    UH-BY5     10100 RPV  4     16      XM916
32100     LT-ARM     61
```

** NOTE EXAMPLE LINES ARE WRAPPED AROUND **

12-19. ROUTINE : END$SIMULATI (SIMU64)

a. Condition. This file is created at the end of the simulation. It contains one record for each type unit.

b. Purpose. The file is used to estimate expenditures for certain nonmodeled munitions, based on analysis of small unit engagements and withdrawal operations

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1-4	1	a 6	1-6	alpha	Name of type unit
	2	a 6	8-13	alpha	Name of category to which type unit belongs
	3	i 1	15	integer	Side: 1=Red or 2=Blue
	4	i 5	17-21	integer	Number of daytime unit engagements for units of this type
	5	i 5	23-27	integer	Number of night time unit engagements for units of this type
	6	i 5	29-33	integer	Number of daytime withdrawal operations for units of this type
	7	i 5	35-39	integer	Number of night time withdrawal operations for units of this type

EXAMPLE:

```
1    UMXDV   MECH    2    1    2    0    1
2    UMXDV2  MECHIV  2   11    4    2    5
3    RDAPAT  AIRDEF  1    2    4    1    0
4    RARBD   ARMOR   1   15    6   12    1
```

12-20. AMMUNITION POSTPROCESSING (SIMU65)

a. Condition. This file is created for ammunition postprocessing.

b. Purpose. This file is created to provide information for the COSAGE/APP Interface File. The SIMU65 file is composed of five segments, numbered 0, 1, 2, 3, 5. The reason for the strange numbering scheme is to correspond to the organization of the Interface File. Each segment starts with a header and ends with a trailer record. Both records have a "*" in column 1. The header contains the segment number and the number of records in the segment, while the trailer contains an "end" to signify the end of the segment.

```
HEADER FORMAT : "*", s 1, i 2, s 1, i 6
TRAILER FORMAT : "* END"


        ####  ALL FIELDS ARE SEPARATED BY ONE SPACE  ####

** SEGMENT 0 : consists of 1 record for each blue type battery
   a)    name of type battery     (a 6)
   b)    name of indirect fire vehicle (howitzer) associated
         with this type battery   (a 6)

** SEGMENT 1 : consists of 1 record for each vehicle
   a)    name of vehicle      (a 6)
   b)    side 1=Red, 2=Blue   (i 1)
   c)    direct fire flag:    (i 1)
             1 if weapon was modeled as direct fire
             0 otherwise
   d)    initial density of vehicles at start of simulation    (i 6)

** SEGMENT 2 : consists of 1 record for each direct fire weapon
   a)    name of the weapon     (a 6)

** SEGMENT 3 : consists of 1 record for each indirect fire munition
   a)    name of munition       (a 6)
   b)    type of munition       (a 6)
                   HE, ICM, ILLUM, SMOKE, FASCAM, PGM, LGM
** SEGMENT 5 : consists of 1 record for each blue direct fire
               vehicle/weapon combination
   a)    name of vehicle           (a 6)
   b)    name of weapon            (a 6)
   c)    initial density of vehicle/weapon combination      (i 6)


                 ** EXAMPLE AND FORMAT GIVEN ON NEXT PAGE **
```

EXAMPLE:

```
* 0     3
UH-BY1 UH105A
UH-BY2 UH105Z
UM-HG1 UM155Z
* END
* 1     2
UM1A1  2 1   127
RHIPE1 1 1    12
* END
* 2     4
UIHAWK
UICHAP
UHHELO
UHCOBR
* END
* 3     2
M1     HE
RXM913 ILLUM
* END
* 5     3
UHAWKI UIHAWK      16
UTRUCK UHTOWA       1
UHCAH1 UTOW2H      40
* END
```

```
****               IN THE HEADING FORMAT               ****
            FIELD 1   --    segment number
            FIELD 2   --    number of records in the segment
```

12-21. ROUTINE: RALPH$OUT (SIMU66)

a. Condition . No analysis switch used.

b. Purpose. Provides a skeleton to be used to create the equipment rollup file for use by RALPH.

RECORD	FIELD	FORMAT	COL	VARIABLE TYPE	DESCRIPTION
1	1	i 3	3-5	integer	The number of Blue equipments
	2	i 3	10-12	integer	The number of Red equipments
2-18	1	a 6	1-6	alpha	The name of the equipment
	2	i 3	13-15	integer	The number of weapons or munitions associated with this equipment (possibly zero)
	3	a 6	19-24	alpha	Name of the 1st weapon/munition (if any)
	4	a 6	28-33	alpha	Name of the 2d weapon/munition (if any)
	5	a 6	37-42	alpha	Name of the 3d weapon/munition (if any)
	6	a 6	46-51	alpha	Name of the 4th weapon/munition (if any)
	7	a 6	55-60	alpha	Name of the 5th weapon/munition (if any)
	8	a 6	64-69	alpha	Name of the 6th weapon/munition (if any)

NOTE: if more than six weapons or munitions are associated with one equipment, the list of names is continued on the next line starting with the 7th name in columns 19-24, etc.

EXAMPLE:

```
  9      8
UM1A1         3   UM1120   UMG50P   UMG50T
UM1           0
U60A3         0
UM2IFV        2   UGUN25   UTW2BV
UHMVT2        1   UTW2BV
UOPAT4        2   UAT-4    UM16A2
UM-60M        1   M720
UH155A        5   M795     M549A1   M483A1   XM864    XM898
FASCAM        1   MINES
RFST          3   RFT125   RMG12V   RFTAT8
RT80B         0
RAD57A        1   RAA57
RM120M        1   M120HE
RM240Z        1   M240HE
RH152Z        4   H152H    152RAP   152FLE   152ICM
RH152A        3   H152HF   152RAP   152FLE
RG130A        1   G130HE
```

CHAPTER 13

COSAGE POSTPROCESSORS

13-1. INTRODUCTION. This chapter provides a listing of the available postprocessors for use with COSAGE. It also will give more detailed information and an example of each one.

13-2. LISTING. The following postprocessors will be discussed:

```
COSAGE REPLICATION SHOT SUMMARY
COSAGE POSTURE SHOT SUMMARY
KV SUMMARY
DIRECT FIRE
    DF-SUM/FIRER-BY-REP
    DF-SUM/TGT-BY-REP
INDIRECT FIRE
    IF-SUM/TGT-BY-REP
    IF-SUM/TYPE-BY-REP
    IF-SUM/FIRER-BY-REP
    IF-SUM/MUN-BY-REP
TACAIR
AIRDEF
TARGET-RPT.
MINES
HELO
SMARTMUNS
```

13-3. POSTPROCESSOR - COSAGE REPLICATION SHOT SUMMARY. Two COSAGE Replication Shot Summary Files, one for direct fire results and one for indirect fire, are produced for each replication of the model.

a. Required Files

(1) **Input Files.** The COSAGE SIMU55 and SIMU16 of each replication.

(2) **Output Files.** SIMU13.

b. Direct Fire File (SIMU55). The direct fire file contains three types of records, identified by a type indicator in column 1 of each record. The first record in the file is a type "C" record identifying the source of the data; type "I" records show the initial equipment densities; and type "D" records show direct fire shots and kills.

(1) Type C Records

Field	Columns	Format	Description
1	1	A 1	"C"; identifies this as a C type record
2	3-41	A 39	COSAGE case identifier, for audit trail
3	43-45	I 3	COSAGE Model version number
4	47-49	I 3	Random number stream for this replication
5	51-52	I 2	COSAGE file number from which the case identifier, etc., was extracted; 55

(2) Type I Records

Field	Columns	Format	Description
1	1	A 1	"I"; identifies this as an I type record
2	3-8	A 6	name of the equipment
3	10-15	I 6	Initial equipment density

(3) Type D Records

Field	Columns	Format	Description
1	1	A 1	"D"; identifies this as a D type record
2	3-8	A 6	Name of the firing equipment
3	10-15	A 6	Name of the firing weapon (in the case of LGM rounds designated by the "firing equipment", this is the name of the round)
4	17-22	A 6	Name of the target equipment
5	24-29	I 6	Number of rounds fired by the firing equipment and weapon at the target in this replication
6	31-36	I 6	Number of kills due to these rounds
7	38-43	I 6	Average firing range (meters)

EXAMPLE:

