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STAGE 64: PLAN WRITER

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PREFACE

This report provides documentation of the work accomplished on the Plan Writer Task, prior to its being terminated at the end of the first quarter's effort.

It must be emphasized that the material contained in this report documents an incomplete Plan Writer; therefore, some of the material, discussions, and flow charts will be less thorough than desired but as complete as the particular circumstances permit.

The Plan Writer is a method for allocating strategic weapon systems to enemy targets and for developing outline sortie plans. A general discussion of the method, concepts, Missile Allocation Model, and Aircraft Allocation Model is contained in the main body of the report. Appendices contain users and operators instructions and gross flow charts. Tables, routine listings, TOSO's, and card decks are not furnished as part of the documentation but are provided to the user separately.

ACKNOWLEDGMENTS

The authors wish to acknowledge the contributions of the many individuals of the Air Battle Analysis Center and Project OMEGA. Mr. D. E. Muir is given special acknowledgment for the initial conceptualization and vigorous prosecution of the Plan Writer Task. Of particular importance in the development of the method were the contributions of Lt. Colonel A. W. Banister, Major W. F. Crate, Captain W. Halterlein, Captain B. D. Smith of ABAC, and Mr. E. H. Kingsley and Mr. R. W. Bluehdorn of Project OMEGA.

INTRODUCTION TO STAGE

STAGE (Simulation of Total Atomic Global Exchange) is a digital computer simulation of the interaction of aircraft, missiles, offensive and defensive sites, targets, and plans of both sides in a two-sided global atomic exchange. The operation of the model is dynamic; that is, the results of past interactions, as determined by probabilistic considerations, affect future interactions. The simulation of the interactions consists of examining the course of the exchange at stated intervals of real time and determining which events occurred during that interval. A history of the transpired events is recorded as the exchange progresses and is later sorted, printed, and summarized to allow evaluation of the plans, structure of forces, targeting concepts, and attack timing strategy.

The system of digital computer programs which makes up STAGE is divided into four major subsystems:

1. Sortie Programmer,
2. Preprocessor,
3. Simulator, and
4. Output Processor.

The Sortie Programmer produces detailed sortie specifications from outline sortie plans drawn up by the planning teams, taking into account fuel consumption, probable attrition at various velocities and altitudes, and hardware restrictions. The Preprocessor is designed to produce inputs acceptable to the Simulator from the Sortie Programmer-generated sortie specifications and from raw data provided by the planning teams for each side of the global exchange. The Preprocessor performs the tasks of precomputing many events that are independent of probabilistic considerations. Automatic error detection and correction are incorporated whenever possible. The Simulator, by introducing the outcome of probabilistic events, simulates the actual interaction of the offensive forces, defensive forces, targets, and bases of the two sides for a given period of time, and records a raw form of the history of these interactions. This raw form of the history of the exchange is then sorted, summarized, and output in tabular form by the Output Processor.

The current version of the STAGE System, called the STAGE 64-1 System, contains simulations of the significant aspects of a modern two-sided global nuclear exchange. The recently incorporated revised simulations provide for the treatment of new weapon systems and improve the capability for command and control of offensive and defensive forces. Technical reports covering all aspects of the STAGE 64-1 System are being published in the TR 65-1 through TR 65-10 series and will be of interest to those desiring a more thorough knowledge of the system.

The following paragraphs give a more detailed account of the Sortie Programmer, Preprocessor, Simulator, and Output Processor.

SORTIE PROGRAMMER

From a set of brief sortie plans, the Sortie Programmer produces detailed sortie specifications by computing defensive avoidance legs, selecting recovery bases, looking up locations of bases, targets, and penetration and depenetration routes, selecting air-launched missile and decoy launch points, and selecting optimum altitudes and velocities for each leg of each mission. During this processing, extensive error checks are made on the plans and data tables. Detected errors are noted with English-language comments. The final output of the Sortie Programmer consists of sortie specifications for direct, error-free input to the Preprocessor, and a detailed set of sortie specifications for analysis by the planning teams.

PREPROCESSOR

The system of programs which makes up the Preprocessor is designed to perform three major functions. The first of these is to convert the inputs as prepared by the planning teams and the Sortie Programmer into a form acceptable to the Simulator. This automatic conversion allows the planners to write their inputs in a form convenient for them rather than for the digital computer. The second function is to precompute those events which are independent of probabilistic considerations — for example, fuel consumption and distance — and to determine possible attrition interactions by comparing flight paths with the disposition of the opposing side's defenses. The precomputation performed here will reduce the computer running time of the Simulator, especially when replications are played. (A replication is a rerunning of the simulation with identical inputs except for a variation of the outcome of probabilistic events and is used to study the effects of chance.) The Preprocessor's third function is to detect errors which occur in the inputs prepared by the planning teams.

A significant feature of the Preprocessor is its capability to accept modifications to inputs it has already processed. When data is input, that portion of it that is found to be error-free is processed to completion and the erroneous portions are marked for correction. To correct the errors, it is not necessary to reinput the entire set of data; rather the corrections themselves may be reinput and the Preprocessor will then process these segments and add them to the previous, error-free data. A further advantage of this updating feature is that inputs may be processed in segments as they are completed by the planners — the whole set of inputs does not have to be complete before making a computer run. In addition, changes may be made to an existing set of inputs to convert them to a new set, using this updating feature.

The work performed by the Preprocessor is divided into five major phases. The processing of physical resources data is handled in Phase 1. This includes information on items such as manned aircraft bases, missile bases and other types of installations. Phase 2 converts the sortie specifications for both manned offensive aircraft and offensive missiles into actions which describe the movements and operations performed by these vehicles. This phase also develops the refueling requirements of the manned aircraft for processing by Phase 4. The interaction of the forces of each side, which determines the possible attrition of offensive vehicles, and information about which bases could be threatened are developed in Phase 3. The refueling requirements of manned aircraft developed in Phase 2 are processed in Phase 4 to generate plans for tankers to meet those requirements. Phase 5 merges the results of the preceding phases into the proper order for handling by the Simulator, taking into account the difference in the times at which the two sides begin active participation in the exchange.

SIMULATOR

The Simulator is a system of programs which processes the events developed by the Preprocessor and incorporates the probabilistic considerations required to introduce the element of chance into the play of the game. In the course of processing the events, all significant information pertaining to each event is recorded in the form of a raw history.

The operations performed by the Simulator are divided into 10 classes. The first and ninth classes process doglegs, penetration into enemy territory, depenetration from enemy territory, splashes, releases and impacts of air-to-surface missiles, releases and impacts of decoys, targeting of bombers and missiles, a type of aerial refueling, and several branching operations based on the results of previous events or the outcome of probabilistic events. The handling of bases under threat by enemy aircraft is accomplished in the second class Classes three, four, and five compute the attrition of offensive aircraft as the result of their interaction with fighter/interceptors and local defense sites. The sixth class handles the takeoff and landing of manned aircraft. When a base is threatened, this class will optionally evacuate and orbit manned aircraft during the period of the threat. Missile launching is accomplished in the seventh class, and a second type of aerial refueling occurs in the eighth. Damage to various bases and facilities is assessed by the tenth class.

Several important features have been incorporated into the Simulator design. One of these is its modular structure, which provides for flexibility in putting together the algorithms that compose a simulation to study particular problems. This modular structure also facilitates making modifications and additions to the set of algorithms. Another important feature of the Simulator is its monitoring capability, which provides for the on-line display of pertinent information during the running of the model and permits observation of machine errors, input data errors, and programming errors. A set of switches providing controls which may be set at run times has been built into the Simulator. These switches may be used to control such things as whether or not to perform the damage computations and whether or not to permit the evacuation of aircraft from threatened bases. This switching permits variation of the type of game to be played without requiring major changes to the inputs.

OUTPUT PROCESSOR

The Output Processor is a system of programs that sort, summarize, and output in tabular form the raw history outputs produced by the Simulator.

The first of two major program categories forms histories of the most significant events of the war. For example, separate histories are made of sortie actions, zone and local defense sites, missile bases, and so on. These histories are available in sorted form, sorted according to various keys such as base identification, sortie tail number, etc.

The second set of programs tallies and summarizes the history outputs. Tallies, for example, are made of the number of planes killed and the number of bases damaged or killed. These tallies are grouped in categories such as the time period in which the event occurred, type of offensive or defensive system involved, attacking wave, etc.

Summaries condense the history of an individual sortie from takeoff time to the end of its mission. For manned aircraft sorties, a brief summary of what happened to each weapon on board the sortie at takeoff time has been included.

The structure of the Output Processor provides flexibility in its use. Any history may be formed and tallied up without reference to the other histories available, thus saving extensive running time.

In addition, new histories may be added any time, for further analysis and study, without disrupting the current programs.

THE PLAN WRITER

INTRODUCTION

The utility of large-scale war game models such as STAGE (Simulated Total Atomic Global Exchange) is, in large measure, dependent upon the time required to complete a game. Experience has shown that a significant portion of this time is spent in preparing plan inputs necessary to run the program. For some time, therefore, efforts have been underway to seek means to reduce the time required to prepare plan inputs. A step in this direction was the development of the Sortie Programmer.

The Sortie Programmer develops detailed sortie specifications from a set of outline plans (brief descriptions of the mission of each sortie) which are input to the program. In addition to the outline plans, input data required are:

- Locations of aircraft bases, missile bases, enemy local defenses, recovery bases, enemy targets, and certain geographical points;
- Characteristics of various delivery vehicle/weapon combinations, vehicles, weapons, and enemy local defenses;
- Specification of penetration routes and depenetration routes.

Although the Sortie Programmer achieves a reduction in input time and in the tedium of preparing detailed sortie specifications, it was recognized that a further reduction in input time could be accomplished if the outline plans required by the Sortie Programmer were generated by a prior program, on the basis of a general plan concept. To build such a program, a task was initiated under Project OM[illegible] and designated Plan Writer.

PURPOSE AND SCOPE

The initial overall Plan Writer concept is documented in "A Proposed Design for a Plan Writer," a Technical Operations Research, Project OMEGA working paper. The purpose of this report is to provide documentation on the concept, and preliminary descriptions of the methods and programs developed.

The succeeding sections of this report deal with:

- A general description of the Plan Writer method and of certain concepts involved in the method,
- A description of the Missile Allocation Model of the Plan Writer, and
- A description of the Aircraft Allocation Model of the Plan Writer.

The appendices which have been included are:

Appendix	Content
A	Missile Allocation Model gross flow charts.
B	Missile Allocation Model - Users and operators instructions for the portion of program developed.
C	Aircraft Allocation Model - Users and operators instructions for the portion of the Table Generator program developed.
D	Aircraft Allocation Model gross flow charts.

DESCRIPTION

Plan Writer is a method for allocating strategic weapon systems to enemy targets. This method was being designed and developed by Project OMEGA of

Technical Operations Research for the Air Battle Analysis Center of the U. S. Air Force. A significant part of the Plan Writer will be computer programmed.

The objective of the Plan Writer is to develop a set of targets and produce an outline plan for each sortie. An outline sortie plan contains information on:

- Unit and sortie
- Offensive system (i.e., vehicle and weapons)
- Preference scheme (for flight path profile)
- Launch base
- Refueling points*
- Turning point code*
- Penetration route exit point*
- Depenetration route entry point*
- Time reference and time
- Targets and heights of burst

The purpose of the Plan Writer is to provide the planners of the Air Battle Analysis Center with a tool that develops a set of outline sortie plans, within planning constraints, more consistently, more rapidly, and more optimally than can be done by manual means currently employed.

The design of Plan Writer is such that Plan Writer is also a one-sided expected value war game. Thus, one set of Plan Writer outputs reflects a possible expected outcome of an air battle, using a particular planning scheme and a particular set of input data. The output may serve, then, as a measure of the effectiveness of a particular planning scheme.

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*These items are for aircraft sorties

GENERAL METHOD

The function of the Plan Writer is to develop a set of targets and an outline plan for each sortie to be played in a war game. The following discussion of the general method developed to perform this function is organized into four parts:

- Outline of input data,
- General description of program processes,
- Description of concepts, and
- Outline of output data.

INPUTS. The inputs to the Plan Writer, in outline form, are data on:

- Resources of one side
- Targets of an opposing side
- Defenses of an opposing side
- Interaction of resources with defenses and targets
- Routes for aircraft
- Planning procedure for allocation

PROGRAM. The Plan Writer program is comprised of two major models: a Missile Allocation Model and an Aircraft Allocation Model. Both models utilize the concept of substrike phases; that is, only a subset of the resources and targets are treated in a substrike. Within a substrike phase, a subset of the total set of outline plans is developed. The collection of outline plans from all substrikes, therefore, gives the total set of outline plans.

Within either model, there are basically four processes used in substrike planning.

- Setting of Common Mission Factors
- Setting of Variable Mission Factors
- Nominating of feasible candidate sorties
- Electing of a feasible candidate sortie

The Common Mission Factors Process sets the values of factors which are to be common for each set of sorties nominated in a particular run of the nomination process.

The Variable Mission Factors Process sets the values of factors which are desired to be common for each set of sorties but may, if necessary, be relaxed to nominate a sortie.

The Nomination Process develops feasible sorties. In a particular run of this process, all sorties developed have the same value for each common mission factor; however, the value of each variable factor may be different from sortie to sortie. The intermediate output of the Nomination Process is a list of feasible sorties. The output also includes a value of each sortie.

The Election Process compares the values of all sorties nominated in Process 3 and elects (assigns) that sortie having the highest value.

All the processes are repeated until one or more of three conditions is attained:

1. Vehicles or weapons are depleted.
2. The probabilities of destruction on all targets are equal to or exceed specified maxima.
3. The maximum permissible number of sorties has been nominated and elected within the limits of the common and variable mission factors without achieving either condition above.

CONCEPTS. Underlying the overall operation of Plan Writer are several basic concepts.

- Planning Specifications
- Candidate
- Substrike
- DELKIL
- Cell
- Ring Rules
- Timely

Planning Specification Concept. A planner considers several important factors (i.e., constraints) which he can control in the process of "laying on" or planning sorties. The factors are applied in a particular order or are given relative priorities based on the planner's intent and/or general planning criteria. Each factor may have a range of values. These values are relaxed as they are required during the process of his planning.

To reflect the above planning process, the Plan Writer incorporates a concept known as planning specifications. A planning specification contains several important factors which are ordered and may assume a range of values.

The Missile Allocation Model of Plan Writer will initially provide the planner with 12 planning specifications, that is, 12 ordered sets of factors. This means that the planner will have available 12 alternate ways to develop missile sortie outline plans. The list of 12 planning specifications is shown on page 27. The Aircraft Allocation Model of Plan Writer will initially provide the planner with one planning specification. The acceptable planning specification is shown on page 74.

There are five factors comprising any missile planning specification:

- Target Class
- Weapon Priority
- Cross Targeting
- Base Nominee
- Candidate/Exempt

These five factors, which may vary in value during the model's first three processes, control the association of a base nominee with a target.

There are many factors other than the above that are accounted for in the model. These factors (constraints) (for example, range) are specified in the form of input data and cannot vary during the model processes.

As the first three model processes are executed, the target class factor indicates the class (priority) of targets being considered for missile sorties; the cross targeting factor indicates the number of missiles from a particular base which may be sent to a particular target; the weapon priority factor indicates the priority of missile weapons being considered (i.e., the first preferred group of target types and then the second for a given weapon type); and the base nominee factor identifies the base being considered for nomination.

The candidate/exempt factor will be discussed under the Candidate Concept.

There are 13 factors comprising an aircraft planning specification. These are:

- Target Class
- System
- First Weapon Cross Targeting
- Mission
- Weapon Loading

- Profile
- Candidate/Exempt (Cell)
- Succeeding Weapon Cross Targeting
- Base (Air Alert Point)/ Refuel Area
- Weapon Release Sequence
- Weapon Priority
- Ring Rules
- Depenetration/Recovery

The 13 factors listed above, which may vary in value during the model's first three processes, control the association of a system (plane type) /mission/weapon loading/profile and takeoff base with one or more targets for a single sortie.

There are other factors than the above that are accounted for in the model. These factors (constraints) are specified in the form of input data and cannot vary during the model processes.

