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THE NMCSSC QUICK-REACTING GENERAL WAR GAMING SYSTEM USERS MANUAL, VOLUME III. WEAPON ALLOCATION SUBSYSTEM

Richard L. Page, et al

National Military Command System Support Center
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THE NMCSSC QUICK-REACTING GENERAL WAR GAMING SYSTEM (QUICK)

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WEAPON ALLOCATION SUBSYSTEM

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The NMCSSC Quick-Reacting General War Gaming System (QUICK) is used to generate missile and bomber plans suitable for strategic war gaming, and to simulate execution of the planned events. The Users Manual consists of five volumes which are intended for the user/analyst who is concerned with preparing the data base for a war game, selecting optional features of QUICK, designating control parameters, submitting computer jobs, and analyzing computer output. This volume provides instructions for using the Weapon Allocation Subsystem. It describes control parameters, computer job structure, and computer output from QUICK.

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Computer System Manual CSM UM 9-74

1 June 1974

THE NMCSSC QUICK-REACTING GENERAL WAR GAMING SYSTEM (QUICK)

Users Manual

Volume III - Weapon Allocation Subsystem

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CONTENTS

Section | Page

Section Page

Section	Page

ILLUSTRATIONS

Figure		Page
44	Weapon Allocation Print (Print Option 2)	83
45	Weapon Allocation Summary Print (Print Option 4)	85
46	Fixed Missile Information Print	87
47	Range Change Information Print	89
48	Minimum Range Information Print	90
49	MIRV Weapon Restriction Information Print	90
50	FLAG Restriction Information Print	91
51	Country Location Code Restrictions Information Print	92
52	Print Option 5 - Target Weight Information	93
53	Print Option 6 -- Basic Target Data	95
54	Print Option 7 -- Weapon/Target Interaction Data	96
55	Print Option 11--- Initial Values of Lagrange Multipliers	97
56	Print Option 23 -- Timing Information	98
57	Print Option 25 -- Inactive Array	99
58	Print Option 26 -- Bomber Penetration Probability	101
59	Print Option 8-- RISK Array Print	102
60	Print Option 9 -- Marginal Value for Currently Allocated Weapons	103
61	Print Option 10 -- Weapon Profit and Efficiency Information	105
62	Print Option 12 -- Weapon/Target Calculation Synopsis ...	106
63	Print Option 13 -- Payoff Calculations	108
64	Print Options 14 and 15 -- Potential Weapon Detailed Calculations	109
65	Print Option 19 -- Planning Factors - Terminal BMD Targets	111
66	Print Option 20 -- WADOUT Summary	112
67	Print Option 21 -- Allocation Error Estimates	113
68	Print Option 22 -- Marginal Value of Potential Weapons ..	114
69	Messages of Decision by Subroutine STALL	115
70	Print Option 27 -- Missile Rate of Return	116
71	Print Option 28 -- Terminal BMD Target Allocation	116
72	Print Option 29 -- Salvoed Group Information	117
73	Print Option 30 -- Bomber Payload Indicators	118
74	IMATCH Print -- Target Values Calculations for MINKILL/ MAXKILL	119
75	Control Program Error Messages	120
76	ALLOCATE Function Error Messages	120
77	FLAGREST Function Error Message	124
78	LOCREST Function Error Messages	124
79	READMUL Function Error Message	124
80	File Utilization: Operation of EVALALOC After ALOC	126
81	File Utilization: Operation of EVALALOC After PLANOUT ..	127
82	EVALALOC Filehandler Buffer Utilization - Operation After ALOC	127
83	EVALALOC Filehandler Buffer Utilization -- Operation After PLANOUT	128
84	EVALALOC General Control Card	130

Figure		Page

TABLES

ABSTRACT

The computerized QUICK-Reacting General War Gaming System (QUICK) will accept input data, automatically generate global strategic nuclear war plans, simulate the planned events, and provide statistical output summaries. QUICK has been programmed in FORTRAN for use on the NMCSSC HIS 6080 computer system.

The QUICK Users Manual consists of five volumes: Volume I, Data Assembly Subsystem; Volume II, Weapon/Target Identification Subsystem; Volume III, Weapon Allocation Subsystem; Volume IV, Sortie Generation Subsystem; Volume V, Simulation Subsystem. The Users Manual complements the other QUICK Computer System Manuals to facilitate application of the war gaming system. This volume, Volume III, provides instructions for using the Weapon Allocation subsystem. It is intended for the NMCSSC user/analyst who is concerned with preparing the data base for a war game, selecting optional features of the system, designating control parameters, submitting computer jobs, and analyzing computer output. Companion documents are:

a. PROGRAM MAINTENANCE MANUAL
Computer System Manual CSM MM 9-74 (five volumes)
Provides detailed instructions for maintenance of the system

b. COMPUTER OPERATION MANUAL
Computer System Manual CSM OM 9-74
Provides instructions and procedures for the computer operators

c. TECHNICAL MEMORANDUM
Technical Memorandum TM 90-74
Provides analytical relationships and methodology discussion for users of the system

d. ANALYTICAL MANUAL (three volumes)
Computer System Manual CSM AM 9A-67
Provides a description of the system methodology for non-programmer analysts

e. FUNCTIONAL DESCRIPTION
System Planning Manual SPM FD 90-74
Provides a non-technical description of the system for senior management personnel

SECTION 1. GENERAL

1.1 Purpose

This volume of the QUICK Users Manual is intended to inform the NMCSSC user/analyst on how to prepare control cards; structure execution (run) decks; prepare computer job requests; and understand the associated computer output, to include the recognition of error messages for the Weapon Allocation subsystem of QUICK. It complements information contained in the Analytical Manuals on the QUICK System. The abstract of this document references other documents describing QUICK.

1.2 General Description

The Weapon Allocation subsystem uses the output from program PLANSET of the Weapon/Target Identification subsystem and produces a plan using the weapon resources specified to maximize the expected target value destroyed. The subsystem consists of programs PREPALOC, ALOC, EVALALOC, and ALOCOUT, as shown in figure 1. Figure 2 shows the relationship of the Weapon Allocation subsystem to other QUICK subsystems in terms of procedural and information flow.

The programs and supporting subroutines of this subsystem are used to define information for use in later processes and allocate given weapons to targets to optimize expected value destroyed. Figure 3 shows the subsystem data flow schematic. The spill tape from program ALOCOUT is the input to program FOOTPRNT which initiates the Sortie Generation subsystem.

The first program, PREPALOC, precomputes much of the information required by later processors. It organizes the input data for efficient use by other components of the Weapon Allocation subsystem. In addition, it provides capabilities for planning factor modification and fixed weapon assignment specification.

The basic data manipulated by this program include the distance and attrition factors for the weapons, the geographic description of the air defense zones and the bomber penetration corridors, the weapon characteristic tables (e.g., warhead and payload tables), and the target characteristics.

The next program, ALOC, performs the allocation of weapons to targets. Using a generalized Lagrange multiplier method, an optimal allocation is generated subject to several forms of user-input allocation constraints. These constraints include specification of minimum and maximum desired damage levels, restriction of weapons to specified subsets of the target system, and specification of weapons allocated to specific targets by the user. Within these constraints, the program generates the allocation which maximizes the expected value destroyed in

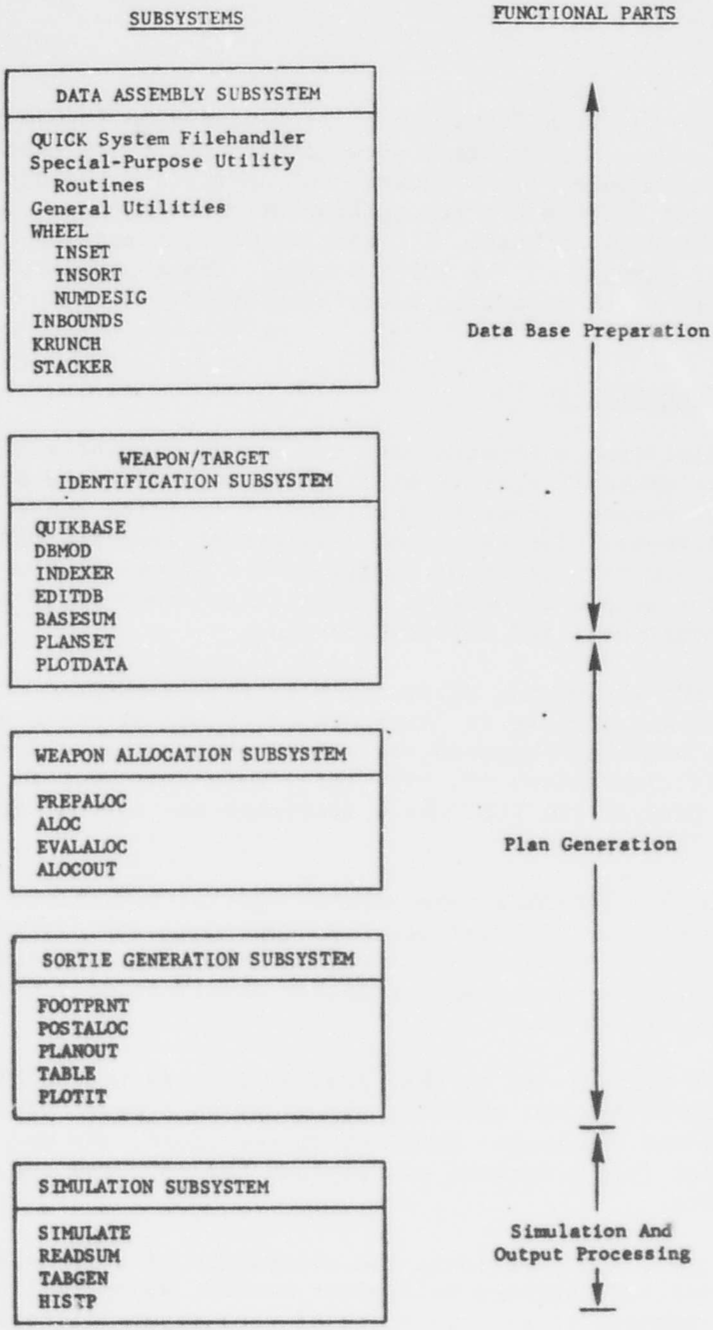

Figure 1. Major Subsystems of the QUICK System

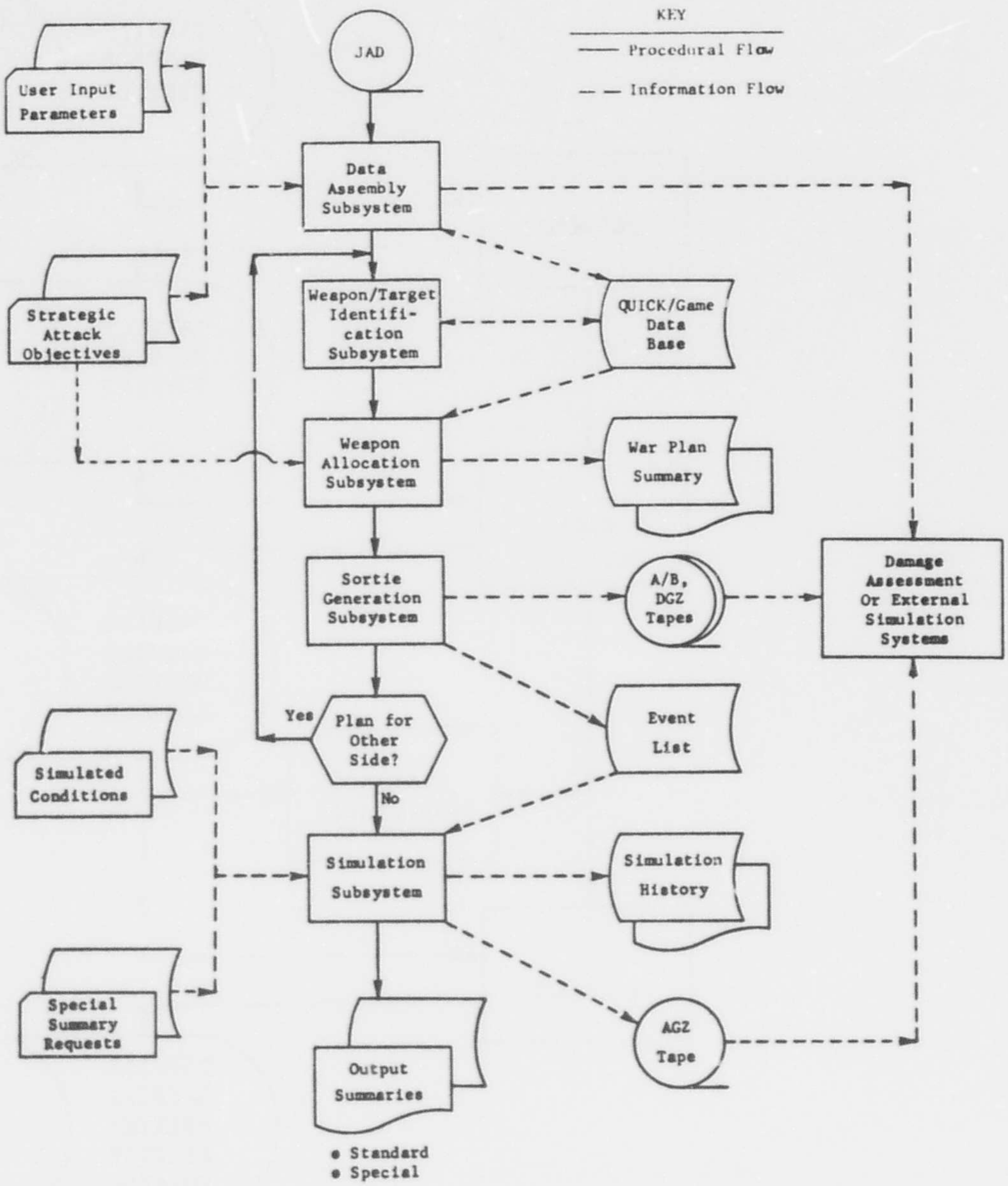

Figure 2. Procedure and Information Flow in QUICK/HIS 6080

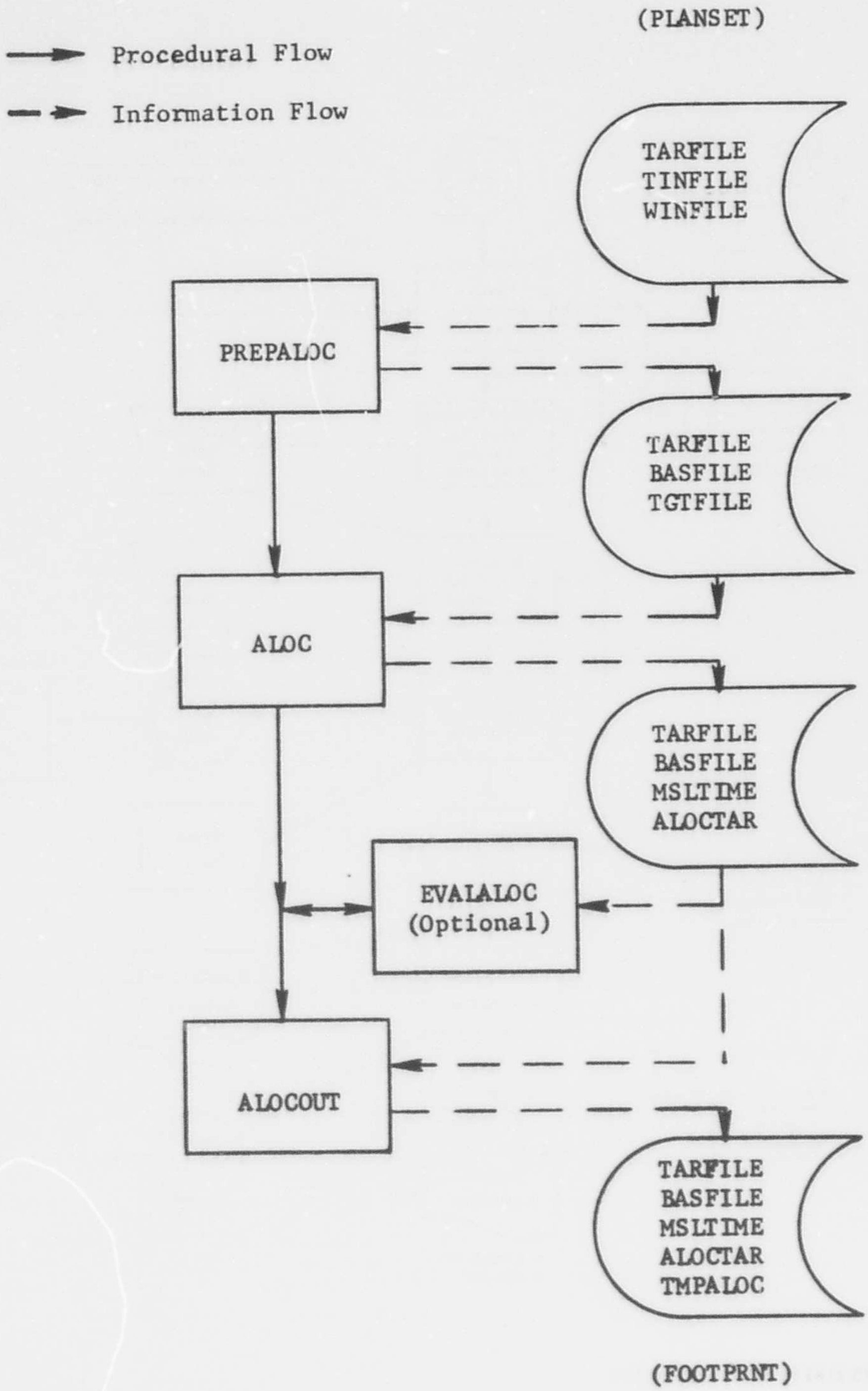

Figure 3. Weapon Allocation Subsystem - Data Flow

the target system. Program ALOC is also referred to as the Allocator.

Referring again to figure 3, the input to PREPALOC consists of two files, WINFILE (Weapon Input File) and TINFILE (Target Input File). TARFILE is used only in program PLANOUT of the Sortie Generation Subsystem.

The front end of the weapon file carries a variety of other miscellaneous information. It carries information on penetration and depenetration corridors, refueling locations, and recovery points needed to computerize bomber routing distances. It also contains information on air defense zone boundaries needed by the Simulator. This information is used by PREPALOC in preparing bomber route information.

The target input file (TINFILE) includes three types of targets:

a. Simple target: one target element

b. Complex target: several target elements either exactly collocated or well within the lethal radius of a single weapon so that they must be treated as a single target complex

c. Multiple targets: actually several independent identical targets such as separate missile silos in a Minuteman squadron that are close together relative to the range of the weapon systems, but far enough apart that each target element must be treated as an independent aim point.

Each complex target is represented on the file in an aggregated form representing the total value of the complex as required by ALOC. This aggregated representation on TINFILE is paralleled by auxiliary detailed target data on WINFILE which includes a specific representation of each target element as a separate simple target. Similarly, each multiple target is represented on TINFILE by a single representative target (of the appropriate multiplicity). The representative target is paralleled by a list of specific coordinates for each target element in the auxiliary target data on WINFILE. These detailed target element data on multiple and complex targets are transferred directly to the BASFILE so that it can be used later:

a. To evaluate the allocation

b. To develop specific aiming offsets for the targeting of complexes

c. To provide specific target coordinates for the detailed plans.

The weapon data, organized by "groups," with type characteristic data and payload data are then read. Distances from each bomber group to each penetration corridor are computed. Information is organized in a format required for it to be transmitted to the allocator via the BASFILE. The weapon group and corresponding weapon type data are also placed on the

BASFILE one group at a time to be used for reference by POSTALOC and PLANOUT. The representative targets (simple, complex, and multiple) on TINFILE are then processed and formatted as required by the allocator (ALOC) and placed in the target file (TGTFILE). A specific depenetration route is then associated with each target, and the relevant depenetration and recovery distances are computed.

Finally, the defense zone boundary data together with detailed descriptions of all the corridors are placed in the BASFILE for use by PLANOUT in the development of detailed sorties. These data are followed by information needed by PLANOUT to prepare TANKER plans.

After reading this file, program ALOC processes the TGTFILE one target at a time. As each target is processed, the capability of each weapon against that target is computed and a preferred penetration corridor for each bomber group to the target is computed. The allocation achieved on the first pass of the targets is only a first approximation.

Therefore, the allocation ordinarily continues for several passes before the final allocation is achieved. The final allocation of weapons to targets is output via the ALOCTAR file.

If a summary evaluation of the allocation is desired, this can be obtained using EVALALOC. EVALALOC reads the allocation from ALOCTAR, and extracts the information it needs concerning the weapon groups from BASFILE.

Program EVALALOC provides a summary of the allocation produced in program ALOC by calculating an expected-value estimate of its results. In addition, the program has the capability of evaluating the effect upon the results of variations in input values for weapon and target parameters. Program EVALALOC may be run either before program ALOCOUT or after program PLANOUT.

ALOCOUT optimizes the location of aim points for target complexes and collects all the strikes assigned to each weapon group by the Allocator so that detailed plans for each group can be formulated by FOOTPRNT and POSTALOC.

ALOCOUT reads the allocation to each target that it finds on ALOCTAR. Since the targets are still in the original order, it can read more detailed data on individual target elements from the BASFILE. In this way, it defines specific target elements and coordinates for the strikes specified by ALOC against multiple targets. Similarly, it reads in all the individual elements of a target complex (or complex target) and uses this information to select efficient desired ground zeros for each weapon allocated to the target complex. The resulting strikes with actual aim points (and offset aim points where appropriate) are then sorted. The final output of this sorting process is the allocation file (TMPALOC), which contains a list of all the strikes assigned to each weapon group.

In the case of bomber groups, the lists are also sorted into sublists according to the specific penetration corridors used. ALOCOUT produces spill tapes of its output for use by programs FOOTPRNT and POSTALOC of the subsequent Sortie Generation Subsystem.

1.3 Organization of Users Manual, Volume III

The components of the Weapon Allocation subsystem are characterized in the following major sections on a program-by-program basis. In general, each major section of this manual is further subdivided into three principal subsections, which are: program file utilization, input, and output for each program. Outline descriptions of the content of program subsections follow.

1.3.1 Program File Utilization. This subsection details the input and output data files and how they are used in the given program.

1.3.2 Program Input. This subsection details the set-up of input data, with notated examples. Note that although attribute names are presented in eight characters in the examples, they must actually be unique in the first six characters. This is taken care of internally in the code.

1.3.3 Program Output. This subsection describes the scope and content of program output, with notated examples.

SECTION 2. PROGRAM PREPALOC

2.1 Purpose

The purpose of this program is to perform preliminary calculations on the weapon and target data supplied by program PLANSET. The output data from PREPALOC will be in a form convenient for use by the remaining processors which perform plan generation. In addition, the user may select options to modify some of the data at this stage of processing.

2.2 Concept of Use

Program PREPALOC has three major capabilities: generation of weapon and target data, modification of target values and damage constraints, and preparation of data for the fixed weapon assignment capability of program ALOC.

The data produced by the first capability can be divided into three categories: geographic, weapon, and target. The geographic data are produced from the data on boundaries and routes passed by PLANSET on the WINFILE. Program PREPALOC uses these data to define the legs for each penetration corridor, the location of each refuel area (except for those determined automatically by program PLANOUT), the bases available for recovery from each depenetration corridor, and the air defense zones to be used in calculating bomber attrition. The weapon data are aggregates of the weapon data input on WINFILE. Such characteristics as speed, range, yield, CEP, and function are aggregated by weapon type. Data on payloads, warheads, and air-to-surface missiles (ASMs) are also calculated for use by later processors. The target data are the characteristics which define the target as a candidate for weapon allocation. The geographic location, vulnerability, value, damage constraints, value reduction with respect to time, local defense levels and other target characteristics are considered for each simple, complex, or multiple target. These data will determine the worth of weapon allocations in program ALOC. The only user input data required for this capability identify the time of the strike (e.g., initiative or retaliatory).

The second major capability of this program is the modification of the target characteristics, VTO, MINKILL, and MAXKILL. VTO is the value of the target relative to the others. MINKILL is the minimum fraction of value that must be destroyed, and MAXKILL is the maximum desired fraction destroyed. Any of these parameters may be changed for any target. The change requests can change these parameters for a single target or for a set of targets. The set of targets for which a change is requested is identified by target class, type, and individual identifier (either target designator code (DESIG) or index number (INDEXNO)), or any combination of these. For complex targets, the class, type, designator code, and index number of each component will be checked to determine if a target parameter for the complex is to be changed.

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An additional planning factor which can be modified in this program is weapon height of burst. In the absence of any user specifications, QUICK uses the height of burst for each weapon/target combination that produces the most damage. However, the user can specify use of air or ground bursts in preference to the optimal height. The user can request ground or air bursts on the basis of weapon type, target designator code, target type, target class, target country location, or target region.

The third major capability is the request for allocation of specific weapons to specific targets. (These requests are called "fixed assignments.") This fixing of weapons to targets enables the user to determine part of the weapon allocation while leaving the allocation program free to determine the remaining allocation. In addition, the time of arrival at target can be fixed for missile weapons. This information will be passes to program PLANOUT which will adjust the launch time accordingly. The specified fixed assignment of weapons remains in effect for the remainder of the plan generation process. Later programs will retain the assignments as best possible. (For example, it is possible to fix a set of weapons from a weapon group with multiple independently targetable re-entry vehicles (MIRV) in such a manner that there are no feasible footprints that cover that target set adequately. In that case, some of the fixed assignment requests must be ignored.)

2.3 File Utilization

A diagram illustrating the file requirements for the execution of program PREPALOC is shown in figure 4.

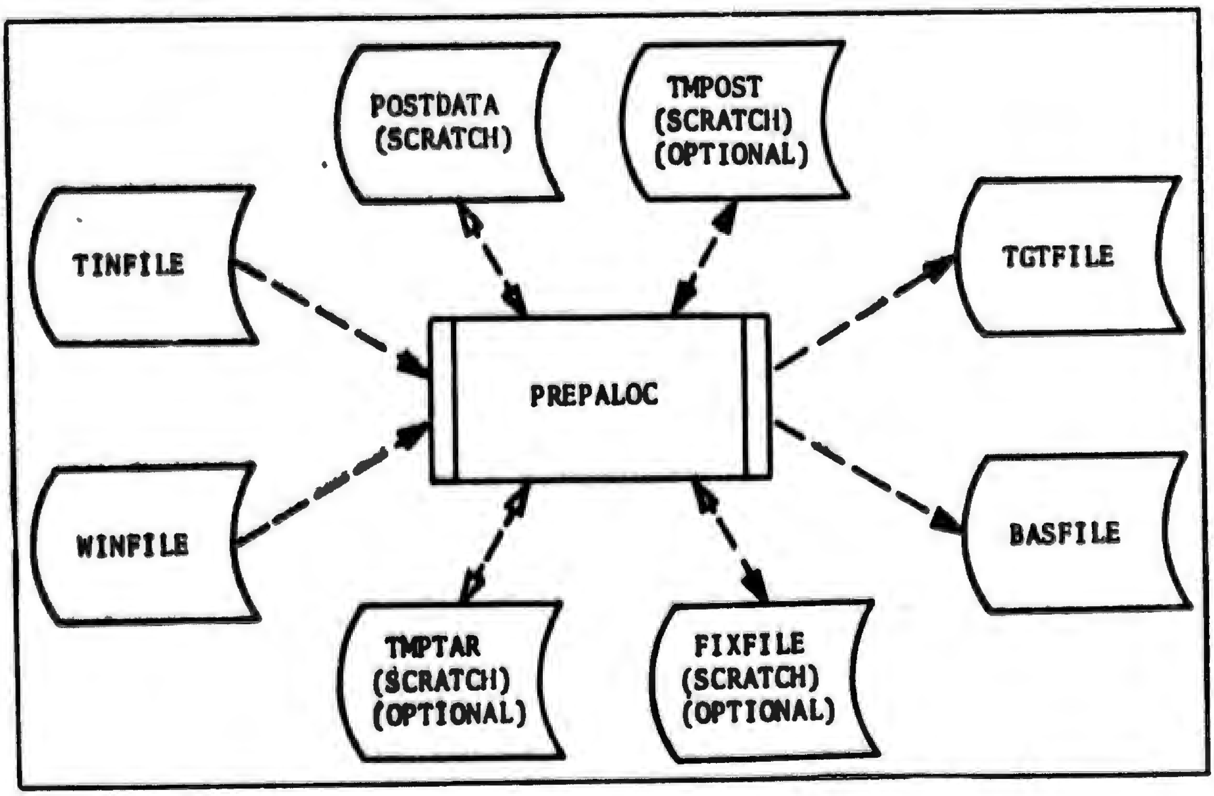


Figure 4. Program PREPALOC File Utilization

2.3.1 Input Files. The Target Input File (TINFILE) is generated by program PLANSET, and contains the characteristics (e.g., value, latitude and longitude) for each target.

The Weapon Input File (WINFILE), also generated by program PLANSET, contains data on the weapon groups, geographic information, and data for components of complex and multiple targets.

2.3.2 Output Files. The Target File (TGTFILE) contains the target information input on the TINFILE as modified by the planning factor modification options of program PREPALOC. Also included are some geographic data and fixed weapon assignment requests.

The Base File (BASFILE) contains the data from WINFILE modified so as to be more efficiently accessible to later programs.

2.3.3 Scratch Files. The Temporary Weapon Group/Target Data File (POSTDATA) is used for temporary storage of data on weapon groups and components of complex and multiple targets.

The Temporary Target Data File (TMPTAR) is used if any of the planning factor modification options or the fixed weapon assignment option have been exercised. The TMPTAR file contains a temporary version of the TGTFILE.

The Fixed Assignment File (FIXFILE) is created if the fixed weapon assignment option has been exercised. It contains the user-input information for this option.

The Temporary POSTDATA File (TMPOST) is created if any of the planning factor modification options have been exercised. It is created as a temporary POSTDATA file containing unnormalized target component values.

2.3.4 Filehandler Buffer Utilization. The Filehandler buffer area is utilized in conjunction with the above files as indicated in table 1.

File Name	Buffer Number (LUN)
WINFILE	10
TINFILE	9
BASFILE	8
TGTFILE	2
TMPOST	29 (Scratch)
POSTDATA	27 (Scratch)
FIXFILE	26 (Scratch)
TMPTAR	25 (Scratch)

Table 1. Program PREPALOC Filehandler Buffer Utilization

2.4 Input

2.4.1 User Options In Program Functions. There are six major program functions in running program PREPALOC. The functions are: data precomputation (PRECOMP), target value modification* (VALUMOD), minimum required probability of target destruction modification* (MINKLMOD), maximum desired probability of target destruction modification* (MAXKLMOD), weapon height of burst specification (HEIGHT), and fixed weapon assignment (FIXASG).

The data precomputation function PRECOMP must be present in every run of program PREPALOC. (All other functions are optional.) The PRECOMP function prepares the files required by program ALOC and later processors in plan generation.

The optional planning factor modification functions (VALUMOD, MINKLMOD, and MAXKLMOD) allow the user to change target value, minimum required destruction fraction, and maximum desired destruction fraction on any target or set of targets. The identification of the target set over which a specific change is to be effected may include the desired target class (CLASS), type name (TYPE), designator code (DESIG), index number (INDEXNO), or a combination of these. For example, if a request specifies the target set to be identified by a type name, all target components with that type name would be changed appropriately. Even if some targets with this type name are components of a target complex, the planning factors for the complex would be changed to agree with the modified values for the components.**

The optional weapon height of burst specification function (HEIGHT) allows the user to specify the weapon height of burst to be used in plan generation. In the absence of a specification, the optimal height is used. The user can select either air or ground bursts on the basis of weapon type, target designator code, target type, target class, target country location, or target region. These user specifications are used to calculate target damage. For complex targets, the height of burst selected for the lead (representative) element sets the height of burst for all elements of the complex.

The optional fixed assignment function specifies the allocation of weapons to specific targets. A fixed assignment of weapons from a specific group to a specific target is maintained by program ALOC, which optimizes

---

* When considered as a group, these three functions are referred to as the planning factor modification functions.