```
C A-C01A01R01B01=IC-US_ROK_WAR_PLAN_1999  106 001 55
I UM60A3    103
D UM60A3 U60105 RT808      16      7   1800
```

c. **Indirect Fire File (SIMU16)** The indirect fire file also contains three types of records. Again the first record is type "C", followed by type "S" records showing the total number of rounds of a munition fired by each indirect firer and type "K" records showing kills. The format of each type of record is described in detail below.

(1) Type C Records

Field	Columns	Format	Description
1	1	A 1	"C": identifies this as a C type record
2	3-41	A 39	COSAGE case identifier, for audit trail
3	43-45	I 3	COSAGE model version number
4	47-49	I 3	Random number stream for this replication
5	51-52	I 2	COSAGE file number from which the case identifier, etc., was extracted; 16

(2) Type S Records

Field	Columns	Format	Description
1	1	A 1	"S"; identifies this as an S type record
2	3-8	A 6	Name of the firing equipment
3	10-15	A 6	Munition type: HE, ICM, PGM, SMOKE, ILLUM, or FASCAM
4	17-22	A 6	Munition name
5	24-29	I 6	Number of rounds fired

(3) Type K Records

Field	Columns	Format	Description
1	1	A 1	"K"; identifies this as a K type record
2	3-8	A 6	Name of the firing equipment
3	10-15	A 6	Munition type: HE, ICM, PGM, SMOKE, ILLUM, or FASCAM
4	17-22	A 6	Munition name
5	24-29	A 6	For HE, ICM, or PGM munitions, the target name; for FASCAM munitions, the mission type (CBTRY, PTMINE, or RESEED); for SMOKE or ILLUM munitions, "NONE"
6	31-35	I 5	Number of rounds fired at this target (note that a single round may affect several targets.)
7	37-41	I 5	Number of kills
8	43-48	I 6	Average range per round (meters)

EXAMPLE:

```
C A-C01A01R01B01=IC-US_ROK_WAR_PLAN_1999  106 001 16
S UH155Z ICM    XM792       34
K UH155Z ICM    XM792  RH152A     7     4   1800
```

13-4. POSTPROCESSOR - COSAGE POSTURE SHOT SUMMARY. The COSAGE Posture Shot Summary File summarizes the results of both direct and indirect fire expenditures, averaged over several replications in a single combat posture.

a. Required Files

(1) Input Files. The COSAGE compressed SIMU55 and SIMU16 (see Postprocessor - COSAGE Replication Shot Summary) of each replication.

(2) Output Files - SIMU13

b. Output File Contents. The file contains six types of records, identified by a type indicator in column 1 of each record. Type "C" records indicate the source of the data; type "I" records show the initial equipment densities; type "S" records show the total number of rounds of a munition fired by an indirect firer; type "K" records show the kills due to indirect fire; type "D" records pertain to direct fire; and type "T" records contain statisics on TACAIR sorties. The format of each type of record is described in detail below.

(1) Type C Records

Field	Columns	Format	Description
1	1	A 1	"C"; identifies this as a C type record
2	3-41	A 39	COSAGE case identifier, for audit trail
3	43-45	I 3	COSAGE model version number
4	47-49	I 3	Number of replications on which this summary is based

(2) Type I Records

Field	Columns	Format	Description
1	1	A 1	"I"; identifies this as an I type record
2	3-8	A 6	Name of the equipment
3	10-17	F 8.2	Initial equipment density

(3) Type S Records

Field	Columns	Format	Description
1	1	A 1	"S"; identifies this as an S type record
2	3-8	A 6	Name of the firing equipment
3	10-15	A 6	Munition type: HE, ICM, PGM, SMOKE, ILLUM, or FASCAM
4	17-22	A 6	Munition name
5	24-31	F 8.2	Number of rounds fired, averaged over all replications

(4) Type K Records

Field	Columns	Format	Description
1	1	A 1	"K"; identifies this as a K type record
2	3-8	A 6	Name of the firing equipment
3	10-15	A 6	Munition type: HE, ICM, PGM, SMOKE, ILLUM or FASCAM
4	17-22	A 6	munition name
5	24-29	A 6	For HE, ICM, or PGM munitions, the target name; for FASCAM munitions, the mission type (CBTRY, PTMINE, or RESEED); for SMOKE or ILLUM munitions, "NONE"
6	31-38	F 8.2	Average number of rounds fired at this target (note that a single round may affect several targets.)
7	40-47	F 8.2	Average number of kills
8	49-56	F 8.0	Average range per round (meters)

(5) Type D Records

Field	Columns	Format	Description
1	1	A 1	"D": identifies this as a D type record
2	3-8	A 6	Name of the firing equipment
3	10-15	A 6	Name of the firing weapon (in the case of LGM rounds designated by the "firing equipment", this is the name of the round)
4	17-22	A 6	Name of the target equipment
5	24-31	F 8.2	Number of rounds fired by the firing equipment and weapon at the target, averaged over replications
6	33-40	F 8.2	Number of kills due to these rounds
7	42-49	F 8.0	Average firing range (meters)

(6) Type T Records

Field	Columns	Format	Description
1	1	A 1	"T"; identifies this as an T type record
2	3-8	A 6	Name of aircraft type
3	10-17	F 8.2	Average number of sorties per replication flown by this aircraft type

EXAMPLE:

```
C A-C01A01R01B01=IC-US_ROK_WAR_PLAN_1999  106  11
I UM60A3   103.00
S UH155Z ICM    XM792     22.00
K UH155Z ICM    XM792  RH152A     7.00     3.40    1655.
D UM60A3 U60105 RT80B     18.15    11.20     1860.
T UACF15     3.00
```

13-5. POSTPROCESSOR - KILLER/VICTIM SUMMARY (KV SUMMARY). The KV SUMMARY consists of five different reports. The first report is the killer/victim scoreboard for Red killers versus Blue victims. The second report is the killer/victim scoreboard for Blue killers versus Red victims. The third report is the expenditures for Blue weapons versus Red targets and Red weapons versus Blue targets. The fourth report is the ammunition report for indirect fire. The fifth report is a summary of the killer/victim scoreboard, but rolled up according to the desires of the analyst.

a. Required Files

(1) Input Files. The COSAGE SIMU8, SIMU9, SIMU10, and SIMU40 of all replications and the SIMU55 of one replication.

(2) Output Files. SIMU6, SIMU21, SIMU22, and SIMU23.

b. First Report. This report gives the mean, standard deviation, minimum, and maximum kills of an enemy equipment against each of the friendly's equipment. The initial density of each equipment, both friendly and enemy, are also shown. The mean, standard deviation, minimum, and maximum kills of all the enemy equipment against each of the friendly's equipment is also given for total kills and percent of the friendly losses.