As the first three model processes are executed, the factors indicate the following:

Factor	Control
Target Class	Class (Priority) of targets being considered
System	Plane Type being considered
First Weapon Cross Targeting	Number of first weapons from a particular base which may be sent to a particular target
Mission	Air Alert or ground based; refueled or unrefueled; one way or two way
Weapon Loading	Types and quantities of weapons loaded on a system

Factor	Control
Profile	Over-enemy-territory flight modes
Candidate/Exempt (Cell)	Candidate/Exempt will be discussed under Candidate Concept; cell indicates penetration point being considered
Succeeding Weapon Cross Targeting	Number of weapons, other than first one released, which may be allocated to a particular target from a particular base
Base (Air Alert)/ Refuel Area	The takeoff base or air alert point being considered as the origin of a sortie for the cell (penetration point) being considered
Weapon Release Sequence	The order in which to consider each weapon of a given weapon loading
Weapon Priority	The first preferred group of target types and then the second for a given weapon type
Ring Rules	Will be discussed under the sub-section on Ring Rules
Depenetration/Recovery	The depenetration routes and recovery bases associated with the last target for a sortie

Candidate Concept. The Candidate/Exempt factor, referred to in the discussion of Planning Specifications, has a special purpose in the nomination process and serves as a buffer and as a switch.

As a buffer, it separates into two groups the factors required to nominate sorties. The two groups are common mission factors and variable mission factors.

As a switch, it indicates whether a target or cell has a candidate in light of the constraints. A candidate is defined as a potential sortie.

During each candidate nomination process, the common mission factors are "frozen," and the variable mission factors are permitted to change, in a specific way as indicated by planning specifications, until a candidate can be nominated. If a candidate cannot be nominated, the target or cell is marked temporarily exempt (the exempt switch for the target or cell is turned on). When all targets or cells currently being considered are marked exempt, one of the common mission factors is changed and is again "frozen." The exemption is removed from the targets or cells (the exempt switch for each target or cell is turned off), and the candidate nomination process is repeated.

Substrike Concept. The task of the Plan Writer is to develop the outline plans for a strike, i.e., for a war or conflict. To do this efficiently, it is necessary to sub-divide this task into a series of subtasks. Each subtask is defined as a substrike.

The characteristics of a substrike are:

- The execution of the plans is time constrained.
- A section of weapon systems of one side and targets of the other side are considered.
- The outline plans are developed using a single planning specification.

In addition to providing a more efficient means for developing the outline plans for a strike, the Substrike Concept provides the planner with control of the resources, targets, and methods of developing the outline plans.

DELKIL Concept. The DELKIL Concept has been developed to provide a quantitative means for comparing potential sorties. DELKIL is the incremental increase in the probability of target kill that would result from the addition of another weapon.

$$\text{DELKIL} = (1 - \text{Prekill})(\text{SSPK})(\text{SURVF}),$$

where, Prekill = probability target destroyed by previously assigned weapons or the accumulative probability of kill;

SSPK = probability of given weapon destroying target, given that weapon reaches target;

SURVF = probability of weapon surviving (reaching) to target.

During the election process of the Missile Allocation Model, the DELKILs for each nominated sortie are compared, and the sortie having the highest DELKIL is elected; that is, the sortie attaining the largest incremental increase in the probability of target kill is chosen and appears in the outline plan. The same criterion (DELKIL) may be used in the election process for aircraft, or a Timely criterion may be used. (See sub-section on TIMELY.)

Note: The DELKIL method is an optimizing technique which provides the greatest increase in the fraction of the target set killed, subject to the planning constraints.

A refinement to the DELKIL concept was introduced to provide a quantitative means for comparing potential sorties, when the targets involved are of different relative worth. The relative worth (weighting factor) for each target is supplied to the model as input data by the planner. The refined DELKIL reflects the relative worth of each target and is called RELDEL; hence,

RELDEL = (DELKIL)(Relative Worth).

Cell Concept. The Cell Concept was developed for the Aircraft Allocation Model in order to facilitate the selection of a first target for an aircraft sortie.

A cell is a list of targets associated with the routes emanating from a common penetration point. Each target is associated with the nearest penetration route exit point (PRXP), consistent with the restriction that the change in aircraft heading to attack the target from the PRXP is not greater than 60° (or a value input by the planner). A target may be associated with more than one cell (penetration point) if, for the other cells, the change in heading restriction is met, the distances from the penetration points to the target (along the other routes) are not greater than 120% (or value specified by the planner) of the distance to the target for the primary cell, i.e., that cell containing the nearest acceptable penetration route exit point, and the number of cells with which the target is associated is not greater than two (or value specified by the planner).

Ring Rules Concept. The Ring Rules Concept was developed for the Aircraft Allocation Model to facilitate the selection of the targets succeeding the first target for a sortie carrying several weapons.

A ring is an area to be "searched," based on the sortie's current and preceding positions. The boundaries of a ring area are a function of the permissible change in heading and the lower and upper limits of distance from current position. To reflect the notion that it is more desirable to "search" certain areas (rings) before "searching" others, the planner is provided with the capability to indicate several rings to be searched and the order in which the rings are to be searched (i.e., ring rules).

For example, as shown in Figure 1, the sortie's preceding and current positions and three rings to be searched are shown. The program will attempt to find a suitable target in the first ring; if unsuccessful, the second ring is searched; if still unsuccessful, the third ring is searched. If unsuccessful in finding an acceptable target in any ring, the program will attempt to modify preceding constraints on the sortie.

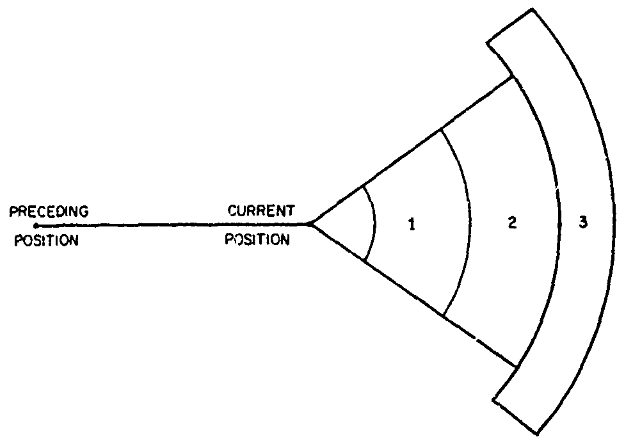


Figure 1 Ring Rules

Timely Concept. The Timely Concept was developed for the Aircraft Allocation Model to provide a time criterion by which to compare potential aircraft sorties in order to elect one sortie.

Essentially, all the sorties nominated during a particular cycle through the nomination process are compared in terms of time of arrival at their respective first targets. The sortie having the earliest time of arrival is elected, the resource and target data are updated, and the nomination process is recycled.

OUTPUTS. The outputs from the Plan Writer, in outline form, are:

- A set of outline plans for missile and aircraft sorties
- A resource allocation summary
- A target summary, including unit/sortie assignments and accumulative probability of kill
- A table of offensive system descriptions

- A total value for the allocation, i.e., the expected fraction of the enemy's target set killed

MISSILE ALLOCATION MODEL

INTRODUCTION

This section contains descriptions of the inputs, the processing procedures, and outputs of the Plan Writer Missile Allocation Model. Appendix A contains the gross flow charts developed for the Missile Allocation Model. Appendix B contains user's and operator's instructions for that portion of the Missile Allocation Model developed.

INPUTS

The inputs to the Missile Allocation Model include:

- Resource data
- Target data
- Resource - Target interaction data
- Planning specification data
- Substrike data

The following constraints, i.e., maximum values, apply to certain inputs:

Item	Maximum
Targets in a strike	5,000
Missile bases in a strike	1,000
Missiles on a base in a strike	100
Missiles in a strike	100,000
Missile types (plane types) in a strike	15
(the plane type identification, however, may go to 31)	
Weapon types in a strike	31
Vulnerability number (types)	31

Item	Maximum
CEPs per missile type in a strike	6
Targets in a substrike	1,000
Missile bases in a substrike	100
Missiles on a base in a substrike	100
Missiles in a substrike	1,000

It should be noted that the resource and target data tables, with the exception of the VNC table, are common with Sortie Programmer input tables. The Sortie Programmer will ignore the input data which is required for Plan Writer only.

RESOURCE DATA. In general, resource data include:

- identification, location, and "beddown" information for each missile base;
- reliability, penetration capability, range, and accuracy information for each missile type; and
- weight and target suitability information for each weapon type.

The resource data is applicable to all substrikes, that is, to all missiles. The formats of the input tables containing the resource data are shown on the next five pages.

TABLE MIBASE

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1MIBASE	STRING			
9	Side		1,2		3
10-14	Line number		1(1)1000		Yes
16-20	Missile base identification name		1(1)1000	MIBID	
22-27	Latitude	Deg., Min., Sec.		MILA	
29-36	Longitude	Deg., Min., Sec., E/W		MILO	
54-55	Plane type		1(1)31	MIBPTY	
57-58	Weapon type		1(1)31	MIBWT	
60-62	Unit number		1(1)255	MIBUN	
64-66	Number of missiles to be programmed		1(1)100	MIBNMG	
68-70	Total number of missiles		1(1)100	MIBNM	

MIBASE is the master list of all missile bases in game.

TABLE WEAPON

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name - F1WEAPON	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)38		Yes
16-20	Weap i identification:			WEID	
16-19	Weapon number (bomb or decoy size)		Bombs 1(1)31 Decoys 1(1)6	WEIDN	
20	Weapon type 0 bomb 1 - ASM 2 - decoy		0,1,2	WETYPM	
22-24	Weight of weapon	Thous-ands of pounds	.1(.1)99.9	WEWT	
26-29	Range at which to launch for low altitude launch	Nautical miles	0(1)5000	WERNGL	For ASM's and decoys
31-34	Range at which to launch for high altitude launch	Nautical miles	0(1)5000	WERNGH	For ASM's and decoys
36-37	Plane type corresponding to ASM or decoy type		1(1)31	WEPTYP	For ASM's and decoys
39-41	Deviation for ASM Launch	Nautical miles	1(1)999	WEDEVT	
43-44	First priority first VN code		1(1)31	WVN11C	
46-47	First priority last VN code		1(1)31	WVN12C	
49-50	Second priority first VN code		1(1)31	WVN21C	
52-53	Second priority last VN code		1(1)31	WVN22C	
55-56	First exception	STRING	AA-ZZ or A-Z	WEXCP1	

TABLE WEAPON (Continued)

Columns	Information	Units	Value Range	Symbol	Optional
58-59	Second exception	STRING	AA-ZZ or A-Z	WEXCP2	
61-62	Third exception	STRING	AA-ZZ or A-Z	WEXCP3	
64-65	Fourth exception	STRING	AA-ZZ or A-Z	WEXCP4	
67-68	Fifth exception	STRING	AA-ZZ or A-Z	WEXCP5	
70-71	Sixth exception	STRING	AA-ZZ or A-Z	WEXCP6	

TABLE PLTYPE
Card 1

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1PLTYPE	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)10		
15	Card number = 1		1		
17-18	Plane type		1(1)31	PLTID	
20-23	Over-all reliability factor		.01(.01)1.00	PLTREL	
25-27	Penetration capability factor		.01(.01)1.00	PLTPCF	
29-33	Minimum range	Nautical miles	1(1)16000	PLTMIN	
35-39	Maximum range	Nautical miles	1(1)16000	PLTMAX	
41-45	Mode 1 maximum range	Nautical miles	1(1)16000	DIST	
47-50	Mode 1 CEP	Tens of feet	1(1)2047	CEP	
52-56	Mode 2 maximum range	Nautical miles	1(1)16000	DIST2	
58-61	Mode 2 CEP	Tens of feet	1(1)2047	CEP2	
63	Penetration point marker		0, 1	PLTPNT	
65	Guidance marker		0, 1	PLTGUI	

TABLE PLTYPE
Card 2

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name - F1PLTYPE	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)10		
15	Card number - 2		2		
19-23	Mode 3 maximum range	Nautical miles	1(1)16000	DIST3	
25-28	Mode 3 CEP	Tens of feet	1(1)2047	CEP3	
30-34	Mode 4 maximum range	Nautical miles	1(1)16000	DIST4	
36-39	Mode 4 CEP	Tens of feet	1(1)2047	CEP4	
41-45	Mode 5 maximum range	Nautical miles	1(1)16000	DIST5	
47-50	Mode 5 CEP	Tens of feet	1(1)2047	CEP5	
52-56	Mode 6 maximum range	Natuical miles	1(1)16000	DIST6	
58-61	Mode 6 CEP	Tens of feet	1(1)2047	CEP6	

TARGET DATA. Target data include:

- identification, location, vulnerability, desired height of burst, and AICBM defense information for each target, and
- vulnerability conversion information.

This data applies to all substrikes. The formats of the input tables containing target data are shown on the next two pages.

TABLE TARGET

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name - F1TARGET	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)1200		Yes
16-20	Target designator	STRING	5 non-blank characters	TACODE	
[illegible]-27	Latitude	Deg., Min., Sec.		TALA	
29-36	Longitude	Deg, Min, Sec, E/W		TALO	
56	Target defense marker		0,1	TADEFM	
58	Height of burst		0,1	TAHOB	
60-63	Vulnerability number	STRING	4 non-blank characters	TAVN	
65-67	Target prekill		0(.001).999	TAKILL	
69-70	Missile attrition factor		0(.01).99	TMATRF	

TARGET is the master list of all targets in game.

TABLE VNC

Columns	Information	Units	Value Range	Symbol	Optional
1-5	Format and table name = F1VNC	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)31		Yes
16-19	VN	STRING	4 non-blank characters	VN	
21-22	VN code		1(1)31	VNCODE	

RESOURCE-TARGET INTERACTION DATA. Resource-target interaction data include:

- missile penetration capability,
- target defense capability, and
- weapon kill probability.

Missile penetration capability information is contained in resource data, specifically, in table PLTYPE. Target defense capability information is contained in target data, specifically, in table TARGET. The weapon kill probability information, which is a function of target vulnerability, bomb size, delivery system accuracy, and desired height of burst, is applicable to all substrikes. The format for the input table containing weapon kill probability information is shown on page 26.

TABLE SSPKTB

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name - F1SSPKTB	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)3600		Yes
16-19	Target VN code		1(1)31	SSPVNC	
21-22	Bomb size		1(1)31	SSPBS	
24-27	CEP	Tens of feet	1(1)2047	SSPCEP	
29	Height of burst		0,1	SSPHOB	
31-33	Single shot kill probability		.001(.001).999	SSPK	

PLANNING SPECIFICATION DATA. It is by means of the planning specification data input that a planner indicates the procedure to be used in the model for developing the sorties for each substrike. The Missile Allocation Model contains 12 allocation procedures. The planner indicates which procedure to employ by the order in which he inputs the factors comprising a planning specification. The acceptable planning specifications and corresponding ordering of factors are shown below:

Planning Specification	Ordering of Factors
1	TARGET CLASS CANDIDATE/EXEMPT WEAPON PRIORITY CROSS TARGETING BASE NOMINEE
2	TARGET CLASS WEAPON PRIORITY CANDIDATE/EXEMPT CROSS TARGETING BASE NOMINEE
3	TARGET CLASS CANDIDATE/EXEMPT CROSS TARGETING WEAPON PRIORITY BASE NOMINEE
4	TARGET CLASS CROSS TARGETING CANDIDATE/EXEMPT WEAPON PRIORITY BASE NOMINEE

Planning Specification	Ordering of Factors
5	WEAPON PRIORITY TARGET CLASS CANDIDATE/EXEMPT CROSS TARGETING BASE NOMINEE
6	CROSS TARGETING TARGET CLASS CANDIDATE/EXEMPT WEAPON PRIORITY BASE NOMINEE
7	TARGET CLASS WEAPON PRIORITY CROSS TARGETING CANDIDATE/EXEMPT BASE NOMINEE
8	TARGET CLASS CROSS TARGETING WEAPON PRIORITY CANDIDATE/EXEMPT BASE NOMINEE
9	WEAPON PRIORITY TARGET CLASS CROSS TARGETING CANDIDATE/EXEMPT BASE NOMINEE

Planning Specification	Ordering of Factors
10	CROSS TARGETING TARGET CLASS WEAPON PRIORITY CANDIDATE/EXEMPT BASE NOMINEE
11	WEAPON PRIORITY CROSS TARGETING TARGET CLASS CANDIDATE/EXEMPT BASE NOMINEE
12	CROSS TARGETING WEAPON PRIORITY TARGET CLASS CANDIDATE/EXEMPT BASE NOMINEE

Each Planning Specification ordering requires the last item to be BASE NOMINEE, and CANDIDATE/EXEMPT never to appear before TARGET CLASS.