** If an attempt is made to modify the same planning factor for a complex target as a whole, and also on a component of that complex, the former change will be effected and the latter change will be ignored.

the assignment of the nonfixed weapons. In addition, the delivery time* of non-MIRV missile fixed weapons may be specified. The user has several options concerning the source of the fixed assignment information. Although the usual source is punched cards, the user may specify a magnetic tape (containing either BCD card images or cards in filehandler format). These alternate sources must be prepared by the user externally to the QUICK system and are included as a user convenience in the case where a large volume of input data is required. In addition, the target identifier may be changed from designator code or index number to target number (TGTNUM) only. (The target number is the number assigned by program PLANSET as the index to the shuffled target list.)

2.4.2 User-Input Parameters. The execution of each function is initiated by the presence of a card with the function name punched in the first eight columns (e.g., PRECOMP for the Data Precomputation function.) Each of these function request cards is followed by its required user-input parameter as described below. The order of the functions is irrelevant except that the PRECOMP function must be the last function exercised. The run of program PREPALOC is terminated normally by a function request card with "STOP" punched in the first four columns. If the user desires a memory dump at the end of processing by program PREPALOC, the last function request card should have "DUMP" punched in the first four columns.

2.4.2.1 Data Precomputation: PRECOMP Function. The data for this required function identify the timing parameters used in allocating the weapons to targets and define the size of weapon overallocations. In addition, various prints may be requested.

The input format for these parameters is free field, and as follows:

a. INITSTRK: This parameter determines the strike type. A value of 1 is first strike; a value of 2 is second strike. In the first strike case, the launch timing is determined by the other two input parameters. In the second strike case, all alert weapons launch after their specified alert delay (ALRTDL), all nonalert weapons launch after their specified nonalert delay (NLRTDL), and the detailed coordinated missile timing parameters in program PLANOUT are ignored.

   NAME: INITSTRK
   RANGE: 1 or 2
   DEFAULT: 1

b. CORMSL. This parameter specifies the gross missile launch timing. (Program PLANOUT uses more detailed missile timing parameters in planning launch times.) It is defined as the

* In minutes relative to time zero (0.0) which is H-hour.

fraction of missile flight completed at time zero. A value of 0.0 specifies missile launch; a value of 1.0 specifies missile impact.

NAME: CORMSL
RANGE: 0.0 - 1.0
DEFAULT: 0.0

c. CORBOMB. This parameter specifies the bomber launch timing. It is defined as the number of nautical miles prior to the corridor entry that each bomber reaches at time zero.

NAME: CORBOMB
RANGE: ≥0.0
DEFAULT: 0.0

d. PEXBOMB.** This parameter specifies the fraction of the number of weapons specified for each group by program PLANSET that is to be added to each bomber group as an overallocation.*

NAME: PEXBOMB
RANGE: ≥0.0
DEFAULT: 0.0

e. EXNBOMB.** This parameter specifies the number of vehicle "loads" of weapons to be added to each bomber group.* A vehicle "load" for each group is defined as the ratio of the number of weapons specified by program PLANSET to the number of vehicles specified by the same program.

NAME: EXNBOMB
RANGE: 0.0 - 1000.0
DEFAULT: 3.0

f. PEXMISS.** This parameter performs the same function as PEXBOMB, except it operates on missile groups without a MIRV capability.

NAME: PEXMISS
RANGE: ≥0.0
DEFAULT: 0.0

---

* These parameters are modified for bomber groups with less than 15 bombers.

** These variables must be such that the total number of vehicles per group (including overallocation) does not exceed 1030 for bombers and 1130 for missiles.

g. EXNMISS.** This parameter performs the same function as EXNBOMB, except it operates on missile groups without a MIRV capability.

NAME: EXNMISS
RANGE: 0.0 - 1000.0
DEFAULT: 0.0

h. PEXMIRV.** This parameter performs the same function as PEXBOMB, except it operates on missile groups with a MIRV capabiltiy.

NAME: PEXMIRV
RANGE: ≥0.0
DEFAULT: 0.1

i. EXBMIRV.** This parameter performs the same function as EXNBOMB, except it operates on missile groups with a MIRV capability.

NAME: EXBMIRV
RANGE: 0.0 - 1000.0
DEFAULT: 2.0

j. PRINT. This parameter selects a print option. Each option produces a set of data output on the standard output. Table 2 describes the print resulting from each option. This parameter may appear several times. The value of the parameter is the print option number. The print may be modified by the user input parameters NOPRINT, FIRSTAR, LASTAR, and NTOPRINT.

NAME: PRINT
RANGE: 1 - 7
DEFAULT: 1, 3, 5

k. NOPRINT. This parameter is used to remove a default print option request (numbers 1, 3, and 5). Its value is the option to be removed.

NAME: NOPRINT
RANGE: 1, 3, 5
DEFAULT: None

l. FIRSTAR. This parameter specifies the first target on which a print option is to be activated. It refers to the last print request (parameter PRINT) preceding this parameter on the same card. This parameter is applicable only for print options 5, 6, and 7.

** These variables must be such that the total number of vehicles per group (including overallocation) does not exceed 1030 for bombers and 1130 for missiles.

Table 2. Print Option Description

OPTION	DESCRIPTION
1	Geographic routing data input from WINFILE and output to BASFILE
2	Filehandler dump of input routing data from WINFILE
3	Weapon characteristic data output to BASFILE
4	Filehandler dump of input weapon data from WINFILE
5	Target characteristic print (does not include planning factors)
6	Filehandler dump of input target data from TINFILE
7	Modified target planning factors

l. FIRSTAR. (cont.)

NAME: FIRSTAR
RANGE: 1 - 5000
DEFAULT: 1

m. LASTAR. This parameter specifies the last target on which a print option is to be activated. It refers to the last print request (parameter PRINT) preceding this parameter on the same card. This parameter is applicable only for print options 5, 6, and 7.

NAME: LASTAR
RANGE: 1-5000
DEFAULT: 5000

n. NTOPRINT: This parameter specifies the number of words per target to be dumped from the TINFILE. It refers to the last print request (parameter PRINT) preceding this parameter on the same card. This parameter is applicable only for print option 6.

NAME: NTOPRINT
RANGE: 1 - 29
DEFAULT: 29

2.4.2.2 Planning Factor Modification Functions: VALUMOD, MINKLMOD, MAXKLMOD. The input parameters for each of these optional functions are similar. They consist of a number of factor change requests, input one request per card. Each card contains the following input parameters:

a. CLASSWAN: Alphameric class name for which request is to be effected

b. TYPEWAN: Alphameric type name for which request is to be effected (e.g., POL-AZ)

c. IDENTIFIER: Target designator code or index number

d. VALUENEW: New planning factor value (either target value (VTO), MINKILL, or MAXKILL)

If a request is to be effected regardless of the value of the target class, type, and/or identifier, the appropriate word(s) should be left blank on the input card, or the word ALL should be punched in the first three columns of the field. The format of these cards is displayed in table 3.

Table 3. Format for Change Request Cards

COLUMN*	FORMAT	(J)	RANGE	LABEL
1-6	A6	L	(Standard)	CLASSWAN
11-16	A6	L	(Standard)	TYPEWAN
21 - 30	A5, 5X	L for designator code	(Standard)	IDENTIFIER
	A6, A4	N/A for index number	(Standard)	
31-40	Floating Point	N/A	(Standard)	VALUENEW

* All columns not listed are ignored.

The limit on the number of change requests is a total of 1,500 requests for value, MINKILL, and MAXKILL, cumulatively. If the number of requests exceeds 1,500, the excess will be ignored. Since the target variable change requests are input separately for each variable, any combination of value, MINKILL, and MAXKILL can be changed on a single target. If a change is requested for a target set, the change will be made on components of a complex target if they meet the request requirements. The complex target data would then be changed to show the effect of the request.

If a planning factor is changed for a target complex as a whole, change requests for that same factor will be ignored for all components of the complex target. However, if change is requested for a member of a multiple target, the change is made on all members of that multiple target.

If a target meets the requirements of more than one request for either value, MINKILL, or MAXKILL, only the first request encountered will be considered. (However, the user can change all three variables, or any combination, on a single target or set of targets.)

Targets may be identified by either target designator code (DESIG) or index number (INDEXNO) interchangeably. The identifiers may be intermingled by DESIG or INDEXNO without restriction.

The set of change request cards is terminated by a card with the characters ENDCHANG in columns 1-8.

2.4.2.3 Fixed Assignment Function: FIXASG. The input for this optional function consists of four optional subcommands and the fixed assignment request data.

In the absence of any subcommand, the fixed assignment request data are assumed to be contained on cards. The target identifier may be either DESIG or INDEXNO. The format for the card is discussed below. There are four subcommands which allow user modification of parameters input unit and target identifier. The format for the subcommands is free field. The four subcommands and their interpretation are as follows.

a. TAPE: This parameter specifies the input unit for fixed assignment information to be a magnetic tape in filehandler format. This tape, produced by the QUICK filehandler, contains each card image as 14 consecutive words, each word representing six columns of the card (columns 1-6 in word 1; columns 7-12 in word 2; etc.). The value of the parameter is the logical tape unit number.

   NAME: TAPE
   RANGE: 2, 3, 4, 7, 8, 9
   DEFAULT: 0 (a value must be specified)

b. BCDTAPE: This parameter also specifies an input unit for fixed assignment information as a magnetic tape unit. The format of this tape is BCD card images. That is, each card is represented as 80 characters of BCD information, one record per card.

The value of the parameter is the logical tape unit number.

NAME: BCDTAPE
RANGE: 1-38 (except 1, 3, 5, 6, 10, 31, 32, 33)
DEFAULT: 0 (a value must be specified)

c. DISK: This parameter specifies as input medium for fixed assignment information a disk file in fiehandler format. The value of the parameter is the logical file code.

NAME: DISK
RANGE: Same range as for BCDTAPE command
DEFAULT: 0 (a value must be specified)

d. TGTNUM: This parameter, if present as input, specifies that the target identifiers for fixed assignment are the target numbers assigned in program PLANSET as indices to the shuffled target list. If this parameter is not present, the identifiers are either DESIG or INDEXNO. The value of this parameter is ignored.

The fixed assignment information cards (see table 4) consist of a set of cards (which may have only one card) for each target on which fixed assignments are to be placed. Each card set specifies the weapons are identified by weapon group. Each appearance of a group number fixes one weapon.* If a target is not referenced by any card set, no weapons are fixed to that target.

Fixed assignments may be made on a limit of 5,000 targets. No more than 7,500 weapons may be fixed on all the targets. On targets without terminal ballistic missile defenses, a maximum of 30 weapons (missile and/or bomber) may be fixed. On defended targets, a maximum number of 30 missile groups may be fixed. No bomber weapon may be fixed on a target if more than 30 weapons are fixed. On defended targets, the maximum number of fixed missile weapons is 1,600.

* If the target is a multiple target, the number of weapons fixed is equal to the multiplicity.

Table 4. Format for Fixed Assignment Request

First Card

COLUMN	FORMAT	(J)	RANGE	DESCRIPTION
1-10	Alphameric	(L for DESIG; N/A otherwise	(Standard)	Target identifier
11-13	Integer	N/A	(1-200)	Group number of fixed assignment
14-18	Floating Point	N/A	(Standard)	Arrival time of fixed missile (minutes relative to H-hour)
21-28	Same as columns 11-18			
31-38	Same as columns 11-18			
41-48	Same as columns 11-18			
51-58	Same as columns 11-18			
61-68	Same as columns 11-18			
71-72	Alphameric	L	(Standard)	Nonblank if more fixed assignments follow for this target

Second through Next-to-Last Cards

Same format as first card, except columns 1-10 are ignored.

Last Card

Same as first card, except columns 1-10 are ignored, and columns 71-72 are blank.

The card sets are terminated by a card with the characters ENDFIXES in columns 1-8.

2.4.2.4 Weapon Height of Burst Specification Function (HEIGHT). The weapon height of burst specification function is initiated by a function initiation card containing the word HEIGHT punched in the first six columns.

Six sets of HOB designation cards follow. These sets relate to the six methods of burst height specification.

The first set specifies HOB by weapon type, attribute TYPE. Each card is divided into eight fields of 10 columns each. Within each 10-column field is the weapon type name (attribute TYPE) left justified in the first six columns and a burst height specifier in the ninth column of the field. The specifier is blank, A, or G. Blank or G specifies ground burst. An A specifies air burst. (This code for the burst height of specifier is used in the following sets as well.)

The second set specifies HOB by target designator code. Within each 10-column field is a five character designator code (left justified) and the burst specifier in the ninth column of the field.

The third set of cards specifies HOB by target type. Each 10-column field contains a target type (attribute TYPE) left justified in the first six columns and the burst height specifier in the ninth column.

The fourth set of cards specifies HOB by the target class. Each 10-column field contains a target class name (attribute CLASS) left justified in the first six columns and the burst height specifier in the ninth column.

The fifth set of cards specifies HOB by target country location. Each 10-column field contains a target country location code (attribute CNTRYLOC) left justified in the first two columns and the burst height specifier in the ninth column.

The sixth set consists of one card which specifies HOB by target designator code set (sometimes called region). A blank, A, or G is punched in the first three columns for designator code sets one, two, or three respectively. A blank means no specification; an A specifies air burst; a G specifies ground burst. Region one is defined as those targets whose numeric portion of the target designator code (attribute DESIG) lie between 000 and 499. Region two is defined as targets with numeric codes between 500 and 799. Region three is defined as targets with numeric codes greater than or equal to 800.

Each set of cards is terminated by a blank field. That is, when the program encounters a ten-column field that is blank, it stops processing the current set of cards and reads the next card as the beginning of a new set. Note that if a burst height specification card set uses the last field (columns 71-80) of a card for the last burst height specifier, a blank card must follow to terminate the set. All six sets of cards must be present. If the user has no specifications for a set, a blank card must be present for that set.

The user input for this function is terminated by a card with the word END punched in columns one to three.

Figure 5 displays a sample of user input to this function.

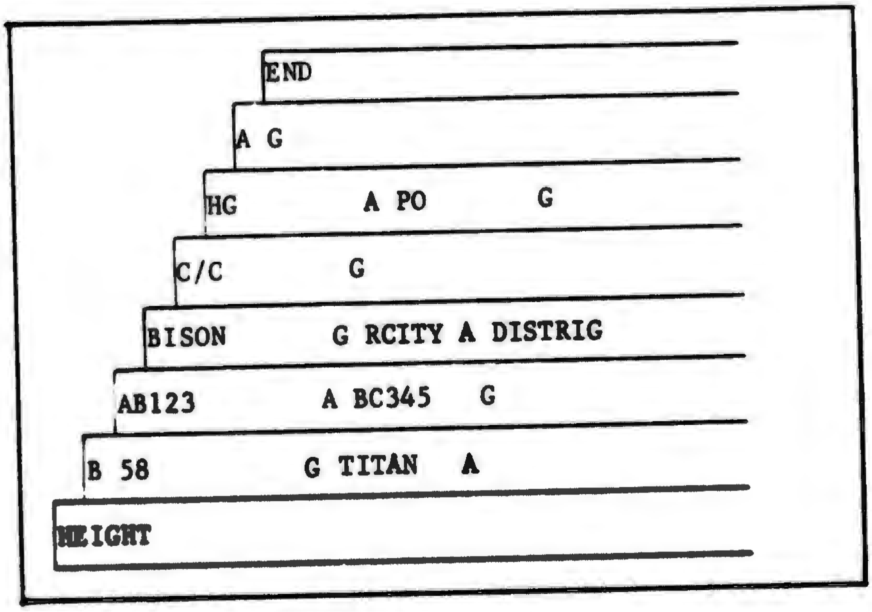


Figure 5. Sample User Input to Burst Height Specification Function

2.5 Output

2.5.1 Planning Factor Modification Functions: VALUMOD, MINKLMOD, MAXKLMOD. The output for these optional functions is divided into two phases. The first phase lists the input parameter cards. The second phase displays the new planning factor values for each target. The second phase output is printed during the PRECOMP function.

Figure 6 displays the format of the input card listing.

2.5.2 Fixed Assignment Processing Function: FIXASG. This optional function also divides the output into two phases. The first phase prints the input data, while the latter phase (printed during exercise of the PRECOMP function) displays the fixed assignments as interpreted by the program.

Figure 7 displays the format for the first phase of printing.

USER INPUT CHANGE REQUESTS FOR MINKIL (1) MODIFICATION (SUBROUTINE MINMOD) (2)

TARGET CLASS	TARGET TYPE	TARGET IDENTIFIER	NEW MINKILL (1)
(3) BOMBER	(4) B-52	(5)	(6) 0.5
	BLUNST		0.75
BOMBER	B-58	AB123	.9
		2175	.9

(7) ENDCHANGES

A TOTAL OF 4 (8) MINKIL (1) CHANGE REQUESTS WERE PROCESSED. THE REQUESTS ARE STORED IN LOCATIONS 217 (9) THROUGH 220 (10)

HEADING	LABEL	DESCRIPTION
(1)	---	Planning factor identification
(2)	SUBROUTINE	Name of subroutine reading input cards
(3)	CLASS	Target class name*
(4)	TYPE	Target type name*
(5)	IDENTIFIER	Target identifier (DESIG OR INDEXNO)*
(6)	NEW	New value for planning factor
(7)	---	Terminating signal
(8)	---	Number of change requests read
(9)	---	First index to change requests
(10)	---	Last index to change requests

* Blank or "ALL" means that this attribute is not checked in determining whether or not the target meets the change criteria.

Figure 6. Change Request Input Card Print

USER INPUT PARAMETER CARDS FOR FIXED ASSIGNMENTS

(1) TAPE = 6@

USER INPUT PARAMETER INTERPRETATIONS

DATA INPUT FROM TAPE(2) UNIT 6(3) BY INPUT(4)

DATA FORMAT IS FILEHANDLER(5) BY INPUT(4)

TARGET IDENTIFIERS ARE(6) DESIG/INDEX NO. BY DEFAUL (4)

THE LISTING OF USER INPUT PARAMETER CARDS CONTINUES ON THE NEXT PAGE

USER INPUT PARAMETER CARDS FOR FIXED ASSIGNMENTS (CONTINUED)

(7) AB123 (8) 4 (9) 1.0 (8) 5 (9) (8) 4 (9) (8) 5 (9) (10)

2175	19	0.0	19						
2181	16		16	1.0	16	16	16	16	CONTINUE
	16		16	1.4	16	16			

(11) ENDFIXES

FIXED ASSIGNMENTS REQUESTED BY GROUP

GROUP (12)	NO. OF REQUESTS (13)
4	2
5	2
16	10
19	2

TOTAL NUMBER OF FIXED ASSIGNMENT REQUESTS IS (14) 16 for (15) 3 TARGETS

HEADING	LABEL	DESCRIPTION
1	---	Print of user-input parameter card
2	UNIT	Input unit type (TAPE UNIT OR DISK FILE)
3	UNIT	Unit identification (logical unit number or logical file name)
4	---	Parameter input type (DEFAULT or INPUT)
5	FORMAT	Card image format (BCD or FILEHANDLER)
6	IDENTIFIERS	Target identifier type (DESIG/INDEX NO. or TARGET NUMBER)
7	---	Target identifiers
8	---	Fixed assignment group numbers
9	---	Fixed assignment arrival times (minutes relative to H-hour)
10	---	Continuation field
11	---	Termination card
12	GROUP	Group number
13	NO. OF REQUESTS	Number of fixed assigned weapons in each group
14	---	Total number of fixed assignments
15	---	Total number of targets on which weapons are fixed

Figure 7. Print of User-Input Parameters for Fixed Assignments

2.5.3 Weapon Height of Burst Specification Function: HEIGHT. The input parameter cards are printed as previously shown in figure 6. The burst height to be used on each target is printed during the PRECOMP function.

2.5.4 Data Precomputation Function: PRECOMP. The user-input parameter cards and their interpretations are listed first for this function.

Figure 8 displays this print.

Print options numbered 1, 3, and 5 are the standard output selections. These requests output the geographic, weapon, and target data as prepared by PREPALOC. In addition, if any of the planning factor modification options (VALUMOD, MINKLMOD, or MAXKLMOD) or the fixed assignment option (FIXASG) have been exercised, the program will print the current planning factor values and the fixed assignment information ordered by target.

Table 2 lists the print options. Prints 1, 3, and 5 are produced automatically. Their printing may be removed by the user by use of the user-input parameter NOPRINT.

2.5.5 Print Option 1: Geographic Routing Data. This print displays information on the penetration and depenetration corridors, recovery bases, refuel points, routing points, and boundary data. The output is divided into six sections which are described separately below:

a. Penetration Corridor Data. The three tables of penetration corridor data are shown in figures 9, 10, and 11.

b. Depenetration Corridor Data. The two tables of depenetration corridor data are presented in figures 12 and 13.

c. Recovery Data. The two tables of recovery data are displayed in figures 14 and 15.

d. Refueling Data. A table of the refuel point data is displayed in figure 16. These data are in auxiliary class POINT, with a value of REFUEL for attribute TYPE.

e. Routing Data. A table of the route points is displayed in figure 17. These data are in auxiliary class POINT, with a value of ROUTE for attribute TYPE.

f. Zone Boundary Data. A print of zone boundary data is displayed in figure 18. These data are in auxiliary class POINT, with a value of BOUNDARY for attribute TYPE.

USER INPUT PARAMETER CARDS FOR OPTION PRECOMP

```
(1) INITSTRK = 1, COMMSL = 0.5
    PEXMIRV = .05
    PRINT = 6, FIRSTAR = 10, LASTAR = 20, NTOPRINT = 5
    NOPRINT = 3
    @
```

USER INPUT PARAMETERS FOR OPTION PRECOMP

PRINT REQUESTS

NUMBER	STATUS	FIRST TARGET	LAST TARGET	NO. OF WORDS	SET BY
(2) 1	(3) ON	(4) N/A	(5) N/A	(6) N/A	(7) DEFAUL
2	OFF	N/A	N/A	N/A	DEFAUL
3	OFF	N/A	N/A	N/A	REMOVE
4	OFF	N/A	N/A	N/A	DEFAUL
5	ON	1	5000	15	DEFAUL
6	ON	10	20	3	INPUT
7	OFF	1	.5000	15	DEFAUL

OTHER PARAMETERS

(8) INITST	=	(9) 1	BY	(10) INPUT
COMMSL	=	0.5	BY	INPUT
CORBOM	=	0.0	BY	DEFAUL
PEXBOM	=	0.0	BY	DEFAUL
EXNBOM	=	3.0	BY	DEFAUL
PEXMIR	=	.05	BY	INPUT
EXNMIR	=	2.0	BY	DEFAUL
PEXMIS	=	0.0	BY	DEFAUL
EXNMIS	=	0.0	BY	DEFAUL

HEADING	LABEL	DESCRIPTION
(1)	---	User input parameter cards
(2)	NUMBER	Print request number
(3)	STATUS	Print request status (ON or OFF)
(4)	FIRST TARGET	First target to activate request (numbers 5-7 only)
(5)	LAST TARGET	Last target to activate request (numbers 5-7 only)
(6)	NO. OF WORDS	Number of words printed from each end of array (numbers 5-7 only)
(7)	SET BY	Selection mode for request (DEFAULT, INPUT, REMOVED)
(8)	---	Parameter name (first six characters)
(9)	---	Parameter value
(10)	---	Mode (DEFAULT or INPUT)

Figure 8. Print of User-Input Parameters for PRECOMP Function

PENETRATION CORRIDOR DATA

(1) CORRIDOR	(2) LINK	(3) LAT	(4) LONG	(5) ZONE	(6) TYPE	(7) CORSTYLE	(8) HILOATTR	(9) DEFRANGE	(10) ATTRSUPP	(11) ATTRCORR
1	7	29.0	217.1	7	2	5.0	3.0	250.0	.0001	.0005
2	8	13.5	105.2	10	3	2.0	3.0	250.0	.0002	.0010

HEADING	LABEL	DESCRIPTION
(1)	CORRIDOR	Penetration corridor number
(2)	LINK	Link to table of route points data, below
(3)	LAT	Latitude of corridor axis orientation point
(4)	LONG	Longitude of corridor axis orientation point
(5)	ZONE	Zone of corridor origin
(6)	TYPE	Corridor type
(7)	CORSTYLE	Exponent for definition of curvilinear coordinates (attribute KORSTYLE in data base)
(8)	HILOATTR	Ratio of high altitude attrition to low altitude attrition
(9)	DEFRANGE	Characteristic distance defining rate of change from suppressed attrition to normal attrition
(10)	ATTRSUPF	Attrition probability per nautical mile (suppressed)
(11)	ATTRCORR	Attrition probability per nautical mile (normal)

All items are taken from the game data base (except TYPE, which is set internally in program PLANSET) according to the attribute TYPE.

Figure 9. Penetration Corridor Data Print

① CORRIDOR	② DISTBC	③ ATTRBC	④ IBEGIN
1*	0	0	0
2*	0	0	0
3	5.0722E 02**	0	1
4	0	0	3
5	0	0	10

<u>HEADING</u>	<u>LABEL</u>	<u>DESCRIPTION</u>
①	CORRIDOR	Penetration corridor number
②	DISTBC	Length of corridor (nautical miles) (from entry to origin)
③	ATTRBC	Attrition in corridor
④	IBEGIN	Index to routing points table for beginning of corridor.

---

* The values for corridors 1 and 2 are irrelevant, since these are the "dummy" corridors for tactical a[illegible]raft and aircraft with a value greater than zero for the at[illegible]bute PKNAV. See Analytical Manual, Volume II, Plan Generation Process, Chapter 2, Analytical Concepts and Techniques, Basic Sortie Generation, Bomber Plans.

** The E format is mathematical base 10 notation. The number w.mmEyy is equivalent to $w.mm \times 10^{yy}$. For example, 5.0722E02 represents 507.22 (i.e., 5.0722×100).

Figure 10. Penetration Corridor Data Print--Corridor Distance and Attrition

① CORRIDOR	② NPRCRDEF	③ DISTDEF	④ PRATTR
1	0	0	0
		0	0
		0	0
2	0	0	0
		0	0

HEADING	LABEL	DESCRIPTION
①	CORRIDOR	Penetration corridor number
②	NPRCRDEF	Number of precorridor legs with defenses
③	DISTDEF	Length of defended corridor segments
④	PRATTR	Probability of attrition in each defended corridor segment

Figure 11. Penetration Corridor Data Print--Precorridor Defenses

DEPENETRATION CORRIDOR DATA

①	② LINK	③ LAT	④ LONG
1	6	21.2	217.4
2	5	31.5	314.1

HEADING	LABEL	DESCRIPTION
①	---	Depenetration Corridor number
②	LINK	Link to Route Points table
③	LAT	Latitude of depenetration point
④	LONG	Longitude of depenetration point

Figure 12. Depenetration Corridor Data Print--Part A

① DPEN PT	② DISTEG	③ DISTEF
1	0	0
2	0	0
3	0	0
4	0	0

HEADING	LABEL	DESCRIPTION
①	DPEN PT	Depenetration corridor number (see column ① of Part A)
②	DISTEG	Length of depenetration corridor (nautical miles from entry to end)
③	DISTEF	Distance from depenetration corridor entry point to recovery point (nautical miles)

Figure 13. Depenetration Corridor Data Print--Part B

① BASE	② LINK	③ LAT	④ LONG	⑤ CPACTY	⑥ INDEX
1	6	21.7	217.4	60	2176
2	5	31.5	341.2	40	1745

HEADING	LABEL	DESCRIPTION
①	BASE	Base number (arbitrarily assigned)
②	LINK	Link to depenetration corridor (see column ① of previous figure)
③	LAT	Latitude of recovery base
④	LONG	Longitude of recovery base
⑤	CPACTY	Capacity (number of aircraft)
⑥	INDEX	Index number of recovery base

Figure 14. Recovery Base Data Print

DEPENETRATION CORRIDOR - RECOVERY BASE LINKING

(1) DEPENETR CORRIDOR	(2) BASE ORDER	(3) BASE LATITUDE	(4) BASE LONGITUDE	(5) BASE INDEX	(6) BASE CAPACITY	(7) BASE DISTANCE
1	1	41.0	210.0	2176	10	100.0
	2	41.2	210.0	2177	20	200.0
	3	41.3	215.1	2178	30	300.0
	4	0	0	0	0	0
2	1	36.2	215.3	2191	60	0.0
	2	37.5	215.4	2192	50	50.0

HEADING	LABEL	DESCRIPTION
(1)	DEPENETR CORRIDOR	Depenetration corridor number
(2)	BASE ORDER	Order of base according to increasing distance from end of depenetration corridor
(3)	BASE LATITUDE	Base latitude
(4)	BASE LONGITUDE	Base longitude
(5)	BASE INDEX	Base index number
(6)	BASE CAPACITY	Base capacity (number of aircraft)
(7)	BASE DISTANCE	Base distance from end of depenetration corridor (nautical miles)

Figure 15. Recovery Base Data Print--Depenetration Corridor - Recovery Base Linking

REFUEL POINTS

(1) POINT NO.	(2) LATITUDE	(3) LONGITUDE
1	21.2	212.2
2	31.3	212.3

HEADING	LABEL	DESCRIPTION
(1)	POINT NO.	Refuel area number (attribute IPOINT in data base)
(2)	LATITUDE	Latitude of refuel point
(3)	LONGITUDE	Longitude of refuel point

Figure 16. Refuel Point Data Print

ROUTING POINTS

(1) POINT NO.	(2) LINK	(3) LATITUDE	(4) LONGITUDE	(5) ATTRITION
1	6	21.2	212.0	.0001
2	0	31.3	212.3	.0002

HEADING	LABEL	DESCRIPTION
(1)	POINT NO.	Point number (attribute IPOINT in data base)
(2)	LINK	Link to next point (links to value in column (1))
(3)	LATITUDE	Latitude of point
(4)	LONGITUDE	Longitude of point
(5)	ATTRITION	Probability attrition per nautical mile on leg defined by this point (attribute ATTRLEG in data base)

Figure 17. Routing Points Data Print

BOUNDARY DATA

① NUMBER	② LINK	③ LATITUDE	④ LONGITUDE	⑤ ZONE	⑥ NEXT ZONE
1	3	21.2	160.1	14	16
2	4	31.3	160.2	15	17

HEADING	LABEL	DESCRIPTION
①	NUMBER	Boundary point number (attribute IPOINT in data base)
②	LINK	Link to next boundary point (links to values in column ①)
③	LATITUDE	Latitude of boundary point
④	LONGITUDE	Longitude of boundary point
⑤	ZONE	Zone defined by this boundary
⑥	NEXT ZONE	Zone adjacent to this boundary

Figure 18. Zone Boundary Data Print

2.5.6 Print Option 3: Weapon Group - Penetration Corridor Interaction. This print displays the distance in nautical miles from the centroid of each bomber group to the entry of each corridor. The distance DISTAC for dummy corridor 2 is always zero. Figure 19 displays this print. To conserve space in programs PREPALOC and ALOC, the locations in the array corresponding to corridor 1 (the tactical aviation dummy corridor) are used to hold the fraction of ASM weapons in the group. If there are no ASM weapons in the group, the value of DISTAC (column 3 in figure 19 for the group will be 0.000. If all weapons in the group are ASMs, the value of DISTAC for the group is 1.000. If half the weapons are ASMs, the value is .500, and so on.

① GROUP	② CORRIDOR	③ DISTAC
1	1	0.000
	2	0.000
	3	2931.083
	4	4763.809
	5	5187.943
	6	3516.968
	7	3843.813
	8	4461.455
	9	4860.476
	10	3346.470
	11	3706.963
2	1	0.000

HEADING	LABEL	DESCRIPTION
①	GROUP	Weapon group number (1-200 as assigned by program PLANSET)
②	CORRIDOR	Corridor index number (column 1 of Penetration Corridor Prints)
③	DISTAC	The great circle distance from the centroid of the weapon group to the penetration corridor entry point in nautical miles

Figure 19. Weapon Group to Penetration Corridor Distance Print

2.5.7 Print Option 5: Target Information. This print option prepares two tables which display the target parameter output on the TGTFILE. Figures 20 and 21 display these prints .

```
(1)             (2)                 (3)               (4)
TARGET NO 12    TGTNAME = MOSCOW    INDEXNO = 11234   DESIG = AB123UR1
(5)        (6)              (7)              (8)                 (9)
TASK = AB  TGTMULT = 1.0    TGTLAT = 45.2    TGTLONG = 212.8     INDYPEN = 4
(10)             (11)               (12)               (13)
DISTEG = 213.4   DISTDG = 514.2     DISTDF = 317.2     DHOB = GROUND
```

HEADING	LABEL	DESCRIPTION
(1)	TARGET NO	Target number (assigned by PLANSET)
(2)	TGTNAME	Target name
(3)	INDEXNO	Index number
(4)	DESIG	Designator code/country location code/flag code
(5)	TASK	Task/subtask
(6)	TGTMULT	Target multiplicity
(7)	TGTLAT	Target latitude
(8)	TGTLONG	Target longitude
(9)	INDYPEN	Depenetration corridor index (see column (1) Depenetration Corridor Data Prints)
(10)	DISTEG	Length of depenetration corridor (nautical miles)
(11)	DISTDG	Distance from target to recovery base (nautical miles)
(12)	DISTDF	Distance from target to end of depenetration corridor (nautical miles). Depenetration point is beginning of depenetration corridor
(13)	DHOB	User desired height of burst or optimal height if no user specification

Figure 20. Target Information Print--Part A

① ICORR	② DISTCD	③ ATTRCD
1	0	.0001
2	0	.0002
3	201.4	.0005

HEADING	LABEL	DESCRIPTION
①	ICORRF	Penetration corridor number (see column ①, Penetration Corridor Data Prints)
②	DISTCD	Distance corridor origin to target (nautical miles)
③	ATTRCD	Attrition parameter, corridor origin to target (this value is used as the exponent in the attrition probability calculation).