```
          EXAMPLE:

                                 RED KILLER VS BLUE VICTIM SCOREBOARD
                              REPORT SHOWING THE MEAN, STANDARD DEVIATION,
                                MINIMUM, AND MAXIMUM VALUES OF 5 INPUTS

       DENSITY   864      0     72    576    288      0      0      0    144
       VICTIM UM1A1  UM1A2  UAGS   UM2IFV UM3CFV UFIFV  ULOSAT USTRAY UHMVT2
       CEM NO  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)

SHOOTER/DENSITY

RT72     168    18.2    0.     1.8   28.8   14.2    0.     0.     0.      6.
                 4.5    0.     1.2    6.5    3.1    0.     0.     0.      0.9
                15.     0.     1.    19.    10.     0.     0.     0.      5.
                27.     0.     4.    36.    19.     0.     0.     0.      7.

RT80       0     0.     0.     0.     0.     0.     0.     0.     0.      0.
                 0.     0.     0.     0.     0.     0.     0.     0.      0.
                 0.     0.     0.     0.     0.     0.     0.     0.      0.
                 0.     0.     0.     0.     0.     0.     0.     0.      0.

RT80B     18     0.     0.     0.     1.     0.4    0.     0.     0.      0.
                 0.     0.     0.     0.9    0.5    0.     0.     0.      0.
                 0.     0.     0.     0.     0.     0.     0.     0.      0.
                 0.     0.     0.     2.     1.     0.     0.     0.      0.

RBRDM2   132    17.4    0.     3.     6.4    0.8    0.     0.     0.      6.
                 8.2    0.     1.1    8.7    1.2    0.     0.     0.      2.1
                10.     0.     2.     0.     0.     0.     0.     0.      3.
                33.     0.     5.    22.     3.     0.     0.     0.      8.

RBRDM5    48     7.4    0.     2.     2.     0.6    0.     0.     0.      3.2
                 1.9    0.     1.3    1.8    0.8    0.     0.     0.      1.9
                 5.     0.     0.     0.     0.     0.     0.     0.      1.
                10.     0.     3.     4.     2.     0.     0.     0.      6.

-TOTAL KILLS-   167.8    0.    15.    53.    33.2    0.     0.     0.     29.
                 22.2    0.     2.4   13.4    2.0    0.     0.     0.      6.6
                139.     0.    11.    33.    31.     0.     0.     0.     19.
                202.     0.    18.    66.    36.     0.     0.     0.     39.

-PERCENT LOSS-  19.4%   0. %  20.8%   9.2%  11.6%   0. %   0. %   0. %  20.1%
                 2.6%   0. %   3.4%   2.3%   0.7%   0. %   0. %   0. %   4.6%
                 0.0%   0.0%   0.0%   0.0%   0.0%   0.0%   0.0%   0.0%   0.0%
                23.4%   0. %  25.0%  11.5%  12.5%   0. %   0. %   0. %  27.1%
```

c. Second Report. This report gives the mean, standard deviation, minimum, and maximum kills of a friendly equipment against each of the enemy's equipment. The initial density of each equipment, both enemy and friendly, are also shown. The mean, standard deviation, minimum, and maximum kills of all the friendly equipment against each of the enemy's equipment is also given for total kills and percent of enemy losses.

```
                                EXAMPLE:

                                             BLUE KILLER VS RED VICTIM SCOREBOARD
                                          REPORT SHOWING THE MEAN. STANDARD DEVIATION.
                                            MINIMUM. AND MAXIMUM VALUES OF 5 INPUTS

        DENSITY  168       0      18     132      48       0       0       0      45
        VICTIM RT72    RT80   RT80B  RBRDM2 RBRDM5 RBTR60 RBMP3  RBMP5  RTRUCK
        CEM NO (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)

SHOOTER/DENSITY

UM1A1    864   48.6    0.     1.6   43.2   18.6    0.     0.     0.     4.
                5.4    0.     1.0    8.5    2.2    0.     0.     0.     1.8
               39.     0.     0.    37.    16.     0.     0.     0.     2.
               55.     0.     3.    60.    21.     0.     0.     0.     6.

UM1A2      0    0.     0.     0.     0.     0.     0.     0.     0.     0.
                0.     0.     0.     0.     0.     0.     0.     0.     0.
                0.     0.     0.     0.     0.     0.     0.     0.     0.
                0.     0.     0.     0.     0.     0.     0.     0.     0.

UAGS      72    1.8    0.     0.     4.2    1.     0.     0.     0.     0.
                1.2    0.     0.     1.9    0.6    0.     0.     0.     0.
                1.     0.     0.     2.     0.     0.     0.     0.     0.
                4.     0.     0.     7.     2.     0.     0.     0.     0.

UM2IFV   576   15.4    0.     1.     5.2    1.     0.     0.     0.     1.
                3.6    0.     0.6    2.6    0.9    0.     0.     0.     1.5
               10.     0.     0.     2.     0.     0.     0.     0.     0.
               20.     0.     2.     8.     2.     0.     0.     0.     4.

UM3CFV   288    9.2    0.     2.     3.6    0.6    0.     0.     0.     0.8
                1.9    0.     0.6    1.9    0.5    0.     0.     0.     0.7
                6.     0.     1.     1.     0.     0.     0.     0.     0.
               12.     0.     3.     6.     1.     0.     0.     0.     2.

-TOTAL KILLS- 136.     0.    12.8  112.2   39.6    0.     0.     0.    34.4
                2.9    0.     1.3    4.2    3.5    0.     0.     0.     1.4
              131.     0.    11.   107.    33.     0.     0.     0.    32.
              140.     0.    15.   119.    43.     0.     0.     0.    36.

-PERCENT LOSS- 81.0%   0. %  71.1%  85.0%  82.5%   0. %   0. %   0. %  76.5%
                1.7%   0. %   7.4%   3.1%   7.3%   0. %   0. %   0. %   3.0%
                0.0%   0.0%   0.0%   0.0%   0.0%   0.0%   0.0%   0.0%   0.0%
               83.3%   0. %  83.3%  89.4%  89.6%   0. %   0. %   0. %  80.0%
```

d. Third Report. This report is written in two parts. The first gives the mean, standard deviation, minimum, and maximum expenditures of a friendly weapon against each of the enemy's equipment. The mean, standard deviation, minimum, and maximum is also given for total expenditures of all the friendly weapons against each of the enemy's equipment. The second part is the same as the first part, only it shows enemy weapons against friendly equipment.

```
                       EXAMPLE:  PART 1

                            EXPENDITURES FOR BLUE WEAPONS AGAINST RED TARGETS
                              REPORT SHOWING THE MEAN, STANDARD DEVIATION,
                               MINIMUM, AND MAXIMUM  VALUES OF 5 INPUTS
TARGET  RT72     RT80     RT80B    RBRDM2   RBRDM5   RBTR60   RBMP3    RBMP5    RTRUCK

WEAPON
UAG105   12.4     0.       0.      39.       8.6     0.       0.       0.       0.
          5.0     0.       0.      14.6      3.7     0.       0.       0.       0.
          5.      0.       0.      21.       2.      0.       0.       0.       0.
         20.      0.       0.      60.      12.      0.       0.       0.       0.

UMG50T    0.      0.       0.       0.       0.      0.       0.       0.       0.
          0.      0.       0.       0.       0.      0.       0.       0.       0.
          0.      0.       0.       0.       0.      0.       0.       0.       0.
          0.      0.       0.       0.       0.      0.       0.       0.       0.