SUBSTRIKE DATA. Substrike data include:

- a list of targets to be considered in each substrike including, for each target, identification, target class (priority), minimum acceptable single weapon kill probability, maximum desired cumulative kill probability, and relative worth;
- a list of missile bases to be considered in each substrike including, for each missile base, identification, percentage of the in-commission missiles to be allocated, survival factor, and time information;

- parameters (input by card) for each substrike, including substrike number, maximum missiles to be allocated per target, maximum cross targeting allowable, and SRTKEY, key for sorting of bases for each target.

The formats of the input tables containing the targets and missile bases to be considered in a substrike are shown on the next two pages. It should be noted that there are as many instances of each table as there are missile substrikes.

The parameters are input by means of four cards per substrike. The substrike number parameter is used for program restart. The maximum missiles to be allocated per target in a substrike include missiles allocated in previous substrikes. SRTKEY, the key for sorting of bases for each target, indicates whether the list of bases for a target should be ordered on (1) descending value of adjusted weapon kill probability, and then (2) on descending number of targets which a base can hit, or conversely.

PROCESSING PROCEDURES

The Missile Allocation Model processing procedures are subdivided into two groups. The first group of processing procedures is contained in a pre-substrike program; the second group, in a main substrike allocation program.

PRE-SUBSTRIKE PROGRAM. Regardless of the planning specification used, each missile substrike requires a common amount of preprocessing, mostly checking for input errors and constructing internal tables which are to be used by the main substrike allocation program.

The value of each item appearing in each input table is checked to verify that the value is within acceptable bounds. The ordering of the cards making up the planning specification is checked to assure that the item BASE NOMINEE is last, and that CANDIDATE/EXEMPT appears after TARGET CLASS.

TABLE SITARG

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name -- FISITARG	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)100		Yes
16-20	First target identification name	STRING	5 non-blank characters	SITAR1	
22-26	Last target identification name	STRING	5 non-blank characters or 5 blanks	SITAR2	
28-29	Target class		1(1)50	SITARC	
31-33	Minimum kill probability		0(.001).999	SMINKP	
35-37	Maximum kill probability		0(.001).999	SMAXKP	
39-41	Relative worth factor		.01(.01)1.00	SITRWF	

SITARG is the planner's input of targets assigned to a substrike.

TABLE SIMIBA

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1SIMIBA	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)100		Yes
16-19	First missile base identification name		1(1)1000	SIMB1	
21-24	Last missile base identification name		1(1)1000 or blanks	SIMB2	
26-28	Percentage of weapons		.01(.01)1.00	SIMPCT	
30-32	Base survival factor		.01(.01)1.00	SIBSF	
34	Time reference		0,1,2,3,4	SITREF	
36-39	First sortie time:			SITIME	
36-37	Hours	Hours	0(1)99	SIHRS	
38-39	Minutes	Minutes	0(1)59	SIMINS	
41-43	Time increment	Minutes	0(.1)99.9	SITINC	

SIMIBA is the planner's input of missile bases assigned to a substrike.

From input tables TARGET, SITARG, and VNC, the internal table SSTARG is derived. This table is a list of all targets to be considered in a substrike (from SITARG) and information about each target (from SITARG, TARGET, and VNC). The following information is included for each target:

- Identification code
- Class
- Longitude and latitude
- Height of burst
- Vulnerability code
- Missile attrition factor
- Prekill
- Relative worth factor
- Minimum and maximum kill probabilities

This table has a maximum of 1,000 lines.

From input tables MIBASE and SIMIBA, the internal table SSMIBA is derived. This table is a list of all missile bases to be considered in a substrike (from SIMIBA) and information about each missile base (from SIMIBA and MIBASE). The following information is included for each missile base:

- Identification
- Unit number
- Weapon type
- Plane type (i.e., missile type)
- Number of missiles to be programmed for a strike

- Total number of missiles
- Base survival factor
- Longitude and latitude

This table has a maximum of 100 lines.

The TLB table is constructed from the SSTARG and SSMIBA tables. Each target in the SSTARG list is checked against all bases in the SSMIBA list. If the target is within range of the base, the base has suitable weapons, and the single shot probability of kill is greater than or equal to the minimum SSPK required for the target, the base identification is entered in the TLB. The TLB table lists for each target those missile bases with suitable weapons capable of reaching the target. For each base listed for a target, the following information is included:

- Weapon priority
- Mode (function of distance to target)
- Adjusted single shot probability of kill

The target list of bases is sorted by weapon priority, and either by increasing number of targets in range of the base and by decreasing adjusted SSPK values, or conversely, if indicated by the substrike parameter card, SRTKEY.

The information included in TLB table, which is not derived from SSTARG or SSMIBA, is obtained from tables WEAPON, PLTYPE, and SSPKTB. The TLB table will be stored on tape.

MAIN SUBSTRIKE ALLOCATION PROGRAM. The main substrike allocation program has four major routines: LIST; FEASBL; COMMON; and ASSIGN.

Each of these routines are described here and a detailed description of the procedural steps for a specific planning specification, to illustrate the program operation, is given beginning on page 36.

LIST Routine. The LIST routine used in a substrike is one of 12 planning control routines which is indicated by the planner's input planning specification. The LIST routine controls the allocation of missiles in a substrike and reflects the way in which a planner desires the allocation to be made. It is the LIST routine which sets and relaxes the values of the common and variable mission factors in a prescribed manner.

FEASBL Routine. The FEASBL routine is used with any planning specification (i.e., LIST routine). The function of the FEASBL routine is to nominate a missile sortie for each target consistent with the values of the factors (constraints) set by the LIST routine. If a sortie cannot be nominated for a target consistent with the values of factor constraints, control is returned to the LIST process to relax the value of a variable mission factor constraint, or to exempt the target (i.e., to exempt the target temporarily from the requirement of having a sortie nominated).

COMMON Routine. The COMMON routine, used with any planning specification, is basically a check and transfer routine. If more nominations, consistent with the values of common mission factors, might be made, control is returned to the LIST routine to set variable mission factors. If not, and there are nominees, control is transferred to the ASSIGN routine to elect a sortie. If not, and there are no nominees, control is transferred to the LIST routine to relax a common mission factor or to end the substrike planning.

ASSIGN Routine. The ASSIGN routine is used with any planning specification. This routine compares the values of all nominated sorties consistent with factor constraints and elects, i.e., assigns, the sortie with the highest value. This routine also updates the prekill information for the target of the elected sortie, reduces the stock of missiles on the missile base of the elected sortie by one, and outputs the elected sortie.

Detailed Description Of One Mode Of Program Operation. To illustrate the main substrike allocation program operation, one mode of operation is described in detail below, using Planning Specification - 2.

The planner initially choses a specific Planning Specification for a substrike which reflects his priority of the factors to be considered in allocating missiles. For the purpose of this description, Planning Specification - 2 was chosen. This means that the Substrike Planning Specification Cards must appear in the following sequence:

Card Number	Characters Card Punched
1	TARGET CLASS
2	WEAPON PRIORITY
3	CANDIDATE/EXEMPT
4	CROSS TARGETING
5	BASE NOMINEE

The routine selected for setting the values of the planning specification factors and for relaxing them is LIST 2. The Nomination Process is made up of the two routines, FEASBL and COMMON. The Election Process is contained within the ASSIGN routine. The steps required for each routine are listed below:

- LIST2 — Steps 1 through 7
- FEASBL — Steps 8 through 13
- COMMON — Steps 14 through 18
- ASSIGN — Steps 19 through 24

The basic steps in the main substrike allocation program are described on the following page.

Routine LIST 2

Step	Description
1	Set Common Mission Factor, Target Class = 1. Set routine parameter, K = 1.
2	Set Common Mission Factor, Weapon Priority = 1. Set routine parameter, L = K.
3	Set routine parameter, SW = 1. Set target index parameter, I = L. Release all Exempt targets in current Target Class (that is, set or reset the planning specification factor, Candidate/Exempt = 0 for these targets).
4	Set Variable Mission Factor, Cross Targeting = 1 for the indexed target. Is indexed target killed? If yes, go to Step 14. If no, go to Step 8.
5	Increase Cross Targeting by 1 for indexed target. Does target's new Cross Targeting value exceed maximum Cross Targeting for substrike (as indicated on Substrike Parameter Card, Maximum Cross Targeting)? If yes, mark target Exempt and go to Step 14. If no, go to Step 8.
6	Increase Weapon Priority by 1. Does new Weapon Priority value exceed 2? If yes, proceed to Step 7. If no, return to Step 3.

Routine LIST 2 (Continued)

Step	Description
7	Increase Target Class by 1. Does new Target Class value exceed maximum number of Target Classes in substrike? If yes, end the substrike! If no, return to Step 2.

Routine FEASBL

Step	Description
8	Read the target list of bases (TLB) for indexed target. Set Variable Mission Factor, Base Nominee = 1 for current Weapon Priority.
9	Is the base in question in the current Weapon Priority? If yes, go to Step 10. If no, go to Step 5.
10	Are there any missiles (for substrike) left on this base? If yes, go to Step 11. If no, go to Step 13.
11	Does this base already have plans to launch N missiles against indexed target, where N equals current Cross Targeting value? If no, go to Step 12. If yes, go to Step 13.
12	In the SSTARG list, record this base as a candidate (or nominee) for indexed target. Compute RELDEL and record in SSTARG list. Go to Step 14.

Routine FEASBL (Continued)

Step	Description
13	Increase value of Base Nominee by 1. Does the new value exceed number of bases listed for indexed target? If yes, go to Step 5. If no, return to Step 9.

Routine COMMON

Step	Description
14	Is routine parameter, SW = 1? If yes, go to Step 15. If no, set routine parameter, SWA = 2, and go to Step 19.
15	Increase target index parameter by 1. Is new target index parameter greater than number of targets in substrike? If no, go to Step 16. If yes, go to Step 18.
16	Is indexed target in Current Target Class? If no, go to Step 17. If yes, return to Step 4.
17	Set routine parameter, K = target index.
18	Set routine parameter, SW = 2. Are there any nonexempt, nonkilled targets in current Target Class? If yes, set routine parameter, SWA = 1, and go to Step 19. If no, return to Step 6.

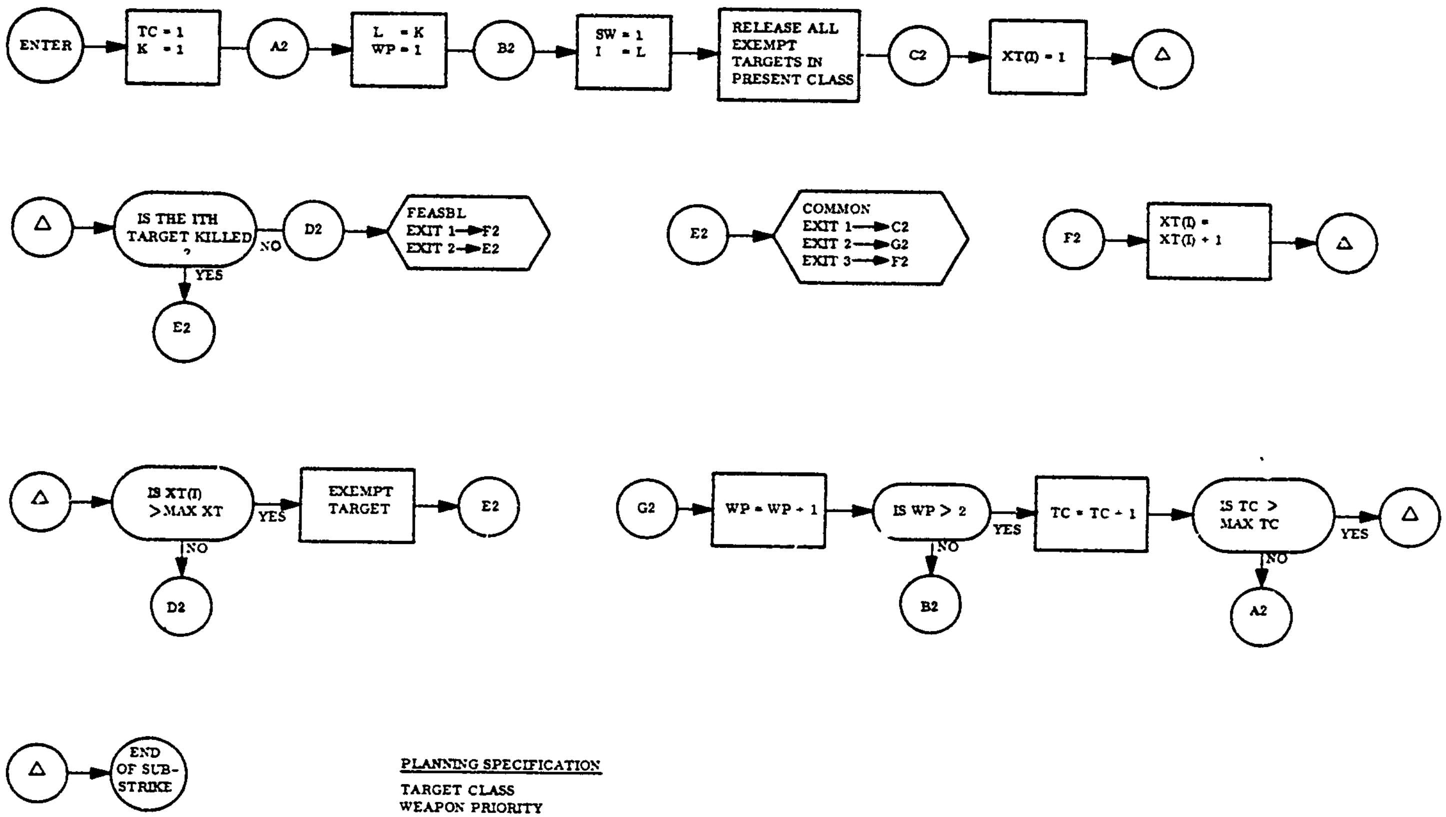
Routine ASSIGN

Step	Description
19	Is routine parameter, SWA = 1? If yes, go to Step 20. If no, go to Step 22.
20	Elect that candidate, from the set of candidates (or nominees) listed in the SSTARG list, which has the highest RELDEL. If more than one candidate has this value (i. e., highest RELDEL), select the first. Set target index parameter equal to index of target just elected. Increase elected target's prekill by actual DELKIL. Decrease by one the remaining missiles for the substrike on the base just elected. Record sortie on tape. Is the target's new prekill greater than or equal to the desired maximum probability of kill? If yes, go to Step 21. If no, return to Step 8.
21	Mark the target as killed for remainder of substrike.
22	Set routine parameter, SWA = 2. Are there any remaining missiles for the substrike on the base just elected? If no, go to Step 23. If yes, return to Step 18.

Routine ASSIGN (Continued)

Step	Description
23	Does any other candidate sortie in SSTARG list call for a missile from the base just elected? If no, return to Step 18. If yes, go to Step 24.
24	Set target index parameter equal to index of target requiring a new candidate (base) as a result of the condition that the missiles for the substrike from the current listed base have been expended.
	Return to Step 8.