Figure 21. Target Information Print--Part B

2.5.8 Print Option 7: Changed Planning Factors. If any planning factor change requests were input by the user, the new planning factors for each target are printed. Figure 22 displays this print.

(1) ITGT	(2) TGTNAME	(3) INDEXNO	(4) DESIG	(5) IHCLASS	(6) ICLASS	(7) IHTYPE	(8) VALUE
5	MOSCOW	2131	AB123UR1	U/I	13	RCITY	21.4

(9) MINKILL	(10) MAXKILL	(11) IVULN	(1) ITGT
0.50	0.75	06P0	5

HEADING	LABEL	DESCRIPTION
(1)	ITGT	Target number
(2)	TGTNAME	Target name
(3)	INDEXNO	Index number
(4)	DESIG	Designator code/country location code/ flag code
(5)	IHCLASS	Target class name
(6)	ICLASS	Target class number
(7)	IHTYPE	Target type name
(8)	VALUE	Target value
(9)	MINKILL	Target minimum required destruction fraction
(10)	MAXKILL	Target maximum desired destruction fraction
(11)	IVULN	Target Vulnerability

Figure 22. Planning Factors Print

In addition to the print for each target, a summary of the changes is output as displayed in figure 23.

①

THERE WERE A TOTAL OF 123 CHANGES ACTUALLY MADE ON THE TARGET DATA

HEADING	DESCRIPTION
①	Number of planning factors changed by input requests

Figure 23. Summary of Planning Factor Changes

2.5.9 Fixed Weapon Assignment Information. If some weapons are specified for fixed assignment (FIXASG option), the assignments are printed as they are added to the TGTFILE. Figure 24 displays this print. If there are no fixed assignments for a target, items ① to ④ are printed with the notation ⑤ "NO FIXED ASSIGNMENTS," and items ⑥ to ⑧ are omitted. At the end of computations, a summary of the fixed assignment data is printed.

This print is illustrated in figure 25.

(1) TARGET NO.	(2) TGTNAME	(3) DESIG	(4) INDEXNO
(5)	MOSCOW	AB123UR1	2178

(5)

4 FIXED ASSIGNMENTS

(6) GRP	(7) TIME	(8) SAL
94	1.0	5
13	- .5	0
17		0
100		1

HEADING	LABEL	DESCRIPTION
(1)	TARGET NO.	Target number (assigned by program PLANSET)
(2)	TGTNAME	Target name
(3)	DESIG	Designator code/country location code/flag code
(4)	INDEXNO	Index number
(5)	FIXED ASSIGNMENTS	Number of fixed assignments on this target
(6)	GRP	Group Number
(7)	TIME	Time of arrival for missile weapons (in minutes from H-hour)
(8)	SAL	Salvo number

Figure 24. Fixed Assignment Print

```
OUT OF 137 REQUESTS FOR FIXED ASSIGNMENT, 137 WERE FULFILLED.
          (1)                                 (2)
(3)
EVERY TARGET IDENTIFIER REQUESTED WAS ENCOUNTERED ON THE TARGET FILE

BREAKDOWN OF FIXED ASSIGNMENTS BY GROUP

        (4)            (5)               (6)
       GROUP      FIXED WEAPONS     TOTAL WEAPONS

         1             100               200
         5              20               300
        93              17               150
```

HEADING	LABEL	DESCRIPTION
(1)	---	Number of weapons requested for fixed assignment
(2)	---	Number of weapons actually assigned
(3)	---	Message verifying correct input of target identifiers
(4)	GROUP	Group number
(5)	FIXED WEAPONS	Number of weapons fixed from group
(6)	TOTAL WEAPONS	Total number of weapons in group

Figure 25. Summary of Fixed Assignment Information

2.5.10 Target Summary Data. At the end of all data precomputation, this fraction of the total value in each target class is displayed. Figure 26 displays this print.

(1) 684 TARGETS PROCESSED

(2) ICLASS	(3) CLASS NAME	(4) FRACTION OF TOTAL VALUE IN CLASS
1	MISSILE	0.2500
2	BOMBER	0.3500
3	TANKER	0.1000
⋮	⋮	⋮
15	NOT USED	0.0000

HEADING	LABEL	DESCRIPTION
(1)	TARGETS PROCESSED	Number of targets on TGTFILE
(2)	ICLASS	Class number (ICLASS)
(3)	CLASS NAME	Class name (CLASS)
(4)	FRACTION...CLASS	Fraction of total target value in class

Figure 26. Target Data Summary Print

2.5.11 Debug Prints. Only function PRECOMP has the capability of producing debug prints. Print options 2, 4, and 6 produce these prints. These prints display the information input on the files generated by program PLANSET. Option 2 displays the routing information from the WINFILE; option 4 displays the weapon information from the WINFILE; and option 6 displays the target information from the TINFILE. These prints are produced by the dump capability (IFTPRINT) of the filehandler. The format of these prints is discussed under the section of this manual dealing with the filehandler.

2.5.12 Error Messages. During a run of program PREPALOC, error messages as shown in figure 27 may emanate from several sources. Those messages produced by errors in file input/output are discussed in the section of this manual dealing with the filehandler.

Main Control Program

1. UNRECOGNIZED RUN OPTION

   This message reports that the user-input function request does not match an existing function. The run terminates without further processing. Correct function request card and rerun job.

Planning Factor Modification Functions: VALUMOD, MINKLMOD, MAXKLMOD

1. PREVIOUS CHANGE REQUEST INVALID. REQUEST IGNORED

   The user-input change request card printed preceding this message is not a valid request. At least one field of CLASS, TYPE, or identifier must be nonblank. The card is ignored and processing continues normally.

2. PREVIOUS CHANGE REQUEST IS OUT OF RANGE NEW (1) IS NOW (2)

   The user-input change request printed immediately preceding this message requests an illegal planning factor value. The factor to be changed is named in (1). The change requested is changed to (2). The generation of (2) is shown as follows.

FACTOR ((1))	INVALID VALUE	NEW VALUE ((2))
VALUE	NEGATIVE	0.0
MINKILL	NEGATIVE	0.0
MINKILL	> 1.0	1.0
MAXKILL	NEGATIVE	0.0
MAXKILL	> 1.0	1.0

Figure 27. PREPALOC Error Messages (Part 1 of 5)

3. MORE THAN 1500 CHANGE REQUESTS. REMAINDER OF REQUESTS IGNORED

The cumulative total number of user-input change requests exceeds 1,500. All further change requests will be ignored.

Fixed Weapon Assignment Function FIXASG

1. TOO MANY TARGETS FOR FIXED ASSIGNMENT. ONLY FIRST 5000 REQUESTS WILL BE PROCESSED. FIX REQUESTS ON ALL TARGETS AFTER CURRENT TARGET WILL BE IGNORED

The user-input fixed assignment requests contain more than 5,000 target identifiers. Only the first 5,000 identifiers encountered in the user-input parameter card deck will be available for fixed assignments.

2. GROUP NUMBER ① OUT OF RANGE. FIXED ASSIGNMENT REQUEST IGNORED

A user-input fixed assignment request contains an illegal group number (①). The request for this group is ignored.

3. MORE THAN 7500 FIXED ASSIGNMENT REQUESTS. REMAINDER WILL BE IGNORED.

The user-input fixed assignment request card deck requests the fixed assignment of more than 7,500 weapons. Only the first 7,500 weapons encountered in this deck will be assigned by fixed assignment.

Data Precomputation Function: PRECOMP

1. UNABLE TO DECIPHER VARIABLE NAME ①. INPUT REQUEST IGNORED.

The user-input parameter cards requested a change to the variable named ①. The program was unable to identify the appropriate variable, and the request for a modification of variable ① is ignored. Correct spelling of variable name and rerun job.

2. ERROR IN WEAPON INPUT FILE TYPE ①

The file accessed as the WINFILE does not contain the label WINFILE as its first word. Instead it contains the name specified by ①. The job stops without further processing. Rerun job with correct WINFILE.

Figure 27. (Part 2 of 5)

3. MORE THAN FOUR RECOVERY BASES, IDPEN① IRECOVER②

More than four recovery bases are linked to depenetration point①. Recovery base② and all recovery bases later in the recovery base list linked to depenetration point① will be ignored. Processing continues using the first four bases found linked to point①. Change data base to link fewer bases to this depenetration point.

4. HAPPEN ARRAY OVERFLOW

The number of points required to define the penetration and depenetration corridors exceeds the number allowed in common block /HAPPEN/. Processing continues using only the points and links which do fit in common /HAPPEN/. To remove this problem, decrease number of corridors corridor legs, or precorridor legs.

5. ERROR IN TARGET INPUT FILE TYPE① ②

The file accessed as the TINFILE does not contain the label shown as ② as its first word, but rather the name shown as ①. The job stops without further processing. Rerun job with correct TINFILE.

6. MORE THAN 150 COUNTRY LOCATION CODES. SOME WILL BE IGNORED.

There are more than 150 unique country location codes (CNTRYLOC) in the target system for the current plan. (This is a limit on each side considered separately.) Only the first 150 unique codes can be used for weapon restriction by country code in program ALOC. All country location codes will be passed through the system in the normal manner, however.

7. THE FOLLOWING CHANGE REQUESTS WERE NEVER EXERCISED

TARGET CLASS	TARGET TYPE	TARGET IDENTIFIER	TARGET CHANGE	
①	②	③	④	⑤

If this message appears, some of the planning factor modification requests were never exercised. That is, no target in the target system met the requirements of target class name (①), target type name (②), and/or target identifier (③). The name of the factor to be changed (VALUE, MINKILL, or MAXKILL) is displayed in⑤, and the new requested value is listed in④. This message is merely informational and has no effect on processing.

Figure 27. (Part 3 of 5)

8. MORE THAN 1600 FIX REQUESTS ON THIS TARGET. EXCESS WILL BE IGNORED.

The user has attempted to fix-assign more than 1,600 weapons to a single target. Only the first 1,600 assignment requests will be processed, and the remainder of requests for the current target will be ignored.

9. ①GROUP NO. ②IS OUT OF RANGE. REQUEST IGNORED.

The user has input a fixed assignment request for group number ②. Since there is no group in the current plan with that number, the request is ignored. The word of fixed assignment information (three characters of group number, five characters of arrival time) is printed as ① .

10. ①GROUP NO. ②HAS ALL ITS WEAPONS (③) FIXED. REQUEST IGNORED.

The user has attempted to fix more weapons from group number ②than are available. The maximum number available for assignment is ③. The current request, as displayed in ①, is ignored.

11. MORE THAN 30 WEAPONS FIXED ON AN UNDEFENDED TARGET. ALL FURTHER REQUESTS FOR THIS TARGET IGNORED.

The user has attempted to fix the assignment of more than 30 weapons on a target without terminal ballistic missile defenses. Only the first 30 requests are processed; the remainder are ignored.

12. ①GROUP NO. ②IS A BOMBER ON A TARGET ALLOCATED MORE THAN 30 WEAPONS. REQUEST IGNORED.

The user has attempted to fix-assign a bomber weapon from group ② on a target (with terminal BMD) which has already had more than 30 weapons fixed. Since program ALOC will not consider a bomber weapon in an attack exceeding 30 weapons, the user request, displayed in ①, is ignored.

13. THE FOLLOWING TARGET IDENTIFIERS WERE NEVER ENCOUNTERED ON THE TARGET FILE

DESIGNATOR OR INDEX NUMBER.

① ②

The user requested fixed assignments on targets specified by the designator codes ①or index numbers ②. Since no target which matched either of these identifiers was encountered in processing the target file, no fixed assignment requests referring to these identifiers were processed (see following error message).

Figure 27. (Part 4 of 5)

14. THE FOLLOWING TARGET IDENTIFIERS WERE NEVER ENCOUNTERED ON THE TARGET FILE

TARGET NUMBER

(1)

This message is output under the same conditions as the previous error message when the TGTNUM option is requested for the FIXASSGN option. In this case, of course, (1) is a target number never encountered.

15. ****, LAUNCH TIME NEGATIVE FOR TYPE (1), GROUP = (2), IMPACT TIME = (3)
In fix assigning salvoed group (2) with down time (3); a negative launch time was found for weapon type (1). The fixed assignment will be honored for the first salvo.

16. **** MYSAL GREATER THAN MAXIMUM GROUP, (1)
Attempt to fix assign a missile from salvoed group (1) with a salvo number that is greater than maximum. Salvo number is set to maximum and processing continues.

17. ***** IGOT LT MULT, MYSAL, (1), NSHIFT, (2), IGOT, (3)
The number of salvoed weapons in salvo number (1) is less than the requested number of fix assignments for this group. The number of weapons returned is (3) and the shifting parameter is (2). The next salvo number is attempted.

18. ********** LOOPING IN FIXWEAP *****
Cannot find salvo number that honors fixed assignment request. Fixed assignment ignored for this group.

Figure 27. (Part 5 of 5)

SECTION 1. PROGRAM ALOC

3.1 Purpose

The major purpose of this program is to determine the optimal allocation of weapons to targets, using a Lagrange multiplier technique. The weapons are divided into weapon groups. A group contains weapons of the same characteristics which are geographically proximate. Thus, weapons are considered identical within groups. Each target is considered individually for weapon assignment. The order of investigation is determined by program PLANSET when it shuffles the targets from their data base ordering. When all targets have been processed, another pass over the targets begins. This process continues until the Lagrange method has allocated all the weapons to the targets. The assignments are then passed to later processors which calculate the detailed sorties for each vehicle.

3.2 Concept of Use

The program allows the user to specify the assignment of weapons to specific targets. These fixed assignments need not be mathematically optimum. However, the program will optimally allocate the remaining weapons. The input for fixed assignment information is generated by program PREPALOC for input on the TGTFILE.

In addition, there are other minor capabilities which allow the user to modify weapon range values, to restrict the use of MIRV weapons by target class, and to restrict the use of any weapon group by flag (attribute FLAG) or country (attribute CNTRYL).

As input, program ALOC uses the data on the TGTFILE and BASFILE concerning the target system and weapon stockpile (respectively). Using user-input parameter information concerning allocation restrictions (e.g., fixed assignments and range restrictions), program ALOC generates an assignment of weapons to each target. This assignment is used by later processors to generate a sortie for each bomber and missile.

3.3 File Utilization

Figure 28 illustrates the use of files in program ALOC.

3.3.1 Input Files. The Base File (BASFILE) contains information on the weapon groups, geographic information, and data for components of complex and multiple targets.

The Target File (TGTFILE) contains the target characteristics (e.g., value, latitude, and longitude) for each target. Included are geographic data relating each target to the penetration and depenetration corridors. Some fixed weapon assignment information is also included.

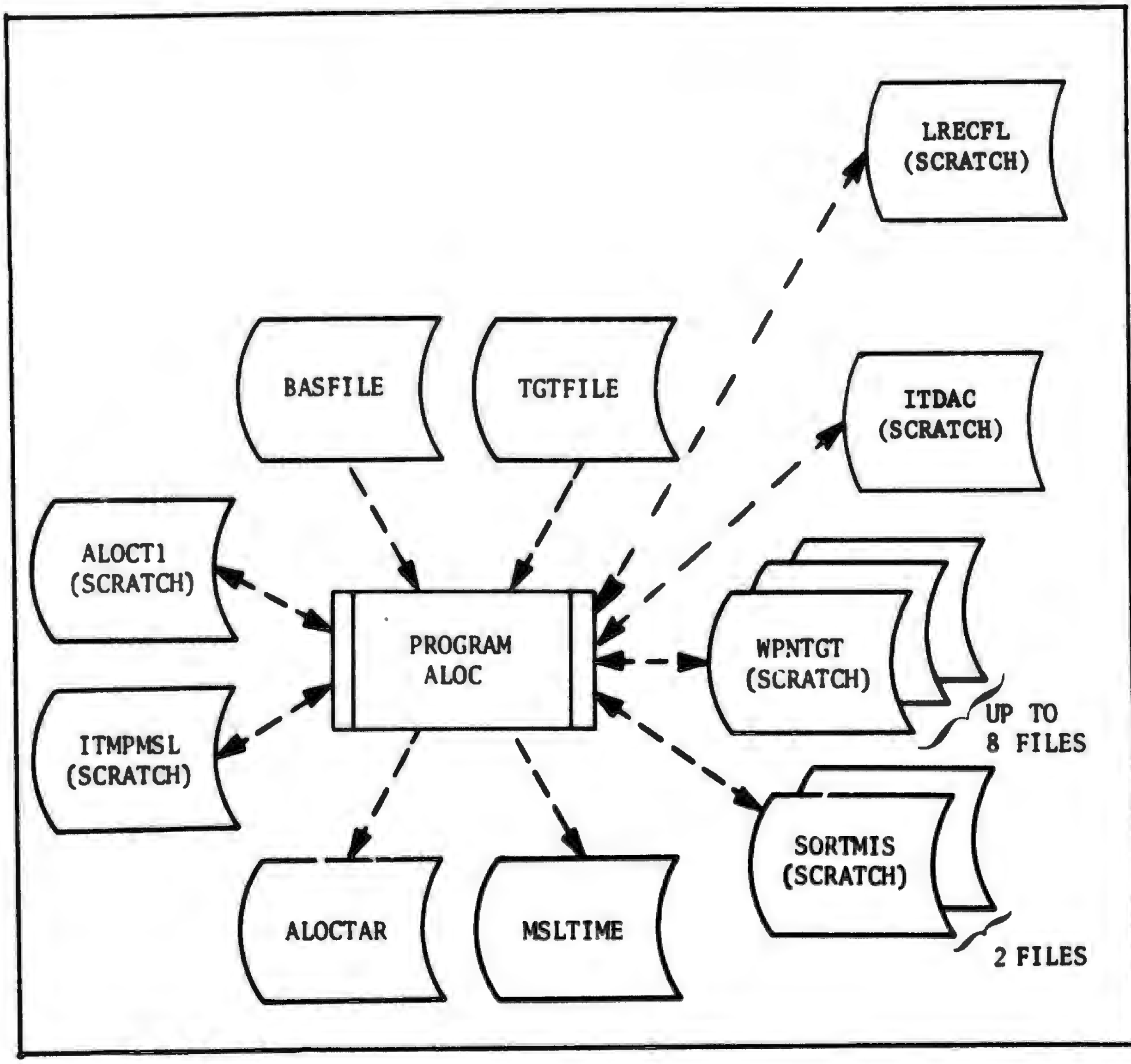


Figure 28. Program ALOC File Utilization

3.3.2 Output Files. The Allocation by Target File (ALOCTAR) consists of basic target characteristics and the record of the allocation of weapons to each target.

The Missile Time-on-Target File (MSLTIME) contains the launch timing information for missiles allocated by the fixed weapon assignment feature. This file is used by program PLANOUT to determine the launch time of these weapons.

3.3.3 Scratch Files. The Temporary Allocation File (ALOCT1) is identical to the ALOCTAR file.

The Temporary Missile Timing File (ITMPMSL) is similar to the MSLTIME file. On the MSLTIME file, the information is sorted by weapon group; on this file, the information is sorted by target number.

The Weapon/Target Files (WPNTGT) contain information on the weapon target interaction parameters which determine the kill probability of each weapon against each target and the effects of interweapon correlations. The number of WPNTGT files is determined dynamically by the program. Each file is one million words in length.

The Missile Data Sort Files (SORTMIS) are used to sort the timing information on the ITMPMSL file preparatory to writing the MSLTIME file. The files are generated only if there are more than 1,000 fixed missiles.

The Weapon Restriction File (ITDAC) contains the weapon allocation restrictions for each group.

The Static Data Record Length File (LRECFL) contains the number of words in each record on the WPNTGT files.

3.3.4 Filehandler Buffer Utilization. The Filehandler buffer area is utilized in conjunction with the above files as indicated in Table 5.

Table 5. Program ALOC Filehandler Buffer Utilization

FILE NAME	BUFFER NUMBER (LUN)	
BASFILE	8	
TGTFILE	2	
ALOCTAR	4	
MSLTIME	7	
ALOCT1	23	(scratch)
ITMPMSL	21	(scratch)
SORTMIS (2 Files)	9, 10	(scratch)
LRECFL	25	(scratch)
ITDAC	26	(scratch)

The WPNTGT files are read and written without using the filehandler. The number of these files and their logical file names are dynamically determined by subroutine GETDTA. The first buffer number opened is 11, the second is 12, and so forth.

3.4 Input

3.4.1 User Options in Program Functions.

There are eight major program functions available in program ALOC. Only one, the ALLOCATE function, is required in any run. This function actually determines the optimal weapon assignments. Of the remaining seven optional functions, five restrict the domain of feasible weapon allocations, while two are used to make multiple runs of program ALOC more efficient. The eight functions are described in the following paragraphs.

The ALLOCATE Function (weapon allocation), a required function, performs the weapon-target allocations using a generalized Lagrange multiplier method. This function must be exercised in every run of program ALOC.

The RANGEMOD Function (modification of weapon ranges), an optional function, allows the user to specify a new range (both refueled and unrefueled) for any weapon group. This specified range is in effect only for program ALOC. Later processors use the range specified in the data base. This function allows the user to restrict weapons by range of the sortie.

The MINRANGE Function (specification of minimum allowed weapon ranges), an optional function, allows the user to specify the minimum range between group centroid and target for any weapon group. Targets closer to the group than the minimum range are not considered for allocation of weapons from the group.

The MIRVREST Function (restriction of MIRV weapons), an optional function, allows the user to restrict the use of each weapon system with a MIRV capability by target class. In addition to listing the classes that may be targeted by each weapon system, the user can also include multiple targets and targets with terminal ballistic missile defense as permitted targets. Each MIRV weapon system can be restricted independently of the others.

The FLAGREST Function (restriction of weapons using FLAG attribute), an optional function, allows the user to restrict the allocation of weapons from any group according to the attribute FLAG. (This attribute is set in the data base by the user.) Weapon groups may be permitted or forbidden to strike targets according to the FLAG value for the targets.

The LOCREST Function (restriction of weapons using CNTRYL attribute) is an optional function which restricts weapon use in a manner similar to that of the FLAGREST function. In this case, the weapon groups are restricted by the country code (CNTRYL in the data base).

The READMUL Function (initial Lagrange multiplier input) is an optional function which reads the values of the initial Lagrange multipliers to initiate the run. It is useful when the user has some information on the relative worth of the weapon systems. The closer the initial multipliers are to the optimal setting, the less time is spent in the allocation process. Also, this option may be useful if nonconvergence occurs and the value of error, VERR, is very small.

The PUNCH Function (final Lagrange multiplier output) is an optional function which punches the final multipliers from the Lagrange process. It allows the user to reinsert these values in a later similar plan to speed up the allocation.

3.4.2 User-Input Parameters. The initiation of each function is effected by insertion of a card in the run deck with the name of the function punched in the first eight columns. Each function card is then followed by a series of user-input parameter cards, described later in this section.

All functions except ALLOCATE are optional. The order of execution of the functions is immaterial, except that (1) the PUNCH function, if selected, must follow the ALLOCATE function, and (2) the ALLOCATE function must follow all the functions except PUNCH.

The run is terminated by a card with "STOP" punched in the first four columns. If, in place of this card, a card with "DUMP" in these columns is encountered, the job will terminate with a memory dump.

Figure 29 displays the format of a function request card. There is no default for the function request.

COLUMNS	FORMAT	J	RANGE	DESCRIPTION
1-8	A8	L	ALLOCATE, RANGEMOD, MINRANGE, MIRVREST, FLAGREST, LOCREST, READMUL, PUNCH, STOP, DUMP	Function name

Figure 29. Function Request Card Format

3.4.2.1 <u>ALLOCATE Function--Weapon Allocation</u>. With respect to Input Parameter Cards, there are 30 user-input parameters for the ALLOCATE function. Of these, 13 are used to control the efficiency and convergence of the allocation process. The remaining 17 parameters describe weapon or target parameters. All parameters use free field input format.

The set of option cards is terminated by a blank card or a card with a termination field (i.e., at sign @ as the first nonblank character in a name subfield).

The print requests may be intermingled with the user-input parameters, specifications for which are shown in table 6.

Tables 7, 8, and 9 provide information concerning SMAT array values.

Table 6. Input Parameter Card Specifications (Part 1 of 6)

NAME	RANGE	DEFAULT	DESCRIPTION
IMATCH	Standard integer	0	Controls the method used to determine if a weapon allocation has met the required minimum destruction fraction specified by MINKILL. If IMATCH is 0, the calculation of fraction killed includes the time dependence of target value. If IMATCH is not equal to 0, the fraction calculation does not consider time dependence of target value.
TARFAC	≥0.0	0.1	Multiplies the level of terminal bomber defense on each target (TARDEF). Used to increase or decrease all local bomber defenses.
BPENFAC	≥0.0	1.0	Multiplies attrition rates for bomber penetration given in the data base. Normally should be equal to 1.0, but can be used to test alternative assumptions without changing the data base.
PKTX	0.0-1.0	0.0	Probability of missile warhead kill by one terminal ballistic missile defense interceptor.
RADPX	0.0-1.0	0.0	Probability of missile warhead kill by a random area ballistic missile defense.
MINDAMAG	0.0-1.0	0.0	Minimum fraction of original value of a target without terminal ballistic missile defenses that must be destroyed by each weapon allocated to the target. If the default option is not used, this constraint may cause non-convergence by not allowing ALOC to put down all the weapons. The fix for this case is to reduce MINDAMAG or reduce weapon inventory.
FIXOPT	*TRUE*, *FALSE*, *NOSAVE*	*TRUE*	Fixed assignment option. If TRUE, fix as on TGTFILE; if FALSE ignore fix requests; if NOSAVE, fix as on TGTFILE but do not create MSLTIME file.
LOWFAC	0.0-1.0	0.0	Multiplier of the nominal level of terminal ballistic missile defense. Represents the lower estimate of the defense level (see PROBLOW).

Table 6. (Part 2 of 6)

NAME	RANGE	DEFAULT	DESCRIPTION
PROBLOW	0.0-1.0	0.0	Probability that the level of terminal ballistic missile defense is degraded by the factor LOWFAC; e.g.; if the nominal number of terminal BMD interceptors is MISDEF but there is a 25% probability that the actual level of interceptors is half this large, LOWFAC = .5 and PROBLOW = .25. These factors apply to every target with terminal BMD.
HIGHFAC	$\geq$0.0	0.0	Serves the same function as LOWFAC, except that it represents the upper estimate of terminal ballistic missile capability.
PROBHIGH	0.0-1.0	0.0	Same function as PROBLOW except that it is the probability of occurrence of the upper defense estimate HIGHFAC.
LAW	*SQUAREROOT* or *POWER*	*POWER*	Specifies the form of damage law used on area targets (i.e.; targets with RADIUS >0.0). If it is equal to *SQUAREROOT* the square root damage law is used. Otherwise, the power (or exponential) law is used on area targets.
TINTFAC	$\geq$0.0	1.0	Acts as a multiplier for the number of terminal BMD defense interceptors over the entire target system.
SMAT	See DESCRIPTION		Failure mode-attribute matrix used in calculating interweapon correlation effects. Estimate of the amount of variance in probability of failure by several failure modes shared by similar weapons. Doubly indexed. Input as SMAT (I,J), where I is an index over the weapon attributes, and J is the index over the failure modes. Table 7 displays

Table 6. (Part 3 of 6)

NAME	RANGE	DEFAULT	DESCRIPTION
SMAT (cont.)			the acceptable values for I and J. Default values of SMAT array are displayed in table 8. Restrictions on range of individual elements are: (a) each element must lie between 0.0 and 1.0; (b) sum of all elements with the same failure mode index J must be less than 1.0.
CORR	0.0-1.0	0.5	Acts as a multiplier for the entries in the SMAT array. Decreasing the value of CORR reduces the effect of interweapon correlations. (With the default SMAT array, the value of CORR should not exceed .5 for good results.)
CORR2	0.0-1.0	0.0	Optional, to evaluate the final weapon allocation with a different multiplier for the SMAT array values. Used in conjunction with the user-input parameter IVERIFY.
FACMIRV	0.0-1.0	0.0	Modifies the SMAT array for MIRV systems. For weapons with a MIRV capability, the values of the SMAT array corresponding to the GROUP attribute for failure modes SBL, CC, and REL (see table 7) are increased by the product of FACMIRV and the unassigned variance for those failure modes. (For the default SMAT array, table 8, the unassigned variance for SBL is .30, for CC is .30, and for REL is .65.) Table 9 provides two examples of the SMAT array for MIRV systems: when the default SMAT array is used in conjunction with FACMIRV = 0.5, and when it is used with FACMIRV = 1.0.
RINTPRD	>1.0	2.0	Approximate ratio between rate of change of target weights between different integration periods. An increase in this parameter increases the sensitivity of the multiplier adjustment to recent target experience.

Table 6. (Part 4 of 6)

NAME	RANGE	DEFAULT	DESCRIPTION
RATIOINT	≥0.0	2.0	Ratio of longest integration period used to the theoretical*--a low value allows higher sensitivity without oscillations in the values of the Lagrange multipliers, but too low a value makes convergence to the correct stockpile sensitive to statistics of the target list. If the target list contains targets with heavy ballistic missile defenses or if a large fraction of the weapons are assigned by the fixed assignment capability, this parameter value should be increased (to 4.0 or above if necessary).
SNSTVTY	≥0.0	0.1	Controls sensitivity of multiplier adjustment during early phases. Too high a sensitivity can cause oscillations in multipliers. If the parameter RATIOINT is increased, this parameter should be decreased, and vice versa.
FSNSTVTY	≥0.0	1.0	Controls sensitivity of multiplier adjustment during latter part of allocation. If the parameter SETTLE is increased, this parameter should be decreased, and vice versa.
CLOSE	>1.00	1.05	Must be greater than 1.00. Excess over 1.00 determines magnitude of closing force relative to Lagrange multipliers at start of closing phase (PROGRESS = 1.0).
DELTVAL	0.0-1.0	.005	Maximum fractional difference in time-dependent target value permitted in the same time-of-arrival cell. (Will be automatically increased if available cells are exceeded--a high value allows slightly faster operation--a low value increases accuracy of time-of-arrival calculations.)
PRM	0.0-1.0	.5	Controls value of quadratic premium before PROGRESS = 1.0. Must lie between 0 and 1.0. Higher values give more stable performance.