UGUN25    0.      0.       0.     536.     118.      0.       0.       0.      68.8
          0.      0.       0.     270.3     63.1     0.       0.       0.      39.4
          0.      0.       0.     231.      33.      0.       0.       0.       5.
          0.      0.       0.     893.     221.      0.       0.       0.     111.

UTW2BT  147.2     0.      14.8      0.       0.      0.       0.       0.       0.
          7.5     0.       7.7      0.       0.      0.       0.       0.       0.
        140.      0.       3.       0.       0.      0.       0.       0.       0.
        160.      0.      26.       0.       0.      0.       0.       0.       0.

UM1120  350.8     0.      32.4    374.4    124.      0.       0.       0.      71.4
         50.2     0.      15.4    103.2     19.8     0.       0.       0.      43.0
        270.      0.      13.     278.      90.      0.       0.       0.      18.
        411.      0.      56.     567.     150.      0.       0.       0.     133.

TOTAL:  628.4     0.      81.2   1140.     355.4     0.       0.       0.     199.
         57.1     0.      15.9    363.1     65.0     0.       0.       0.      51.4
        527.      0.      59.     765.     265.      0.       0.       0.      30.
        701.      0.     100.    1626.     450.      0.       0.       0.     247.
```

```
                 EXAMPLE:  PART 2

                           EXPENDITURES FOR RED WEAPONS AGAINST BLUE TARGETS
                              REPORT SHOWING THE MEAN, STANDARD DEVIATION,
                                 MINIMUM, AND MAXIMUM VALUES OF 5 INPUTS

TARGET  UM1A1    UM1A2    UAGS     UM2IFV  UM3CFV  UFIFV   ULOSAT  USTRAY  UHMVT2

WEAPON
R72100    0.       0.       0.       2.4     1.8     0.      0.      0.      0.
          0.       0.       0.       2.9     2.2     0.      0.      0.      0.
          0.       0.       0.       0.      0.      0.      0.      0.      0.
          0.       0.       0.       8.      6.      0.      0.      0.      0.

RMG14V    0.       0.       0.       0.      0.      0.      0.      0.      0.
          0.       0.       0.       0.      0.      0.      0.      0.      0.
          0.       0.       0.       0.      0.      0.      0.      0.      0.
          0.       0.       0.       0.      0.      0.      0.      0.      0.

RAT5V     0.       0.       0.     101.6    11.8     0.      0.      0.     47.4
          0.       0.       0.     124.9    12.7     0.      0.      0.     11.3
          0.       0.       0.       6.      0.      0.      0.      0.     32.
          0.       0.       0.     326.     30.      0.      0.      0.     62.

RAT7G    56.4      0.      13.4      0.      0.      0.      0.      0.      0.
         16.5      0.       7.7      0.      0.      0.      0.      0.      0.
         36.       0.       3.       0.      0.      0.      0.      0.      0.
         86.       0.      26.       0.      0.      0.      0.      0.      0.

R80125   27.       0.      10.6     59.     27.      0.      0.      0.     12.8
          4.5      0.      13.9     21.6     7.3     0.      0.      0.      4.7
         22.       0.       1.      37.     18.      0.      0.      0.      7.
         35.       0.      38.      97.     37.      0.      0.      0.     18.

R80MSL    0.6      0.       0.       1.      0.6     0.      0.      0.      1.4
          0.8      0.       0.       1.1     0.8     0.      0.      0.      1.0
          0.       0.       0.       0.      0.      0.      0.      0.      0.
          2.       0.       0.       3.      2.      0.      0.      0.      3.
```

e. **Fourth Report.** This report is written in three parts. The first gives the TBTRY name, the weapon name, the weapon density, the TBTRY density, the mean rounds, and the rounds per tube per total simulation time. The mean kills and rounds per kill are also given by TBTRY name. The second part gives the mean, standard deviation, maximum, and minimum of artillery consumption in rounds by TBTRY. The third part gives the mean, standard deviation, maximum, and minimum of artillery consumption by type munitions.

```
                    EXAMPLE:  PART 1

TBTRY      HOWITZER     HOW DENSITY    TB DENSITY    MEAN RDS    RDS/TUBE/TOT SI


UH-BY1      UH105A           80.             20      14919.80             186.50
UH-TGW      UAFAST            0.              0          0.                 0.
UH-BY7      UAFAS           192.             48      36409.60             189.63
RH-BY1      RH105A           15.              5       3421.00             228.07
RH-TGW      RAFAST           24.              6       1177.00              49.04
RH-BY7      RAFAS            24.              6       2600.00             108.33


    TOTAL   UH-BY7        PGM
                             MEAN   KILLS    0.60
                          ROUNDS PER KILL    6.33


    TOTAL   UH-BY7        LGM
                             MEAN   KILLS    0.
                          ROUNDS PER KILL    0.


    TOTAL   RH-BY7        PGM
                             MEAN   KILLS    0.20
                          ROUNDS PER KILL   12.00


                    EXAMPLE:  PART 2
     STAT SUMMARY OF ARTY CONSUMPTION IN ROUNDS BY TYPE BATTERY

                                                MEAN     STD.DEV   MAXIMUM     MINIMUM
  3  UH-BY7  UAFAS    48 HE      UM795       24503.      2051.85     27265.     22360.
  3  UH-BY7  UAFAS    48 ICM     UM483       6471.20      890.48      7696.      4989.
  3  UH-BY7  UAFAS    48 ICM     UXM864      3121.60      269.02      3476.      2656.
  3  UH-BY7  UAFAS    48 PGM     UXM898         3.80        0.40         4.         3.
  3  UH-BY7  UAFAS    48 LGM     UM712         14.         11.58        35.         0.
  5  UL-ICO  UMLRS    32 ICM     UM26        1186.80       67.49      1286.      1087.
  5  UL-ICO  UMLRS    32 PGM     U26SDM       209.         38.34       273.       170.
 11  RH-BY1  RH105A    5 HE      RM760        539.        104.17       710.       394.
 11  RH-BY1  RH105A    5 HE      RM913       1909.60      304.30      2231.      1408.
 11  RH-BY1  RH105A    5 ICM     RXM915       949.60      276.64      1270.       461.
 11  RH-BY1  RH105A    5 ILLUM   R314A2         1.20        2.40         6.         0.
 11  RH-BY1  RH105A    5 SMOKE   R8481         21.60        8.14        30.        12.
 15  RL-ICO  RMLRS     8 ICM     RM26         179.40       42.58       231.       119.
 16  RADSXN  RFOGML    7 PGM     RFOG           0.          0.           0.         0.
```

```
                    EXAMPLE:  PART 3
STAT SUMMARY OF ARTY CONSUMPTION BY TYPE MUNS.