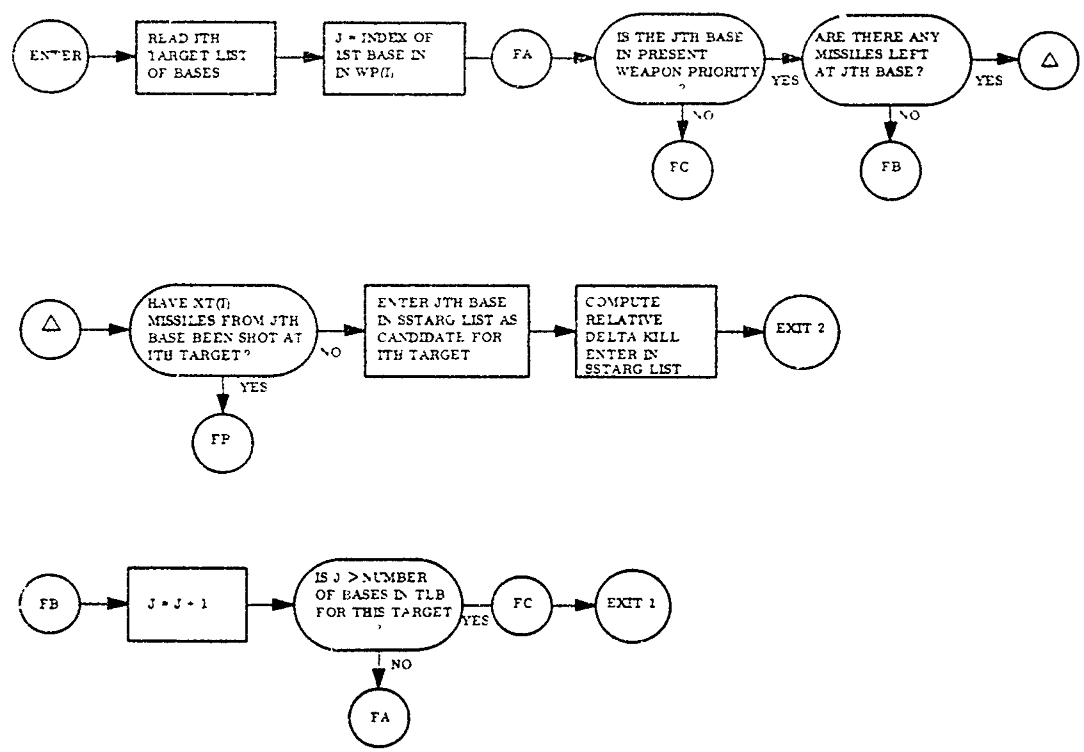
GROSS FLOW CHART FOR ROUTINE LIST 2



PLANNING SPECIFICATION

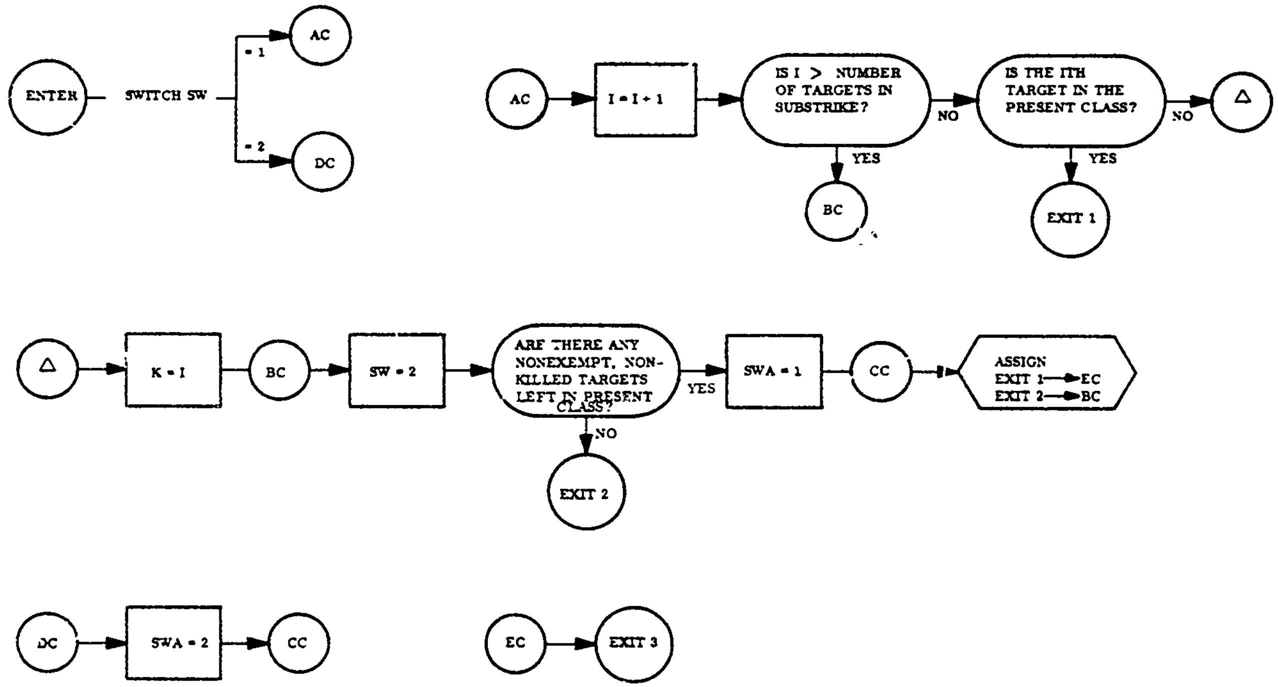
TARGET CLASS
WEAPON PRIORITY
CANDIDATE/EXEMPT
CROSS TARGET
BASE NOMINEE

GROSS FLOW CHART FOR ROUTINE FEASBL

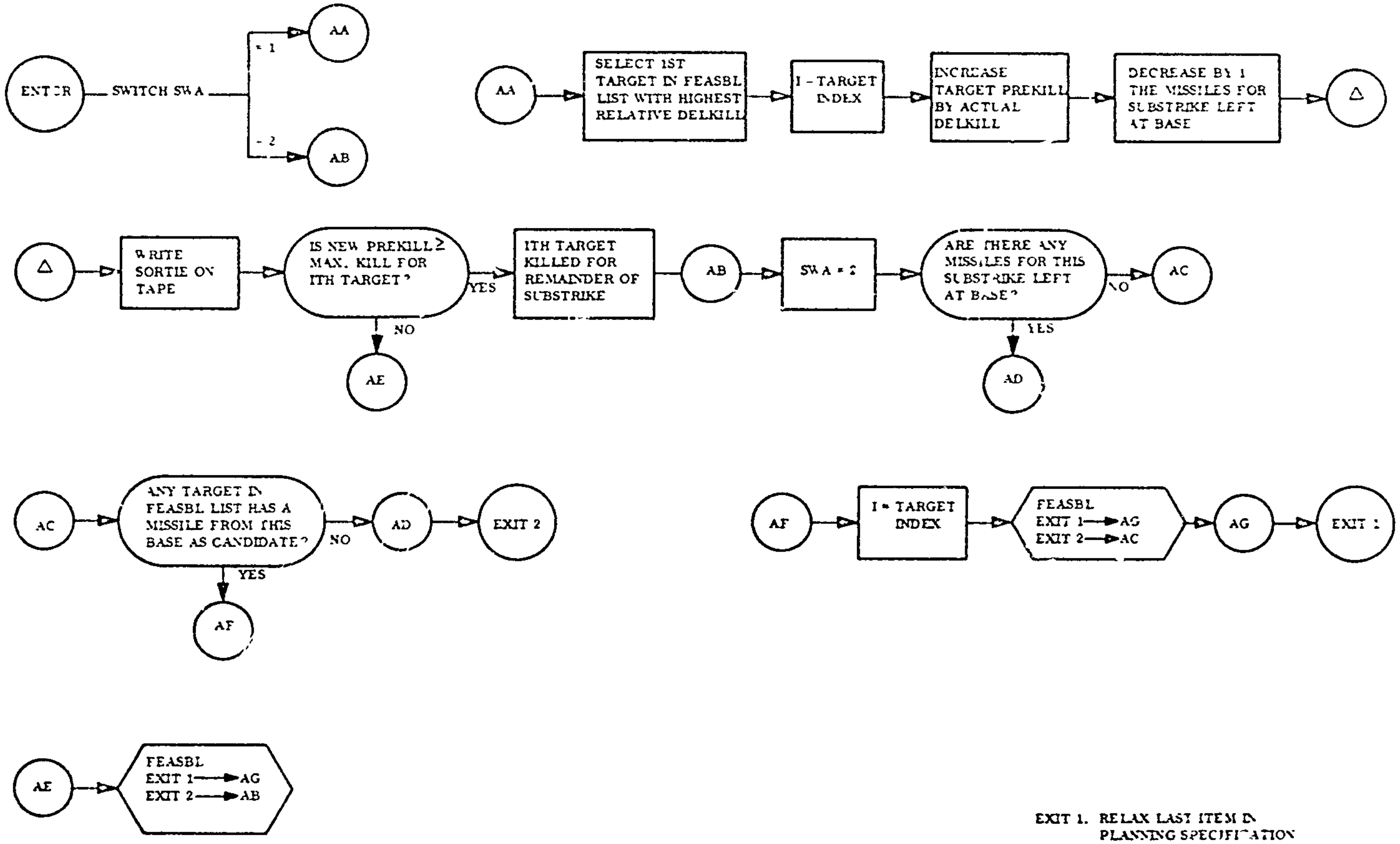


EXIT 1: RELAX LAST ITEM IN PLANNING SPECIFICATION
EXIT 2: NORMAL EXIT

GROSS FLOW CHART FOR ROUTINE COMMON



GROSS FLOW CHART FOR ROUTINE ASSIGN



EXIT 1. RELAX LAST ITEM IN PLANNING SPECIFICATION
EXIT 2. NORMAL EXIT

OUTPUTS

The outputs of the Plan Writer Missile Allocation Model for each substrike are:

- A set of outline plans
- An updated version of the TARGET table, including identifications of unit/sortie assignments
- An updated version of the MIBASE table
- A record of the last sortie assigned from each unit
- An updated version of OFFENS table
- A target-missile assignment summary table

The formats for the output tables have not been defined; however, the general contents of the tables are described below.

OUTLINE PLANS.

- Unit/sortie identification
- Offensive system
- Preference scheme
- Launch base
- Time in hours and minutes
- Time reference
- Burst height for target
- Target identification

TARGET TABLE.

- Target identification
- Location
- Target defense marker

- Height of burst
- Vulnerability
- Target prekill
- Missile attrition factor
- Unit/sortie assignments

MIBASE TABLE.

- Missile base identification
- Location
- Plane type
- Weapon type
- Unit number
- Number of missiles in commission
- Total number of missiles
- Number of missiles to be allocated in substrike
- Number of missiles not allocated in substrike

UNIT TABLE.

- Unit
- Sortie
- Target identification
- DELKIL
- RELDEL

OFFENS TABLE.

- Offensive system identification number
- Plane type
- Mission type = 0
- Attritable missile marker = 1

- Guidance
- Preference scheme number
- First type weapon carried

  1. weapon type
  2. number of weapon = 1
  3. kind of weapon = 0
  4. mode
  5. distance required for bomb run in = 0
  6. distance required for bomb run out = 0

TARGET-MISSILE ASSIGNMENT SUMMARY.

- Target identification
- Target relative worth
- Target minimum probability of kill
- Target maximum probability of kill
- Target killed marker
- Target accumulative kill
- Target accumulative relative worth kill
- Unit/sortie assignments

  1. unit/sortie identification
  2. base identification
  3. weapon identification
  4. DELKIL
  5. RELDEL
  6. accumulative DELKIL
  7. accumulative RELDEL

AIRCRAFT ALLOCATION MODEL

INTRODUCTION

This section contains descriptions of the inputs, the processing procedures, and the outputs of the Plan Writer Allocation Model. Appendix C contains users and operators instructions for the portion of Table Generator developed. Appendix D contains gross flow charts for the allocation program of the Aircraft Allocation Model.

INPUTS

The inputs to the Aircraft Allocation Model include:

- Resource data
- Route data
- Target data
- Resource-Target interaction data
- Planning specification data
- Substrike data

RESOURCE DATA. In general, resource data include:

- identification, location, and "beddown" information for each offensive aircraft base;
- reliability, range, bomb run tactics, and accuracy information for each aircraft type;
- weight and target suitability information for each weapon type;
- order in which to consider weapons for release for each weapon loading configuration; and

- identification of plane type, mission, weapon loading, and over-enemy-territory flight profile comprising an offensive system.

The resource data are applicable to all substrikes. The formats of the input tables containing the resource data are shown on the next six pages.

TABLE SMWP

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1SMWP	String			
9	Side		1, 2		Yes
10 - 14	Line number				
16 - 19	SMWP index				
21 - 22	Plane type		1(1)31		
24	Mission: 0 = one way; 1 = two way		0, 1		
26	Refuel: 0 = no; 1 = yes		0, 1		
28 - 30	Weapon loading index		1(1)99		
32 - 33	Profile		1(1)16		

TABLE BASE

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1BASE	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)600		
16 - 20	Base identification number		1(1)1000	BASID	
22 - 27	Latitude	Deg. Min. Sec.		BALA	
29 - 36	Longitude	Deg. Min. Sec. E/W		BALO	
38 - 39	First weapon loading code		1(1)99	BALW1	
41 - 43	Number of sorties with first weapon loading		1(1)100	BANWL1	
45 - 46	Second weapon loading code		1(1)99	BAWL2	
48 - 50	Number of sorties with second weapon loading		1(1)100	BANWL2	
54 - 55	Plane type		1(1)31	BAPTY	
60 - 62	Unit number		1(1)255	BAUN	
64 - 66	Number aircraft to be allocated		1(1)100	BANMG	
68 - 70	Total number of aircraft		1(1)100	BANM	

TABLE PLTYPA

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1PLTYPA	String			
9	Side		1, 2		
10 - 14	Line number		1(1)31		
17 - 18	Plane type		1(1)31	PLTID	
20 - 23	Takeoff reliability factor		0(.01)1.00		
25 - 27	Refueling reliability factor		0(.01)1.00		
29 - 33	Minimum range		1(1)16000		
35 - 39	Maximum range (cruise)	Naut. Mi.	1(1)16000	PLTMAX	
41 - 42	High dash to cruise Range trade-off factor		1.0(.1)4.0		
44 - 45	Low to cruise Range trade-off factor		1.0(.1)4.0		
47 - 49	Bomb run into target	Naut. Mi.	1(1)100		
51 - 53	Bomb run out from target	Naut. Mi.	1(1)100		
55 - 59	Cruise CEP	Tens of Ft	1(1)2047		
61 - 64	Low CEP	Tens of Ft	1(1)2047		

TAPLE WEAPON

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1WEAPON	String			
9	Side		1, 2		Yes
10 - 14	Line number				
16 - 20	Weapon identification			WEID	
16 - 19	Weapon number (bomb or decoy size)		Bombs 1(1)31 Decoys 1(1)6	WEIDN	
20	Weapon type: 0 = bomb; 1 = ASM; 2 = decoy		0, 1, 2	WETYPM	
22 - 24	Weight of weapon	1000 lbs.	.1(.1)99.9	WEWT	
26 - 29	Range at which to launch for low altitude launch	Naut. Mi.	0(1)5000	WERNGL	ASM, Decoys
31 - 34	Range at which to launch for high altitude launch	Naut. Mi.	0(1)5000	WERNGH	ASM, Decoys
36 - 37	Plane type corresponding to ASM or decoy type		1(1)31	WEPTYP	ASM, Decoys
39 - 41	Deviation for ASM launch	Naut. Mi.	1(1)999	WEDEVT	
43 - 44	First priority first VN code		1(1)31	WVN11C	
46 - 47	First priority last VN code		1(1)31	WVN12C	
49 - 50	Second priority first VN code		1(1)31	WVN21C	
52 - 53	Second priority last VN code		1(1)31	WVN22C	
55 - 56	First exception	String	AA-ZZ or A-Z	WEXCP1	
58 - 59	Second exception	String	AA-ZZ or A-Z	WEXCP2	
61 - 62	Third exception	String	AA-ZZ or A-Z	WEXCP3	
64 - 65	Fourth exception	String	AA-ZZ or A-Z	WEXCP4	
67 - 68	Fifth exception	String	AA-ZZ or A-Z	WEXCP5	
70 - 71	Sixth exception	String	AA-ZZ or A-Z	WEXCP6	

TABLE WPNSEL

Card 1

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1WPNSEL	String			
9	Side		1, 2		
10 - 14	Line number		1(1)100		
15	Card number	1			
16 - 20	Weapon consideration sequence			WPNSEQ	
16 - 18	Weapon loading index		1(1)99		
19 - 20	Consideration sequence		1(1)10		
22 - 26	First weapon identification				
28 - 32	Second weapon identification				
34 - 38	Third weapon identification				
40 - 44	Fourth weapon identification				
46 - 50	Fifth weapon identification				
52 - 56	Sixth weapon identification				
58 - 62	Seventh weapon identification				
64 - 68	Eighth weapon identification				

TABLE WPNSEL

Card 2

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1WPNSEL	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)100		
15	Card number	2			
16 - 20	Weapon consideration sequence			WPNSEQ	
16 - 18	Weapon loading index		1(1)99		
19 - 20	Consideration sequence		1(1)10		
22 - 26	Ninth weapon identification				
28 - 32	Tenth weapon identification				

ROUTE DATA. Route data include:

- identification and location of refueling, penetration, over-enemy-territory, depenetration, and recovery base points;
- specification of permissible associations of points;
- specification of permissible bounds of flight path changes to attack targets; and
- basic probabilities of sector attrition.