Table 6. (Part 5 of 6)

NAME	RANGE	DEFAULT	DESCRIPTION
STALADJ	0.0-1.0	.5	Determines extent to which STALL favors high unit profit versus efficiency in selecting weapons for initial laydown on each target. Should be adjusted to minimize IOPS for run, so long as it does not adversely affect total payoff.
CLOSER	≥0.0	4.0	Controls rate of increase in CLOSE or closing force per pass over target system. High values will close allocation to exact stockpile more rapidly but will cost more in payoff to do so.
QUALITY	0.0-1.0	0.5	Controls extent to which STALL will attempt to refine allocation for each target. Should be set as low as possible for fast operation, so long as total payoff is not reduced. In cases tried so far, half refinement works well; but this should not be assumed.
IVERIFY	0, 1, 2	0	Controls the operation of the allocator after the final weapon allocation has been determined. A value of 0 is used to terminate processing at this phase. A value of 1 will verify the optimality of the payoff by processing another pass through the target list (called the verification pass) with no premiums and the values of the Lagrange multipliers frozen at their final weapon allocation values. The difference in profit between the end of the weapon allocation and the end of the verification pass is a strict upper bound on the difference between the payoff at the end of weapon allocation and the optimal payoff. A value of 2 for IVERIFY is used to evaluate the final weapon allocation using the value of CORR2 in place of CORR as the SMAT array multiplier.
SETTLE	≥0.0	1.0	Controls the number of passes at PROGRESS = .75 before PROGRESS is set to 1.00 and closing begins. Larger numbers give more exact multipliers. However, 1.00 usually is quite adequate. A value

Table 6. (Part 6 of 6)

NAME	RANGE	DEFAULT	DESCRIPTION
SETTLE (cont.)			of SETTLE less than 1.00 can yield a very suboptimal allocation if defective allocations prior to PROGRESS = .75 are not replaced in closing (see parameter FSNSTVTY).
ERRCLOS	0.0-1.0	.001	Provides one control of the termination of weapon allocation processing (ALLOCATE function). If $\|VALERR\| <$ VALWPNS * ERRCLOS, where VALERR is the absolute value of the sum of the Lagrange multipliers for all under-or-over-allocated weapons, and VALWPNS is the sum of the Lagrange multipliers for all weapons in the stockpile, then the weapon allocation process will terminate normally. The complete set of normal terminating conditions for this function is described in the Termination of ALLOCATE Function. (Section 3.5.1.8)

Table 7. Acceptable Values for SMAT Array Indices

J Index. Failure Modes

J	MNEMONIC	DESCRIPTION
1	SBL	Survival before launch
2	CC	Reliability of command and control system
3	REL	Weapon system hardware reliability
4	PEN	Penetration probability
5	STK	Probability of target kill by warhead

I Index. Weapon Attributes

I	NAME	DESCRIPTION
1	ALL	Shared by all weapons in the stockpile
2	GROUP	Weapons of same class, type, region, and alert status whose launch bases are close to one another
3	REGION	Region of launch base
4	CLASS	Weapon class, either bomber or missile
5	TYPE	Weapon type (e.g., B-52G, Poseidon)
6	ALERT	The alert status of the weapon, either alert or nonalert

Table 8. Default Values for SMAT Array

		ATTRIBUTES					
	I =	1	2	3	4	5	6
	J	ALL	GROUP	REGION	CLASS	TYPE	ALERT
	1 SBL	0	.10	.10	.40	.10	0
FAILURE	2 CC	0	.20	.30	.10	.10	0
	3 REL	0	.05	0	.10	.20	0
MODES	4 PEN	0	0	.10	.20	.20	0
	5 STK	0	0	0	0	0	0

Table 9. SMAT Array for MIRV Systems (FACMIRV = 0.5 and FACMIRV = 1.0)

FACMIRV = 0.5

ATTRIBUTES

		ALL	GROUP	REGION	CLASS	TYPE	ALERT
	SBL	0	.25	.10	.40	.10	0
FAILURE	CC	0	.35	.30	.10	.10	0
	REL	0	.38	0	.10	.20	0
MODES	PEN	0	0	.10	.20	.20	0
	STK	0	0	0	0	0	0

FACMIRV = 1.0

ATTRIBUTES

		ALL	GROUP	REGION	CLASS	TYPE	ALERT
	SBL	0	.40	.10	.40	.10	0
FAILURE	CC	0	.50	.30	.10	.10	0
	REL	0	.70	0	.10	.20	0
MODES	PEN	0	0	.10	.20	.20	0
	STK	0	0	0	0	0	0

With respect to Print Options, prints are requested by print option number. Table 10 displays the prints requested by each option number. (The format of each print is described later in the Output section.) A print request is defined by an option number, the first and last pass on which the print is to be active (i.e., printed), the first and last target on which the print is active, and the print frequency (i.e., if frequency is 50, the print is output every 50 targets). Table 11 shows the prints requested by default. (To remove a request, see parameter NOPRINT, in this section.) The print request parameters are input in free field format. The print parameters may be intermingled with the user-input parameters described previously. All parameters for a single request, however, must be input on a single card. The print request input parameters are described in table 12. The maximum number of options requested is 40.

Table 10. Description of Print Option Numbers for Program ALOC (Part 1 of 3)

OPTION	DESCRIPTION OF PRINT
1	Control parameters
2	Main summary prints after weapons have been allocated to target
3	Not used
4	Print for all weapon groups the Lagrange multipliers, the total number of weapons allocated (RNALL), and number of weapons allocated this pass (NALL) with total weapon value and value of error in allocation
5	Print of data on target weights and rates of change of weights
6	Target input data before allocation begins
7	Basic weapon/target interaction data before allocation of weapons to target
8	Risk array before allocation begins on target
9	Summary of weapons assigned to present target and marginal values for each (see option 22 for companion print of potential weapons)
10	Input data to the single target allocator (STALL)--i.e., output from WAD
11	Initial values for lambdas, VALWPNS and VALERR, at start of program only
12	Debugging print showing synopsis of calculation of actual payoff by WAD
13	Debugging print showing after-the-fact synopsis of potential weapon added and weapon deleted payoff calculations by WAD
14	Header for option #15

Table 10. (Part 2 of 3)

OPTION	DESCRIPTION OF PRINT
15	Separate entry point for in-process debugging print of WAD potential weapon added payoff calculations (call deactivated)
16	Defense level and attack mode print for targets with terminal ballistic missile defense
17	Header for option #18
18	Same as #15 but for potential weapon deleted payoffs
19	Planning factor summary for targets with terminal ballistic missile defenses
20	Summary of WADOUT cost payoff benefit, etc.
21	Complete listing of allocation error estimates (ALLEREST)
22	Summary of marginal payoff data for potential weapons followed by resulting STALL decision: a companion print to print number 9
23	Printout of timing information
24	Memory dump and run termination
25	List of inactive switches for each weapon group as related to current target
26	Print of preferred corridors and computed penetration probabilities for each penetration corridor for all bomber groups relative to current target; available only on first pass
27	Best rate of return for missile allocation in DEFALOC
28	Debugging print of allocations and payoff computed in RESVAL

Table 10. (Part 3 of 3)

OPTION	DESCRIPTION OF PRINT
29	Print of Lagrange multiplier, balance parameter, and stockpile for salvoed missiles
30	Print of bomber payload indicators and allocation fractions
31-40	Reserved for future development

Table 11. Default Print Requests

OPTION	FIRST PASS	FIRST TARGET	LAST PASS	LAST TARGET	FREQUENCY
1	1	1	9999	9999	1
2	1	1	9999	9999	1
4	1	1	9999	9999	50
16	1	1	9999	9999	1

Table 12. Print Request Input Parameters (Part 1 of 2)

NAME	RANGE	DEFAULT	DESCRIPTION
NOPRINT	1,2,4,16	None	Used to remove a default print request. Its value is the print option number to be removed.
PRINT	1-28, 101-110	None	Used to request a print. Its value is the option number of the print requested. If its value exceeds 100, it is interpreted as requesting a filehandler dump on the unit equal to the code minus 100 (i.e.; a value of 104 requests a filehandler dump of the file on unit 4). The format of this print is described under program FILEHNR.
FIRSTPAS	1-9999	1	Its value is the first pass on which the print is active. It refers to the nearest preceding 'PRINT' request on the same card.
FIRSTAR	1-5000	1	Its value is the first target in each pass on which the print is active. It refers to the nearest preceding 'PRINT' request on the same card.
LASTPASS	1-9999	9999	Its value is the last pass on which the print is active. It refers to the nearest preceding 'PRINT' request on the same card.
LASTAR	1-5000	9999	Its value is the last target in each pass on which print is active. It refers to the nearest preceding 'PRINT' request on the same card.
TGTFREQ	1-5000	1	Its value is the number of targets processed between successive activations of the print. For example, if TGTFREQ=10, the print is active on every tenth target

Table 12. (Part 2 of 2)

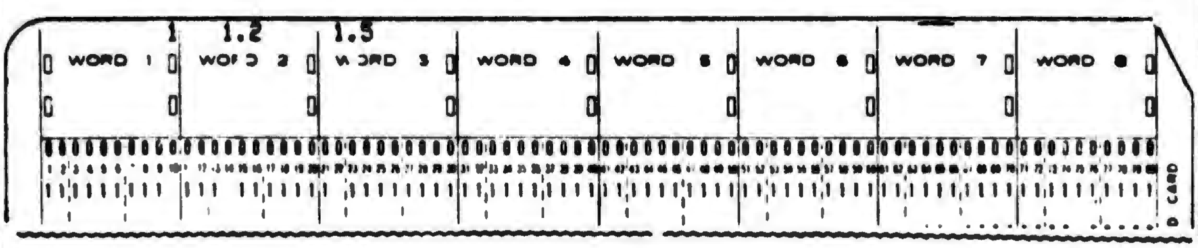
NAME	RANGE	DEFAULT	DESCRIPTION
TGTFREQ (cont.)			within the range defined by the previous four parameters. It refers to the nearest preceding 'PRINT' request on the same card. If the print option number is greater than 100, the value of this parameter is the number of words to be printed from each end of the array input or output on the appropriate file. (If the code is greater than 100, the print frequency is presumed to be each target.)

3.4.2.2 RANGEMOD Function--Modification of Weapon Ranges. These cards allow the user to change the range of all vehicles in any specific weapon group. These new ranges will be used only during weapon allocation in program ALOC. Later programs will use the range specified in the data base.

The user may input two parameters RANGEMUL and RANRFMUL for each group (G). The program will multiply the unrefueled range RANGE(G) by the user-specified RANGEMUL(G). The refueled range RANGEREF(G) is multiplied by RANRFMUL(G). If the user does not specify range multipliers for a group, they are assumed to be equal to 1.0.

Figure 30 shows a range change card. This data card set is terminated by a card with a nonpositive integer in the first field. If the user wishes the same multiplier for both refueled and unrefueled range, he need only specify RANGEMUL(G) and leave the RANRFMUL(G) field blank on the card. The program will set the refueled range multiplier equal to the unrefueled range multiplier. Also, sometimes convergence cannot occur because ALOC has too many weapons for a heavily-constrained target set. By setting multipliers to 0.0, these weapons will be deleted from the allocation. If these multipliers are set to 0.0, the value of the group lambdas should also be set to 0.0 in the READMUL function.

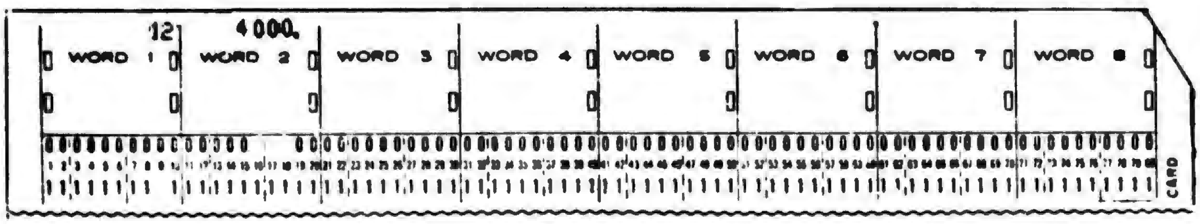
If conflicting range change requests are input, the last request input will take precedence.



WORD	FORMAT	(J)	RANGE	LABEL	DESCRIPTION
1	Integer	N/A	(1-200)	G	Group number
2	Floating Point	N/A	(Standard)	RANGEMUL	Multiplier for unrefueled range
3	Floating Point	N/A	(Standard)	RANRFMUL	Multiplier for refueled range

Figure 30. Range Change Card

3.4.2.3 MINRANGE Function--Specification of Minimum Allowed Weapon Range. These cards allow the specification of a minimum range for a weapon group. The group will be assigned to targets which are further than the minimum range from the group centroid. If conflicting requests are input (i.e., more than one card from the same group), the last one read will take precedence. If no minimum range is input, it is assumed to be zero. Figure 31 shows a minimum range card. This set of cards is terminated by a card with a nonpositive integer in the first field.



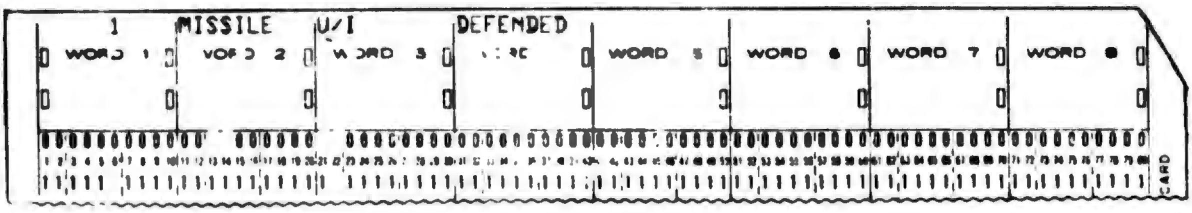
WORD	FORMAT	(J)	RANGE	LABEL	DESCRIPTION
1	Integer	N/A	(1-200)	G	Group number
2	Floating Point	N/A	(Standard)	RANGEMIN	Minimum range in nautical miles

Figure 31. Minimum Range Card

3.4.2.4 MIRVREST Function--Restriction of MIRV Weapons. This function restricts the use of MIRV weapons to specific target classes. The user input for this option consists of a series of cards which list permitted target classes for each restricted MIRV system. Figure 32 displays the format of this card. The data set is terminated by a zero or negative IMIRV number.

The permitted target class name fields are scanned on each card. Only the nonblank fields are processed. The contents of these fields may be the names of the QUICK target classes (e.g.; MISSIL, U/I) or COMPLE or COMPLD. (The target class names COMPLD and COMPLE refer to complex targets with and without terminal bomber defenses, respectively.) In addition, two other target classes may be put on the permitted list. The word DEFENDED permits targets with terminal ballistic missile defenses; the word MULTIPLE permits multiple targets.

The cards do not need to be in any particular order, nor is there any required order for the target classes. The same IMIRV number may appear more than once. If so, the permitted classes on the second and succeeding cards are added to the classes permitted on previous cards. The maximum number of permitted classes, not including DEFENDED and MULTIPLE, is 16. There is no limit on the number of restriction cards, either total or per IMIRV number.

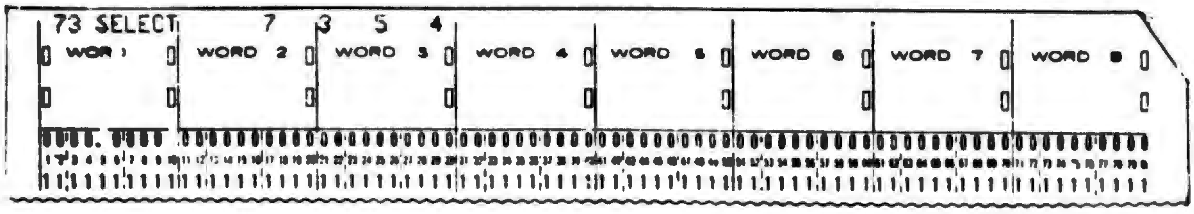


WORD	FORMAT	(J)	RANGE	LABEL	DESCRIPTION
1	Integer	N/A	(1-40)	IMIRV	MIRV system identification number
2-8	A8,2X	L	Target class names plus COMPLE, COMPLD, DEFENDED, MULTIPLE	N/A	Alphameric names of permitted target classes

Figure 32. MIRV System Restriction Card Format

If this run type option is used and there is no restriction card for a certain system, that system will be unrestricted. Note that the data fields are the permitted classes. Thus, if a card contains an IMIRV number and is blank thereafter, the system cannot be allocated unless there are other cards with that number that do contain permitted classes.

3.4.2.5 FLAGREST Function--Restriction of Weapons Using FLAG Attribute. This function permits user restriction of weapon allocations by the value of the target attribute FLAG. The user input consists of a series of FLAG restriction cards. The format of these cards is displayed in figure 33.



COLUMNS	FORMAT	(J)	RANGE	DESCRIPTION
1- 4	Integer	N/A	(1-200)	Group number to be restricted
5-10	Alphameric	L	(SELECT, DELETE)	Restriction mode (see text)
11-80	Integer	N/A	(1-9)	FLAG values

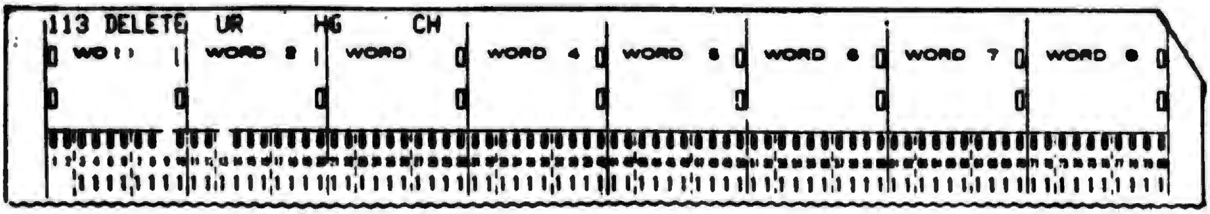
Figure 33. FLAG Restriction Card Format

The weapons are restricted by group. A FLAG restriction may be either SELECT or DELETE. If SELECT is chosen, only targets whose value of FLAG matches values on the card are eligible for weapon allocation. If DELETE is chosen, targets of all values of FLAG are eligible for weapon allocation except those which match values on the restriction card. The acceptable values of FLAG range from 1 to 9. The values may be placed on the card in any order. Blanks may appear between the values. For example, the card displayed in figure 33 allows weapons from group 73 to be allocated only to those targets with a FLAG code of 3, 4, 5, and 7.

The set of FLAG restriction cards is terminated by a card with the word END punched in the first three columns.

3.4.2.6 LOCREST Function--Restriction of Weapons Using CNTRYLOC Attribute. This function is similar to the FLAGREST function except that weapons are restricted by the value of target country location codes CNTRYLOC. The weapons are restricted by group using the SELECT or DELETE feature as in the FLAGREST option. Figure 34 displays the format of the country location code restriction code. The set of these cards is terminated by a card with the word END punched in columns 1-3.

The card displayed in figure 34 allows weapons from group 113 to attack a target only if the target country location code is not UR, HG, or CH. (Blanks are ignored in columns 11-80.)



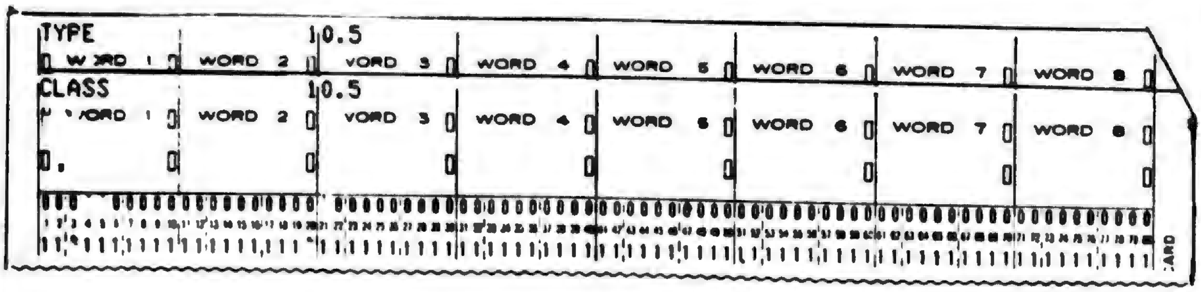
COLUMNS	FORMAT	(J)	RANGE	DESCRIPTION
1- 4	Integer	N/A	(1-200)	Group number to be restricted
5-10	Alphameric	L	(SELECT, DELETE)	Restriction mode (see text)
11-80	Alphameric	N/A	(Standard)	Two-character country location codes (blanks ignored)

Figure 34. Country Location Code Restriction Cards

3.4.2.7 READMUL Function--Initial Lagrange Multiplier Input. This function allows the user to input the values of the local Lagrange multipliers before starting the weapon allocation.

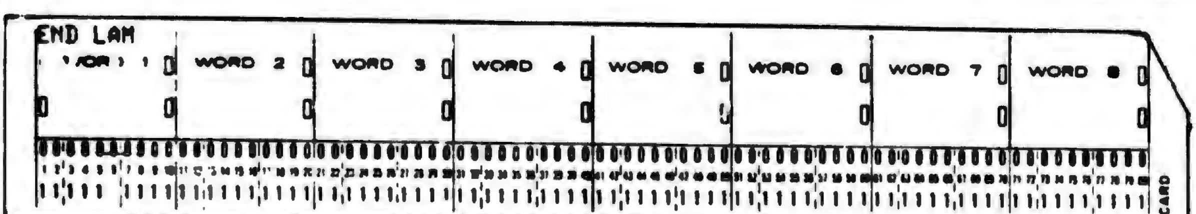
Unless otherwise specified, all local multipliers are initially set to 1.0. These values may be set by the user on data cards. The first word specifies either ALL, REGION, CLASS, TYPE, GROUP, OTHER, or END LAM. The integer in the second word represents the index of the weapon attribtue to be changed (e.g.; 1 for first group; 2 for second group), and the floating point number in the third word represents the new value of the particular local multiplier. The last card in the user-input parameter cards for this option must be an END LAM card. Figures 35 and 36 describe the user-input parameter cards. In this example, all items of CLASS 1 will have their lambdas multiplied by 0.5; additionally, TYPE 1 will have its lambda multiplied by 0.5. Thus, the weapons of CLASS1, will have an initial lambda of .25.

3.4.2.8 PUNCH Function--Final Lagrange Multiplier Output. There are no user-input parameters for this function. Only the function selection card is required.



WORD	FORMAT	(J)	RANGE	DESCRIPTION
1	Alphabetic	L	(8 Char)	REGION, CLASS, ALL, TYPE, GROUP, or OTHER
2	Integer	R	(Standard)	Index number of attribute
3	Floating Point	N/A	(Standard)	New value of multiplier (lambda) for this REGION, CLASS, TYPE, GROUP, or alert status

Figure 35. Multiplier Input Card



WORD	FORMAT	(J)	RANGE	DESCRIPTION
1	Alphabetic	L	(END LAM)	END LAM

Figure 36. END LAM Card

3.5 Output

The standard output of the various functions are described in the following.

3.5.1 ALLOCATE Function-Weapon Allocation. This function produces most of the printed output from a run of program ALOC. It consists of timing information for previous functions, (3.5.1.1) values of user-input parameters, (3.5.1.2) basic weapon group information, (3.5.1.3), detailed weapon allocation data, (3.5.1.4) summary of weapon allocation data, (3.5.1.5), timing information for the ALLOCATE function, (3.5.1.6), and a listing of missiles allocated by fixed assignment, (3.5.1.7).

3.5.1.1 Timing Information For Previous Functions. This print displays the amount of time spent in processing functions of program ALOC. Figure 37 displays the format of this print. The times are all in minutes. In each column there are two times. The upper time is the time used in the option. The lower time is the total time used in the option. For most runs, times should be the same. The value of "LOST" time is irrelevant in this print.

3.5.1.2 Values of User-Input Parameters. The user-input parameters are printed in five sections, comprising the print requests, parameter list, damage law option, weapon correlation array, and fixed assignment input mode card. Figures 38 through 41 display the formats of these prints.

3.5.1.3 Basic Weapon Group Information. This print (print option 1 displays the basic information defined for each weapon group. Figure 42 displays this print.

```
TIMING INFORMATION FOR PREVIOUS OPTIONS

INITIALIZE     RANGEMOD     MINRANGE     MIRVREST     FLAGREST     LOCREST     READMUL
(1) 0.5389   (2) 0.0000   (3) 0.0000   (4) 0.0000   (5) 0.0000   (6) 0.0000   (7) 0.0000   8 0.0000
    0.5389       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000     0.0000
ACTIVE TIME =        0.5389 MIN.       LOST TIME =       0.0000 MIN.       ELAPSED TIME =    0.5389 MIN.
                      (8)                                 (9)                                (10)
```

HEADING	LABEL	DESCRIPTION
(1)	INITIALIZE	Number of minutes spent in initializing variables for program ALOC.
(2)	RANGEMOD	Number of minutes spent in RANGEMOD option
(3)	MINRANGE	Number of minutes spent in MINRANGE option
(4)	MIRVREST	Number of minutes spent in MIRVREST option
(5)	FLAGREST	Number of minutes spent in FLAGREST option
(6)	LOCREST	Number of minutes spent in LOCREST option
(7)	READMUL	Number of minutes spent in READMUL option
(8)	ACTIVE TIME	Total number of minutes spent in all options in processing
(9)	LOST TIME	Total number of minutes clock was stopped for debug printing
(10)	ELAPSED TIME	Total elapsed time since beginning of run ((8) + (9))

Figure 37. Timing Information Print (Maintenance Print)

PRINT REQUESTS

(1) REQUEST	(2) IPASS	(3) ITGT	(4) LPASS	(5) LTGT	(6) FREQ	(7) MODE
1	1	1	9999	9999	1	DEFAULT
2	1	1	9999	9999	1	DEFAULT
4	1	1	9999	9999	50	DEFAULT
16	1	1	9999	9999	1	DEFAULT
23	1	1	9999	9999	10	INPUT

(1) Print request code (see table 8)

(2) Initial pass to produce print

(3) Initial target to produce print

(4) Last pass to produce print

(5) Last target to produce print

(6) Frequency of print (e.g., 50 means every 50 targets)

(7) Mode (DEFAULT, INPUT, or REMOVED)

Figure 38. Print Request Print

(1)		(2)	(3)
IMATCH	=	0	BY DEFAULT
RINTRPRD	=	2.0000	BY DEFAULT
RATIOINT	=	2.0000	BY DEFAULT
SNSTVTY	=	0.1000	BY DEFAULT

(1) Parameter name

(2) Parameter value for this run of ALOC

(3) Mode of setting (DEFAULT or INPUT)

Figure 39. Parameter List Print

①
DAMAGE LAW OPTION IS EXPONENT LAW.
① Damage law option (EXPONENTIAL or SQUAREROOT)

Figure 40. Damage Law Option Print

WEAPON CORRELATION ARRAY (SMAT) INTERPRETED AS FOLLOWS

	ALL	GROUP	REG	CLASS	TYPE	ALERT
SBL	0.00	0.10	0.10	0.4	0.10	0.00
CC	0.00	0.20	0.30	0.1	0.10	0.00
REL	0.00	0.05	0.00	0.10	0.20	0.00
PEN	0.00	0.30	0.10	0.20	0.20	0.00
STK	0.00	0.00	0.00	0.00	0.00	0.00

Figure 41. Weapon Correlation Array

(1)	(2) NWPNS	(3) WLAT	(4) WLONG	(5) IREG	(6) LTYP	(7) ALRT	(8) SBL	(9) IREF	(10) YIELD	(11) RANGE	(12) CEP	(13) SPEED	(14) ALRTDL	(15) NLRTDL	(16) RDEC	(17) ICLS	(18) RANGEREF	(19) REL	(20) CC
1	72	40.50	91.50	1	2	1	0.79	-5	1.75	4800.00	0.50	510.00	0.00	6.00	3.0	2	6300.00	0.90	1.00
2	80	40.50	91.50	1	2	2	0.17	-5	1.75	4800.00	0.50	510.00	0.00	6.00	3.0	2	6300.00	0.90	1.00
3	72	33.50	97.50	1	2	1	0.79	-5	1.75	4800.00	0.50	510.00	0.00	6.00	3.0	2	6300.00	0.90	1.00
4	80	33.50	97.50	1	2	2	0.17	-5	1.75	4800.00	0.50	510.00	0.00	6.00	3.0	2	6300.00	0.90	1.00
5	50	48.50	100.50	1	1	1	0.90	11	1.00	4700.00	1.00	12000.00	0.00	0.00	1.1	1	0.00	0.70	1.00

(21) TOTAL WEAPONS = __

HEADING	LABEL	DESCRIPTION
(1)		Weapon group number
(2)	NWPNS	Number of weapons in group (not fixed by the user). This includes weapons which had RNGMOD and LAMBDA set to zero.
(3)	WLAT	Latitude of group centroid
(4)	WLONG	Longitude of group centroid
(5)	IREG	Index of command and control region for group
(6)	LTYP	Weapon type index (LTYPE from program PLANSET)
(7)	ALRT	Weapon alert status: 1=alert; 2=nonalert
(8)	SBL	Probability of weapon survival before launch
(9)	IREF	Weapon refuel code for bombers; vehicle payload index for missiles
(10)	YIELD	Mean yield of weapons in group (megatons)
(11)	RANGE	Unrefueled range of vehicles (nautical miles)[disregarding modifications made in RANGEMOD option]
(12)	CEP	Probable circular error of weapon vehicle (nautical miles)
(13)	SPEED	Vehicle bomber speed (knots); for missiles, minimum time of flight (hours)
(14)	ALRTDL	Delay of alert vehicles before commencing launch (hours)
(15)	NLRTDL	Delay of nonalert vehicles before commencing launch (hours)
(16)	RDEC	Ratio of high-altitude range to low-altitude range (RANGEDEC); for missiles, flight time variable
(17)	ICLS	Target class number (ICLASS) for weapons: 1=missile; 2=bomber
(18)	RANGEREF	Refueled range for bombers; minimum range (n. miles)
(19)	REL	Reliability of weapon vehicle
(20)	CC	Command and control reliability for weapon vehicle
(21)	TOTAL WEAPONS	Sum of Column (2)

Figure 42. Basic Weapon Group Information Print (Print Option 1) (Part 1 of 2)

SALVOED WEAPON STOCKPILE (AFTER REMOVAL OF FIXED WEAPONS)

GROUP (1)	SALVO (2) → (3) 1	2	3	4	5 24
1	5	5	5	5	5 5
2	2	2	2	0	0 0
3	3	0	1	3	1 0
4	0	0	0	1	5 0

HEADING	LABEL	DESCRIPTION
(1)	GROUP	Group number
(2)	SALVO	Salvo number
(3)	--	Number of weapons in salvo for this group

Figure 42. (Part 2 of 2)

3.5.1.4 Detailed Weapon Allocation Data. These prints (print options 2 and 16) display the allocation to each target as the target is processed. Figures 43 and 44 display these prints. The print displayed in figure 43 is print number 16 and appears only preceding data for targets with terminal ballistic missile defenses. The quantities:

DPROFIT = PROFIT - OPROFIT

SDPROFIT = DPROFIT

DELTEFF = DPROFIT/VALWPNS

SDELTEFF = SDPROFIT/VALWPNS

require some explanation. These quantities are computed and the latter two are printed out in the standard option 2* to help the user in evaluating the progress of the allocation. The quantity OPROFIT represents the "profit" of the old allocation to the target evaluated in terms of the present values of the Lagrange multipliers. DPROFIT is thus a measure of the improvement in profit using the new allocation. Up until PROGRESS = 1.0 this quantity is summed over all targets (one complete pass only), to give SDPROFIT. Thus when the multipliers have been near the correct values for one full pass the value of SDPROFIT should be small. To provide a standard relative value for interpreting these quantities, they are divided by the value of all weapons VALWPNS,**

$$\text{VALWPNS} = \sum \text{NWPNS(G)} * \text{LAMEF(G)}$$

to obtain DELTEFF and SDELTEFF which measure changes in profit as a fraction of the total value of all weapons.

The quantity SDELTEFF therefore provides an estimate of how efficient the allocation would have been if the allocation had been terminated one pass earlier. Presumably, the current efficiency is substantially higher, but SDELTEFF does not, at this point, give any indication of how much. It is nevertheless of value in developing experience on how soon the PROGRESS .75 phase can be terminated. When PROGRESS is equal to 1.00 the multipliers are frozen, and this role of SDELTEFF ceases to be relevant. The quantity is then reset to zero. Thereafter it provides a measure of the effect on the profit of closing to the exact stockpile. Usually during the closing phase SDELTEFF goes slightly negative. However, since during this phase we continue to replace allocations originally produced with slightly different values of the multipliers, the value may go positive for a while until the closing

---

* See column labeled (P-O)/VWPS in this print, headings 17 and 27 in figure 44.

** The value of NWPNS does not include the weapons fixed by the user.

forces get large enough to force closure even at some loss of profit. Thus the value of SDELTEFF at the end of the PROGRESS = 1.0 phase measures the loss of profit associated with closing. In the event that closing requires more than one full pass a test has been inserted which causes SDELTEFF to continue to accumulate over more than one pass when PROGRESS = 1.0.

Finally when PROGRESS = 2.0 the quantity is again set equal to zero. If a verification pass is carried out, SDELTEFF then measures any increase in profit in the verification pass relative to the final allocation. In this role it defines an upper limit on the inefficiency of the actual allocation.