              MEAN           STD. DEV.      MAXIMUM          MINIMUM
UM760       8331.20          610.91         9224.            7504.
UM913       2874.20          343.37         3168.            2211.
UXM915      3695.20          921.80         5328.            2592.
U314A2        19.20            5.88           24.               8.
U84B1         0.               0.              0.               0.
UM795      24503.           2051.85        27265.           22360.
RM760        539.            104.17          710.             394.
RM913       1909.60          304.30         2231.            1408.
RXM915       949.60          276.64         1270.             461.
R314A2         1.20            2.40            6.               0.
R84B1         21.60            8.14           30.              12.
```

f. **Fifth Report.** This report gives the total density and kills of a category of equipment, as defined by the analyst, against all of the other analyst-defined categories of equipment. Total kills and percent losses are also given. The first example shows the format of the input file needed to define the categories and report switches needed by the program. The second example shows the format of the output.

EXAMPLE: INPUT FILE NEEDED

```
4 2 RTRPS   5  RINTP  ROPAGS ROPMG  ROPR16 RFOTP

4 2 RARTTP  2  RM-TP  RFATP

4 2 RSUPTP  1  RSUPTP

4 2 RATWPN  3  RATT12 ROPAT7 RSPG-9

4 2 RTANKS  4  RFST   RT80B  RT55/4 RT72

4 2 RLTARM  3  RBTR60 RBRDM2 RGLLD

4 1 BTRPS   6  UINTP  UFAFO  UOP60G UOP50G UOPSAW
               UOP203

4 1 BARTTP  2  UM-TP  UFATP

4 1 BSUPTP  1  USUPTP

4 1 BATWPN  2  UOPAT4 UOPAWS

4 1 BTANKS  3  UM1A1  UM1    U60A3

4 1 BLTARM  6  U113A1 UAPC19 UFISTV UHMV19 UHMV25
               UGLLDV
5 2
5 3
5 6
5 8
5 4
5 7
5 9
5 5
5 10
5 11
 1
```

```
EXAMPLE:  OUTPUT FILE

     BLUE KILLER VS RED VICTIM SCOREBOARD

DENSITY  882  1020  600    0  219   28  1116  8883
VICTIM RTANKS RATVEH RPTADA RAADA  RHELO  RACFT  RLTARM RTRPS
CEM NO  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)

SHOOTER/DENSITY

BTANKS     328  138.40 103.00  10.40  0.    30.40  0.    70.60  63.20

BATVEH     362   47.00  96.60  12.20  0.    14.20  0.    49.20 101.40

BRPV         9   0.     0.     0.     0.     0.    0.     0.     0.

BHELO      152   60.00  75.80  10.00  0.     8.40  0.     1.20  14.00

==TOTAL KILLS==  413.60 470.80 126.20  0.    88.20   6.40 344.001340.60

==PERCENT LOSS=   46.9%  46.2%  21.0%  0. %  40.3%  22.9%  30.8%  15.1%


     RED  KILLER VS BLUE VICTIM SCOREBOARD

DENSITY  328   362     9   152    45     0   216    192
VICTIM BTANKS BATVEH BRPV   BHELO  BLACFT BAADA  BPTADA BLTARM
CEM NO  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)  (  0)

SHOOTER/DENSITY

RTANKS     882   84.80  60.20  0.    17.80  0.     0.     6.40  16.00

RATVEH    1020   27.20  44.80  0.    12.60  0.     0.    19.40  18.80

RPTADA     600   0.     0.     0.     0.     5.60  0.     0.     0.

RAADA        0   0.     0.     0.     0.     0.    0.     0.     0.

==TOTAL KILLS==  171.40 207.00  0.    37.80   5.60  0.   107.60 100.60

==PERCENT LOSS=   52.3%  57.2%  0. %  24.9%  12.4%  0. %  49.8%  52.4%
```

13-6. POSTPROCESSOR - DIRECT FIRE SUMMARY BY REP. The direct fire summary consists of two different reports. Both reports are broken out by replication and totals giving the the minimum, maximum, average, standard deviation, and coefficient of variation.

a. Required Files

(1) **Input Files.** The COSAGE COMPRESS-55 of all replications.

(2) **Output Files.** FORTRAN Files 11 (FIRER) and 12 (TARGET).

b. First Report. This report consists of two parts, a summary of rounds, kills, and kills/round sorted by firing equipment and weapon combination. The second part consists of the total losses of each equipment. (This report can be found in file DFFIR.OUT.)

```
                    EXAMPLE:  PART 1

FIRER = RT72     R72100      SUMMARY OF ROUNDS   ON:

                    UAGS      UHC64H    UHMVAM    UHMVT2    UM3CFV    TOTAL
 1                    38         7        62        13        18       214
 2                     4         6        53        18        34       209
 3                     1         3        37         8        22       134
 4                     8        56        93        18        37       333
 5                     2         2        47         7        24       158

MIN                    1         2        37         7        18       134
MAX                   38        56        93        18        37       333
AVG                10.60     14.80     58.40     12.80     27.00    209.60
DEV                15.55     23.12     21.37      5.26      8.12     76.85
CV                  1.47      1.56       .37       .41       .30       .37

FIRER = RT72     R72100      SUMMARY OF KILLS    ON:

                    UAGS      UHC64H    UHMVAM    UHMVT2    UM3CFV
 1                     4         0        31         7        10
 2                     1         0        27         7        15
 3                     1         1        18         6        12
 4                     2         5        35         5        15
 5                     1         0        26         5        19

MIN                    1         0        18         5        10
MAX                    4         5        35         7        19
AVG                 1.80      1.20     27.40      6.00     14.20
DEV                 1.30      2.17      6.35      1.00      3.42
CV                   .72      1.81       .23       .17       .24
```

```
FIRER = RT72     R72100     SUMMARY OF KILL/RND ON:

               UAGS     UHC64H    UHMVAM    UHMVT2    UM1A1     UM3CFV
 1              .11       .00       .50       .54       .77       .56
 2              .25       .00       .51       .39       .54       .44
 3             1.00       .33       .49       .75       .69       .55
 4              .25       .09       .38       .28       .67       .41
 5              .50       .00       .55       .71       .68       .79

MIN             .11       .00       .38       .28       .54       .41
MAX            1.00       .33       .55       .75       .77       .79
AVG             .17       .08       .47       .47       .67       .53
DEV             .05       .03       .03       .06       .04       .04
CV              .30       .39       .06       .13       .06       .08

               EXAMPLE:  PART 2

RT72        TOT LOSS
 1               109
 2               101
 3                97
 4               101
 5               104

MIN               97
MAX              109
AVG           102.40
DEV             4.45
CV               .04
```

c. Second Report. This report consists of two parts: (1) a summary of kills and rounds sorted by target, and (2) the total rounds fired by each equipment and weapon combination. (This report can be found in file DFTGT.OUT.)

```
               EXAMPLE:  PART 1

TARGET = RT72       SUMMARY OF KILLS    FROM:

               UAC64H    UHC64H    UM1A1     UM2IFV    UM3CFV    TOTAL
               UHELFH    UHELFH    UM1120    UTW2BT    UTW2BT
 1                  8         2         2         1         2       15
 2                  7         2         1         1         2       13
 3                  6         0         2         0         3       11
 4                  8         0         0         2         2       12
 5                  6         2         3         1         1       13

MIN                 6         0         0         0         1       11
MAX                 8         2         3         2         3       15
AVG              7.00      1.20      1.60      1.00      2.00    12.80
DEV              1.00      1.10      1.14       .71       .71     1.48
CV                .14       .91       .71       .71       .35      .12
```

```
TARGET = RT72       SUMMARY OF ROUNDS   FROM:

              UAC64H     UHC64H     UM1A1      UM2IFV     UM3CFV
              UHELFH     UHELFH     UM1120     UTW2BT     UTW2BT
 1                23          6         56         12          3
 2                25         10         13          7          4
 3                35          0         20         11          8
 4                31          0         42         16         10
 5                21         19         31          2          1

MIN               21          0         13          2          1
MAX               35         19         56         16         10
AVG            27.00       7.00      32.40       9.60       5.20
DEV             5.83       7.94      17.18       5.32       3.70
CV               .22       1.13        .53        .55        .71

              EXAMPLE:  PART 2

RT72     R72100     TOT RNDS
 1                388
 2                396
 3                387
 4                414
 5                360

MIN               360
MAX               414
AVG            389.00
DEV             19.49
CV                .05
```

13-7. POSTPROCESSOR - INDIRECT FIRE SUMMARY BY REP. The indirect fire summary consists of four different reports. All reports are broken out by replication and totals giving the the minimum, maximum, average, standard deviation, and coefficient of variation.

a. Required Files

(1) Input Files. The COSAGE COMPRESS-16 of all replications.

(2) Output Files. FORTRAN Files 11 (FIRER), 12 (MUN), 13 (TARGET), and 14 (TYPE).

b. First Report. This report consists of two parts, a summary of kills, rounds, and kills/round sorted by equipment, munition, and type of munition combination. The second part consist of the total losses of each equipment. (This report can be found in file IFFIR.OUT.)