This data may change from substrike to substrike. The formats of the input tables containing route data are shown on the next seven pages.

TABLE REFUEL

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = FIREFUEL	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)600	·	Yes
16 - 20	Refueling area identification		1(1)600	REFID	
22 - 27	Latitude	Deg., Min. Sec.		RELA	
29 - 36	Longitude	Deg., Min. Sec. E/W		RELO	
38	Post strike marker 0 = before penetration 1 = after penetration		0, 1	REPSM	

TABLE INASTB

Columns	Information	Units	Value Range	Symbol	Optional
1 - 6	Format and table name = F11NASTB	STRING			
10 - 14	Line number		1(1)100		Yes
16 - 20	Base or air alert point identification		1(1)1000	INBASE	
22	Air alert flag		0,1	INAAFL	
24 - 28	Refueling area identification		1(1)600	INREF	Yes
30 - 32	First cell		1(1)999	CELL 1	
34 - 36	Second cell		1(1)999	CELL 2	Yes
38 - 40	Third cell		1(1)999	CELL 3	Yes
42 - 44	Fourth cell		1(1)999	CELL 4	Yes
46 - 48	Fifth cell		1(1)999	CELL 5	Yes
50 - 52	Sixth cell		1(1)999	CELL 6	Yes
54 - 56	Seventh cell		1(1)999	CELL 7	Yes
58 - 60	Eighth cell		1(1)999	CELL 8	Yes
62 - 64	Ninth cell		1(1)999	CELL 9	Yes
66 - 68	Tenth cell		1(1)999	CELL 10	Yes

TABLE ROUTE

Columns	Information	Units	Value Range	Symbol	Optional
1 - 7	Format and table name=F1ROUTE	STRING			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)300		
16 - 20	Route identification		1(1)300	PNID	Yes
23	Type of route 1 = penetration only 2 = depenetration only 3 = both penetration and depenetration		1, 2, 3	PNRTE	
25 - 27	1st point on route		1(1)999	PNP1	
29 - 31	2nd point on route		1(1)999	PNP2	Yes
33 - 35	3rd point on route		1(1)999	PNP3	Yes
37 - 39	4th point on route		1(1)999	PNP4	Yes
41 - 43	5th point on route		1(1)999	PNP5	Yes
45 - 47	6th point on route		1(1)999	PNP6	Yes
49 - 51	7th point on route		1(1)999	PNP7	Yes
53 - 55	8th point on route		1(1)999	PNP8	Yes
57 - 59	9th point on route		1(1)999	PNP9	Yes
61 - 63	10th point on route		1(1)999	PNP10	Yes
65 - 67	Penetration point		1(1)999	PNPEN	Yes
69 - 71	Last high leg		1(1)999	PNLSTH	Yes

TABLE POINT

Columns	Information	Units	Value Range	Symbol	Optional
1 - 7	Format and table name = F1POINT	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)1300		Yes
16 - 20	Point identification		1(1)1300	POID	
22 - 27	Latitude	Deg. Min. Sec.		POLA	
29 - 36	Longitude	Deg. Min. Sec. E/W		POLO	
67 - 68	Leg sector attrition probability*		0(.01).99	POLAP	
70 - 71	Exit sector attrition probability		0(.01).99	POEAP	

*Probability of attrition from the prior route point to the present route point.

TABLE RINGRU

Card 1

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1RINGRU	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)31		Yes
15	Card number	1			
16 - 20	Plane type		1(1)31		
22 - 24	Ring One-Change of heading angle	Deg.	0(1)180		
26 - 28	Ring One-Minimum Radius	Naut. Mi.	0(1)999		
30 - 32	Ring One-Maximum Radius	Naut. Mi.	0(1)999		
34 - 36	Ring Two-Change of heading angle	Deg.	0(1)180		
38 - 40	Ring Two-Minimum Radius	Naut. Mi.	0(1)999		
42 - 44	Ring Two-Maximum Radius	Naut. Mi.	0(1)999		
46 - 48	Ring Three-Change of heading angle	Deg.	0(1)180		
50 - 52	Ring Three-Minimum Radius	Naut. Mi.	0(1)999		
54 - 56	Ring Three-Maximum Radius	Naut. Mi.	0(1)999		
58 - 60	Ring Four-Change of heading angle	Deg.	0(1)180		
62 - 64	Ring Four-Minimum Radius	Naut. Mi.	0(1)999		
66 - 68	Ring Four-Maximum Radius	Naut. Mi.	0(1)999		

TABLE RINGRU

Card 2

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1RINGRU	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)31		Yes
15	Card	2			
16 - 20	Plane type		1(1)31		
22 - 23	Ring Five-Change of heading angle	Deg.	0(1)180		
26 - 28	Ring Five-Minimum Radius	Naut. Mi.	0(1)999		
30 - 32	Ring Five-Maximum Radius	Naut. Mi.	0(1)999		
34 - 36	Single Maximum Turn	Deg.	0(1)180		
38 - 40	Single Turning Angle	Deg.	0(1)180		
42 - 44	Additional Turning Angle	Deg.	0(1)180		

TABLE RECBAS

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1RECBAS	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)300		Yes
16 - 20	Identification of final route point		1(1)999		
22 - 25	First recovery base		1(1)1000	REBS1	Yes
27 - 30	Second recovery base		1(1)1000	REBS2	Yes
32 - 35	Third recovery base		1(1)1000	REBS3	Yes
37 - 40	Fourth recovery base		1(1)1000	REBS4	Yes
42 - 45	Fifth recovery base		1(1)1000	REBS5	Yes
47 - 50	Sixth recovery base		1(1)1000	REBS6	Yes
52 - 55	Seventh recovery base		1(1)1000	REBS7	Yes
57 - 60	Eighth recovery base		1(1)1000	REBS8	Yes
62 - 65	Ninth recovery base		1(1)1000	REBS9	Yes
67 - 70	Tenth recovery base		1(1)1000	REBS10	Yes

TARGET DATA. Target data include:

- identification, location, vulnerability, and desired height of burst information for each target;
- vulnerability conversion information; and
- identification, location, and radii of action of each local defense.

This data applies to all substrikes. The formats of the input tables containing target data are shown on the next three pages.

TABLE TARGET*

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1TARGET	String			
9	Side		1, 2		
10 - 14	Line number		1(1)1200		
16 - 20	Target designator	String	5 nonblank characters	TACODE	
22 - 27	Latitude	Deg. Min. Sec.		TALA	
29 - 36	Longitude	Deg. Min. Sec. E/W		TALO	
58	Height of burst		0, 1	TAHOB	
60 - 63	Vulnerability number	String	4 nonblank characters	TAVN	
65 - 67	Target prekill		0(.001).999	TAKILL	
69 - 70	Missile Attrition Factor		0(.01)(.99)	TMATRF	

*There may be five records of Table TARGET; however, only 5,000 targets may be input.

TABLE LOCAL

Columns	Information	Units	Value Range	Symbol	Optional
1 - 7	Format and table name = F1LOCAL	String			
9	Side		1, 2		
10 - 14	Line number		1(1)2000		
16 - 20	Identification	String	up to five characters		
22 - 27	Latitude	Deg. Min. Sec.		LOLA	
29 - 36	Longitude	Deg. Min. Sec. E/W		LOLO	
40 - 43	Low radius of action of the zone	Naut. Mi.	1(1)200	LORADA	
45 - 48	High radius of action of the zone	Naut. Mi.	1(1)500	LORADH	

TABLE VNC

Columns	Information	Units	Value Range	Symbol	Optional
1 - 5	Format and table name = F1VNC	String			
9	Side		1,2		Yes
10 - 14	Linc number		1(1)31		
16 - 19	VN	String	4 nonblank characters	VN	
21 - 22	VN code		1(1)31	VNCODE	

RESOURCE-TARGET INTERACTION DATA. Resource-target interaction data include:

- Weapon kill probability,
- Probability of sector attrition, and
- Probability of zone attrition.

The weapon kill probability information, which is a function of target vulnerability, bomb size, delivery system accuracy, and desired height of burst, is applicable to all substrikes. The format for the input table containing weapon kill probability information is shown on the next page.

The probability of sector attrition, which is a function of plane type, mode, and route, is divided between two tables. The basic probability of sector attrition on and off over-enemy-territory routes is input in table POINT (see Route Data). Values input should correspond to the attrition of the "best" plane type in a high cruise mode. A multiplication factor to apply to the basic probability of sector attrition, as a function of plane type and mode, is input in table ATTR. In addition, table ATTR contains the probabilities of attrition for high and low capable zones. The format of input table ATTR is shown on the second succeeding page. Information in table ATTR is applicable to all substrikes.

TABLE SSPKTB

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1SSPKTB	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)3600		
16 - 19	Target VN code		1(1)31	SSPVNC	
21 - 22	Bomb size (weapon number)		1(1)31	SSPBS	
24 - 27	CEP	Tens of Ft.	1(1)2047	SSPCEP	
29	Height of burst		0, 1	SSPHOB	
31 - 33	Single shot probability		.001(.001).999	SSPK	

TABLE ATTR

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name=F1ATTR	STRING			
9	Side		1, 2		
10 - 14	Line number		1(1)100		Yes
17 - 18	Plane type				
19	Mode		1(1)6		
21 - 23	Multiplication factor of basic probability of sector attrition		0(.1)10.0		
25 - 27	Basic high capable zone probability of attrition		0(.1)1.0		
29 - 31	Basic low capable zone probability of attrition		0(.1)1.0		

PLANNING SPECIFICATION DATA. It is by means of the planning specification data input that a planner indicates the procedure to be used in the model for developing the sorties for each substrike. The Aircraft Allocation Model contains only one allocation procedure. The planner indicates the use of this procedure by the order in which he inputs the factors comprising a planning specification. The acceptable planning specification and the corresponding ordering of the factors are shown below:

Planning Specification	Ordering of Factors
	TARGET CLASS
	SYSTEM
	FIRST WEAPON CROSS TARGETING
	MISSION/WEAPON LOADING/PROFILE
	CANDIDATE/EXEMPT
	CELL
	SUCCEEDING WEAPON CROSS TARGETING
1	BASE/REFUEL
	WEAPON RELEASE SEQUENCE
	WEAPON PRIORITY
	FIRST TARGET
	WEAPON PRIORITY
	ASM TARGETS
	WEAPON PRIORITY
	RING RULES
	SUCCEEDING TARGETS
	DEPENETRATION/RECOVERY

SUBSTRIKE DATA. Substrike data include:

- A list of targets to be considered in each substrike including, for each target, identification, target class (priority), minimum acceptable single weapon kill probability, maximum desired cumulative kill probability, and relative worth;
- A list of aircraft bases to be considered in each substrike including, for each aircraft base, identification, the percentage to be allocated of the in-commission aircraft, survival factor, and time information;
- Parameters (input by card) for each substrike, including substrike number, maximum weapons to be allocated per target, maximum cross targeting of first weapons, and maximum cross targeting of succeeding weapons.

The formats of the input tables containing the targets and aircraft bases to be considered in a substrike are shown on the next two pages. It should be noted that there are as many instances of each table as there are aircraft substrikes.

The parameters are input by means of four cards per substrike. The substrike number parameter is used for program restart. The maximum weapons to be allocated per target include weapons allocated in previous substrikes. The maximum cross targeting of first weapons includes first weapons allocated in previous substrikes. The maximum cross targeting of succeeding weapons includes succeeding weapons allocated in previous substrikes.

PROCESSING PROCEDURES

The Aircraft Allocation Model processing procedures are subdivided into two groups. The first group of processing procedures is contained in a presubstrike program called Table Generator. The second group of processing procedures is

TABLE SITARG

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1SITARG	String			
9	Side		1,2		
10 - 14	Line number		1(1)100		
16 - 20	First target identification name	String	5 nonblank characters	SITAR1	
22 - 26	Last target identification name	String	5 nonblank characters	SITAR2	
28 - 29	Target class		1(1)50	SITARC	
31 - 33	Minimum kill probability		0(.001).999	SMINKP	
35 - 37	Maximum kill probability		0(.001).999	SMAXKP	
39 - 41	Relative worth factor		.01(.01)1.00	SITRWF	

TABLE SIBASE

Columns	Information	Units	Value Range	Symbol	Optional
1 - 8	Format and table name = F1SIBASE	String			
9	Side		1, 2		Yes
10 - 14	Line number		1(1)100		Yes
16 - 19	First base identification		1(1)1000		
21 - 24	Last base identification		1(1)1000		
26 - 28	Percentage of aircraft		.01(.01)1.00		
30 - 32	Base survival factor		.01(.01)1.00		
34	Time reference		0, 1, 2, 3, 4		
36 - 39	First sortie time				
36 - 37	Hours	Hours	0(1)99		
38 - 39	Minutes	Minutes	0(1)59		
41 - 43	Time increment	Minutes	0(.1)99.9		

contained in a main substrike allocation program.

TABLE GENERATOR. Regardless of the planning specification used, each aircraft substrike requires a common amount of preprocessing, mostly checking for input errors and constructing internal tables which are to be used by the main substrike allocation program.

The value of each item appearing in each input table is checked to verify that the value is within acceptable bounds. The ordering of the cards making up the planning specification is checked to assure that the order of factors is acceptable.

From input tables TARGET, SITARG, and VNC, the internal table SSTARG is derived. This table is a list of all targets to be considered in a substrike (from SITARG) and contains information about each target (from SITARG, TARGET, and VNC). The following information is included for each target:

- Identification code
- Class
- Longitude and latitude
- Height of burst
- Vulnerability code
- Prekill
- Relative worth factor
- Minimum and maximum kill probabilities

From input tables BASE and SIBASE, the internal table SSBASE is derived. This table is a list of all aircraft bases to be considered in a substrike (from SIBASE) and contains information about each base (from SIBASE and BASE). The following information is included for each aircraft base:

- Identification
- Unit number

- Plane type
- Weapon loadings
- Number of aircraft to be programmed for strike
- Total number of aircraft
- Base survival factor
- Latitude and longitude

From input tables ROUTE and POINT and internal table SSTARG, the internal table MTRC is derived. This table is a list of targets associated with the points on penetration routes emanating from each penetration point (cell). From the same tables, the internal table DEPEN is derived. This table is a list of depenetration routes associated with each target.

From input tables BASE, REFUEL, and INASTB, internal tables CELLAS and REFAS are derived. Table CELLAS is a list of takeoff bases, refueling areas, and/or air alert points associated with each cell. Table REFAS is a list of takeoff bases associated with each refueling area.

MAIN SUBSTRIKE ALLOCATION PROGRAM. The main substrike allocation program for aircraft is basically comprised of three major processes:

- Setting of common mission factors
- Setting of variable mission factors and nomination of candidate sorties
- Election of a candidate sortie

Common Mission Factors Process. This process initially sets the starting values of the factors Target Class, System, First Target Cross Targeting, and Mission/Weapon Loading/Profile. The constraints which these starting values indicate remain frozen until all sorties within the constraints have been nominated and elected. When this occurs, the common mission factor process is reentered, the value of the last factor is, if possible, relaxed, and the nomination and election processes are recycled. When the value of a particular common mission factor is relaxed beyond the maximum value for the factor, the next higher (preceding) factor is relaxed, all succeeding factor values are reset to starting values, and the nomination and election processes recycled. When the factor Target Class is relaxed beyond its maximum value, the substrike allocation is ended, and transfer is made to an output program.