3.5.1.5 Summary Weapon Allocation Data: This print (print option 4) displays a summary of the weapon allocation. It always appears at the end of the weapon allocation process. If a verification pass is made, this print appears at the end of that pass. Figure 45 displays this print.

3.5.1.6 Timing Information For ALLOCATE Function. This print (option 23) displays the amount of time spent in processing the various phases of weapon allocation.

```
                          ①              ②
DEFENDED  TARGET - MISDEF =  3, NBLN =  -3
```

① Number of terminal ballistic missile interceptors

② Allocation type designator. If positive, allocation did not try to allocate more "objects" (warheads and decoys) to target than the number of BMD interceptors at the target. (This is a leakage tactic.) If this value is negative, more objects were allocated than the number of BMD interceptors. (This is an exhaustion tactic.)

Figure 43. Defended Target Summary Print (Print Option 16)

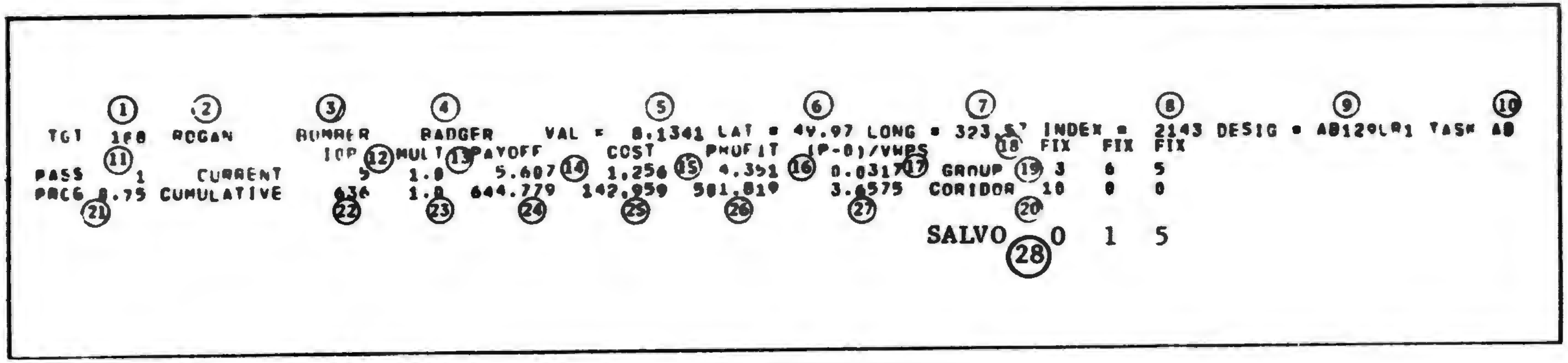


Figure 44. Weapon Allocation Print
(Print Option 2)
(Part 1 of 2)

(1) Target number assigned to program PLANSET
(2) Target name
(3) Target class name
(4) Target type name
(5) Target value
(6) Target latitude
(7) Target longitude
(8) Target index number assigned to program INDEXER
(9) Target designator code/country location code/flag code
(10) Target task/subtask
(11) Current pass for allocation
(12) Number of weapon additions or deletions on this target during processing
(13) Current multiplicity of target
(14) Current value destroyed on target
(15) Sum of Lagrange multipliers for weapons allocated to target
(16) Difference of items (14) and (15)
(17) Ratio of change of profit on this target to total value of all weapons
(18) Fixed Weapon indicator: 'FIX'-weapon allocated by fixed assignment; blank-weapon allocated automatically
(19) Group numbers of weapons currently assigned to target
(20) Penetration corridor for weapon, unless negative; if negative, number of weapons from group assigned. If zero, weapon is a missile.
(21) Value of internal measure of progress
(22) Cumulative number of weapon addition and deletion operations
(23) Original target multiplicity
(24) Cumulative amount of value destroyed
(25) Cumulative sum of Lagrange multipliers for all weapons assigned
(26) Difference of items (24) and (25)
(27) Sum of all ratios of profit to value of weapons
(28) Salvo number: 0 = nonsalvoed missiles; 0 = gravity bombs, 1 = ASMs (bombers)

Figure 44. (Part 2 of 2)

(1)	(2) LAMBDA	(3) NALL	(4) RNALL	(5) RNALL/NWPNS	VALWPNS=	(6) 219.0084	VALERR=	(7) 76.8694
1	0.571938	18	18	0.250				
2	0.272487	0	0	0.000				
3	0.571144	18	18	0.250				
4	0.272487	0	0	0.000				
5	0.621496	6	6	0.120				
6	0.622408	6	6	0.120				
7	0.618269	5	5	0.100				

HEADING	LABEL	DESCRIPTION
(1)		Weapon group index
(2)	LAMBDA	Value of Lagrange multiplier for group
(3)	NALL	Number of weapons of each weapon group that have been allocated since the start of the current pass
(4)	RNALL	Number of weapons of each weapon group that are currently allocated; considers all passes
(5)	RNALL/NWPNS	Ratio of the weapons allocated from each weapon group to the total number of weapons assigned to the group
(6)	VALWPNS	Current value of all weapons
(7)	VALERR	Current value of the error in the allocation process

Figure 45. Weapon Allocation Summary Print (Print Option 4)

3.5.1.7 List of Fixed Missiles. If missile weapons have not been allocated by fixed assignment the message 'NO FIXED MISSILE INFORMATION SAVED' is printed. If some missiles were fixed but the information was not saved (see user-input parameter NOSAVE) the same message is printed. If missiles were fixed and the information output to the MSLTIME file, the print described in figure 46 is output.

3.5.1.8 Termination of ALLOCATE Function. The ALLOCATE function will terminate normally on one of three conditions:

a. More than 1.5 passes while PROGRESS = 1.0

b. $|VALERR| < VALWPNS * ERRCLOS$, where VALERR is the absolute value of the sum of the Lagrange multipliers for all under- or over-allocated weapons, VALWPNS is the sum of the Lagrange multipliers for all weapons in the stockpile, and ERRCLOS is a user-input parameter for the ALLOCATE function.

c. $SUMSQERR < 1/(10*NTGTS^2)$ where NTGTS equals the number of targets and SUMSQERR equals the sum of the squares of the allocation error estimates.

d. If convergence is unlikely, i.e., PROGRESS = 0.75 is not achieved by the end of PASS 3, the run will be terminated (see Error Messages, ALLOCATE Function, message 13).

When condition 1-3 occurs, the message "FINAL WEAPON ALLOCATION"* is printed followed by a print of options 2, 4, and 23. If the input parameter IVERIFY is nonzero, a verification pass is then made. At the end of the verification pass, or immediately following prints described above, the message "END OF WEAPON-TARGET PROCESSING" is printed, followed by a print of options 2, 4, and 23.

* For condition 4, the referenced error message is printed.

```
SORTED FIXED MISSILES
  ①       ②       ③     ④       ⑤
GROUP  INDEXNO  DESIG  TASK  ARRIVAL TIME
    5     2778  AD648   AD
    5     2778  AD648   AD
    5     2778  AD648   AD
    5     2778  AD648   AD
    5     2778  AD648   AD
    5     2778  AD648   AD
    5     2778  AD648   AD
    5     2778  AD648   AD
    5     2778  AD648   AD
```

HEADING	LABEL	DESCRIPTION
①	GROUP	Group number
②	INDEXNO	Index number of target
③	DESIG	Target designator code/country location code/flag code
④	TASK	Target task/subtask code
⑤	ARRIVAL TIME	Weapon delivery time (in minutes) specified by fixed assignment information.

Figure 46. Fixed Missile Information Print

3.5.2 RANGEMOD Function - Modification of Weapon Ranges. This function displays the user-input information and interpretation for this option. Figure 47 displays this print.

3.5.3 MINRANGE Function - Specification of Minimum Allowed Weapon Range. This function displays the minimum range for all groups with a minimum range input. Figure 48 displays this print.

3.5.4 MIRVREST Function - Restriction of MIRV Weapons. This function prints the user-input parameter cards and the list of permitted classes for all restricted MIRV systems. Figure 49 displays this print.

3.5.5 FLAGREST Function - Restriction of Weapons Using FLAG Attribute. This function lists the user-input parameter cards and the groups restricted by target flag code FLAG. Figure 50 displays this print.

3.5.6 LOCREST Function - Restriction of Weapons Using CNTRYLOC Attribute. This function lists the user-input parameter cards and the restrictions of weapon groups according to country location code CNTRYLOC. Figure 51 displays this print.

3.5.7 READMUL Function - Initial Lagrange Multiplier Input. The standard output for this function consists of a listing of the input parameter cards.

3.5.8 PUNCH Function - Final Lagrange Multiplier Output. The standard output for this function consists of a listing of the punched cards containing all the local multipliers. The format of these cards (and therefore their listing) is identical to the user-input parameters for the READMUL function (see figure 35). The card listing is followed by a summary of the final weapon allocation. The format for this print (option 4) is described in figure 45.

3.5.9 Detailed Prints. Only the ALLOCATE function may produce more detailed prints than the standard prints. These prints are described according to their print option as follows.

a. Print Option 1 (Basic Weapon Group Information) This print is a standard print described in figure 42.

b. Print Option 2 (Weapon Allocation) This print is a standard print described in figure 44.

c. Print Option 4 (Weapon Allocation Summary) This print is a standard print described in figure 45.

d. Print Option 5 (Target Weight Information) This is a print of data on target weights and rates of change of weights. Figure 52 displays this print.

```
USER    INPUT    INFORMATION    GROUP    OLD RANGE    NEW RANGE    OLD RANGEREF
1 <------------- (1) -------------> 1
        2.0              2.5     (2)  3   (3)  5000.00  (4)  10000.00  (5)  80000.00

NEW RANGEREF
          (6)
20000.00
```

HEADING	LABEL	DESCRIPTION
(1)	USER INPUT INFORMATION	First 30 columns of user-input parameter card
(2)	GROUP	Group number
(3)	OLD RANGE	Data base unrefueled range (nautical miles)
(4)	NEW RANGE	Modified unrefueled range (nautical miles)
(5)	OLD RANGEREF	Data base refueled range (nautical miles)
(6)	NEW RANGEREF	Modified refueled range (nautical miles)

Figure 47. Range Change Information Print

USER INPUT INFORMATION		GROUP	MINIMUM RANGE
1 ← ① → 1		②	③
3	1000.0	3	1000.00
7	205.0	7	250.00

HEADING	LABEL	DESCRIPTION
①	USER INPUT INFORMATION	First 20 columns of user-input parameter card
②	GROUP	Group number
③	MINIMUM RANGE	Minimum range (nautical miles)

Figure 48. Minimum Range Information Print

IMIRV ①	PERMITTED CLASSES ②
1	U/I MISSILE DEFENDED
3	COMPLEX MULTIPLE

HEADING	LABEL	DESCRIPTION
①	IMIRV	MIRV system identification number
②	PERMITTED CLASSES	List of permitted classes for system

Figure 49. MIRV Weapon Restriction Information Print

FLAG RESTRICTIONS

THE FOLLOWING GROUPS ARE RESTRICTED TO THE FOLLOWING FLAGS (REGIONS).

(IF A GROUP DOES NOT APPEAR, IT IS UNRESTRICTED.)

FLAGS

GROUP	①→ 1	2	3	4	5	6	7	8	9
② 5	③ 0	1	0	1	0	1	0	1	0
-	0	0	1	1	0	0	1	1	0

① FLAG values (1-9)

② Group number

③ Restriction code: 0=disallowed; 1=allowed
(e.g., weapons from group 5 may strike targets only if their FLAG code is 2,4,6 or 8)

Figure 50. Flag Restriction Information Print

COUNTRY CODE RESTRICTIONS

THE FOLLOWING GROUPS ARE RESTRICTED TO THE FOLLOWING COUNTRY CODES.

(IF A GROUP DOES NOT APPEAR, IT IS UNRESTRICTED.)

	GROUP		(1)→ US	GB	WG	FR	SP	CA
(2)	3	(3)	0	1	1	0	1	1
	5		1	0	1	0	1	0

(1) Country location codes (CNTRYLOC)

(2) Group number

(3) Restriction code: 0=disallowed; 1=allowed (e.g., weapons from group 3 may strike only targets with country codes of GB, WG, SP, and CA)

Figure 51. Country Location Code Restrictions Information Print

```
          PRINT NO.   5
                          ① 1              ② 2              ③ 3
WTFAC  ④       7.28011+000      7.28011+000      7.28011+000
WTRATE ⑤       1.00000+000      1.00000+000      1.00000+000
WTSUM  ⑥       2.00786+002      2.00786+002      2.01287+002
```

HEADING	LABEL	DESCRIPTION
①	1	Column for first (shortest) integration period
②	2	Column for second integration period
③	3	Column for third (longest) integration period
④	WTFAC	Current running target weight in each integration period
⑤	WTRATE	Rate of increase of target weights in each integration period
⑥	WTSUM	Sum of target weights in each integration period

Figure 52. Print Option 5 - Target Weight Information

e. Print Option 6 (Basic Target Data) This print displays the basic target data prior to the allocation of weapons to the target. Figure 53 displays this print.

f. Print Option 7 (Weapon/Target Interaction Data) This print displays the basic weapon/target interaction data before weapon allocation. Figure 54 displays this print.

g. Print Options 8, 9, 10. These prints are debug prints described in the next section.

h. Print Option 11 (Initial Values of Lagrange Multipliers). This print, available only at the start of the ALLOCATE function, prints the initial values of the local Lagrange multipliers. Figure 55 displays this print.

i. Print Options 12, 13, 14, 15 These prints are debug prints described in the next section.

j. Print Option 16 (Defended Target Summary) This print is a standard print described in figure 43.

k. Print Options 17, 18, 19, 20, 21, 22 These prints are debug prints described in the next section.

l. Print Option 23 (Timing Information) This print displays timing data on the processing during the ALLOCATE function. Figure 56 displays this print. All times are shown in units of minutes. In each column there are two rows of times. The top row is the amount of time recorded in the last call to the timing subroutine for this purpose. The second row is the sum of the times recorded.

m. Print Option 24 This print is a debug print described in the next section.

```
      PRINT NO.   6
(1)                  (2)          (3)       (4)        (5)        (6)        (7)       (8)
TGTNO           TGTNAME        TGTLAT    TGTLONG    TGTRAD     TGTMULT    CTMULT     NK
    9          KARPINSK         59.75     300.00      0.00       1.00       1.00      1
        (9)                (10)   (11)        (12)        (13)       (14)       (15)
        IHCLASS    IHTYPE      TARDEF      MISDEF      MINKILL    MAXKILL    MAXCOST
        F/NUCSTR   RNUCSTOR         0           0         0.00       1.00       1.00
(16)
FVAL       1.00        1.00       1.00
TAU (17) 10000.00      1000.      1000.
```

HEADING	LABEL	DESCRIPTION
(1)	TGTNO	Target number (assigned by PLANSET)
(2)	TGTNAME	Target name
(3)	TGTLAT	Target Latitude
(4)	TGTLONG	Target Longitude
(5)	TGTRAD	Target radius (nautical miles)
(6)	TGTMULT	Target multiplicity (original)
(7)	CTMULT	Target multiplicity (current)
(8)	NK	Number of time value components
(9)	IHCLASS	Target class name
(10)	IHTYPE	Target type name
(11)	TARDEF	Level of terminal bomber defense
(12)	MISDEF	Number of terminal ballistic missile interceptors
(13)	MINKILL	Minimum required kill probability
(14)	MAXKILL	Maximum desired kill probability
(15)	MAXCOST	Maximum ratio of weapon cost to target value acceptable to achieve MINKILL
(16)	FVAL	Fraction of value remaining in each time period
(17)	TAU	Terminating time of each time component

Figure 53. Print Option 6--Basic Target Data

```
PRINT NO.   7
           (1)           (2)          (3)
          ITGT           VTO          M
             5         11.65          1
VO (4)   11.65          0.00
M  (5)    1.71          0.00
(15) MA   1.03          0.03
(16) DHOB 0

      (7)TOA  (8)TVALTOA  (9)VTOA(1)  (10)MUP(1)  (11)SSIG(1)  (12)VTOA(2)  (13)MUP(2)  (14)SSIG(2)
(6) 1   0.20     7.28        7.28        0.56        0.66
    2   0.20     7.28        7.28        0.56        0.66
    3   0.20     7.28        7.28        0.56        0.66
    4   0.23     7.28        7.28        0.56        0.66
    5   0.22     7.28        7.28        0.56        0.66
    6   0.21     7.28        7.28        0.56        0.66
    7   0.59     2.85        2.85        0.32        0.25
    8   0.56     2.85        2.85        0.32        0.25
    9   0.43     7.28        7.28        0.56        0.67
   10   0.36     7.28        7.28        0.56        0.67
   11   3.21     7.28        7.28        1.10        2.75
   12   9.21     0.00        0.00        0.14        0.07
   13   3.21     7.28        7.28        1.07        2.54
   14   9.21     0.00        0.00        0.15        0.07
   15   3.21     7.28        7.28        1.19        3.29
   16   3.05     7.28        7.28        1.17        3.18
   17   9.05     0.00        0.00        0.16        0.08
```

HEADING	LABEL	DESCRIPTION
(1)	ITGT	Target number (assigned by program PLANSET)
(2)	VTO	Original target value
(3)	M	Number of hardness components
(4)	VO	Value in each hardness component
(5)	H	Lethal radius in nautical miles of each hardness component for a 1 megaton ground burst
(6)		Group number
(7)	TOA	Time of weapon arrival (hours)
(8)	TVALTOA	Value at risk in this time of arrival period
(9)	VTOA(1)	Value of first hardness component at time of arrival
(10)	MUP(1)	Kill factor for first hardness component
(11)	SSIG(1)	Differential kill factor for first hardness component
(12) - (14)		Same as (9) - (11) for second hardness component (blank if one component
(15)	HA	Lethal radius in nautical miles of each hardness component for a one megaton air burst
(16)	DHOB	Desired height of burst (0 - ground; 1 - air)

Figure 54. Print Option 7--Weapon/Target Interaction Data

```
FRINT NO.  11
                    (2)        (3)
        G(1)          LAM         VALWPNS=        0.0000 (4) VALERR=       0.0000
        1          0.500000
        2          0.050000
        3          0.500000
        4          0.050000
        5          0.400000
        6          0.400000
        7          0.400000
```

HEADING	LABEL	DESCRIPTION
(1)	G	Index to weapon groups
(2)	LAM	Value of Lambda
(3)	VALWPNS	Current value of all weapons
(4)	VALERR	Current value of the error in the allocation process.

Figure 55. Print Option 11--Initial Values of Lagrange Multipliers

TIMING INFORMATION

① MULCON INITIALIZE	② GETDATA PENETRATION	③ GETDTA RECONSTRUCT	④ GETDTA FILE I/O	⑤ MULCON PREPROCESS	⑥ SUBROUTINE STALL	⑦ SUBROUTINE DEFALOC	⑧ MULCON POSTPROCESS	⑨ MULCON FILE I/O	⑩ MULCON MULTIPLIER
1 0.000	2 0.000	3 0.000	4 0.000	5 0.000	6 0.000	7 0.000	8 0.000	9 0.000	10 0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

⑪ ACTIVE TIME = 00.000 MIN. ⑫ LOST TIME = 00.000 MIN. ⑬ ELAPSED TIME = 00.000 MIN.

HEADING	LABEL	DESCRIPTION
①	MULCON INITIALIZE	Time spent in initializing variables in subroutine MULCON
②	GETDTA' PENETRATION	Time spent in weapon target interaction calculations in subroutine GETDTA (first pass only)
③	GETDTA RECONSTRUCT	Time spent in subroutines GETDTA and RECON to load correct variables into weapon target interaction data block
④	GETDTA FILE I/O	Time spent in subroutine GETDTA reading and writing weapon target interaction data files (WPNTGT)
⑤	MULCON PREPROCESS	Time spent in subroutine MULCON removing previous allocation from target and processing fixed weapon assignments
⑥	SUBROUTINE STALL	Time spent in subroutine STALL
⑦	SUBROUTINE DEFALOC	Time spent in subroutine DEFALOC
⑧	MULCON POSTPROCESS	Time spent in subroutine MULCON to update weights sums and profits calculations
⑨	MULCON FILE I/O	Time spent in subroutine MULCON reading and writing dynamic target files (ALOCTAR and ALOCT1)
⑩	MULCON MULTIPLIER	Time spent in subroutine MULCON adjusting Lagrange multipliers
⑪	ACTIVE TIME	Sum of second row of times for items ① - ⑩
⑫	LOST TIME	Time spent in print subroutines
⑬	ELAPSED TIME	Sum of items ⑪ and ⑫

Figure 56. Print Option 23--Timing Information

n. Print Option 25 (Inactive Array) This print displays the value of the inactive flags during processing. These flags determine which weapons may be allocated to each target. The code for the inactive flags is:

- 100	Currently on target.
0	Active. May be allocated to target.
+100	Inactive. May <u>not</u> be allocated to target.
2000	Conditionally active. May be allocated to meet MINKILL.
30000	Conditionally active. May be allocated to meet MINKILL.

Codes 2000 and 30000 are similar but arise at different stages of processing in subroutine WAD. Figure 57 displays the format of this print.

(1)
INACTIVE FLAGS

-100 0 100 2000 30000 100 0 0

HEADING	LABEL	DESCRIPTION
(1)	INACTIVE FLAG	Inactive codes for all groups, 20 groups per line, ascending order left to right

Figure 57. Print Option 25--Inactive Array

o. Print Option 26 (Bomber Penetration Probability) This print displays the results of the penetration probability calculations performed by subroutine GETDTA in the first pass. Figure 58 displays this print.

p. Print Options 27, 28. These prints are debug prints described in the next section.

3.5.10 Debug Prints. These print options are used to investigate problems which may arise in allocating weapons. Because of the nature of these prints, the description of the variables printed is somewhat incomplete unless the user becomes familiar with the details of program ALOC. The last print described in this section is obtained if the value of the user input parameter IMATCH is set to 100.

a. Print Option 8 (Risk Array) This print displays the RISK array before the allocation begins on each target. This array contains the estimates of the cross correlation factors affecting weapon effectiveness. Figure 59 displays the format of this print.

b. Print Option 9 (Marginal Value for Currently Allocated Weapons) This print summarizes the weapons assigned to the present target and the marginal values for each. (See print option 22 for companion print for potential weapons.) Figure 60 displays the format of this print.

c. Print Option 10 (Weapon Profit and Efficiency Information) This print displays the variables transmitted from subroutine WAD to subroutine STALL. Figure 61 displays the format of this print.

d. Print Option 12 (Weapon-Target Calculation Synopsis) This print gives a synopsis of the actual weapon-target calculations performed in subroutine WAD. Figure 62 displays this print.

e. Print Option 13 (Payoff Calculations) This print displays the results of the calculations for payoff for weapon addition and deletion. Figure 63 displays the format of this print.

f. Print Options 14 and 15 (Potential Weapon Detailed Calculations) These prints display the potential weapon calculations in subroutine WAD in detail. Print 14 merely provides the labels. To decrease the running time of program ALOC, the calls for these prints in subroutine WAD are deactivated. Figure 64 displays these prints.

g. Print Options 17 and 18 (Currently Allocated Weapon Detailed Calculations) These prints are similar to prints 14 and 15. They display the same calculations only for weapons currently on target. The format is identical to that shown in figure 64.

```
TARGET     21 (1)
GROUP KORR                                                  (4) PENETRATION PROBABILITIES BY CORRIDOR
(2) 1 (3) 7   0.000 0.000 0.742 0.000 0.000 0.000 0.869 0.000 0.000 0.000 0.678 0.596
      2     7   0.000 0.000 0.742 0.000 0.000 0.000 0.869 0.000 0.000 0.000 0.678 0.596
      3     7   0.000 0.000 0.733 0.000 0.000 0.000 0.869 0.000 0.000 0.000 0.639 0.561
      4     7   0.000 0.000 0.733 0.000 0.000 0.000 0.869 0.000 0.000 0.000 0.639 0.561
```

HEADING	LABEL	DESCRIPTION
(1)	TARGET	Target number assigned by program PLANSET
(2)	GROUP	Group number
(3)	KORR	Number of preferred penetration corridor for this group on this target
(4)	PENETRATION PROBABILITIES BY CORRIDOR	Penetration probability for this group to this target through each corridor in ascending order left to right

Figure 58. Print Cption 26--Bomber Penetration Probability

```
                PRINT NO.   8
(3)       (1)    (2)->                                                        (1)   (2)->
   RISK   J=1   A= 1       2       3       4       5       6    J=2   A= 1       2       3       4       5       6
     1          0.00    0.04    0.04    0.11    0.05    0.00          0.00    0.04    0.04    0.11    0.05    0.00
     2          0.00    0.19    0.19    0.72    0.20    0.00          0.00    0.19    0.19    0.72    0.20    0.00
     3          0.00    0.04    0.04    0.11    0.05    0.00          0.00    0.04    0.04    0.11    0.05    0.00
     4          0.00    0.19    0.19    0.72    0.20    0.00          0.00    0.19    0.19    0.72    0.20    0.00
```

HEADING	LABEL	DESCRIPTION
(1)	J	Index to hardness component
(2)	A	Attribute index (see table 8)
(3)	RISK	Group number

Figure 59. Print Option 8- - RISK Array Print

CURRENT STATE ITGT = (1) PASS = (2) TOTAL TARGET VALUE (3) RESIDUAL VALUE (4) COST (5) PROFIT (6) TGTMULT (7) CTMULT (8) CTSPILL (9) PROCMULT (10)

NUMBER OF WEAPONS ASSIGNED = (11) GROUP (12) ACT (13) MRG PAYOFF (14) MRG COST (15) MRG PROFIT (16) EFFICIENCY (17) BENEFIT (18) PVR/0.0 (19) PP/DP (20) PREM/DPREM (21)

SURPWP (22) PENX (23) (24)

HEADING	LABEL	DESCRIPTION
(1)	ITGT	Target number assigned by program PLANSET
(2)	PASS	Number of current pass
(3)	TOTAL TARGET VALUE	Original target value
(4)	RESIDUAL VALUE	Residual target value after weapon deliveries
(5)	COST	Sum of Lagrange multipliers of assigned weapons
(6)	PROFIT	{(3) - (4) - (5)} Profit
(7)	TGTMULT	Original target multiplicity
(8)	CTMULT	Current target multiplicity
(9)	CTSPILL	Number of target components spilled this pass
(10)	PROCMULT	Number of target components processed so far
(11)	---	Number of weapons assigned to target
(12)	GROUP	Group Number

Figure 60. Print Option 9--Marginal Value for Currently Allocated Weapons (Part 1 of 2)

(13)	ACT	Value of inactive flag
(14)	MRG PAYOFF	Marginal payoff for this weapon
(15)	MRG COST	Value of Lagrange multiplier for this weapon
(16)	MRG PROFIT	Marginal profit {(14) - (15)}
(17)	EFFICIENCY	Weapon efficiency {(16) / (15)}
(18)	BENEFIT	Profit including premium and damage constraints
(19)	PVR/0.0	= 0.0 (dummy variable)
(20)	PP/DP	Modified profit ((18) - (15))
(21)	PREM/DPREM	Premium for removing weapon
(22)	SURPWP	Estimated error in number of weapons used
(23)	PENX	Penetration probability
(24)	---	Preferred penetration corridor

Figure 60. (Part 2 of 2)

PROFIT = ① COST = ② TPMX = ③ ALPHA = ④ MINKILL = ⑤ MAXKILL = ⑥

MAXCOST = ⑦ PVRMX = ⑧ (⑨) PPMX = ⑩ (⑪) DPMN = ⑫ (⑬)

HEADING	LABEL	DESCRIPTION
①	PROFIT	Total profit on target
②	COST	Sum of Lagrange multipliers of weapons allocated this target
③	TPMX	Maximum profit considering damage constraints
④	ALPHA	Cost factor for damage constraints
⑤	MINKILL	Minimum desired kill probability
⑥	MAXKILL	Maximum desired kill probability
⑦	MAXCOST	Maximum value of weapon used to achieve MINKILL
⑧	PVRMX	Maximum value of modified efficiency, PVR
⑨	---	Group number which results in PVRMX, (IPVRMX)
⑩	PPMX	Maximum profit value for adding weapon
⑪	---	Group number which results in PPMX, (IPPMX)
⑫	DPMN	Maximum profit gained for deleting weapon
⑬	---	Group number which results in DPMN, (IDPMN)

Figure 61. Print Option 10--Weapon Profit and Efficiency Information

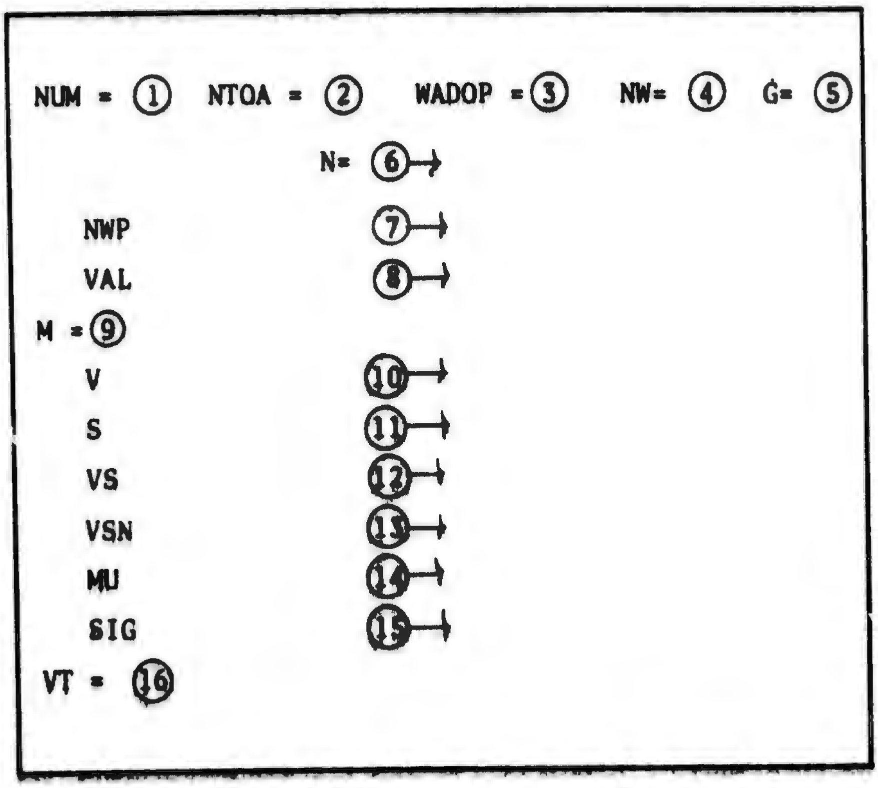


Figure 62, Print Option 12--Weapon Target Calculation Synopsis (Part 1 of 2)

HEADING	LABEL	DESCRIPTION
(1)	NUM	Number of weapons currently allocated to target
(2)	NTOA	Number of time of arrival bins
(3)	WADOP	Operation code for subroutine WAD
(4)	NW	Group number to be deleted
(5)	G	Group number to be added
(6)	N	Index to time of arrival bin
(7)	NWP	Number of weapons in each bin
(8)	VAL	Value at risk in each bin
(9)	M	Index to hardness component
(10)	V	Value at risk in this component in this bin
(11)	S	Survival probability in this component in this bin
(12)	VS	Product of (10) and (11)
(13)	VSN	Normalized (12)
(14)	MU	Modified sum of mean kill factors
(15)	SIG	Modified sum of kill factor variances
(16)	VT	Residual target value

Figure 62. (Part 2 of 2)

M = (1)

G	ITOA	IADDTOA	VTP	PREMIUM	DSIG	SIGP	N = (9)→
(2)	(3)	(4)	(5)	(6)	(7)	(8)	

HEADING	LABEL	DESCRIPTION
(1)	M	Index to hardness component
(2)	G	Group number
(3)	ITOA	Index to time of arrival bin
(4)	IADDTOA	= 1 if new time of arrival bin required
(5)	VTP	Residual target value if weapon added
(6)	PREMIUM	Weapon premium
(7)	DSIG	Weapon variance contribution
(8)	SIGP	Increase in variance for bin if weapon added
(9)	N	Index to time of arrival bins

Figure 63. Print Option 13--Payoff Calculations

G	J	N	XMU	SIG	SIGP	S1	VSN1
①	②	③	④	⑤	⑥	⑦	⑧

HEADING	LABEL	DESCRIPTION
①	G	Group number
②	J	Hardness component
③	N	Time of arrival bin index
④	XMU	Sum of kill factor means
⑤	SIG	Sum of kill factor variances
⑥	SIGP	Addition to variance factor
⑦	S1	Target survival probability
⑧	VSN1	Modified target survival probability

Figure 64. Print Options 14 and 15--Potential Weapon Detailed Calculations

h. Print Option 19 (Planning Factors for Terminal BMD Targets) This print summarizes the planning factors for targets with terminal ballistic missile defenses (BMD). Figure 65 displays the format of this print.

i. Print Option 20 (WADOUT Summary) This print summarizes the variables output by subroutine WADOUT. Figure 66 displays this print.

j. Print Option 21 (Allocation Error Estimates) This print lists all the allocation error estimates (ALLEREST). Figure 67 displays this print.

k. Print Option 22 (Marginal Value of Petential Weapons) This print summarizes the data on marginal payoffs for weapons which may be added to the target. The resulting decision by subroutine STALL is also printed. This print is a comparison to print option 9. Figure 68 displays print option 22; figure 69 shows STALL decision messages.

l. Print Option 24 (Termination Control) This print terminates the run with the message "REQUESTED DUMP." The run aborts and the operating system gives a memory dump.

m. Print Option 27 (Missile Rate of Return) This print displays the best rate of return achieved by any missile in the computations by subroutine DEFALOC. Figure 70 displays this print.

n. Print Option 28 (Terminal BMD Target Allocation) This print displays the allocation to a target with terminal ballistic missile defenses (BMD) and the resulting target residual value as computed by subroutine RESVAL. Figure 71 displays this print.