```
               EXAMPLE:  PART 1

1FIRER = RH155Z   MUNITION = R825     TYPE = SMOKE
 ROUNDS AT:
      *TOTAL
  1        4
  2        8
  3        4
  4        2
  5       12

1FIRER = RH155Z   MUNITION = RX[illegible]8   TYPE = PGM
 KILLS TO:
      UFISTV  UHMVAM  UM3CFV
  1        0       0       0
  2        0       0       1
  3        -       -       -
  4        -       -       -
  5        -       -       -

 MIN       0       0       0
 MAX       0       0       1
 AV       .0      .0      .2
 SD       .0      .0      .4
 CV       .0      .0     2.2

 ROUNDS AT:
      UFISTV  UHMVAM  UM3CFV  *TOTAL
  1        8       8       8       8
  2        4       4       4       4
  3        -       -       -       -
  4        -       -       -       -
  5        -       -       -       -

 MIN       0       0       0       0
 MAX       8       8       8       8
 AV      2.4     2.4     2.4     2.4
 SD      3.6     3.6     3.6     3.6
 CV      1.5     1.5     1.5     1.5

 KILLS/ROUND:
      UFISTV  UHMVAM  UM3CFV
  1     .000    .000    .000
  2     .000    .000    .250
  3        -       -       -
  4        -       -       -
  5        -       -       -

 MIN    .000    .000    .000
 MAX    .000    .000    .250
 AV     .000    .000    .050
 SD     .000    .000    .112
 CV     .000    .000   2.236
```

```
                EXAMPLE:  PART 2

1                           TOTAL LOSSES

       R577CP  RH155Z  RAFAST  RAGS    RFAFO   RFATP   RFDCVH  RFISTV
  1        18      16      12     0       45     416       2       7
  2        19      16      11     0       58     396       6       7
  3        23      15       9     0       59     450       3       7
  4        23      19      12     0       51     490       2       6
  5        20      15      12     0       49     417       3       9

 MIN       18      15       9     0       45     396       2       6
 MAX       23      19      12     0       59     490       6       9
 AV      20.6    16.2    11.2    .0     52.4   433.8     3.2     7.2
 SD       2.3     1.6     1.3    .0      6.0    36.9     1.6     1.1
 CV        .1      .1      .1    .0       .1      .1      .5      .2
```

c. Second Report. This report consists of a summary of kills, rounds, and kills/round sorted by munition. (This report can be found in file IFMUN.OUT.)

```
                EXAMPLE:

1 MUNITION = R26SDM   TYPE = PGM
 KILLS TO:

       U577CP  UAFAS   UFISTV  UGLLDV  UHMMWV  UHMVAM
  1         0      30       0       0       0       0
  2         -      37       0       0       0       1
  3         1      41       -       -       -       -
  4         -      26       0       -       -       0
  5         0      13       -       0       -       0

 MIN        0      13       0       0       0       0
 MAX        1      41       0       0       0       1
 AV        .2    29.4      .0      .0      .0      .2
 SD        .4    10.9      .0      .0      .0      .4
 CV       2.2      .4      .0      .0      .0     2.2

 ROUNDS AT:

       U577CP  UAFAS   UFISTV  UGLLDV  UHMMWV  UHMVAM   *TOTAL
  1         6     176       3       3       3       6      154
  2         -     250       3       3       3       6      222
  3        10     221       -       -       -       -      195
  4         -     169       3       -       -       3      145
  5         2      80       -       3       -       3       71

 MIN        0      80       0       0       0       0       71
 MAX       10     250       3       3       3       6      222
 AV       3.6   179.2     1.8     1.8     1.2     3.6    157.4
 SD       4.3    64.6     1.6     1.6     1.6     2.5     57.5
 CV       1.2      .4      .9      .9     1.4      .7       .4
```

```
KILLS/ROUND:

     U577CP  UAFAS   UFISTV  UGLLDV  UHMMWV  UHMVAM
  1    .000    .170    .000    .000    .000    .000
  2       -    .148    .000    .000    .000    .167
  3    .100    .186       -       -       -       -
  4       -    .154    .000       -       -    .000
  5    .000    .162       -    .000       -    .000

MIN    .000    .148    .000    .000    .000    .000
MAX    .100    .186    .000    .000    .000    .167
AV     .020    .164    .000    .000    .000    .033
SD     .045    .015    .000    .000    .000    .075
CV    2.236    .090    .000    .000    .000   2.236


1 MUNITION = R485A2   TYPE = ILLUM
 ROUNDS AT:

        *TOTAL
  1         -
  2         -
  3         4
  4         4
  5         -
```

d. Third Report. This report consists of a summary of kills sorted by target. (This report can be found in file IFTGT.OUT.)

```
              EXAMPLE:

1                        SUMMED BY TARGET

TARGET = RT72          KILLS FROM:

     TOTKLS  UM26    UM483   UM549   UM760   UM795   UM913   UXM915
  1      31      1       0       2       4      24       0       0
  2      36      5       0       0       1      27       3       0
  3      39      8       1       3       5      22       0       0
  4      30      4       0       3       0      22       1       0
  5      32      4       0       2       6      19       1       0

MIN      30      1       0       0       0      19       0       0
MAX      39      8       1       3       6      27       3       0
AV     33.6    4.4      .2     2.0     3.2    22.8     1.0      .0
SD      3.8    2.5      .4     1.2     2.6     2.9     1.2      .0
CV       .1     .6     2.2      .6      .8      .1     1.2      .0
```

e. Fourth Report. This report consists of a summary of kills sorted by type munition. (This report can be found in file IFTYP.OUT.)