The setting of the values for the common mission factors has the following effects for each nomination and election cycle:

Factor	Effect
Target Class	Restricts the targets to be considered for attack to be of same target class.
System	Restricts the system (plane type) to be considered.
First Target Cross Targeting	Limits the number of first weapons that may be used on a single target from a given base.
Mission/WeaponLoading/ Profile	Restricts the mission, weapon loading, and profile to be the same for all sorties. Mission refers to one way or two way, air alert or ground based, refueled or unrefueled. Weapon loading refers to the quantities and types of weapons to be loaded on an aircraft. Profile refers to the desired over-enemy-territory tactics (modes) to be followed by an aircraft.

In essence, all sorties nominated and elected in a particular nomination and election cycle must have the values of the above factors in common.

Setting of Variable Mission Factors and Nomination Process. This process considers each cell (penetration point) in a substrike and attempts to nominate a candidate sortie; if the attempt is unsuccessful, the cell is marked killed or temporarily exempt.

In the consideration of each cell, further variable constraints (constraints in addition to the common mission factors) are applied to the sortie which may be nominated. The variable constraints are applied in order to nominate first those sorties having more "desirable" flight paths, and then gradually relaxing the variable constraints, thus permitting the nomination of sorties whose flight paths are less "desirable" than the first. For example, the setting of a value for the variable mission factor Base causes the process to consider the aircraft base which is located nearest to the penetration point and therefore able to strike at targets quickest. Gradual relaxation of this factor then permits bases lying at increasingly greater distance from penetration to be considered. (The example assumes, of course, that the bases associated with a cell are sorted on ascending distance from penetration.)

When all cells (penetration points) have been considered and marked killed, exempt, or possessing a candidate sortie, the nomination process has been cycled through once. If all cells are marked either killed or exempt, transfer to the common mission factor process is accomplished in order to relax a constraint or end the substrike planning. If at least one cell has a candidate sortie, transfer to the election process occurs.

During the nomination process, the sequence for setting variable mission factors and selecting locations of a sortie flight path for a particular cell follows this pattern:

- Select a base (or air alert point) possessing sorties of the right system, mission, and weapon loading indicated by common mission factor values.

- Set cross targeting factor for targets succeeding the first.
- Select the first weapon of the weapon loading; the planner inputs the sequence in which weapons of a given weapon loading are to be considered.
- Determine the applicable (preferred) target types against which the first weapon might be used.
- From the cell list of targets, either select a first gravity bomb target, or temporarily exempt all targets and relax preceding variable mission factor(s).
  - . . The selection of a first target may be based on a TIMELY or DELKIL criterion. A TIMELY criterion would call for the selection of a first target which could be hit at the earliest possible time. A DELKIL criterion would call for the selection of a first target against which the sortie has the highest increment of kill, considering such parameters as attrition, target vulnerability, weapon yield, etc.
- If the weapon loading contains air-to-surface missiles, select targets against which the ASMs can be launched before the aircraft reaches the selected first target; if not possible, change the first target.
- Select, from the list of targets in the substrike, succeeding targets for remaining gravity bombs in the weapon loading. The selection of succeeding targets is governed by:
  - . . the preferred target types for each succeeding weapon,
  - . . the location of preceding gravity weapon targets of this sortie, and

. . the restrictions on changes of heading and on range implied by the search areas indicated by ring rules.

- Select a depenetration route and recovery base associated with the last target.

In addition to the setting of factors and selection of locations (bases, route points, targets), the nomination process also checks sortie feasibility (gross check on sortie range capability versus flight path distance).

The internal output of the nomination process is the list of substrike cells with each cell possessing a feasible sortie or marked exempt. If at least one cell possesses a feasible sortie, transfer to the election process occurs; otherwise, transfer to the common mission factors process takes place in order to relax a common factor or end the substrike planning.

Election of a Candidate Sortie Process. This process considers each cell for which a feasible sortie has been nominated. All the nominated sorties are compared in terms of either the earliest arrival time at first target (a TIMELY objective), or the maximum expected fraction of targets killed (a DELKIL objective). The sortie which best meets the objective is elected; that is, the sortie is output.

The targets involved in the sortie are updated; the prekill on each target is incremented by the calculated increase in probability of kill from the weapon allocated. The base involved in the sortie is updated, and the stock of aircraft and weapon loadings is decreased.

Upon the election of a sortie, all cells are re-examined to determine if the elected sortie causes any changes in the other nominated sorties. For all affected cells, including the one for which a sortie was elected, the nomination process is repeated.

The output from the election process is the information required to prepare an outline sortie plan for each elected sortie.

OUTPUTS

The outputs of the Plan Writer Aircraft Allocation Model for each substrike are:

- A set of outline plans
- An updated version of the TARGET table, including identifications of unit/sortie assignments
- An updated version of the BASE table
- A record of the last sortie assigned from each unit
- An updated version of OFFENS table and
- A target-aircraft/weapon assignment summary table

The formats for the output tables have not been defined. However, the general contents of the tables are described below.

OUTLINE PLANS.

- Unit/sortie identification
- Offensive system
- Preference scheme
- Launch base
- Recovery base
- Penetration route exit point
- Depenetration route entry point
- Time in hours and minutes
- Time reference
- Burst heights for targets
- Target identifications

TARGET TABLE.

- Target identification
- Location
- Height of burst
- Vulnerability
- Target prekill
- Unit/sortie assignments

BASE TABLE.

- Base identification
- Location
- Plane type
- Weapon loadings
- Unit number
- Number aircraft in commission
- Total number of aircraft
- Number of aircraft to be allocated in substrike
- Number of aircraft not allocated in substrike

UNIT TABLE.

- Unit
- Sortie
- Target identifications
- DELKILs
- RELDELs

OFFENS TABLE.

- Offensive system identification number
- Plane type
- Mission type = 1
- Preference scheme number
- Types of weapons carried

    1. weapon type
    2. number of weapons
    3. kinds of weapons
    4. mode
    5. distance for bomb run in
    6. distance for bomb run out

TARGET-AIRCRAFT/WEAPON ASSIGNMENT SUMMARY.

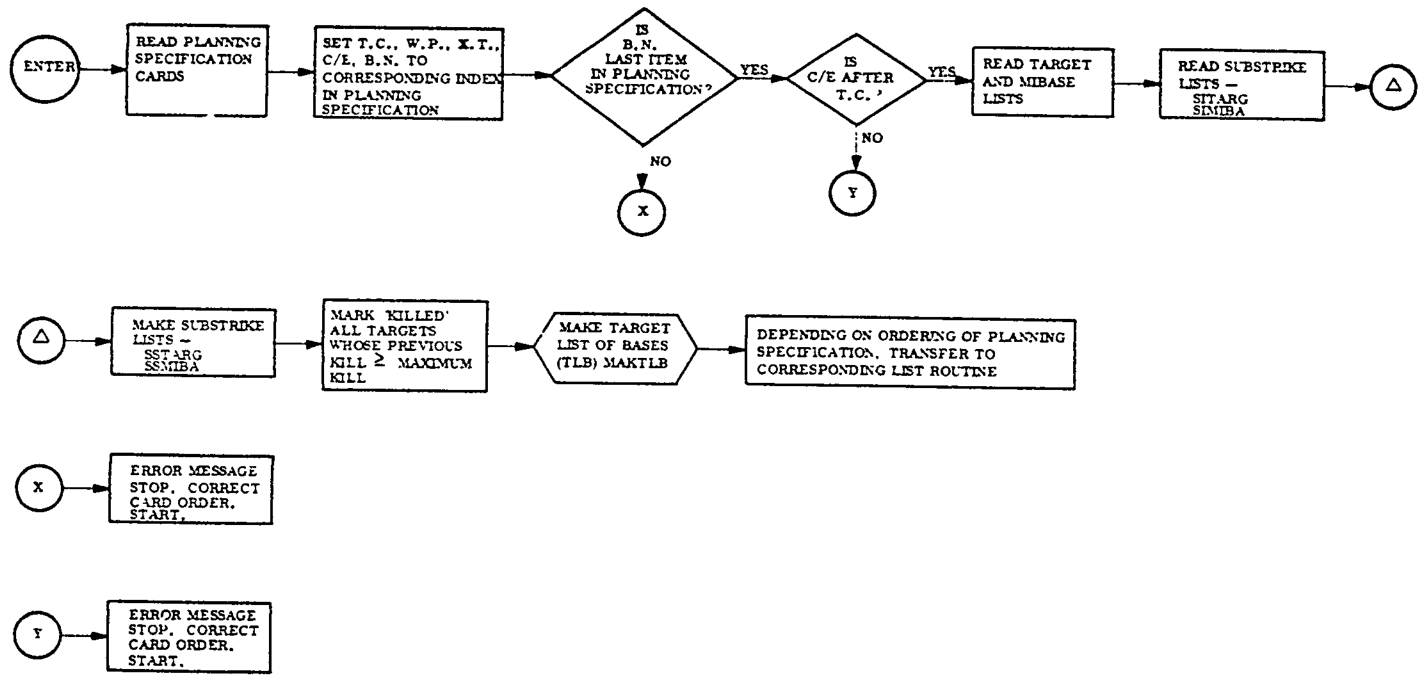
- Target identification
- Target relative worth
- Target minimum probability of kill
- Target maximum probability of kill
- Target killed marker
- Target accumulative kill
- Target accumulative relative worth kill
- Unit/sortie assignment

    1. unit/sortie identification
    2. base identification
    3. weapon identification
    4. DELKIL
    5. RELDEL
    6. accumulative DELKIL
    7. accumulative RELDEL

APPENDIX A

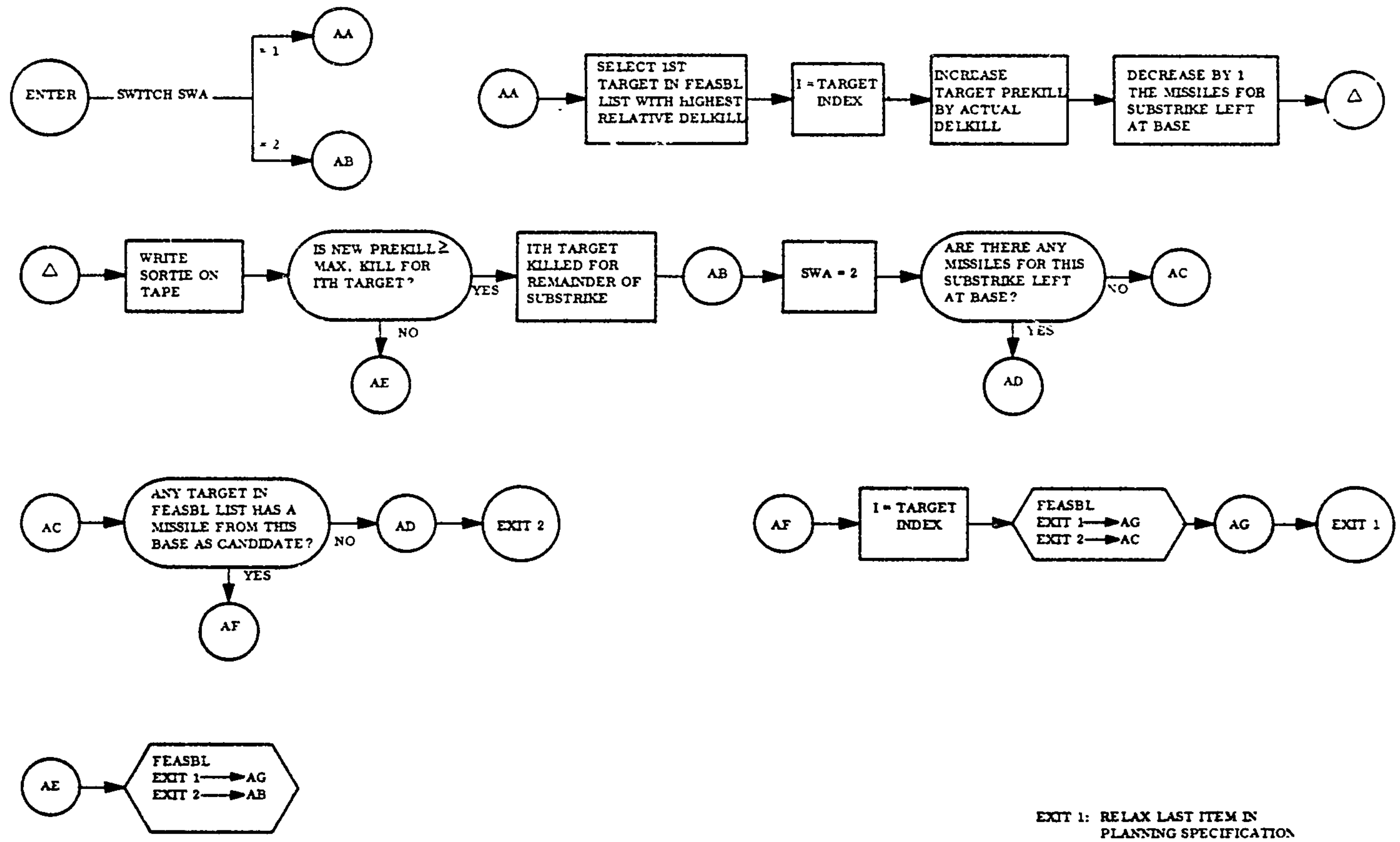
MISSILE ALLOCATION MODEL

GROSS FLOW CHART FOR ROUTINE PSSPRG



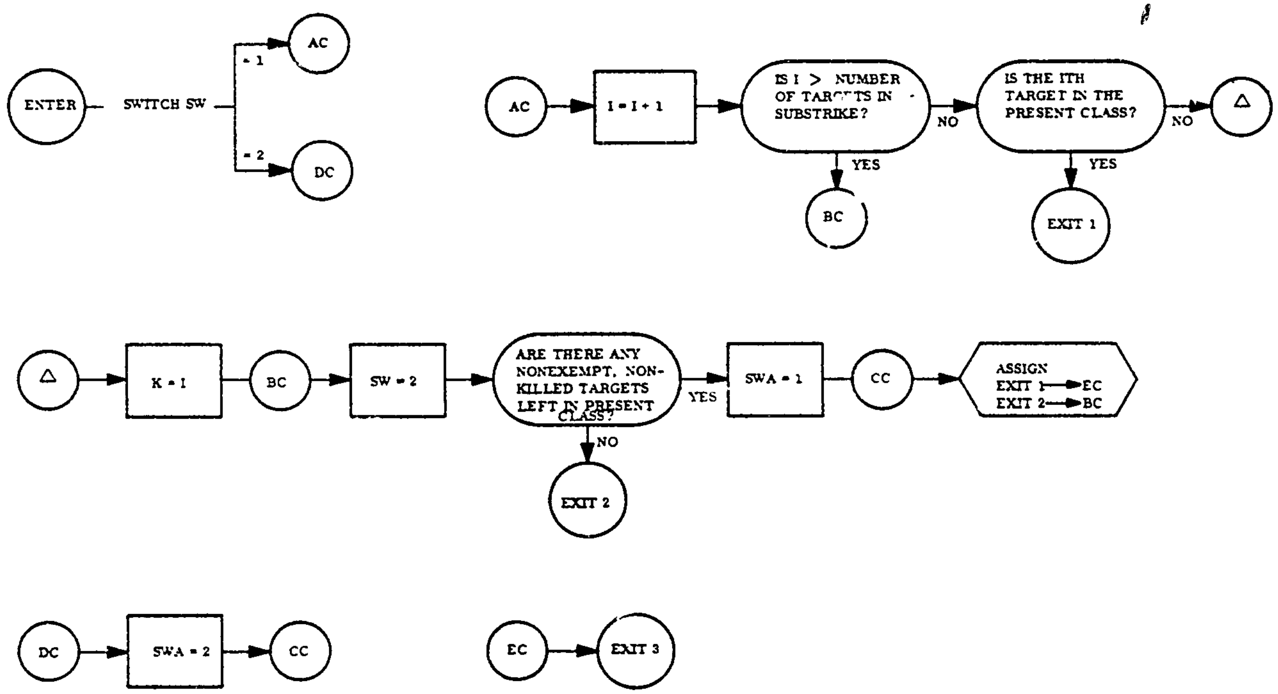
T.C. = TARGET CLASS
W.P. = WEAPON PRIORITY
X.T. = CROSS TARGETING
C/E = CANDIDATE/EXEMPT
B.N. = BASE NOMINEE