I	PREMIUM(I)	NWHD(KK)	NTDEC(KK)	VTO	LAM(I)
①	②	③	④	⑤	⑥

HEADING	LABEL	DESCRIPTION
①	I	Group number
②	PREMIUM(I)	Premium for weapon
③	NWHD(KK)	Number of warheads per weapon
④	NTDEC(KK)	Number of terminal decoys per weapon
⑤	VTO	Original target value
⑥	LAM(I)	Lagrange multiplier for weapon

Figure 65. Print Option 19--Planning Factors-Terminal BMD Targets

PAYOFF	COST	PROFIT	SUMPREM	TBENEFIT	PPMX	TPMX	DPMN
①	②	③	④	⑤	⑥	⑦	⑧

HEADING	LABEL	DESCRIPTION
①	PAYOFF	Value destroyed on target
②	COST	Sum of Lagrange multipliers of weapons on target
③	PROFIT	① - ②
④	SUMPREM	Cumulative premiums for all targets
⑤	TBENEFIT	Total benefit this target
⑥	PPMX	Maximum marginal profit of potential weapons
⑦	TPMX	Maximum marginal profit yet encountered
⑧	DPMN	Maximum profit for weapon deletion

Figure 66. Print Option 20--WADOUT Summary

	LA	RUNSUM			ALLEREST		
①	②	③	④	⑤	⑥	⑦	⑧

HEADING	LABEL	DESCRIPTION	
①	---	Local multiplier index (attribute)	
②	LA	Lagrange multiplier for this index	
③	RUNSUM	Running sum of product of target weight and number of weapons allocated	first integration period
④	RUNSUM		second integration period
⑤	RUNSUM		third integration period
⑥	ALLEREST	Estimate of error in allocation rate	first integration period
⑦	ALLEREST		second integration period
⑧	ALLEREST		third integration period

Figure 67. Print Option 21--Allocation Error Estimates

POTENTIAL WEAPONS

GROUP ACT MRG PAYOFF MRG COST MRG PROFIT EFFICIENCY BENEFIT

(1) (2) (3) (4) (5) (6) (7)

PVR/0.0 PP/DP PREM/DPREM SURPWP PENX

(8) (9) (10) (11) (12) (13)

DECISION MADE NEAR STALPRIN = (14) (15)

HEADING	LABEL	DESCRIPTION
(1)	GROUP	Group number
(2)	ACT	Value of inactive flag
(3)	MRG PAYOFF	Marginal payoff for weapon
(4)	MRG COST	Value of Lagrange multiplier for weapon
(5)	MRG PROFIT	Marginal profit ((3) - (4))
(6)	EFFICIENCY	Weapon efficiency ((3) / (4))
(7)	BENEFIT	Profit including premium and damage constraints
(8)	PVR/0.0	(PVR) modified efficiency
(9)	PP/DP	(PP) perceived profit ((7) - (4))
(10)	PREM/DPREM	(PREM) weapon premium for adding weapon
(11)	SURPWP	Estimated error in number of weapons used
(12)	PENX	Weapon penetration probability
(13)	---	Preferred penetration corridor
(14)	STALPRIN	Indicator of location in subroutine STALL source code of call on subroutine WAD producing this print
(15)	---	Description of decision by subroutine STALL (see figure 69)

Figure 68. Print Option 22--Marginal Value of Potential Weapons

1. ADD (1)

2. DELETE (2)

3. RECALL PRIOR ALLOCATION

4. TERMINATE STALL ALLOCATION

MESSAGE	DESCRIPTION
1.	Add weapon from group (1)
2.	Delete weapon from group (2)
3.	Restore previous allocation. Used only on verification pass when IVERIFY = 2
4.	Return with current allocation

Figure 69. Messages of Decision by Subroutine STALL

RATM = ①

HEADING	LABEL	DESCRIPTION
①	RATM	Best rate of return for missile

Figure 70. Print Option 27--Missile Rate of Return

IN RESVAL VTD = ①

② WEAPONS OF TYPE ③

HEADING	LABEL	DESCRIPTION
①	VTD	Residual target value for following allocation
②	---	Number of weapons assigned from group ③
③	---	Group number

Figure 71. Print Option 28--Terminal BMD Target Allocation

o. Print Option 29 (Salvoed Group Information) This print displays the Lagrange multiplier (for the first salvo), the balance parameter, and number of weapons overallocated from each salvo for missile groups with a launch interval. Exactly allocated salvoes have zero entries, underallocated salvoes have negative entries, and overallocated salvoes have positive entries (an entry of -3 means the salvo is underallocated by 3 weapons). Figure 72 displays this print.

TARGET NUMBER 314 (1)

GROUP (3)	BALANCE PARAMETER (4)	ORIGINAL LAMBDA (5)	SALVO (2) → 1 (6)	2	3	4	. . . . . .	24
1	.95	.00314	2	1	2	1	. . . . . .	0
2	.90	.004.2	0	0	3	8	. . . . . .	0
.	.	.	.	.	.	.		.
.	.	.	.	.	.	.		.
.	.	.	.	.	.	.		.

HEADING	LABEL	DESCRIPTION
(1)	TARGET NUMBER	Target number as assigned by PLANSET
(2)	SALVO	Salvo number
(3)	GROUP	Group number
(4)	BALANCE PARAMETER	Balance parameter (P)
(5)	ORIGINAL LAMBDA	Multiplier for first salvo
(6)	--	Number of weapons allocated in each salvo for each salvoed group

Figure 72. Print Option 29-Salvoed Group Information

p. Print Option 30 (Bomber Payload Indicators) This print displays the average value destroyed (excluding DBL and REL), the actual fraction of weapons that are ASMs, the payload indicator, and the currently allocated fraction of weapons that are ASMs for each bomber group. These factors are used in the selection of gravity bombs or ASMs on each target. Figure 73 displays this print.

GROUP	AVDE	FASM	ISETPAY	EXPASM
① 2	② 0.232	③ 0.010	④ 1	⑤ 0.500
3	0.591	0.110	0	0.100
⋮	⋮	⋮	⋮	⋮

HEADING	LABEL	DESCRIPTION
①	GROUP	Group number (Only bomber groups are printed)
②	AVDE	Absolute average difference in value destroyed between ASM and bomb
③	FASM	Fraction of currently allocated weapons in group which are ASMs
④	ISETPAY	Payload indicator for next target to be processed. Zero for gravity bomb use; one for ASM use
⑤	EXPASM	Actual fraction of weapons in the group which are ASMs

Figure 73. Print Option 30 - Bomber Payload Indicators

IMATCH - Target Value Calculations for MINKILL/MAXKILL

This print is produced on every target if the value of the user input parameter IMATCH is set equal to 100. Figure 74 displays this print.

VTO (1) VT (2) VTZO (3) IFLGMN (4) IFLGMX (5) SVTMIN (6)

SVTMAX (7) VTMIN (8) VTMAX (9) ALPHA (10)

HEADING	LABEL	DESCRIPTION
(1)	VTO	Original target value
(2)	VT	Residual value
(3)	VTZO	Residual value ignoring time dependence
(4)	IFLGMN	Flag showing achievement of MAXKILL
(5)	IFLGMX	Flag showing achievement of MINKILL
(6)	SVTMIN	Minimum allowed residual target value ignoring time dependence of value
(7)	SVTMAX	Maximum allowed residual target value ignoring time dependence of value
(8)	VTMIN	Minimum allowed residual target value considering time dependence of value
(9)	VTMAX	Maximum allowed residual target value considering time dependence of value
(10)	ALPHA	Cost factor used to achieve MINKILL

Figure 74. IMATCH Print--Target Value Calculations for MINKILL/MAXKILL

3.5.11 Error Messages. During a run of program ALOC, error messages may emanate from several sources and are characterized below. Those messages which signal file input/output problems (except on the weapon-target interaction files) are discussed elsewhere under the Filehandler.

The error messages for the Control Program are shown in figure 75.

1. WRONG BASFILE FORMAT. REQUESTED ① GOT ②
   The program expects a BASFILE with format indicator ①. The BASFILE used has format indicator ②. The job will stop. To rerun, use a BASFILE of the correct format.

2. ERROR IN RUN TYPE
   The user input cards request an unrecognized function. The job will stop. Rerun job with corrected function request.

Figure 75. Control Program Error Messages

The error messages for the ALLOCATE Function are shown in figure 76.

1. UNABLE TO DECIPHER VARIABLE NAME ①. INPUT REQUEST IGNORED
   A user input parameter card requests a change to a variable named ①. The program is unable to locate a variable by that name and ignores the request. Correct parameter spelling and rerun.

2. TOO MANY PRINT REQUESTS. ONLY FIRST 40 PROCESSED.
   More than 40 print requests were input on user-input parameter cards. Only first 40 are processed. Remainder are ignored.

3. PRINT REQUEST NUMBER ① IS OUT OF RANGE. REQUEST IGNORED.
   User input parameter cards have requested a print code of ①. This invalid code is ignored. All further information for this request is also ignored.

Figure 76. ALLOCATE Function Error Messages (Part 1 of 4)

4. FIXED ASSIGNMENT REQUEST NOT HONORED FOR GROUP ① ON TARGET DESIG = ② - INDEXNO = ③ - TARGET NO. = ④
TARGET NO. = ④
PROBLEM IS ⑤
The user has requested a fixed assignment of a weapon from group ① to a target with designator code ②, index number ③, and target number ④. The request cannot be honored and the weapon is not allocated at all (to any target). The reason for not honoring the request is given in ⑤. The reasons are as follows:

- CNTRYL -- Restriction by country code (LOCREST option)
- FLAG -- Restriction by flag code (FLAGREST option)
- MINRAN -- Restriction by minimum range (MINRANGE option)
- MIRV -- Restriction of MIRV weapons (MIRVREST option)
- NAVAL -- Restriction of weapons with PKNAV = 0 to targets to class NAVAL and vice versa
- PENETR -- Inadequate capability to penetrate to the target
- RANGE -- Inadequate range to reach the target (possibly RANGEMOD option)
- VALUE = 0 -- The target has zero value at the weapon time of arrival. (Data base entry or possibly VALUEMOD option of program PREPALOC.)

5. LOOP = ①
In this message ① is the total number of targets encountered so far on which more than 100 weapon addition or deletion operations (IOP) were required before subrotuine STALL terminated the allocation process. Once this condition occurs, this message is printed as every succeeding target is processed. On each target with more than 100 weapon addition or deletion operations, the value of ① is incremented by one. This message is for information only; no user action is required.

6. MINKILL NOT ACHIEVED
The required minimum probability of target destruction was not achieved on the preceding target. The program continues after achieving the maximum possible damage within weapon number and cost limitations. This message is for information only; no user action is required.

7. TARGET ① MINKILL REQUIRES TOO MANY WEAPONS
On target with target number ①, a target with terminal ballistic missile defenses, the required minimum target destriction probability cannot be achieved after an allocation of 40% of the total missile force that can reach this target. The program continues using the allocation of 40% of each missile group that can be allocated to this target. This message is for information only; no user action is required.

Figure 76. (Part 2 of 4)

8. EXCESSIVE GROUP ATTRIBUTES

The sum of the number of groups, the number of command and control regions, the number of weapon classes, the number of weapon types and the number of alert status exceeds 308. The program stops without allocating weapons. The plan must be redesigned to decrease this sum.

9. TARGET ① HAS MORE THAN 30 WEAPONS FIXED
The user has requested fixed assignment of more than 30 weapons on target number ①. This target does not have terminal ballistic missile defenses and only the first 30 weapons are fixed to the target. The remaining requests for this target are ignored.

10. UNSATISFACTORY PROGRESS. RUN TERMINATED
After three full passes through the target list the value of PROGRESS is less than 0.75. The probability that the allocation process will converge to the correct stockpile at this point is very low. The job is therefore terminated. There are a large number of conditions which can cause this problem. A close check on the values of the target and planning factors should be made to see if the desired values are being used. If a run of this function with <u>all</u> default user input parameters does not remove this problem, consult a maintenance programmer.

11. DISK SPACE UNAVAILABLE. EXECUTION TERMINATED
Not enough space to open a WPNTGT file; rerun the job.

12. ① ERROR ON WEAPON-TARGET INTERACTION FILE
NO. ② NAMED ③
5 REWRITES WILL BE ATTEMPTED
An error has occurred in writing the weapon-target interaction scratch file number ② named ③. The error (shown by ①) is either PARITY or EOF (end-of-file encountered). The program will attempt to rewrite the information 5 times. If all attempts are unsuccessful the job will abort.

13. IRRECOVERABLE I/O ERROR ON DISK. JOB TERMINATED
The program is unable to read or write information on one of the weapon target interaction disk files. The job is terminated with a memory dump.

14. PARITY ERROR ON WEAPON-TARGET INTERACTION FILE
NO. ① NAMED ②
3 REREADS WILL BE ATTEMPTED

Figure 76. (Part 3 of 4)

14. (cont.)
A read parity error was encountered on the weapon-target interaction file number ① named ②. If 3 more read attempts are unsuccessful, the job will abort.

15. BOMBER FROM GROUP ① CANNOT BE FIXED IN A MISSILE SATURATION ATTACK ON TARGET ② - INDEX = ③ TARGET ④
The user has fixed a bomber weapon from group ① on a target where he has fixed more than 30 weapons. The only case where an excess of 30 weapons is allowed is a missile saturation attack on a target with terminal ballistic missile defenses. The fix request for this bomber weapon is ignored and processing proceeds. The target name is displayed as ②; the index number as ③; the target number as ④.

16. SALVO PROBLEM FOR GROUP = ① IOPT = ② NUM = ③ ISALIN = ④ IDIFF = ⑤ ITEMP = ⑥ ITGT = ⑦
During updating of the stockpile of weapons for a salvoed missile group, one of two problems has occurred:

- If ISALIN ④ is negative, then subroutine ADDSAL was called with a negative salvo number.

- If ITEMP ⑥ is greater than 255, then the salvo stockpile counter has overflowed.

In both cases, consult a maintenance programmer. Identification of the printed variables is as follows: ① is the group number, ② is the ADDSAL option (3 for weapon addition, 4 for weapon deletion), ③ is the number of weapons currently allocated to the target, ④ is the salvo number, ⑤ is the number of weapons to be added or deleted, ⑥ is the salvo stockpile counter, and ⑦ is the target number as assigned by program PLANSET.

Figure 76. (Part 4 of 4)

There are no messages for the following functions:

a. RANGEMOD
b. MINRANGE
c. MIRVREST
d. PUNCH

The error message for the FLAGREST Function is shown in figure 77.

1.	① IS AN INVALID GROUP NUMBER. REQUEST IGNORED A user-input parameter card has requested a restriction on group ①. This number is invalid and the request is ignored. Correct card and rerun job.

Figure 77. FLAGREST Function Error Message

The error messages for the LOCREST Function are shown in figure 78.

1.	See error message 1. of FLAGREST Option
2.	THERE IS NO COUNTRY CODE ① IN THIS TARGET SET. REQUEST IGNORED. A user-input parameter card has requested a restriction according to country code ①. Since this code does not occur on the TGTFILE, the request is ignored. Correct spelling of country code and rerun job.

Figure 78. LOCREST Function Error Messages

The error message for the READMUL Function is shown in figure 79.

1.	UNRECOGNIZED ATTRIBUTE NAME - CARD IGNORED The user-input parameter card printed immediately preceding this message does not have an acceptable attribute name (ALL, CLASS, REGION, TYPE, OTHER, or GROUP). The parameter card is ignored. Correct card and rerun.

Figure 79. READMUL Function Error Message

SECTION 4. PROGRAM EVALALOC

4.1 Purpose

The purpose of program EVALALOC is to summarize the planned allocation of weapons to targets and provide an expected-value estimate of the results. Provision is also included to evaluate the allocation for variations in values of selected parameters associated with the weapons and targets.

4.2 Concept of Use

EVALALOC may be run at two stages of plan development, immediately after program ALOC or immediately after program PLANOUT. If run after ALOC the analysis of aim point offsets is not included in the evaluation since the desired ground zeros (DGZs for complex targets) are not known at this stage of processing (these DGZs are established by program ALOCOUT). The evaluation of EVALALOC, therefore, is an upper limit estimate which assumes that each target element in a complex is directly targeted. When run after PLANOUT, however, weapon aim point offsets are available from the PLANTAPE and are included in the expected-value computations.

EVALALOC processes the targets one at a time. For each target (or target element of a complex target), the weapons assigned are read in and ordered by time of arrival. Surviving target values are calculated, utilizing the same damage functions used in program ALOC (subroutine WAD), except that correlations are ignored.

After the survival probability for each target is computed, the target and the allocated weapons are processed and categorized for processing purposes.

When all targets have been processed, the results are summarized and printed.

The initial pass over the target system always produces an evaluation based on the same weapon and target parameters used in program ALOC. Subsequent passes may be made to investigate the sensitivity of the results to changes in the weapon and/or target parameters.

4.3 File Utilization

EVALALOC can be used to evaluate the weapon allocation produced in plan generation at two different stages of plan development. In both modes of operation, i.e., executed after ALOC or PLANOUT, the BASFILE is used to obtain basic weapon and target parameters. The weapon allocation data is obtained from the ALOCTAR file or the PLANTAPE depending on the mode of operation. No output files are produced by EVALALOC, since its sole function is to produce summaries of data evaluating the weapon-allocation.

Figure 80 illustrates file usage by EVALALOC when it is run after program ALOC. EVALALOC obtains the weapon allocation data from the ALOCTAR file prepared by program ALOC. It processes the data in target order as it is arranged on the file. During the processing, one scratch file is written and later used by subroutine TGTMODIF for target parameter modifications. This scratch file contains the unmodified weapon parameters corresponding to each target, and the data from it are used when the penetration probabilities for specified targets and weapons are to be modified.

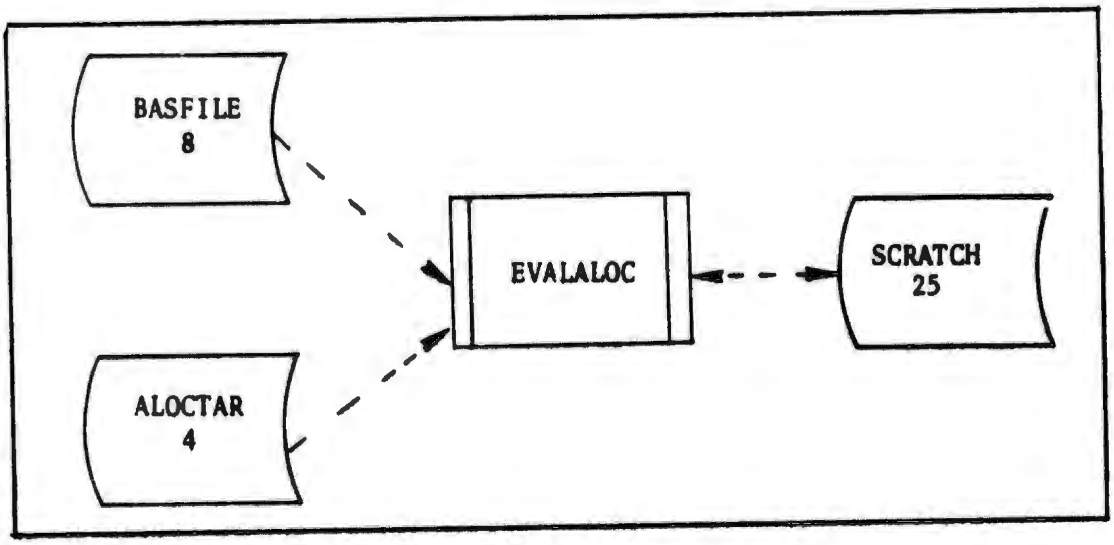


Figure 80. File Utilization: Operation of EVALALOC After ALOC

Figure 81 illustrates file usage by EVALALOC when it is run immediately after program PLANOUT. During this stage of operation, it uses the PLANTAPE as the source for the weapon allocation data and the ALOCTAR file to obtain the arrays of weapon data not relevant to the specific allocation for each target. Since the PLANTAPE is organized in weapon group order instead of target order, the tape must be sorted prior to processing. Two scratch files are used to perform this sort. The final sorted data are merged with weapon data from the ALOCTAR file and are written onto one of these two files. This file is then used by EVALALOC in its evaluation of the weapon allocation.

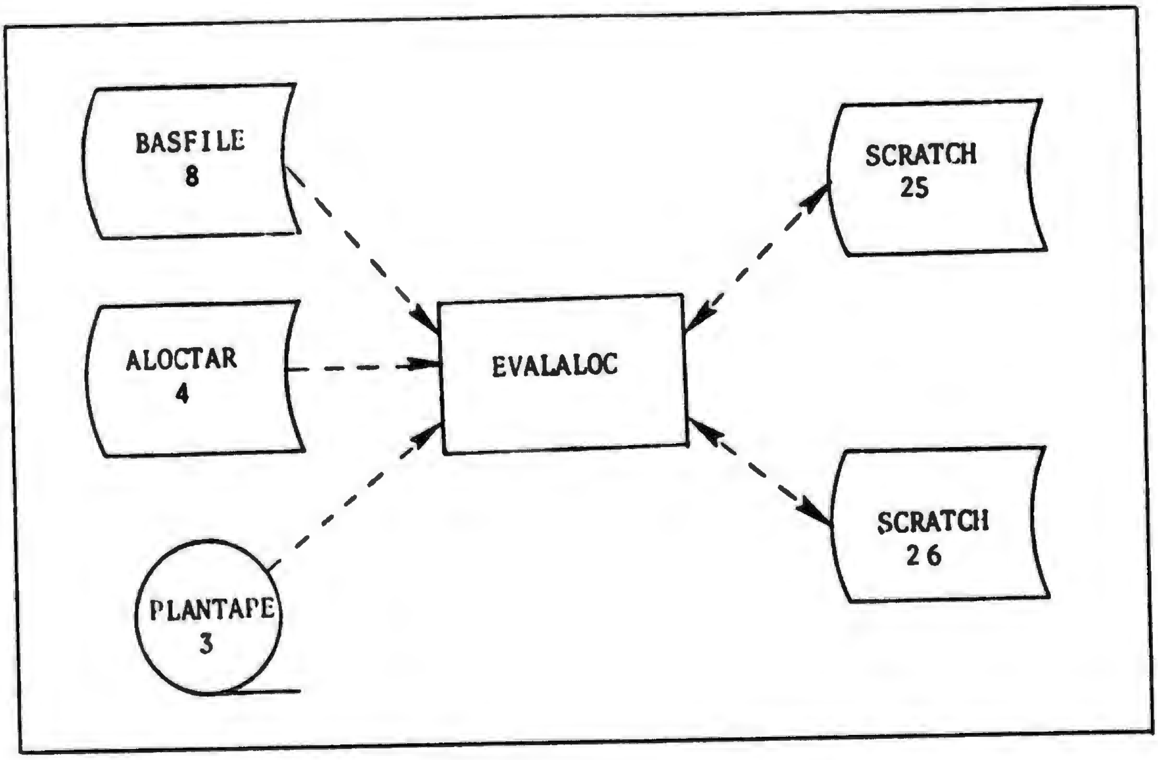


Figure 81. File Utilization: Operation of EVALALOC After PLANOUT

Filehandler buffer utilization in EVALALOC is shown in figure 82 for operation after ALOC, and in figure 83 for operation after PLANOUT.

FILE NAME	BUFFER NUMBER (LUN)
BASFILE	8
ALOCTAR	4
SCRATCH	25

Figure 82. EVALALOC Filehandler Buffer Utilization - Operation After ALOC

FILE NAME	BUFFER NUMBER
BASFILE	8
ALOCTAR	4
PLANTAPE	3
SCRATCH	25
SCRATCH	26

Figure 83. EVALALOC Filehandler Buffer Utilization - Operation After PLANOUT

4.4 Input

When program EVALALOC is run after ALOC, the input files are the BASFILE prepared by program PREPALOC and the ALOCTAR file prepared by program ALOC. When run after program PLANOUT, the input files are the BASFILE, the PLANTAPE produced by program PLANOUT, and the ALOCTAR file.

In addition to the option of running EVALALOC at two stages of plan development, the user may exercise two additional options. The first is a print control option which allows the user to specify the number of targets for which detailed information is to be printed. The second is a parameter modification option which allows the user to evaluate the sensitivity of the allocation/plan to variations in the values of certain parameters which describe the weapons and targets.

In addition to the parameters required to exercise the above options, the user must specify:

a. The probability of a refueling abort. This parameter is required when EVALALOC is run after PLANOUT. At this stage of plan development an alternate mission exists for each bomber scheduled for refueling. Using this parameter, EVALALOC determines the success or failure of the refueling event. If successful, the weapons associated with the primary mission are considered in the evaluation. If unsuccessful, i.e., an abort occurs, the weapons associated with the alternate bomber plan are evaluated.

b. The probability of a terminal defense antiballistic missile killing a penetrating offensive missile.

c. The form of damage assessment law (exponential or square root) to be used in evaluating area type targets.

Excluding the weapon and target parameter modifications, the above parameters are input to EVALALOC on the general control card described in figure 84. (This is the first input data card.) Then the parameter modification cards are organized in "sets" as described below. Data for weapon modifications must be input first.

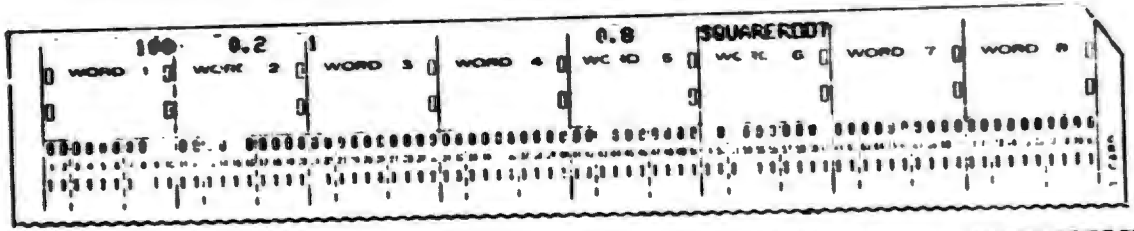
4.4.1 Weapon Parameter Modification (WPNMODIF) Cards. The user may modify certain weapon attributes for one or more weapon types. Four weapon attributes may be modified: reliability (REL),* circular error probability (CEP),* the probability of destruction before launch (DBL), and weapon yield (YIELD). As indicated in figure 118, the weapon type to be modified is entered in word one. The user may input either a specific weapon type (e.g., B-52F) or he may input ALLWPN (all weapons in the plan), BOMBER, MISSIL, or GROUP (indicating the modifications are to be implemented by weapon group). In word two, the name of the attribute to be modified, e.g., REL, is punched. Word three contains the factor by which the data base value of this parameter is to be multiplied. If applicable, word four reflects the number of the weapon group to which this modification applies.

Only one modification may be made per card, but there is no limit on the number of cards which may be entered. The WPNMODIF card set is terminated by placing a blank card at the end of the desired modifications. If no weapon modifications are desired, a blank card must still be included. In the example shown in figure 85, all of the weapons from Group 4 will have their DBL multiplied by 2.0

4.4.2 Target Parameter Modification (TGTMODIF) Cards. The user has the option of altering certain target attributes for specified target types via target parameter modification cards. The attributes which he may change are the first time at which the target changes value rapidly (TAU(1)), the hardness of the first component (H(1)), the original value of the first hardness component (VO(1)), the fraction of target value remaining in the first time period (FVAL(1)), and the weapon penetration probability for a target (PEN), as shown in figure 86.

---

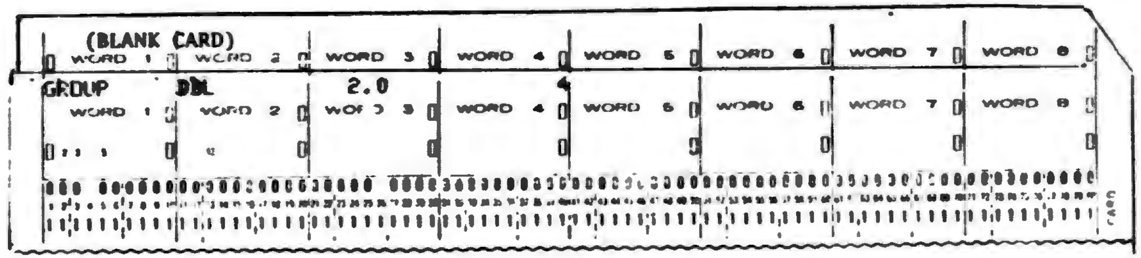
*For bomber weapons, change to reliability REL affects the vehicle reliability only. ASM reliability (for the ASM only) remains constant. For bomber weapons change to delivery error CEP effects gravity bombs only.



WORD	FORMAT	(J)	RANGE	LABEL	DEFAULT	DESCRIPTION
1	Integer		(0-12000)*	ITGTMAX	0	The maximum number of targets about which detailed information is to be printed
2	Floating Point	N/A	(0.0-1.0)	PREFABRT	0.0	The probability of refueling abort
3	Integer (Col. 21)	L	0 or 1	JOPT(1)		Run indicator 0=After ALOC Run 1=After PLNTPLAN Run
3	Integer (Col. 23)	N/A	0 or 1	JOPT(3)		After-PLNTPLAN debug print indicator 0-no debug prints 1-debug prints produced
5	Floating Point	N/A	(0.0-1.0)	PKTX	0.0	Probability of kill of a terminal ballistic missile interceptor
6	Alphameric	R	(EXPONENT or SQUAREROOT)	LAW	EXPONENT	Form of the damage assessment law, exponential law, or square root law

*To terminate the run ITGTMAX should be set to a negative integer.