```
                EXAMPLE:

1                                  SUMMED BY TYPE


 TYPE = PGM     # KILLS TO :

      ROUNDS  U577CP   UAFAS  UFISTV  UGLLDV  UHMMWV  UHMVAM  UHMVT2
  1      162       0      30       0       0       0       0       0
  2      226       0      37       0       0       0       1       0
  3      195       1      41       0       0       0       0       0
  4      145       0      26       0       0       0       0       0
  5       71       0      13       0       0       0       0       0

 MIN      71       0      13       0       0       0       0       0
 MAX     226       1      41       0       0       0       1       0
 AV    159.8      .2    29.4      .0      .0      .0      .2      .0
 SD     58.6      .4    10.9      .0      .0      .0      .4      .0
 CV       .4     2.2      .4      .0      .0      .0     2.2      .0

 TYPE = SMOKE   # KILLS TO :

      ROUNDS    NONE
  1       34       0
  2       42       0
  3       32       0
  4       21       0
  5       26       0

 MIN      21       0
 MAX      42       0
 AV     31.0      .0
 SD      8.0      .0
 CV       .3      .0
```

13-8. POSTPROCESSOR - TACAIR/AIRDEF. This program consist of two reports. the TACAIR summary and the AIRDEF summary.

a. Required files:

(1) Input Files. The COSAGE BREAKPOINT FILE of all replications.

(2) Output Files. FORTRAN 11 (TACAIR) and 12 (AIRDEF).

b. The TACAIR summary consists of three parts. The first part is the "back to base" summary. It consists of the mission number. the target unit number. request time, mission type, start time. aircraft type., time on target, number of aircraft. first pass over target, number aborted, end mission time. and number survived. The second part gives the results of individual CAS mission kills. The third part is the CAS effectiveness by replication and the average over all of the replications. It is listed by aircraft type, mission type, number of mission. number of sorties, losses. losses per sortie, and total aborts.

```
                    EXAMPLE:  PART 1

 1
                                      B A C K   T O   B A S E

MISSION# SIDE TARGET# REQ.TME MISS.TYPE STR.TME AC TYPE  TOT  NUMAC PASS NUMABT

  3        RED   11340   10.02   ON.CLL    10.02  RAC64L  10.02   3  10.20    0
  1        RED   22240    9.91   ON.CLL     9.91  RAC64H   9.91   4  10.09    0
  4        RED   12240   10.53   ON.CLL    10.53  RAC64H  10.53   1  10.71    0
 56        RED   11210   12.21   ON.CLL    13.14  RAC64H  13.14   4  13.34    0
 59        RED   21220   12.72   ON.CLL    12.72  RAC64L  12.72   3  12.90    0
  1       BLUE   51110    5.82   PREPLN     5.82  UAC64H   5.82   2   6.02    0
  3       BLUE   51130    5.82   PREPLN     5.82  UAC64H   5.82   2   6.02    0
  8       BLUE   52110    5.83   PREPLN     5.83  UAC64H   5.83   2   6.02    0
 22       BLUE   51130   10.00   ON.CLL    10.00  UAC64H  10.00   4  10.20    0
 23       BLUE   51220   10.00   ON.CLL    10.00  UAC64H  10.00   4  10.20    0

  ENDMISS NUMSUR

   12.58    3
   13.08    4
   13.32    4
   13.91    1
   15.73    4
   16.13    3
    8.68    2
    8.81    2
    8.94    2
   12.96    4
   13.09    4

                    EXAMPLE:  PART 2

     CAS MISSION# =   3          SIDE =  RED          AC TYPE = RAC64L

               UFISTV  UFAFO   UHMVAM  UM3CFV  UM2IFV
                 0       0       0       0       0       0       0       0
                 0       0       0       0       1       0       0       0

     CAS MISSION# =   1          SIDE =  RED          AC TYPE = RAC64H

               UFISTV  UFAFO   UHMVAM  UM3CFV  UM1A1
                  0       0       0       0       3       0       0       0
                  0       0       0       0       0       0       0       0

     CAS MISSION# =   5          SIDE = BLUE          AC TYPE = UAC64H

               RFISTV  RFAFO   RHMVAM  RM3CFV  RM1A1
                  0       0       0       0       2       0       0       0
                  0       0       1       1       0       0       0       0
                 EXAMPLE:  PART 3

                        NUMBER    NUMBER               LOSSES
AIRCRAFT  MISSION         OF        OF                   PER         TOTAL
  TYPE      TYPE        MISSION   SORTIES     LOSSES   SORTIES       ABORTS

 RAC64L    ON.CLL         5.        15.         0.       .00          0.
 RAC64H    ON.CLL        14.        44.         0.       .00          0.
 UAC64H    ON.CLL        20.        76.         0.       .00          1.
 UAC64H    PREPLN        20.        40.         0.       .00          2.


                        NUMBER    NUMBER               LOSSES
AIRCRAFT  MISSION         OF        OF                   PER         TOTAL
  TYPE      TYPE        MISSION   SORTIES     LOSSES   SORTIES       ABORTS

 RAC64L    ON.CLL         4.         7.         0.       .00          2.
 RAC64H    ON.CLL        14.        44.         0.       .00          0.
 UAC64H    ON.CLL        14.        54.         0.       .00          1.
 UAC64H    PREPLN        20.        40.         0.       .00          0.


                        NUMBER    NUMBER               LOSSES
AIRCRAFT  MISSION         OF        OF                   PER         TOTAL
  TYPE      TYPE        MISSION   SORTIES     LOSSES   SORTIES       ABORTS

 RAC64L    ON.CLL         4.        12.         0.       .00          0.
 RAC64H    ON.CLL        13.        43.         0.       .00          0.
 UAC64H    ON.CLL        15.        58.         0.       .00          1.
 UAC64H    PREPLN        20.        40.         0.       .00          1.


                AVERAGE SUMMARY FOR  5 REPLICATIONS

                   NUMBER   NUMBER           LOSSES
AIRCRAFT  MISSION    OF       OF               PER       AVERAGE       ABORT
  TYPE      TYPE   MISSION  SORTIES  LOSSES  SORTIES      ABORTS        RATE

 RAC64L    ON.CLL    3.8      10.4      .4     .04          .40          .04
 RAC64H    ON.CLL   13.4      43.4      .0     .00          .00          .00
 UAC64H    ON.CLL   16.6      62.8      .8     .01          .80          .01
 RAC64L    PREPLN     .0        .0      .0     .00          .00          .00
 RAC64H    PREPLN     .0        .0      .0     .00          .00          .00
 UAC64H    PREPLN   20.0      40.0     1.0     .02         1.00          .02
```

b. The AIRDEF summary provides data on the sensor name, the sensor numbers, the average number detected, the average number engaged, average number of shots, average number of kills, and average rounds per kill.

```
            EXAMPLE:

      *******************************************
      SENSOR NAME IS :  RADSX3
        ****** NO DATA FOR SENSOR ******
      *******************************************
      SENSOR NAME IS :  RADSX4
      SENSOR NUMBER :  33204
      SENSOR NUMBER :  21102
      SENSOR NUMBER :  34101
      SENSOR NUMBER :  32203

      NUMBER OF AIRCRAFT   :     94.69
      NUMBER DETECTED :          10.13
      NUMBER OF SHOTS :           1.81
      NUMBER OF KILLS  :           .13
      ROUNDS PER KILL  :         14.50
      *******************************************
```

13-9. POSTPROCESSOR - TARGET REPORT. This program consists of two parts. The first part provides information on target reports and fire missions. The second part provides information on counterfire missions.

a. Required files:

(1) **Input Files.** The SIMU43 of all replications.

(2) **Output Files.** SIMU11.

b. The first part consists of the target reports generated, the number of target reports which did not call fire missions, and the total fire missions called, sorted by sensor type and model sensor. Data is also given on the class of munitions and the type of units that fired the mission.