GROSS FLOW CHART FOR ROUTINE ASSIGN

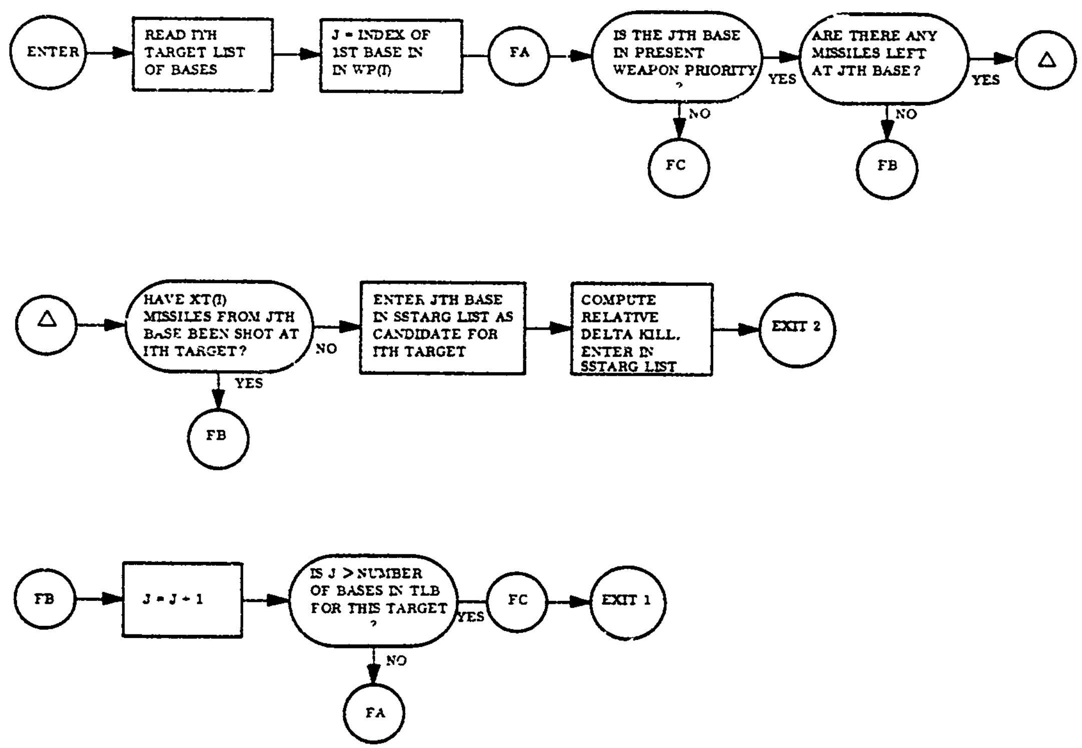


EXIT 1: RELAX LAST ITEM IN PLANNING SPECIFICATION
EXIT 2: NORMAL EXIT

GROSS FLOW CHART FOR ROUTINE COMMON

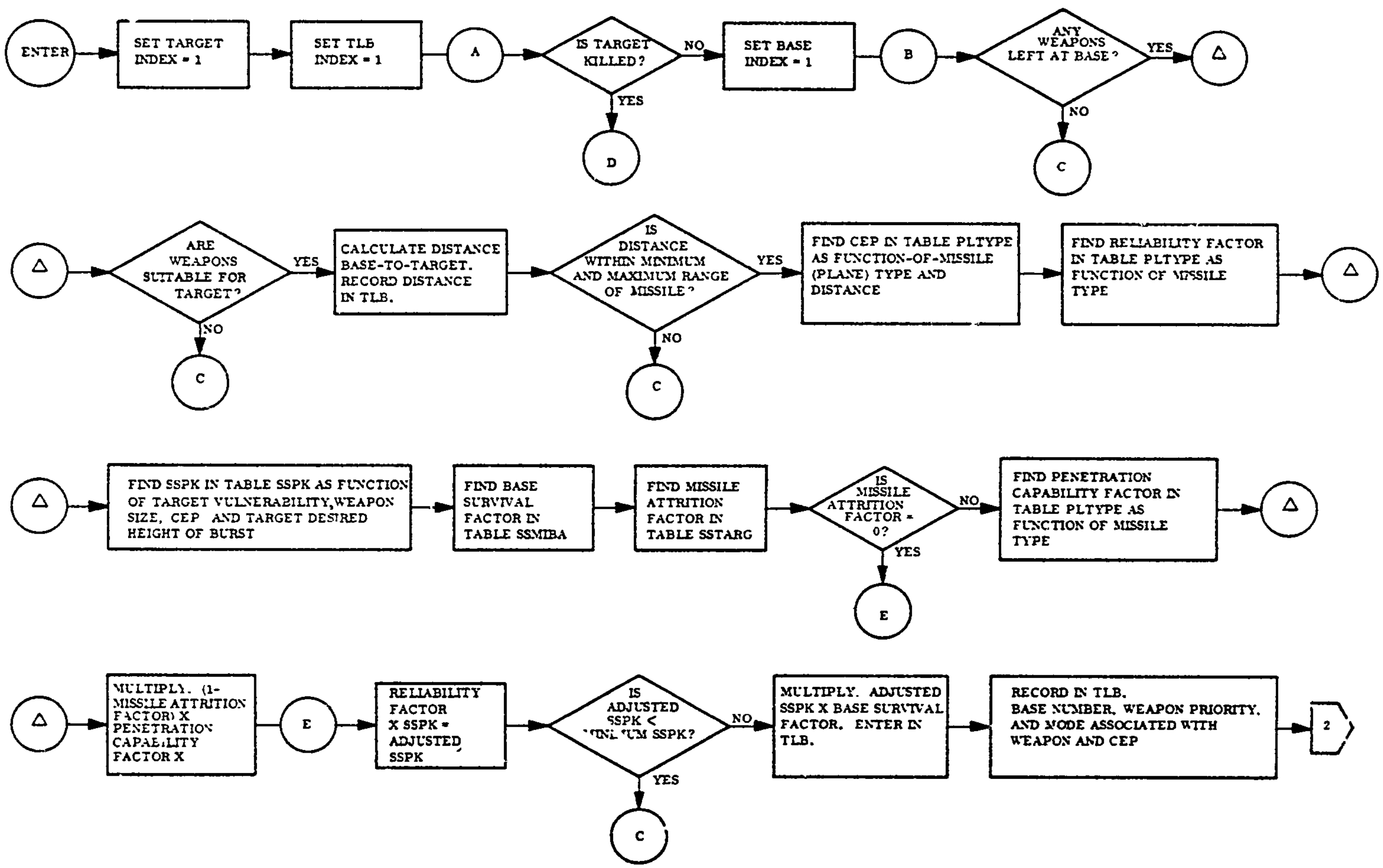


GROSS FLOW CHART FOR ROUTINE FEASBL

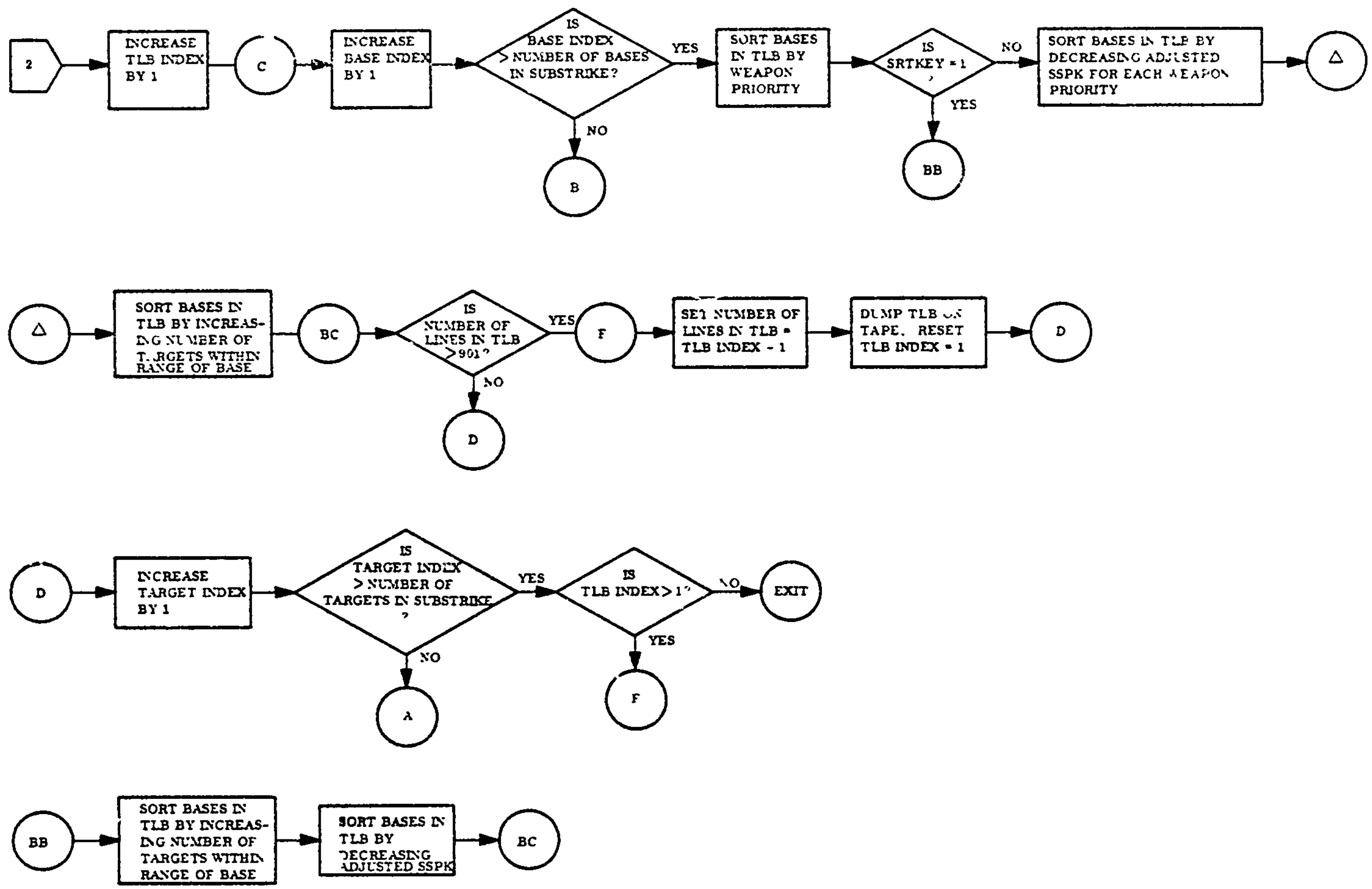


EXIT 1: RELAX LAST ITEM IN PLANNING SPECIFICATION
EXIT 2: NORMAL EXIT

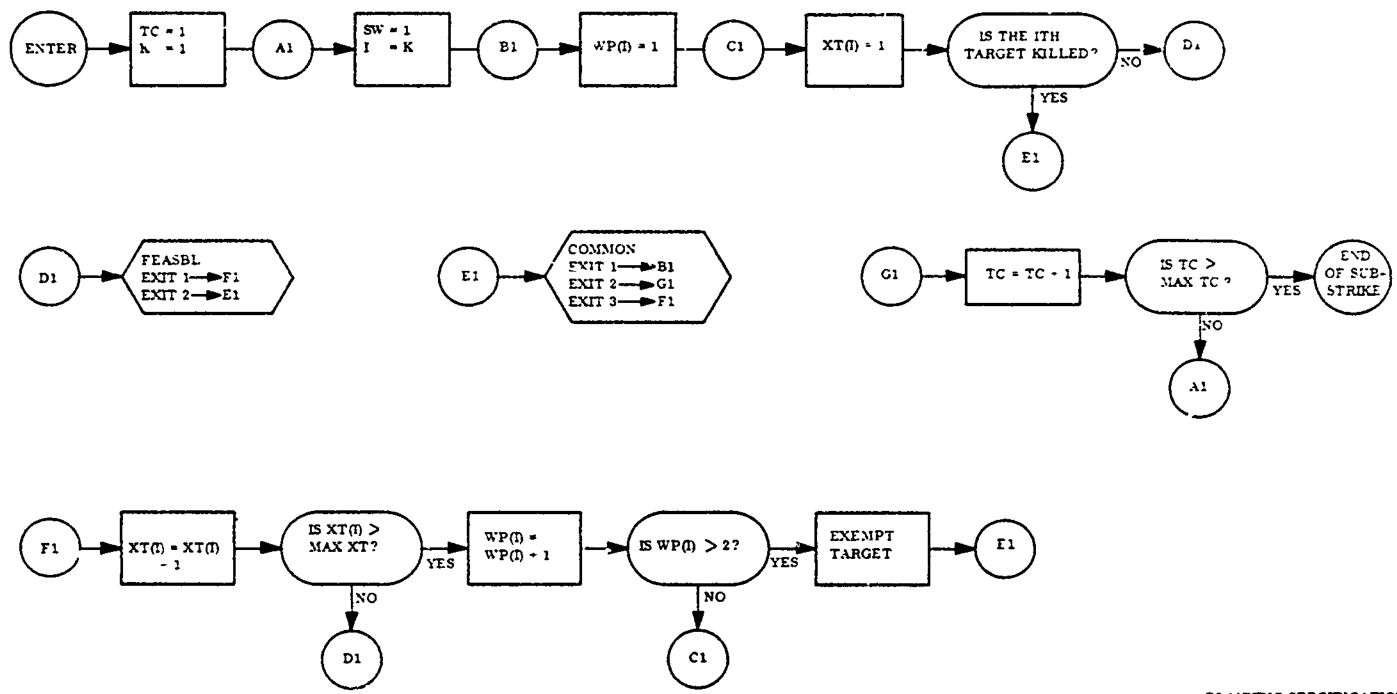
GROSS FLOW CHART FOR ROUTINE MAK TLB



GROSS FLOW CHART FOR ROUTINE MAK TLB



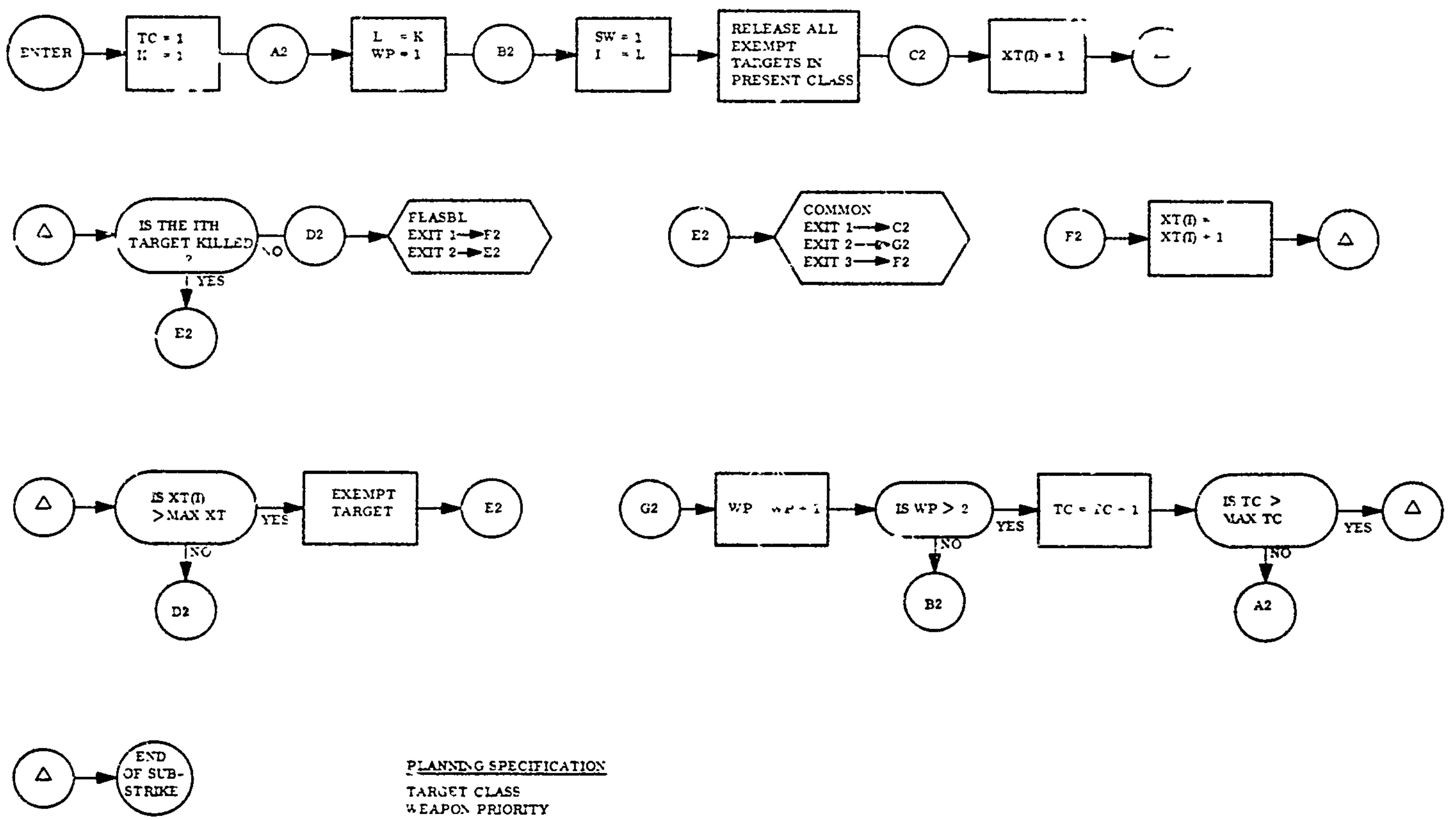
GROSS FLOW CHART FOR ROUTINE LIST 1



PLANNING SPECIFICATION

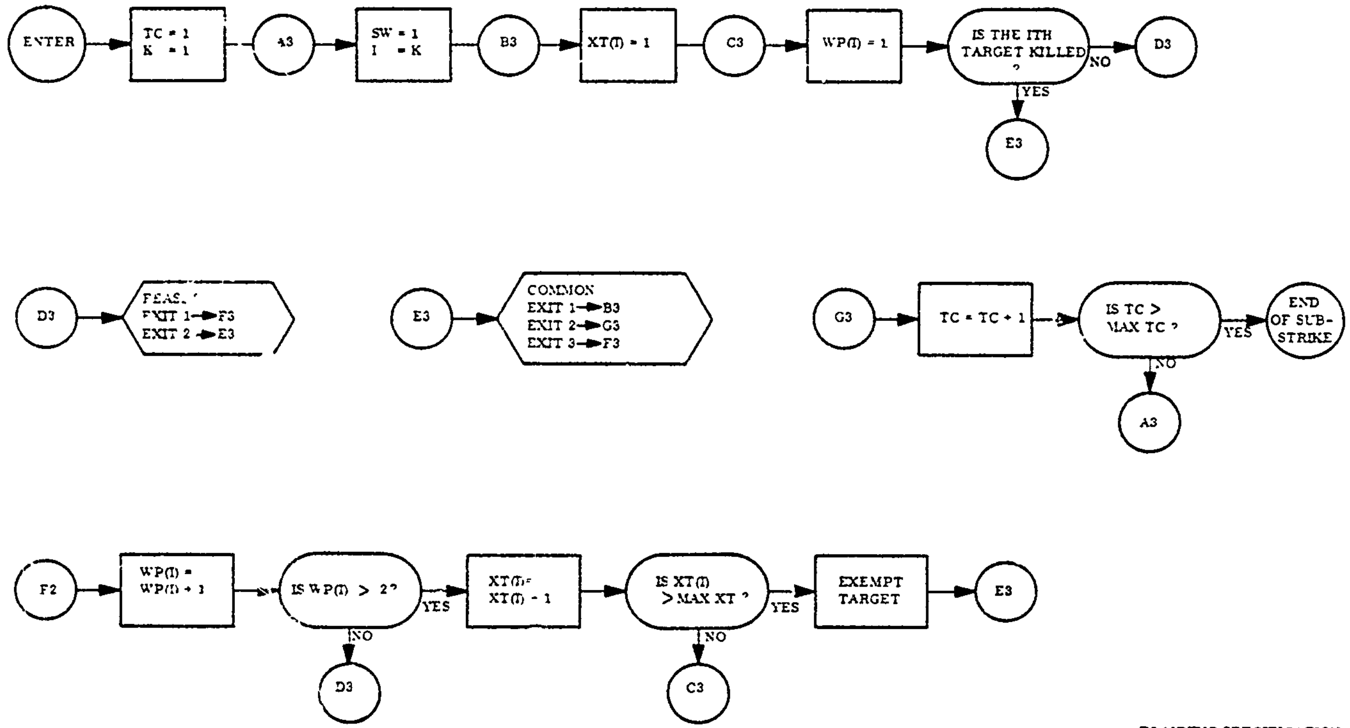
TARGET CLASS
CANDIDATE/EXEMPT
WEAPON PRIORITY