Figure 84. EVALALOC General Control Card



WORD	FORMAT	(J)	RANGE	LABEL	DESCRIPTION
1	Alphameric	L	ALLWP, GROUP, BOMBER MISSIL, specific weapon types, RETURN, blank	IWPNTYPE	Weapon class or type for which modification is intended. If GROUP is selected, only DBL may be modified. ALLWP: All weapons GROUP: Use when DBL is to be modified for a weapon group BOMBER: All bombers MISSIL: All missiles WEAPON TYPE NAME: A specific weapon type name such as B-52E is entered 'RETURN' card: No further weapon or target modifications for this set of general control parameters blank: No further weapon modifications (use after last actual weapon modification card)
2	Alphameric	L	DBL, CEP, REL, YIELD	IWPNATT	Attribute to be modified (DBL and YIELD can be modified only by GROUP; CEP and REL cannot be modified by GROUP)
3	Floating Point	N/A	(Any number greater than .0)	XWPNATT	Factor by which attribute value is to be multiplied for the indicated weapon type or class.
4	Integer	R	(1-200)	IGROUP	The number of the group for which the DBL or YIELD is to be modified if weapon type is GROUP (otherwise, leave columns 31-40 blank)

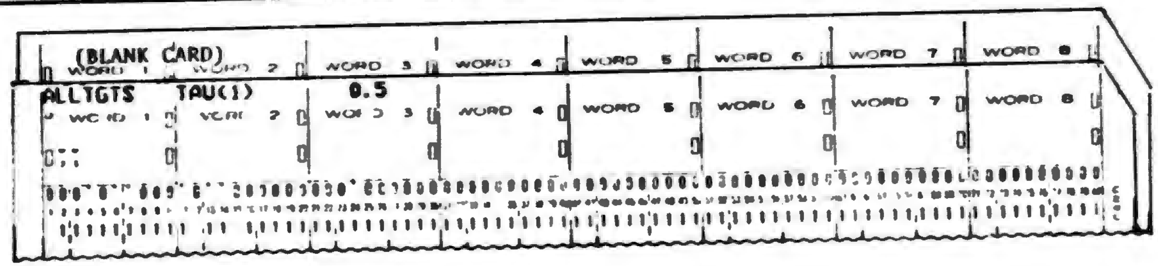
Figure 85. EVALALOC, WPNMODIF Card Format

As indicated in figure 86, the target type to be modified is indicated in word one. This may be either ALLTGT or a specific type name such as HAWK or BEAR. In word two is the attribute to be modified H(1), VO(1), TAU(1), FVAL(1), or PEN. Word three contains a multiplicative factor used to modify the target attribute. If the target attribute to be modified is PEN, the next four words (10 columns each) contain the weapon types to which this modification applies (format 4 (A6, 4X)). The words ALLWPN, BOMBER, or MISSIL may be used as the first word in place of a specific type name, in which case no other type names will be read from this card. In the example shown in figure 86 (for all targets), TAU(1) will be multiplied by 0.5. A blank card is used to terminate the set. If no target modifications are desired, the blank card must still be included.

4.4.3 Card Sequence. The user creates an input data deck for EVALALOC consisting of three types of cards. The first is the General Control Card. This is followed by one or more Weapon Parameter Modification Cards if he desires to modify any of those parameters. Otherwise, the second card is a blank card which causes EVALALOC to consider target parameter modifications, or it contains RETURN in columns 1-6 to indicate that weapon or target modifications are not desired. In the case where there are weapon parameter modification cards, a blank card follows the last modification card. Finally, the user specifies his target parameter modifications on the corresponding cards. Following these cards, if there are any, a blank card must be inserted to indicate the end of a series of changes to be considered in reevaluating the plan. The user inputs a complete series of the above cards except for the General Control Card for each desired plan reevaluation. When the complete series of weapon and target modifications have been made for one set of general control parameters given on the General Control Card, the user must place a RETURN card at the end of the deck. If further modifications with a new set of general control parameters are desired, a new General Control Card is inserted in the deck and this is followed by the appropriate series of modification card sets. If not, a negative integer is inserted in columns 1-10 of the General Control Card. This causes the run to terminate.

4.5 Output.

The standard output produced by program EVALALOC is of four types. First, prints are automatically made of the input parameters from the General Control Card. Second, a Sample Target List is printed which shows the weapons delivered and resulting target damage for the number of targets (ITGTMAX) indicated on the General Control Card. Third, six summaries reflecting the expected value results of the planned allocation are printed. (Only one of these summaries, the Target Destruction Summary, is provided when the plan is reevaluated using modified parameters.) Fourth, when the plan is evaluated using modifi-



WORD	FORMAT	(J)	RANGE	LABEL	DESCRIPTION
1	Alphameric	L	STOP, ALLTGT, blank a specific target type	NTGTTTYPE	The target type for which the modification is intended ALLTGT: All target types STOP: EVALALOC run is terminated blank: End of target modifications
2	Alphameric	L	H(1), VO(1), TAU(1) EVAL(1), PEN	NTGTATT	Target attribute to be modified H(1): First hardness component of the target VO(1): Original value of hardness component TAU(1): First time of rapid target value change FVAL(1): Fraction of target value remaining in first period PEN: Penetration probability
3	Floating Point	N/A	Number greater than 0	XTGTATT	Fraction by which attribute shown in columns 11-16 should be multiplied
4	Alphameric	L	Weapon type	NWPTYPX(1)	If the attribute PEN is being modified by this card, the weapon types for which PEN should be changed are placed in these four
5	Alphameric	L	Weapon type	NWPTYPX(2)	Same as word 4
6	Alphameric	L	Weapon type	NWPTYPX(3)	Same as word 4
7	Alphameric	L	Weapon type	NWPTYPX(4)	Same as word 4

Figure 86. EVALALOC, TGTMODIF Card Format

cations of weapon and/or target parameters, user-input cards containing the modification data are printed. These outputs are described more fully below.

4.5.1 General Control Card Parameters. The initial prints reflect the parameter values as read in from the General Control Card. Examples of these prints are shown in figure 87.

```
ON THIS RUN THE PROBABILITY OF REFUELING ABORT IS -0.000000
DAMAGE LAW OPTION IS THE SQUAREROOT LAW
THE TERMINAL MISSILE INTERCEPTORS HAVE PK = 0.950000
```

Figure 87. EVALALOC General Control Card Print

4.5.2 Sample Target List. This print (figure 88) is produced for the number of targets indicated on the general control card. This detailed listing is followed by a print which indicates how many targets are involved in the evaluation being performed by EVALALOC. An exerpt of this print is as follows:

THERE ARE 1297 TARGETS OF WHICH 1272 ARE ASSIGNED WEAPONS AND 25 ARE LEFT ALONE

When run after program PLANOUT the number of targets is the number of simple, complex and elements of multiple targets. When run after program ALOC the number of targets is the sum of the number of simple, complex and multiple targets.

4.5.3 Target Destruction Summary. This table summarizes the expected target value destroyed as a result of the planned attack (Allocation). The summary, figure 89, shows "real estate" and "QUICK value" destroyed. The former term used to identify the expected target value which would be destroyed assuming target value is not time dependent; i.e., does not degrade over time. "QUICK value" destruction data reflects the time-sensitivity of target value as defined in the data base. The summary shows the total expected target value destroyed and the value destroyed for each target type (attribute TYPE) within each target class (attribute CLASS). In addition, the table provides data on the weapon megatonnage (scheduled and expected to be delivered) which produced the reported target destruction. The Target Destruction summary is provided for the initial evaluation and for each re-evaluation of the plan.

(1) CLASS	(2) TYPE	(3) NAME	(4) LATITUDE DEG MIN SEC	(5) LONGITUDE DEG MIN SEC	(6) TARGET CODE	(7) VALUE	(8) INDEXNO	(9) VALUE OF COMPLEX	(10) TGT NO	(11) MULT
U/I	HCITY-D	DONETSK	48 0 0	322 23 59	AD643	6.6961	2741	0.0000	1	1

(12) NUMBER	(23) SORTIE SEQUENCE	(13) GROUP NUMBER	(14) CORRIDOR NUMBER	(22) SALVO NUMBER	(15) PTP	(16) ARRIVAL TIMES	(17) REAL EST DESTRYED	(18) VALUE DESTRYED	(19) LATITUDE DEG MIN SEC	(20) LONGITUDE DEG MIN SEC	(21) YIELD KILOTONS
1	11	1	0	3	0.9999	0.4143	7.9939	7.9939	47 59 27	322 24 54	100.00
2	116	3	0	4	0.9999	0.4205	17.5649	17.5649	48 0 20	322 24 0	100.00
3	78	2	0	6	0.9999	0.4258	20.8583	20.8583	48 0 30	322 25 51	100.00

HEADING	LABEL	DESCRIPTION
(1)	CLASS	Target class name
(2)	TYPE	Target type name
(3)	NAME	Target name
(4) (5)	LATITUDE, LONGITUDE	Target latitude and longitude in degrees, minutes, seconds
(6)	TARGET CODE	Target designator code
(7)	VALUE	Total target value
(8)	INDEXNO	Target index number; for complex target, first target has * appended to its index numbers; subsequent targets in the complex have two (**)
(9)	VALUE OF COMPLEX	Total value of complex of which target is part
(10)	TGT NO	Internal (program) target number; this list is in order by this ascending number
(11)	MULT	Target multiplicity
(12)	NUMBER	Internal index number for weapon allocated to the target
(13)	GROUP NUMBER	Weapon group number
(14)	CORRIDOR NUMBER	0 for missiles; penetration corridor number for bombers
(15)	PTP	Weapon penetration probability
(16)	ARRIVAL TIMES	Weapon arrival times at target
(17)	REAL EST DESTRYED	Target value destroyed if that value was not time dependent
(18)	VALUE DESTRYED	Calculated target value destroyed
(19) (20)	LATITUDE, LONGITUDE	Calculated latitude and longitude of weapon burst (zero when EVALALOC run after ALOC)
(21)	YIELD	Yield of weapon in kilotons
(22)	SALVO NUMBER	Salvo number (zero for non-salvoed missiles) for bombers, zero for gravity bombs; one for ASM
(23)	SORTIE SEQUENCE	Sortie sequence number

Figure 88. Sample Target List

4.5.4 Schedule of Weapons Allocated. This summary depicts the number o of weapons of each type allocated against each target type. The first five columns contain target information and the remaining contain weapon information. The weapon categories in the summary headings are: (1) ALERT LRA - alert long range aircraft, (2) NONALERT LRA - nonalert long range aircraft, (3) SLBM - submarine-launched ballistic missiles, (4) ICBM - intercontinental ballistic missiles, (5) TACTICAL BOMBERS, (6) MRBM - medium range ballistic missiles, and (7) IRBM - intermediate range ballistic missiles (see figure 126). This summary and the remaining summaries described below are printed only after the first pas pass through EVALALOC and is found after the first "SAMPLE TARGET LIST" print. Any weapon category not listed here will be included under category ICBM.

Some entries in this schedule show allocation of fractional weapons (see figure 90). This circumstance arises when weapons are allocated to complex targets which include target components of more than one type. For each weapon allocated to a complex target, the amount printed in this summary print reflects the fraction of the weapon allocated to each type as if the weapon were divided proportional to the value of the target components. For example, assume a complex target of value 10.0 composed of two components. One component has value 3.0 and is TYPE BISON. The other component has value 7.0 and is TYPE RCITY. Assume further that one weapon of TYPE B-52 is allocated against that target. This weapon is considered, for purposes of this summary print, to be allocated 0.3 to TYPE BISON and 0.7 to TYPE RCITY. In general, if the component value is VALCM and the total complex value is VALCX, the fractional allocation of each weapon allocated to the type of the component is VALCM/VALCX. Note that the totals line of the summary print shows that an integer number of weapons is allocated for the entire plan.

4.5.5 Schedule of Weapons Delivered. This table is a summary by weapon category and target type of the expected number of weapons actually delivered to targets (see figure 91). The entries in this summary are similar to those printed in the preceding summary. The number of weapons delivered is computed as the number of weapons allocated (as displayed in the schedule of weapons allocated) times the average delivery probability for each weapon function/target type combination. Thus, fractional weapon entries in the schedule of weapons delivered arise from two sources. First, the allocated weapons are divided among target types within complexes according to the proportional scheme described in the preceding section, Schedule of Weapons Allocated. Second, the average delivery probability may produce a number of weapons "delivered" that is not an integer. The number printed in this print is the expected number delivered. For example, if 3.0 weapons were allocated to a target type and the average delivery probability is 0.8, then the expected number of weapons delivered is 3.0 x 0.8 = 2.4.

TARGET CLASS (1)	TARGET TYPE (2)	NO. OF TARGETS (3)	REAL ESTATE (NTS)* TOTAL ORIGNL VLUE (4)	VALUE DSTRYED (5)	PERCENT DSTRYED (6)	PERCENT SURVVNG (7)	PERCENT OF QUICK VALUE (TS)* DSTRYED (8)	ESCAPED (9)	REMNING (10)	MEGATONS SCHDULED (11)	MEGATCNS DELIVERD (12)
R/U/I	ALL	122	213.17	121.39	56.94	43.06	56.94	0.00	43.06	306.75	91.42
	RCITY	96	104.04	46.40	44.60	55.40	44.60	0.00	55.40	189.50	46.39
	RCITY-D	26	107.13	74.99	68.72	31.28	68.72	0.00	31.28	117.25	45.03
R/COMMUN	ALL	6	14.64	10.32	70.51	29.49	70.51	-0.00	29.49	18.75	7.64
	RADIO	4	14.64	10.32	70.51	29.49	70.51	-0.00	29.49	18.75	7.64
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	BADGUYS	6	29.28	25.39	86.71	13.29	86.71	-0.00	13.29	28.25	13.28
TOTALS		210	855.86	682.16	79.78	20.22	60.45	12.22	19.33	630.54	264.10

*NTS means "Not Time Sensitive;" TS means "Time Sensitive."

Figure 89. Target Destruction Summary
(Part 1 of 2)

HEADING	LABEL	DESCRIPTION
(1)	TARGET CLASS	Target class
(2)	TARGET TYPE	Target type
(3)	NO. OF TARGETS	Number of targets
(4)	TOTAL ORIGNL VLUE	Total original value of the targets summed by class and type
(5)	VALUE DSTRYED	Target value destroyed (assuming that the target value is not time dependent)
(6)	PERCENT DSTRYED	Percentage of original target value destroyed (assuming that the target value is not time dependent)
(7)	PERCENT SURVVNG	Percentage of original value that still remains (assuming that the target value is not time dependent)
(8)	DSTRYED	Percentage of original target value destroyed (assuming that the target value is time dependent)
(9)	ESCAPED	Percentage of original target value that has escaped before weapons are delivered (assuming that the target is time dependent)
(10)	REMAINING	Percentage of original target value that still remains after weapons are delivered (assuming that the target value is time dependent)
(11)	MEGATONS SCHDULED	Number of megatons scheduled
(12)	MEGATONS DELIVERD	Number of megatons delivered

Figure 89. (cont.)
(Part 2 of 2)

SCHEDULE OF WEAPONS ALLOCATED

(1) TARGET CLASS	(2) TARGET TYPE	(3) TOTAL NUMBER	(4) NUMBER ATTACKED ALONE	(5) COMPLEX	(6) ALERT LRA	(6) NONALERT LRA	(6) SLBM	(6) ICBM	(6) TACTICAL BOMBERS	(6) MRBM	(6) IRBM	(7) WEAPON TOTALS
INTCPTOR	ALL	64	28	36	4.62	34.99	137.87	1.57	0.00	0.00	0.00	179.05
	SPARTAN	12	3	9	0.00	3.83	22.83	0.50	0.00	0.00	0.00	27.17
	F-105	46	24	22	4.62	28.44	105.37	1.07	0.00	0.00	0.00	139.49
	BOMARC	6	1	5	0.00	2.72	9.67	0.00	0.00	0.00	0.00	12.39
	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
NAVAL	ALL	18	0	7	12.80	21.66	12.81	1.98	0.00	0.00	0.00	49.25
	BNAVAL	18	0	7	12.80	21.66	12.81	1.98	0.00	0.00	0.00	49.25
	TOTALS		948	111	662.00	741.00	1128.00	48.00	0.00	0.00	0.00	2579.00

HEADING	LABEL	DESCRIPTION
(1)	TARGET CLASS	Name of target class
(2)	TARGET TYPE	Name of target type
(3)	TOTAL NUMBER	Total number of targets by type
(4)	NUMBER ATTACKED ALONE	Number of targets directly attacked
(5)	NUMBER ATTACKED COMPLEX	Number of targets located within a complex which is attacked
(6)	ALERT LRA,...	Number of weapons in each category allocated to various target classes and types *
(7)	WEAPON TOTALS	Total number of weapons allocated by target class and type

Figure 90. Schedule of Weapons Allocated

* See the text section, Schedule of Weapons Allocated, for a discussion of the meaning of fractional entries.

SCHEDULE OF WEAPONS DELIVERED

① TARGET CLASS	② TARGET TYPE	③ NUMBER	④ ALERT LRA	④ NON-ALERT LRA	④ SLBM	④ ICBM	④ TAC BOMBERS	④ MRBM	④ IRBM	⑤ WEAPON TOTALS
INTCPTOR	ALL	64	0.50	0.63	90.00	0.10	0.00	0.00	0.00	91.23
	SPARTAN	12	0.00	0.09	14.71	0.03	0.00	0.00	0.00	14.83
	F-1C5	46	0.50	0.53	68.99	0.07	0.00	0.00	0.00	70.08
	ROMARC	6	0.00	0.01	6.31	0.00	0.00	0.00	0.00	6.32
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
NAVAL	ALL	18	7.10	1.72	8.39	0.12	0.00	0.00	0.00	17.34
	BNAVAL	18	7.10	1.72	8.39	0.12	0.00	0.00	0.00	17.34
⑤ WEAPON TYPE TOTALS			370.50	49.11	756.95	3.02	0.00	0.00	0.00	1199.67

HEADING	LABEL	DESCRIPTION
①	TARGET CLASS	Name of target class
②	TARGET TYPE	Name of target type
③	NUMBER	Total number of targets by class and type
④	ALERT LRA, . . .	Expected number of weapons in each category delivered to each target class and target type*
⑤	WEAPON TOTALS	Total number of weapons delivered to each target class and type

Figure 91. Schedule of Weapons Delivered

* See the text section, Schedule of Weapons Delivered, for a discussion of the meaning of fractional entries.

4.5.6 Scheduled Megatonnage. This summary depicts the scheduled megatonnage for each target class and type by weapon category. It is illustrated and described by figure 92. Fractional entries in this summary arise from the same source as that described in Schedule of Weapons Allocated.

4.5.7 Delivered Megatonnage. This summary is identical in format to the previous one, except that it depicts expected actual delivered megatonnage (see figure 93). Fractional entries in this summary arise from the same sources as those described in Schedule of Weapons Delivered.

4.5.8 Allowable Weapon Type Names for WPNMODIF. Normally, the first time EVALALOC is run for a given weapon allocation, the user does not alter weapon or target parameters. To help the user in subsequent runs, the following print of allowable weapon type names (i.e., the type names processed during this evaluation) is provided. This message is printed immediately after the Schedule of Weapons Delivered summary, as shown below:

```
          ALLOWABLE WEAPON TYPE NAMES FOR WPNMODIF

SS-6   SS-7   SS-8   SS-9   N-3   N-5    BADGER BISON BEAR
```

4.5.9 Revised Weapon-Target Parameter for Plan Reevaluation. If the plan is to be evaluated using modified weapon or target parameters, the data contained on the WPNMODIF and TGTMODIF parameter cards appears as an initial print in the EVALALOC output which summarizes the reevaluation (the TARGET DESTRUCTION SUMMARY is provided for each plan evaluation performed during the run, whereas the other summaries are produced only once each run). A sample of the output message reflecting these data is shown in figure 94.

4.5.10 Debug Prints. In the post-PLANOUT execution of program EVALALOC, a number of additional debug prints can be obtained by exercising the JOPT (3) print control option on the General Control Card. These prints are described in the Program Maintenance Manual, Volume III, Weapon Allocation Subsystem, since an understanding on their use depends on detailed understanding of the working of several EVALALOC subroutines.

4.5.11 Error Messages. The error messages generated by program EVALALOC are shown in figure 95.

SCHEDULED MEGATONNAGE

① TARGET CLASS	② TARGET TYPE	③ NUMBER	④ ALERT LRA	④ NON-ALERT LRA	④ SLBM	④ ICBM	④ TAC BOMBERS	④ MRBM	④ IRBM
INTCPTOR	ALL	64	18.48	139.97	314.07	6.29	0.00	0.00	0.00
	SPARTAN	12	0.00	15.33	53.50	2.00	0.00	0.00	0.00
	F-105	46	18.48	113.75	[illegible]	4.29	0.00	0.00	0.00
	BOMARC	6	0.00	10.89	19.67	0.00	0.00	0.00	0.00
	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
NAVAL	ALL	18	51.20	80.04	23.06	7.91	0.00	0.00	0.00
	BNAVAL	18	51.20	80.04	23.06	7.91	0.00	0.00	0.00
⑤ MEGATONNAGE TOTALS			2048.00	[illegible]	2970.00	192.00	0.00	0.00	0.00

HEADING	LABEL	DESCRIPTION
①	TARGET CLASS	Target class name
②	TARGET TYPE	Target type name
③	NUMBER	Total number of targets by type
④	ALERT LRA , . . .	Scheduled megatonnage by target type and weapon category
⑤	MEGATONNAGE TOTALS	Total megatonnage by weapon category

Figure 92. Scheduled Megatonnage

DELIVERED MEGATONNAGE

① TARGET CLASS	② TARGET TYPE	③ NUMBER	④ ALERT LRA	④ NON-ALERT LRA	④ SLBM	④ ICBM	④ TAC BOMBERS	④ MRBM	④ IRBM
INTCPTOR	ALL	64	1.99	2.53	201.12	0.40	0.00	0.00	0.00
	SPARTAN	12	0.00	0.37	34.06	0.13	0.00	0.00	0.00
	F-105	46	1.99	2.12	154.47	0.27	0.00	0.00	0.00
	BOMAHC	6	0.00	0.05	12.59	0.00	0.00	0.00	0.00
	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
NAVAL	ALL	18	28.42	6.89	15.44	0.50	0.00	0.00	0.00
	BNAVAL	18	28.42	6.89	15.44	0.50	0.00	0.00	0.00
⑤ MEGATONNAGE TOTALS			1506.33	252.45	2007.23	12.10	0.00	0.00	0.00

HEADING	LABEL	DESCRIPTION
①	TARGET CLASS	Target class name
②	TARGET TYPE	Target type name
③	NUMBER	Total number of targets by type (ALL represents the total within the class)
④	ALERT LRA, . . .	Scheduled megatonnage by target type and weapon category
⑤	MEGATONNAGE TOTALS	Total megatonnage by weapon category

Figure 93. Delivered Megatonnage

```
                    WEAPON TYPES AND ATTRIBUTES MODIFIED ON THIS PASS

  WPNTYPE    ATTRIBUTE   ATTRB CHANGED
 MODIFIED    MODIFIED    BY FACTOR OF
   GROUP        1  DBL            .9104
   GROUP        2  DBL            .9104
   GROUP        3  DBL                0
   GROUP        4  DBL                0
   GROUP        5  DBL                0
   GROUP        6  DBL                0

  ALL MODIFICATIONS MADE.  IF THE ABOVE TABLE IS EMPTY, NO WEAPON CHANGES WERE MADE ON THIS PASS
    NPASS              8

                        TARGET MODIFICATIONS ON THIS PASS

  TGTTYPE ATTRIBUTE  CHNGED BY  WEAPON TYPES FOR WHICH PENETRATION
  CHANGED  CHANGED   FACTOR OF  PROBABILITY WAS CHANGED BY FACTOR
  ALLTGT    PEN          .9630  ALLWPN
```

Figure 94. Weapon and Target Modification Print

1. WRONG BASFILE FORMAT. REQUESTED A GOT B

A and B are the version names for the BASFILES. This message occurs when the program tries to read a BASFILE which is not the version which it is programmed to read; the run is terminated. To use the BASFILE being provided, the program would have to be altered.

2. EVALPLAN PRINTS I TOO MANY VALUE COMPS ON THIS TARGET .NK IS J

I is the index number of the target and J is the number of time components. This message is printed when there are more than three components of time-dependent target value. No further processing of data is done by EVALPLAN for this target.

3. UNEXPECTED FUNCTION CODE IS C. EVALALOC HAS ASSUMED DEFAULT VALUE OF D.

This message is printed whenever a function code for a weapon is not recognized by EVALPLAN. C is the unexpected code and D is the default value. If C is a function code for a missile, a default of ICBM is given as D; similarly, if C is a bomber function code, the default, D, is LRA. Processing continues normally after the message is printed. Incorrect data in the data base is a likely cause of this problem.

4. BAD YIELD FOR GROUP NO I ON TGT INDEXED J

This message is printed if the yield of a weapon being processed is zero or negative. I is the number of the weapon group and J indicates the target number to which the weapon was allocated. After the message is printed the EVALALOC run is aborted. Usually the error must be corrected by a maintenance programmer.

5. ON TARGET INDEX K TOO MANY HARDNESS COMPS TARGET NAME IS TNAME M IS L

This message is printed if the target with index number K has more than two hardness components. L is the number of components; EVAL2 resets it to 2. This error is the result of incorrect data on the ALOCTAR file or PLANTAPE and must be corrected by a maintenance programmer.

Figure 95. EVALALOC Error Messages
(Part 1 of 3)

6. ON TARGET INDEX K TOO MANY VALUE COMPS. TARGET NAME IS TNAME NK IS M

This message has the same meaning as message 2 but is printed by subroutine EVAL2 instead of EVALPLAN. M is the number of components, EVAL2 reduces the number M to 3. The comment for error message 5 applies here too.

7. THERE ARE TOO MANY COMPONENTS ON TARGET NUMBER I NAMED (Name)

There are more than 40 complex target elements. The number is reduced to 40, and the program continues its processing. This message occurs only in post-ALOC operation of the program. Its cause must be determined by a maintenance programmer.

8. THERE ARE TOO MANY NTYPES

This message is printed if the number of weapon types exceeds the number allowed in the program. Processing for this set of target and weapon parameter modifications is terminated.

9. WE HAVE OVERFLOWED A ON TARGET NUMBER INDX NAMED TNAME

This message is printed if the maximum index of any of many arrays used to hold evaluation data for the summaries produced by EVALALOC is larger than the dimensioning given to the variable in the program. A is the name of the variable, INDX the target index number, and TNAME the name of the target. Processing for the target is discontinued; the SAMPLE TARGET LIST print is produced for the target; and the program resumes processing with the next target. Normal processing of the target is possible only if the appropriate array sizes are increased in the program.

10. ERROR, TARGET ATTRIBUTE TO BE CHANGED IS NOT ON LIST

ATTRIBUTE	LIST OF ALLOWABLE ATTRIBUTES				
ANAME	VO(1)	(TAU(1)	H(1)	FVAL(1)	PEN

This message is printed by subroutine TGTMODIF if the user attempts to specify that a target parameter be modified when it cannot be modified by the program. The subroutine ignores this input card and goes on to the next one. The user should consult the list of parameters which can be modified, which is given in the Input section of this program writeup.

Figure 95. (Part 2 of 3)

11. LPLAN GT. LTOT, LGRP = L1 CORRIDOR = L2

This message is printed when the total number of bomber events is less than the number of planned events on a PLANTAPE record for a bomber. The number of planned events is then set to zero and processing continues. L1 is the bomber group number and L2 the corridor number. Program PLANOUT will need the attention of a maintenance programmer.

12. UNPACK UNABLE TO REDUCE NUMBER OF WEAPON GROUPS ON TARGET I, ABORT.

I is the target index number. This message is printed when more than 30 weapons on the PLANTAPE are assigned to the same target and UNPACKER is unable to find weapons beloging to the same wea weapon group so that it can compress or reduce the number of weapons or weapon groups to 30 or less. The run is aborted, and the data base may need to be modified.

13. PACKED SCRATCH FILE OUT OF SYNCH WITH ALOCTAR FILE ON TARGET I HAVING INDEXNO J. ALOCTAR TARGET IS K AND HAS INDEXNO L.

I is the target number on the current ALOCTAR record, J is the index number of the target, K is the target number on the current scratch file record, and L is the target index number. This message is printed by subroutine UNPACKER when the target number or target index number on the aloctar file exceeds that found on the scratch file record. The run is aborted, and output from PLANOUT and ALOC for the targets should be checked to determine the problem. Attention of a maintenance programmer may be required.

14. THERE ARE MORE THAN 5,000 TARGETS

This message is printed when the number of target groups read from the ALOCTAR file in post-PLANOUT execution exceeds the maximum of 5,000. EVALALOC reads no further targets from the file, but continues processing using only the first 5,000 targets.

Figure 95. (Part 3 of 3)

SECTION 5. PROGRAM ALOCOUT

5.1 Purpose and Concept of Use

Program ALOCOUT consists of two overlay programs, ALOCO1 and ALOCO2 which respectively perform two important functions. First, overlay ALOCO1 selects optimal aim point offsets for weapons allocated to complex targets. Second, overlay ALOCO2 reorders the allocation data from the INTERMED file (where it is in target order) to produce a file ordered by weapon group and by penetration corridor within each weapon group order. The reordered data are written onto the TMPALOC file for use by FOOTPRNT, POSTALOC, and PLANOUT by ALOCO2.

The user specifies the type and frequency of printed output he desires from the program. He also influences the way in which the function minimizer determines the aim point offsets by setting parameters which govern the number of iterations for the minimizer and whether it should be used at all.

5.2 File Utilization

Figure 96 displays the use of files in overlays ALOCO1 and ALOCO2.

The input files used by ALOCOUT are prepared by earlier processors. The BASFILE is output by PREPALOC and is used by ALOCOUT to obtain the relevant weapon data and characteristics of the multiple and complex targets which are used in ALOCOUT processing. The ALOCTAR file is output by ALOC and is used by ALOCOUT as the main input file containing the details of the allocation of weapons to targets.

ALOCOUT produces two output files, the INTERMED file and the TMPALOC file. The TMPALOC file contains nearly the same data as the ALOCTAR file, except that DGZ offsets for complex targets are included, and the file is in weapon group order instead of target order. In order to rearrange the data into weapon group order for the TMPALOC file, ALOCO2 uses the INTERMED file from ALOCO1 and the three scratch files illustrated in figure 96.

Filehandler buffer utilization in ALCCOUT is shown in figure 97.

5.3 Input

The only options available to the user in program ALOCOUT are to specify the type and frequency of the various prints and/or to specify the maximum number of iterations to be executed by the generalized function minimizer which is used to select the aim point offsets for those weapons assigned to complex targets. These input parameters are provided by the user on the four data cards described below.

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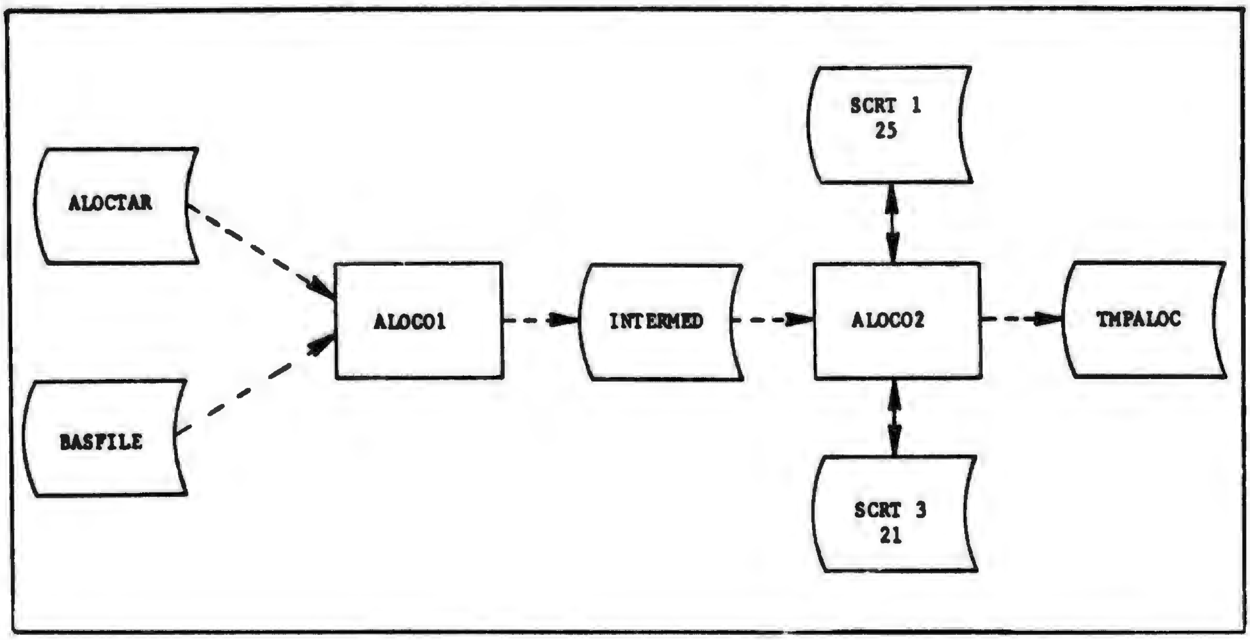
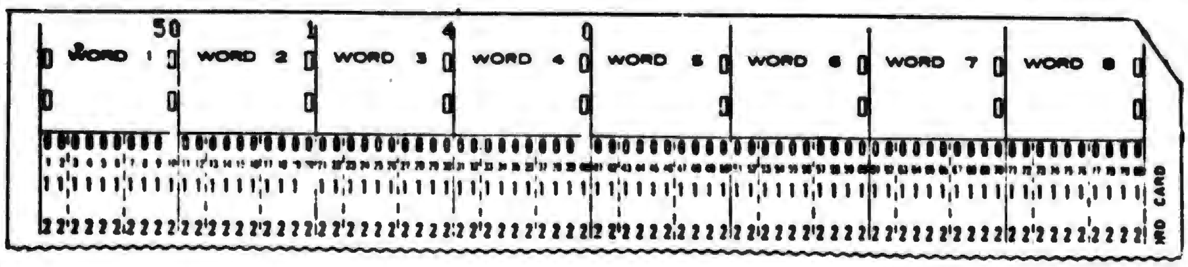


Figure 96. File Utilization

FILE NAME	BUFFER NUMBER
BASFILE	8
ALOCTAR	4
INTERMED	2
SCRATCH	25
SCRATCH	26
SCRATCH	21
TMPALOC	3

Figure 97. ALOCOUT Filehandler Buffer Utilization

5.3.1 Card 1 (ALOC01): ALOCTAR and BASFILE Print Option Card. This card contains four entries; the first specifies the desired print frequency for target information blocks, and the last three control two detailed or debug prints available to the user. If exercised, these debug prints will enable the user to specify how many words ALOCOUT should dump from the beginning and end of arrays read from the ALOCTAR file and the BASFILE file. Figure 98 illustrates and explains the content of this card.