```
                EXAMPLE:  PART 1

SENSOR TYPE FO   TR'S GENERATED    6551.4 #TR'S WHICH DID NOT CALL FM'S   2291.
               TTL FIRE MISSNS CALLED    7345.8

      MODEL UH5802  TR'S GENERATED  1092.  #TR'S WHICH DID NOT CALL FM  460.4
                    TOTAL FIRE MISSIONS CALLED    996.8

           CLASS ICM    FM'S CALLED     341.4
               OF THIS CLASS,  182.4 FM'S WERE FIRED BY UH-BY7
               OF THIS CLASS,  159.  FM'S WERE FIRED BY UL-ICO

           CLASS HE     FM'S CALLED     642.2
               OF THIS CLASS,  642.2 FM'S WERE FIRED BY UH-BY7

           CLASS LGM    FM'S CALLED      13.2
               OF THIS CLASS.   13.2 FM'S WERE FIRED BY UH-BY7
SENSOR TYPE AD   TR'S GENERATED       0.  #TR'S WHICH DID NOT CALL FM'S      0.
               TTL FIRE MISSNS CALLED       0.
```

c. The second part provides the percent of counterfire missions that each unit fired. It is sorted by sensor type and class if munition.

```
                    EXAMPLE:  PART 2

 DISTRIBUTION OF COUNTERFIRE MISSIONS

      ##### SENSOR TYPE IS CM   #####

      ##### SENSOR TYPE IS CB   #####

        MODEL IS BTPQ37

          CLASS IS PGM

      COUNTER FIRE MISSIONS WERE    13.4 % OF MISSION FIRED BY BL-ICO

          CLASS IS ICM

      COUNTER FIRE MISSIONS WERE    10.8 % OF MISSION FIRED BY BH-BY1

          CLASS IS PGM

      ##### SENSOR TYPE IS SD   #####
```

13-10. POSTPROCESSOR - MINES. This summary gives the number of AT, AP, RAAM, point, counterbattery, and reseed mines.

a. Required files:

(1) Input Files. The SIMU47 of all replications.

(2) Output Files. SIMU11.

```
                    EXAMPLE:

     NUMBER OF VOLCAN  , WAS COUNTED AT     11.
                          NUMBER OF AT MINES  8800.
                          NUMBER OF AP MINES  1760.

    NUMBER OF GEMMS   , WAS COUNTED AT     43.9000
                          NUMBER OF AT MINES  35119.9990
                          NUMBER OF AP MINES  7024.0000

     NUMBER OF BARRIE  , WAS COUNTED AT     63.6000
                          NUMBER OF AT MINES  50879.9990
                          NUMBER OF AP MINES  10176.0000
```

```
NUMBER OF RAAM.A --   1592.3438    NUMBER OF RAAM.B --   1560.
NUMBER OF ADAM.A --    858.2813    NUMBER OF ADAM.B --    195.

NUMBER OF POINT ------  59.3750
NUMBER OF COUNTERBTRY  118.5625
NUMBER OF RESEED -----  48.7500
```

13-11. POSTPROCESSOR - HELO/SMARTMUNS REPORT. This program consists of two reports. The first report provides information on helicopter missions. The second report provides data on the smart munitions.

a. Required files:

(1) **Input Files.** The SIMU62 of all replications.

(2) **Output Files.** SIMU11 (HELO) AND SIMU12 (SMARTMUNS).

b. The first report consists of the mean, standard deviation, minimum, and maximum of sorties flown, flight hours, and aborts by individual helicopter.

```
                    EXAMPLE:

                          ------SORTIES FLOWN-----
                       -----OVER  2 REPLICATIONS-----


                  NAME        MEAN      STD DEV      MIN       MAX
                  ----        ----      -------      ---       ---
                  UHC58C      0.         0.           0         0
                  UHC58D     82.        17.          65        99
                  UHCAH1     53.         0.          53        53
                  UHCH64    184.50      51.50       133       236
                  UHCLHX      0.         0.           0         0
                  RHIPE       0.         0.           0         0
                  RHINDE    195.50      29.50       166       225
                  RHAVOC     85.50       3.50        82        89


                          ------FLIGHT HOURS-----
                       -----OVER  2 REPLICATIONS-----


                  NAME        MEAN      STD DEV      MIN       MAX
                  ----        ----      -------      ---       ---
                  UHC58C      0.         0.          0.        0.
                  UHC58D     53.03      27.75       25.28     80.78
                  UHCAH1     58.67       0.93       57.75     59.60
                  UHCH64    121.56      72.48       49.07    194.04
                  UHCLHX      0.         0.          0.        0.
                  RHIPE       0.         0.          0.        0.
                  RHINDE    122.93      21.44      101.49    144.37
                  RHAVOC     52.27       1.90       50.37     54.17
```

```
                      ------ABORTS-----
                 -----OVER  2 REPLICATIONS-----


         NAME        MEAN     STD DEV     MIN      MAX

         UHC58C      0.          0.         0        0
         UHC58D      0.          0.         0        0
         UHCAH1      0.          0.         0        0
         UHCH64      0.          0.         0        0
         UHCLHX      0.          0.         0        0
         RHIPE       0.          0.         0        0
         RHINDE      0.          0.         0        0
         RHAVOC      0.          0.         0        0
```

c. The second report consists of kills, rounds, and operational PKs of each smart munition against each target.

```
               EXAMPLE:

                     M712     VS   RT72
KILLS     123.70    SUB OPER PK     1.4536    RND OPER PK     2.1176
ROUNDS     49.      SUBS/KILL       0.4365    RNDS/KILL       0.3776

                     M26SDM   VS   RH152Z
KILLS      15.      SUB OPER PK     0.0024    RND OPER PK     1.2643
ROUNDS    768.      SUBS/KILL       3.5764    RNDS/KILL       4.6624
```

APPENDIX A

STUDY CONTRIBUTORS

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APPENDIX B

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APPENDIX C

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GLOSSARY

ABBREVIATIONS, ACRONYMS, AND SHORT TERMS

ADA	air defense artillery
ADAM	area denial artillery munition
AO	aerial observer
ATCAL	Attrition Calibration (model)
ATGM	antitank guided missile
BAI	battlefield air interdiction
BMNT	beginning morning nautical twilight
CAA	US Army Concepts Analysis Agency
CB	counterbattery
CEM	Concepts Evaluation Model
CEP	circular error probable
CFR	counterfire radar operator
CM	countermortar
CNVEO	US Army Center for Night Vision and Electro-optics
COSAGE	Combat Sample Generator (model)
CS	combat support
DFFB	distance from FLOT bands
DS	direct support
ECCM	electronic counter-countermeasure(s)
ECM	electronic countermeasure(s)
EENT	end evening nautical twilight
FAC	forward air controller
FARRP	forward area rearm and refuel point
FASCAM	family of scatterable mines
FDC	fire direction center

FIST	fire support team
FL	flash
FLOT	forward line of own troops
FO	forward observer
FORCEM	Force Evaluation Model
GATOR	TACAIR-delivered scatterable mines
GEMSS	ground emplaced mine scattering system
GS	general support
GSR	general support reinforcing; ground surveillance radar
HE	high explosive
ICM	improved conventional munition(s)
JSEAD	joint suppression of enemy air defense
K/V	killer/victim
LCM	life cycle management
LGM	laser guided munitions
LOS	line of sight
MOBA	military operation in built-up areas
MOPMS	modular pack mine system
MT	megaton(s)
PD	probability of detection
PDB	passive detection base
POL	petroleum, oils, and lubricants
PGM	precision guided munitions
RAAM	remote antiarmor mine system
RALPH	Reduction ATCAL Linkage Phase I
RAM	reliability, availability, and maintainability
RAP	rocket assisted projectile

RPV	remotely piloted vehicle (old name; see UAV)
SADARM	sense and destroy armor
SD	sound
TACAIR	tactical air
TOE	table(s) of organization and equipment
TOT	time on target
UAV	unmanned air vehicle
VT	variable timing