WORD	FORMAT	(J)	RANGE	LABEL	DEFAULT	DESCRIPTION
1	Integer	R	STD*	IPINDAT	0	Desired print frequency of data blocks from ALOCTAR file
2	Integer	R	STD	ISNAPDYN	0	Number of arrays read from ALOCTAR file for which the print dump will be in effect
3	Integer	R	STD	IWDSNPDY	0	ALOCTAR file print dump indicator: if greater than 0, the number of words printed from the beginning and the end of the above specified number of arrays; if 0, no dump
4	Integer	R	STD	IWDSNPPD	0	BASFILE complex target data print dump indicator; the explanation is the same as that for the previous parameter, except that it only applies to arrays containing complex target data

*STD = STANDARD RANGE FOR INTEGERS IN THE COMPUTER

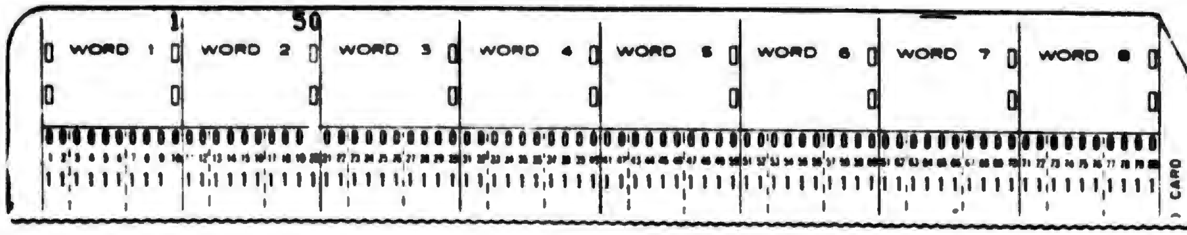
Figure 98. The ALOCTAR and BASFILE Print Option Card

5.3.2 <u>Card 2 (ALOC01): DGZ Selection Logic Option Card</u>. This card contains the parameters which specify whether the optimal DGZ selector (subroutine DGZSEL) will be used; whether the generalized function minimizer (subroutine FINDMIN) will be used; the maximum number of iterations to be executed by subroutine FINDMIN; and the amount of data describing these calculations to be printed. Figure 99 illustrates and explains the content of this card.

5.3.3 <u>Card 3 (ALOC02): Weapon Data Print Option Card</u>. This card contains the parameters which specify the print frequency for the summary weapon data written onto the TMPALOC file and the number of words from the beginning and end of each array written onto that file which are to be printed in a debug print. Figure 100 illustrates and explains the content of this card.

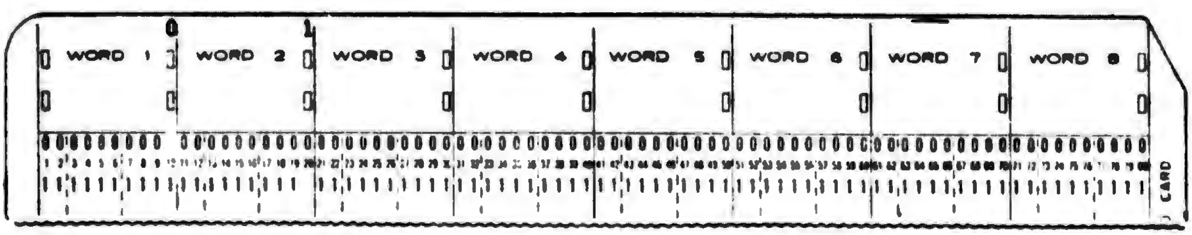
It should be noted that, although both of these types of prints can contain the same data, the format of each is different. For clarification, see section, 5.4, Output.

5.3.4 <u>Card 4 (ALOC02): Strike Data Print Option Card</u>. This data card contains parameters which specify the print frequency of the strike data that are written onto the TMPALOC file as well as two debug print options for the same data. The card is illustrated and explained in figure 101.



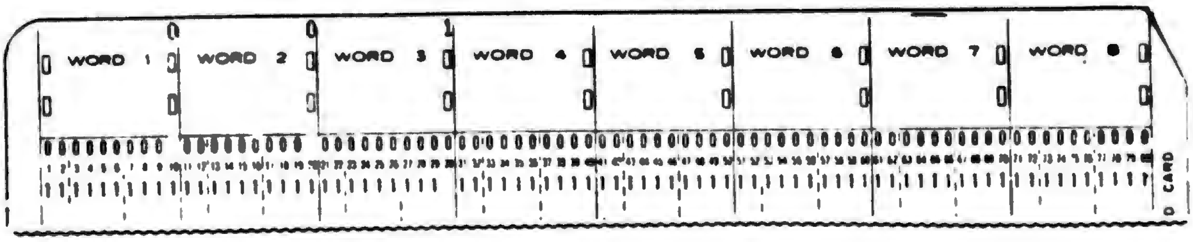
WORD	FORMAT	(J)	RANGE	LABEL	DEFAULT	DESCRIPTION
1	Integer	R	(-2,-1, 0,1,2)	IFLAG	0	Subroutine DGZSEL control parameter -2, subroutine will compute aim points, and debug prints in subroutine FINDMIN will be presented -1, subroutine DGZSEL will not compute aim points; all weapons will have aim point offsets of zero 0, subroutine will compute aim points; no prints will be produced 1, subroutine will compute aim points; prints of input target data and the final weapon lay-down will be presented 2, same as 1, except prints after each iteration of subroutine FINDMIN will also be presented
2	Integer	R	(>-1)	IMAX	2	-1, subroutine FINDMIN not used 0,1,..., maximum number of iterations in sub-routine FINDMIN

Figure 99. The DGZ Selection Logic Option Card



WORD	FORMAT	(J)	RANGE	LABEL	DEFAULT	DESCRIPTION
1	Integer	R	(≥0)	IOUTDAT1	0	Weapon summary data dump indicator: if 0, no words are dumped; number greater than zero specifies number of words to be dumped (printed) from the beginning and end of the /STRKSUM/ arrays which are written onto the TMPALOC file.
2	Integer	R	STD	IOUTDATP	0	Frequency of summary data print

Figure 100. The Weapon Data Print Option Card



WORD	FORMAT	(J)	RANGE	LABEL	DEFAULT	DESCRIPTION
1	Integer	R	(≥0)	IOUTDAT2	0	Dump indicator for TMPALOC strike data header record: if 0, no words are dumped; number greater than zero specifies number of words dumped (printed) from the beginning and end of the strike data header records which are written onto the TMPALOC file.
2	Integer	R	(≥0)	IOUTDAT3	0	TMPALOC file strike data print dump indicator; same as above for arrays written onto the TMPALOC file; which contain strike data
3	Integer	R	(≥0)	JOUTDATP	0	Frequency of print of strike data

Figure 101. The Strike Data Print Option Card

5.4 Output

The two prints which would normally interest the user are the ALOCTAR DATA BLOCK and the TMPALOC DETAILED SUMMARY prints. These detailed listings present the data which come into overlay ALOCO1 on the ALOCTAR and BASFILE files and the data which are written onto the TMPALOC file by ALOCO2.

5.4.1 ALOCTAR Data Blocks (ALOCO1). If on the ALOCTAR and BASFILE Print Option Card the user has set IPINDAT greater than zero, ALOCOUT will print data blocks which it reads from the ALOCTAR file with frequency IPINDAT. This print is illustrated by figure 102. Data are produced about both the target and the weapons allocated to the target in the order that target blocks are read from the ALOCTAR file.

5.4.2 TMPALOC Prints (ALOCO2). This summary of data really consists of two separate segments which should be described individually. The first is a header print and the next is the detailed summary data for bombers and missiles.

a. TMPALOC Header Print: The header print is illustrated in figure 103 and is produced with frequency IOUTDATP, where IOUTDATP is a parameter set by the user on the weapon data print option card. This header identifies the weapon group and corridor for which the subsequent detailed information is printed.

b. TMPALOC Detailed Bomber Summary: The data for this summary come from the /RAIDSTRK/ block of data which is written onto the TMPALOC file for weapons assigned to bomber groups. For each bomber group, the first line of this summary gives the number of targets attacked by the bomber group through one corridor. The remaining lines list, for each weapon, data about the target to which it is allocated. (See figure 104.)

c. TMPALOC Detailed Missile Summary: This summary is exactly like the previous one, except that it is produced for weapons assigned to missile groups; consequently, slightly different target data are relevant. Figure 105 illustrates and explains the content of the summary.

```
-------------TARGET NUMBER IS 24----------------

  (1)      (2)     (3)      (4)     (5)    (6)     (7)     (8)     (9)    (10)    (11)   (12)   (13)   (14)  (15)   (16) (17) (18)
  NAME    INDEX  JHCLASS  JHTYPE   TLAT   TLONG  IATLOC  ITPREM   IDPN   DISTF   DISTG  MULL   ICOMP   N    DFSIG   CL   F   TSK
 FRUNZE    2834   U/1     RCITY    42.8   285.3    0       0       6     369.5   369.5   0      1      4   AD784   UR   0   AD
  (19)         (20)  (27)   (21)          (22)           (23)          (24)          (25)
  IGP          KUR   SAL    DLAT          DLONG          TOA           RELVAL        PENN
   1            7     0     0.0035       -0.0137          3.8           2.6          .8934
   5            7     0     0.0044       -0.0367          9.8           3.1          .6234
   7            7     0    -0.0006       -0.0090          3.8           2.9          .7861
   6            7     0    -0.0048        0.0025          3.8           1.0          .9995
(26)
TGTFAC = 2.10
```

HEADING	LABEL	DESCRIPTION
(1)	NAME	Target name (for first target component)
(2)	INDEX	Index number (for first target component)
(3)	JHCLASS	Target class name
(4)	JHTYPE	Target type name (except for complex targets where it is the number of elements in the complex)
(5)	TLAT	Target latitude
(6)	TLONG	Target longitude
(7)	IATLOC	State of local bomber defense
(8)	ITPREM	Complex target indicator (=1 if complex target; =0 otherwise)
(9)	IDPN	Depenetration corridor index for target
(10)	DISTF	Distance from target to point of depenetration
(11)	DISTG	Distance from target to recovery base
(12)	MULL	Multiple target indicator (= current target multiplicity if multiple target; =0 otherwise)
(13)	ICOMP	Target type for complex target, and 0 otherwise
(14)	N	Number of weapons allocated to target

Figure 102. ALOCTAR Data Block Print
(Part 1 of 2)

HEADING	LABEL	DESCRIPTION
(15) (16) (17) (18)	DESIG CL F TSK	Target designator, country location, and flag and task codes respectively
(19)	IGG	Group number of weapon allocated to the target
(20)	KOR	Weapon penetration corridor or, in case weapons are missiles, the number of missiles from the group assigned to the target
(21) (22)	DLAT DLONG	Offset latitude and longitude, respectively, for weapon delivery
(23)	TOA	Time of arrival for weapon delivery
(24)	RELVAL	Relative value of weapon allocation divided by weapon penetration probability
(25)	PENNAD	Weapon penetration probability
(26)	TGTRAD	Target radius
(27)	SAL	Salvo number (zero for nonsalvoed missiles). For bombers, zero for gravity bomb, one for ASM

Figure 102. (Part 2 of 2)

```
(1) KGROUP =  20 (2) NTSTRK =      36 (3) NCORR = 1
   (4) ICORR =         1
   (5) NSTRK =        36
```

HEADING	LABEL	DESCRIPTION
(1)	KGROUP	Weapon group index number
(2)	NTSTRK	Total number of strikes for weapon group
(3)	NCORR	Number of corridors to be used by weapon group
(4)	ICORR	Sequence numbers: one for each corridor (not necessarily the same as the corridor number
(5)	NSTRK	Number of strikes per corridor (in decreasing order)

Figure 103. TMPALOC Header Print

```
NGRCLF =    14   NTSTRK =    148   NCORR =  9
  ICCRR =        1        2        3       4       5       6       7       8       9 } TMPALOC Header Print
  NSTRK =      108       16       10       4       4       3       1       1       1 }

NT =     100   JGROUP =  14   JCORR =  7
INDEXNO  TGTLAT     TGTLONG     TPREM  IDPEN  DISTOUT   DISTREC   ATTRLOC  RVAL  DLAT     DLONG    LFIX  I  DESIG  CL  F  TSK
 1 1322  56.70000   269.50011   0.00   6      1371.00   1371.00   0.00000  2.60  0.00000  0.00000  0     1  AB806  LR  0  AC
 2 1323  57.01840   271.03400   0.00   6      1371.00   1371.00   0.00000  2.60  0.00000  0.00000  0     2  AC623  LR  0  AC
 3 1324  56.46640   268.33360   0.00   6      1371.00   1371.00   0.00000  2.60  0.00000  0.00000  0     3  AC624  UR  0  AC
 4 1325  56.73360   269.73020   0.00   6      1371.00   1371.00   0.00000  2.60  0.00000  0.00000  0     4  AC625  UR  0  AC
 5 1326  55.85140   269.07820   0.00   6      1371.00   1371.00   0.00000  2.60  0.00000  0.00000  0     5  AC626  UR  0  AC
 6 2394  55.72000   321.82811   0.00   4       829.00    829.00   0.00000  2.47  0.00000  0.00000  0     6  AB350  UR  0  AB
```

HEADING	LABEL	DESCRIPTION
(1)	NT	Number of targets to be attacked through corridor
(2)	JGROUP	Weapon group index number
(3)	JCORR	Corridor index number
(4)	INDEXNO	Target index number
(5) (6)	TGTLAT TGTLONG	Target latitude and longitude
(7)	TPREM	ASM factor. One for ASM; zero for gravity bomb
(8)	IDPEN	Depenetration corridor index
(9)	DISTOUT	Distance from target to point of depenetration
(10)	DISTREC	Distance from target to recovery point
(11)	ATTRLOC	Local target defense potential
(12)	RVAL	Relative value of the target
(13) (14)	DLAT DLONG	Offset latitude and longitude for weapon delivery (degrees)
(15)	LFIX	Weapon fixed assignment indicator (=1 if fixed; =0 otherwise)
(16)	I	Internal weapon index
(17) (18) (19) (20)	DESIG CL F TSK	Target designator, country location, flag, and task codes, respectively

Figure 104. TMPALOC Detailed Bomber Summary

```
NGRCLF =    41   NTSTRK =      24   NCORR =  1  } TMPALOC Header Print
  ICCRR =          1
  NSTRK =          24
 ①                 ②              ③
NT =       24   JGROUP =  41    JCORR =   0
④INDEXNO   ⑤TGTLAT   ⑥TGTLONG  ⑦RVAL     ⑧DLAT     ⑨DLONG  ⑩LFIX ⑪I ⑫DESIG ⑬CL ⑭F ⑮TSK ⑯SAL
 1 2332     37.790    301.580     1.63    0.00000   0.00000    0    1  AB079  UR  0  AB    1
 2 1224     55.416    317.993     0.90    0.00000   0.00000    0    2  AC533  UR  0  AC    3
 3 1225     55.251    318.677     0.90    0.00000   0.00000    0    3  AC534  UR  0  AC    5
```

HEADING	LABEL	DESCRIPTION
①	NT	Number of targets to be attacked through corridor
②	JGROUP	Weapon group index number
③	JCORR	Corridor index number (=0 for missiles)
④	INDEXNO	Target index number
⑤ ⑥	TGTLAT TGTLONG	Target latitude and longitude
⑦	RVAL	Relative value of the target
⑧ ⑨	DLAT DLONG	Offset latitude and longitude for target delivery (degrees)
⑩	LFIX	Weapon fixed assignment indicator (=1 if fixed; =2 otherwise)
⑪	I	Internal weapon index
⑫ ⑬ ⑭ ⑮	DESIG CL F TSK	Target designator, country location, and flag, and task codes, respectively
⑯	SAL	Salvo number (zero for non-salvoed missiles)

Figure 105. TMPALOC Detailed Missile Summary

5.4.3 Debug Prints - A. The remainder of the possible printed output from program ALOCOUT is intended for use when ALOCOUT is being tested and debugged (except for the error messages described in the next subsection). One class of these debug prints is produced by the filehandler when arrays are being read from the BASFILE or ALOCTAR file or when arrays are being written onto the TMPALOC file. They should be used in conjunction with other dumps of these files and with specification sheets which describe what the contents of the files should be, word by word. They are useful only if the user suspects that the data read from or written onto one of these files by ALOCOUT are incorrect in some way. Figure 106 illustrates one of these prints for the ALOCTAR file. The parameter XXXXXX for each debug print is identified below, as is the FILE NAME.

The ALOCTAR Debug Print is governed by the IWDSNPDY and ISNAPDYN parameters on the user ALOCTAR and BASFILE print option card. The user will obtain the first and last IWDSNPDY (which is XXXXXX for this print) words for the first ISNAPDYN target blocks on the ALOCTAR file (FILE NAME = ALOCTAR).

The BASFILE Debug Print is governed by the IWDSNPDD parameter which is also set by the user on the ALOCTAR and BASFILE print option card. Hence, the first and last IWDSNPDD words are printed from every multiple or complex target array which is read from the BASFILE (FILE NAME = BASFILE).

The TMPALOC Debug Prints are governed by the IOUTDAT1, IOUTDAT2, and IOUTDAT3 parameters which the user specifies on the weapon data print option card and on the strike data print option card. XXXXXX is IOUTDAT1 if the /STRKSUM/ array is being written onto the TMPALOC file; it is IOUTDAT2 if NT, JGROUP, and JCORR from the TMPALOC detailed summary are being written onto TMPALOC; and it is IOUTDAT3 if the detailed target and weapon arrays for each weapon group are being written onto TMPALOC. In all three cases, FILE NAME = TMPALOC.

5.4.4 Debug Prints - B. The other class of ALOCOUT debug prints is relevant to the functioning of subroutine DGZSEL, which controls the process by which aim point offsets are determined for weapons allocated to complex targets. These prints allow the user to see the inputs to and results of the desired ground zero selection process. They are described below.

The "Target Data Input to DGZSEL" (ALOC01) Print is obtained if the user has set the parameter IFLAG on the DGZ selection logic option card to a number greater than zero. Subroutine SEEINPUT then will be used by the DGZ selector to print target and weapon data before aimpoint offsets are calculated for the weapons. Figure 107 illustrates this output.

```
    ①                           ②
RDARRAY- ITP =      4 WILL PRINT   20 WORDS FROM EACH END OF ARRAY AT 74741 B
      ③1   ④ 78258217821713 ⑤1.47597303729+034⑥2162635121423021 ⑦ASTRAKHA
        2              2796   4.92619189+030-316  0000000000005154  00000050
        3    76147725110320   1.44222186840+024  2124060006606060  AD660
        4    76193537920048   1.47373814197+025  2124606060606060  AD
        5   -49906701890511  -9.35065421904-091  6451606060606060  IN
```

HEADING	LABEL	DESCRIPTION
①	ITP	Logical unit number of (FILE NAME) file
②	XXXXXX	The number of words printed from each end of an array read from the (FILE NAME) file
③	INDEX	An internal index assigned to each word of the ALOCTAR array
④	INTWORD	The word printed in integer format
⑤	REALWORD	The word printed as a floating point number in E format
⑥	OCTWORD	The word printed as an octal number
⑦	ALPHAWORD	The word printed in alphameric

Figure 106. ALOCTAR Debug Print

TGT DATA INPUT TO DGZSEL

		1	2	3	4
TGTEL	①				
XO	②	0.745810	-0.902489	0.110597	1.403162
YO	③	-0.861090	-0.123431	0.534948	2.004138
RALL	④	2.829217	2.829217	2.829217	2.829217
VI	⑤	0.137391	0.137391	0.137391	0.137391
VTCA(1)	⑥	0.137391	0.137391	0.137391	0.137391
VTCA(2)		0.137391	0.137391	0.137391	0.137391
VTCA(3)		0.137391	0.137391	0.137391	0.137391
VTCA(4)		0.137391	0.137391	0.137391	0.137391
VTCA(5)		0.137391	0.137391	0.137391	0.137391

⑦ WPN	⑧ PDEL	⑨ ERDFL	⑩ YDSCL
1	0.810000	1.000000	1.012909
2	0.719597	0.500000	1.233106
3	0.718460	0.500000	1.235592
4	0.139694	0.500000	1.216440
5	0.150915	0.500000	1.228670

HEADING	LABEL	DESCRIPTION
①	TGTEL	Target element number ($J \leq 7$)
②	XO(J)	E-W and N-S displacements, respectively, of target element J in nautical miles
③	YO(J)	
④	RADL(J)	One-megaton lethal radius for target element J
⑤	VI(J)	Initial value of target element J
⑥	VTOA(J,I)	Value of target element J immediately after the arrival of weapon I
⑦	WPN	Internal weapon index (I)
⑧	PDEL(I)	Delivery probability for the Ith weapon
⑨	ERDEL(I)	CEP for weapon I
⑩	YDSCL(I)	Scaled weapon yield $= \left[(\text{actual yield})\right]^{1/3}$

Figure 107. Target Data Input to DGZSEL Debug Print

The "DGZSEL COMPUTATION VALUES" (ALOC01) Print like the previous one, is governed by the IFLAG parameter on the DGZ selection logic option card which must be greater than zero. It is produced by subroutine SEECALC after offset coordinates have been calculated for each weapon assigned to the target. Figure 108 illustrates and further explains this output.

The DGZ Improvement Print (ALOC01) Print is obtained in the following instance. The optimal aimpoint offsets for weapons allocated to a target are determined by a local function optimizer. Consequently, it is possible that the optimum obtained is only a local one. In such a case, if one of the weapons is targeted directly on one of the target points, a better solution may be obtained. If the user has set IFLAG greater than zero on the DGZ selection logic card, a message is printed when use of the above technique has produced a better result. This message follows the DGZSEL COMPUTATION VALUES print to which it refers (see figure 109.)

5.4.5 Error Messages. ALOCOUT error messages are shown in figure 110.

DGZSEL COMPUTATION VALUES

① WPN	② X	③ Y	④ S1	⑤ S2	⑥ S3	⑦ S4	⑧ S5
1	0.118597	0.534948	0.486132	0.436289	0.348630	0.551396	
2	0.118597	0.534948	0.425465	0.384884	0.308798	0.488238	
3	0.118597	0.534948	0.425842	0.385482	0.309781	0.488373	
4	0.118597	0.534948	0.884130	0.881078	0.865964	0.901547	
5	0.118597	0.534948	0.877694	0.871121	0.855081	0.892927	

⑨ TOTAL ESCAPED TARGET VALUE= 0.034145

HEADING	LABEL	DESCRIPTION
①	WPN	Internal weapon index
②	X(I)	Offset aim coordinates for weapon (in nautical miles)
③	Y(I)	Offset aim coordinates for weapon (in nautical miles)
④ → ⑧	S1 → S5	Survival probability of target element J relative to weapon I (J = 1,5)
⑨	VESCTOT	Total escaped target value

Figure 108. DGZSEL Computation Values Debug Print

DGZSEL COMPUTATION VALUES (1)

WPN	X	Y	S1	S2	S3	S4	S5
1	-0.150479	-0.176596	0.313403	0.376742	0.470989		
2	-0.150479	-0.176596	0.284270	0.367525	0.487184		
3	-0.815144	1.767791	0.487174	0.499898	0.285289		
4	0.900484	0.503420	0.867588	0.849939	0.895484		
5	0.900484	0.503420	0.870582	0.853953	0.896938		

TOTAL ESCAPED TARGET VALUE= 0.825527

(2) BETTER RESULTS ARE ACHIEVED IF WEAPON NUMBER 1 IS PLACED ON TARGET POINT NUMBER 2
LOCATED AT X0 = 0.900484, Y0 = 0.503420

(1) DGZSEL COMPUTATION VALUES: Same format as print shown in figure 268.

(2) DGZ Improvement Print

Figure 109. DGZ Improvement Print

Overlay ALOCO1:

1. WRONG BASFILE FORMAT. REQUESTED _ _ _ _ _. GOT _ _ _ _ _.
   Wrong BASFILE version; run is terminated. Either the program should be updated to read a new BASFILE, or the correct BASFILE should be used with the program.

2. ERROR IN SKIPPING TO POSTDATA PORTION OF BASFILE. END SENTINEL READ WAS _ _ _ _ _ _.
   Run is aborted because BASFILE is not in expected read position or because sequence of read statements for BASFILE is incorrect. The program or the BASFILE must be corrected.

3. ***** PROCESSOR ALOCO1 COMPLETED *****
   Overlay ALOCO1 has completed its processing.

4. ***** PROCESSOR ALOCO2 COMPLETED *****
   Overlay ALOCO2 has completed its processing.

Subroutine PROCSIMP (Fixed Assignment Error): ALOCO1

1. *** ERROR--NFIX = _ _ _ _ _ _
   NFIX, the number of weapons allocated through the fixed assignment capability, is negative; the run is aborted.

Subroutine PROCCOMP (DGZSEL Processing Terminated): ALOCO1

1. *** _ _ _ _ _ _ ***
   ABANDON DGZSEL ON COMPLEX TARGET NAME INDEX COMPONENT TGTNAME INDEXNO
   *** _ _ _ _ _ _ ***
   Subroutine COMPRESS has been entered with open tolerances more than 20 times in succession so no further attempt to use DGZSEL is made for this target.

Subroutine COMPRESS (Excessive Target Aim Points): ALOCO1

1. *** TOLERANCES DOUBLED N TIMES IN SUBROUTINE COMPRESS TO REDUCE NUMBER OF TARGET POINTS TO 40. TARGET NAME INDEX NUMBER INDEX
   COMPRESS doubled tolerances N times to reduce number of target elements. NAME is the target name. INDEX is the target index number. This is a message produced by subroutine COMPRESS, but is not an error message.

Figure 110. ALOCOUT Error Messages
(Part 1 of 2)

Overlay ALOCO2 (Processing Completed)

1. ALOCOUT PROCESSING COMPLETED ON IW WEAPONS IT TARGETS
   Statement of number of weapons and targets processed by ALOCOUT, where number of targets is the sum of the numbers of simple and complex targets and multiple target elements, which were assigned weapons.

Function ERGOT1 (Bad Call): ALOCO1

1. BAD CALL ON ERGOT

   More than 10 serires are being run in parallel; control is returned to the calling subprogram without computing ERGOT1.

Figure 110. (Part 2 of 2)

APPENDIX

EXECUTABLE JOB CONTROL LANGUAGE (JCL)

WEAPON ALLOCATION SUBSYSTEM

This appendix indicates the executable JCL which is required to run the programs of the Weapon Allocation subsystem on the NMCSSC HIS 6080 hardware software system.

The executable JCL which is presented in subsequent figures is on a program-by-program basis, i.e.:

Figure No.	Program
111	PREPALOC
112	ALOC
113	EVALALOC
114	ALOCOUT

```
$        IDENT    5162,XPREP,225,JOE SMITH ,634,17
$        USERID   634PR225$PASSWORD/TTT
$        PROGRAM  PREPALOC,DUMP                   EXECUTE PREPALOC
$        LIMITS   20,60K,,20K
$        PRMFL    **,R,R,634PR225/QUICK/FLIB/PREPALOC
$        PRMFL    P*,R,R,634PR225/QUICK/FLIB/PREPALOC
$        FFILE    P*,LGU/(06,39,42,43)         OUTPUT TO 'P*'
$        FILE     02,F02S,100L                 TARGET FILE
$        FILE     08,F08S,100L                 BASEFILE
$        FILE     09,F09R                      TIMFILE (DEACTIVATED)
$        FILE     10,F10R                      MINFILE (DEACTIVATED)
$        FILE     25,X25R,100L                 SCRATCH
$        FILE     26,X26R,100L                 SCRATCH
$        FILE     27,X27R,100L                 SCRATCH
$        FILE     29,X29R,100L
$        FILE     30,F30S                      FILE HANDLER DIRECTORY
$        DATA     I*
$        ENDJOB
***EOF
```

Figure 111. Program PREPALOC JCL

```
$       IDENT    F162,XALOC,225,JOE SMITH ,634,17
$       USERID   634PR225$PASSWORD/TTT
$       PROGRAM  ALOC,DUMP                     EXECUTE ALOC
$       LIMITS   15,62K,,20K
$       PRMFL    **,R,R,634PR225/QUICK/FLIB/ALOC
$       PRMFL    H*,R,R,634PR225/QUICK/FLIB/ALOC
$       FFILE    P*,LGU/(06,33,42)             OUTPUT TO 'P*'
$       FILE     02,F02S                       TARGET FILE
$       FILE     04,F04S,100L                  ALOCTAB FILE
$       FILE     07,F07S,10L                   MISSLE TIME FILE
$       FILE     08,F08S                       BASE FILE
$       FILE     09,X09R,100L                  SCRATCH
$       FILE     21,X21R,100L                  SCRATCH
$       FILE     23,X23R,100L                  SCRATCH
$       FILE     25,X25R,100L                  SCRATCH
$       FILE     26,X26R,100L                  SCRATCH
$       FILE     30,F30S                       FILE HANDLER DIRECTORY
$       DATA     I*
$       ENDJOB
***EOF
```

Figure 112. Program ALOC JCL

```
$      IDENT    5162,XEVAL,225,JOE SMITH ,634,17
$      USERID   634PR225$PASSWORD/TTT
$      PARAM
$      PROGRAM  EVALALOC,DUMP
$      LIMITS   50,65K,,70K
$      PRMFL    **,R,R,634PR225/QUICK/ELIB/EVALALOC
$      PRMFL    H*,E,R,634PR225/QUICK/ELIB/EVALALOC
$      FFILE    P*,LGU/(06,39,42,43)
$      TAPE9    03,X03D,,#1     PLANTAPE
$      FILE     04,F04S,500L    ALOCTAB
$      FILE     08,F08S,500L    BASFILE
$      FFILE    25,NOSLEW
$      FILE     25,X25R,100L    SCRATCH
$      FFILE    26,NOSLEW
$      FILE     26,X26R,100L    SCRATCH
$      FILE     30,F30S         DIRECTORY
$      DATA     I*
$      ENDJOB
***EOF
```

Figure 113. Program EVALALOC JCL

```
$        IDENT    0142,XALCO,225,JOE SMITH ,634,17
$        USERID   634P0225$PASS*ORD/TTT
$        PROGRAM  ALOCOUT,DUMP                    EXECUTE ALOCOUT
$        LIMITS   15,55K,,24K
$        PRMFL    **,R,R,634P0225/QUICK/LIB/ALOCOUT
$        PRMFL    P*,R,R,634P0225/QUICK/LIB/ALOCOUT
$        FFILE    P*,LGU/(06,30,42,43)            OUTPUT TO 'P*'
$        FILE     02,X02R,100L                    SCRATCH
$        FILE     03,F03S,100L                    TMPALOC FILE
$        FILE     04,F04S                         ALOCTAP FILE
$        FILE     08,F08S                         BASE FILE
$        FILE     21,X21R,100L                    SCRATCH
$        FILE     25,X25R,100L                    SCRATCH
$        FILE     26,X26R,100L                    SCRATCH
$        FILE     30,F30S                         FILE HANDLER DIRECTORY
$        DATA     I*
$        ENDJOB
***EOF
```

Figure 114. Program ALOCOUT JCL

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