CROSS TARGET
BASE NOMINEE

GROSS . LOW CHART FOR ROUTINE LIST 2



PLANNING SPECIFICATION
TARGET CLASS
WEAPON PRIORITY
CANDIDATE/EXEMPT
CROSS TARGET
BASE NOMINEE

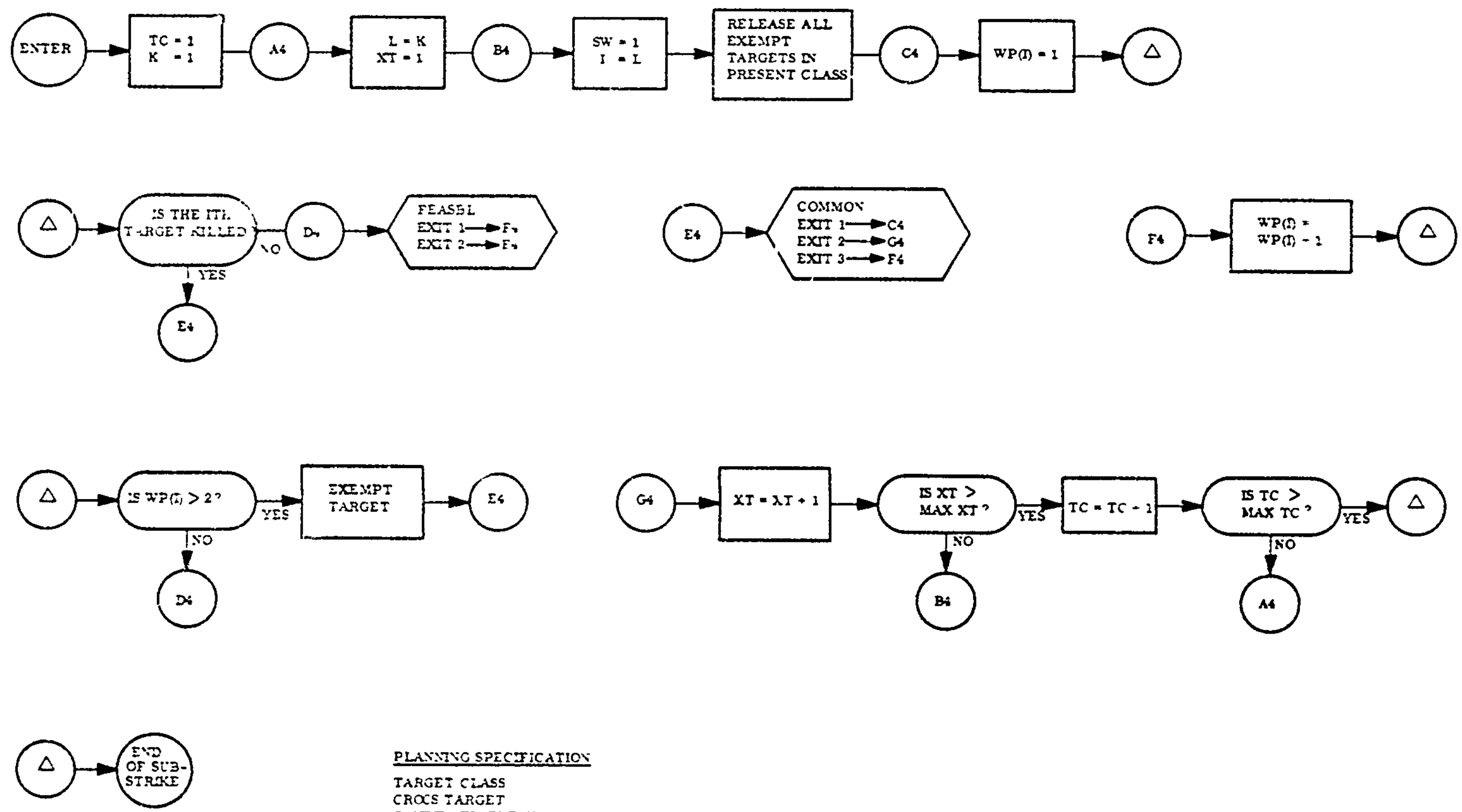
GROSS FLOW CHART FOR ROUTINE LIST 3



PLANNING SPECIFICATION

TARGET CLASS
CANDIDATE/EXEMPT
CROSS TARGET
WEAPON PRIORITY
BASE NOMINEE

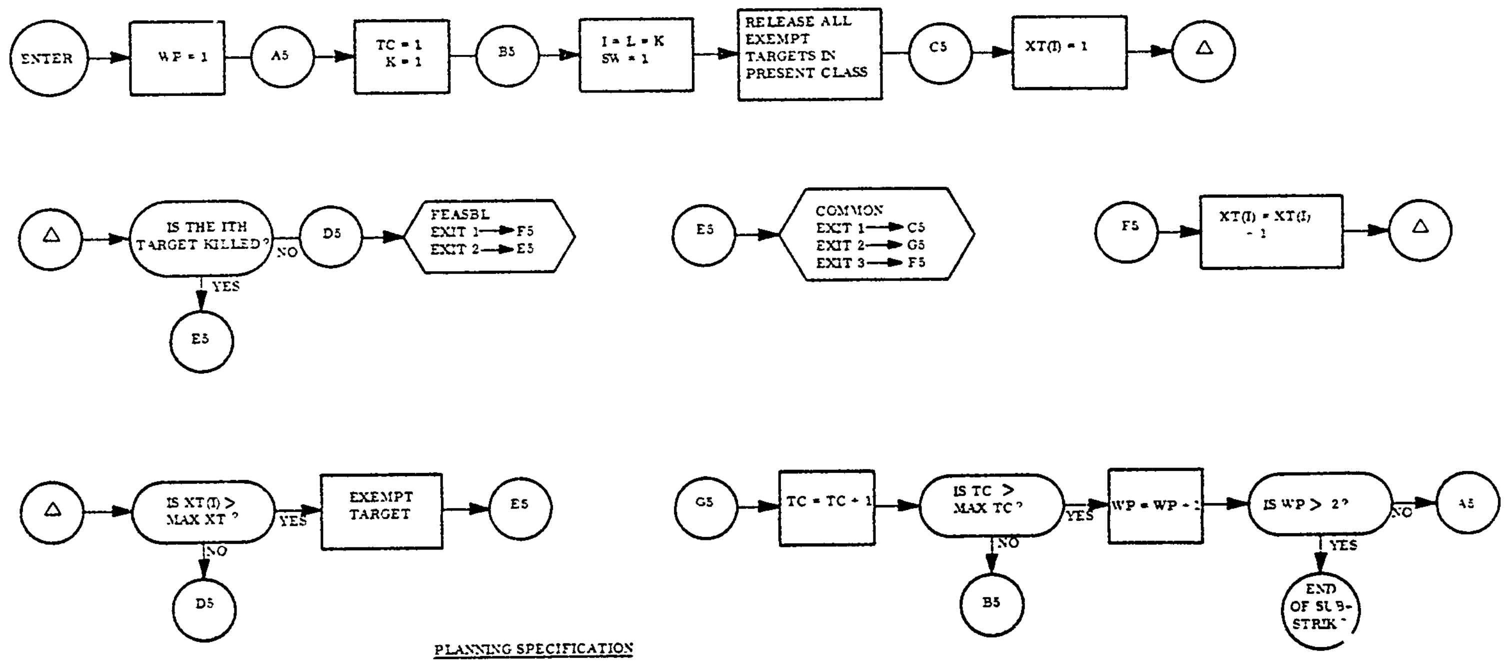
GROSS FLOW CHART FOR ROUTINE LIST 4



PLANNING SPECIFICATION

TARGET CLASS
CROSS TARGET
CANDIDATE EXEMPT
WEAPON PRIORITY
BASE NOMINEE

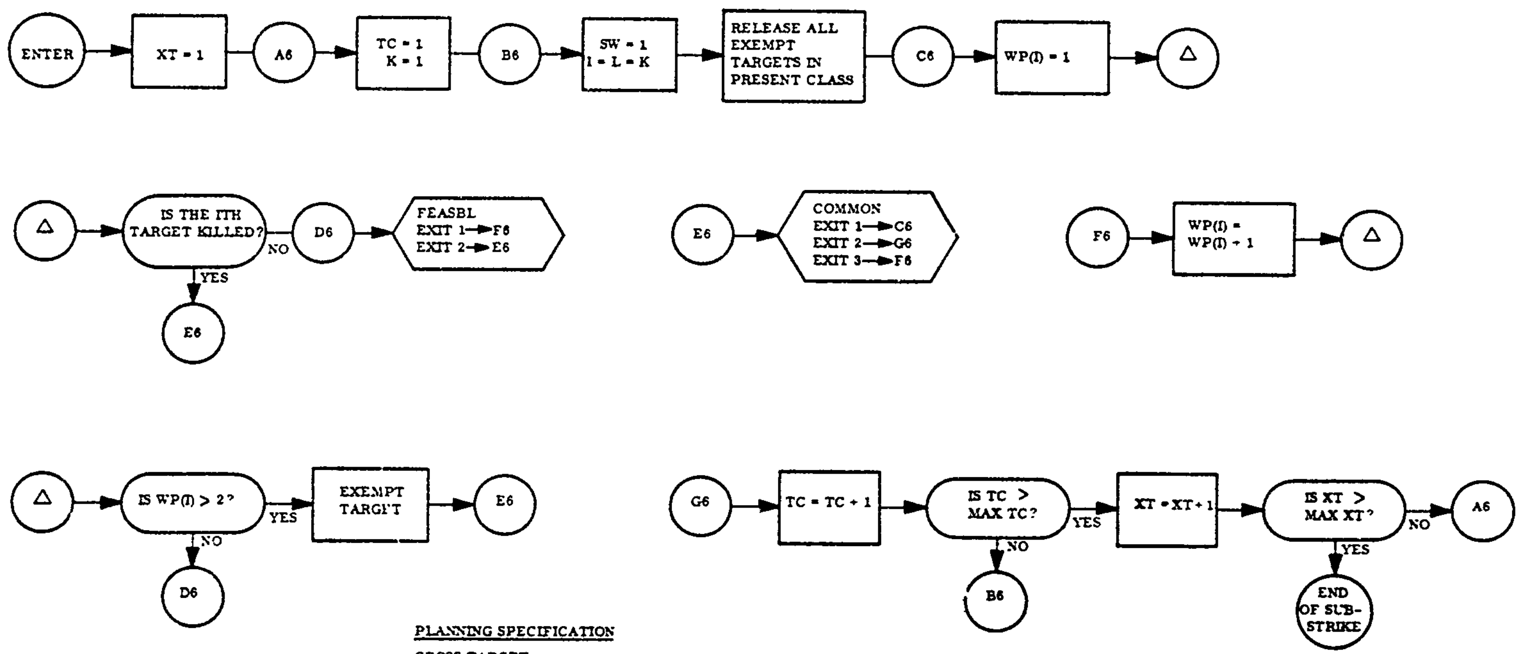
GROSS FLOW CHART FOR ROUTINE LIST 5



PLANNING SPECIFICATION

WEAPON PRIORITY
TARGET CLASS
CANDIDATE EXEMPT
CROSS TARGET
BASE NOMINEE

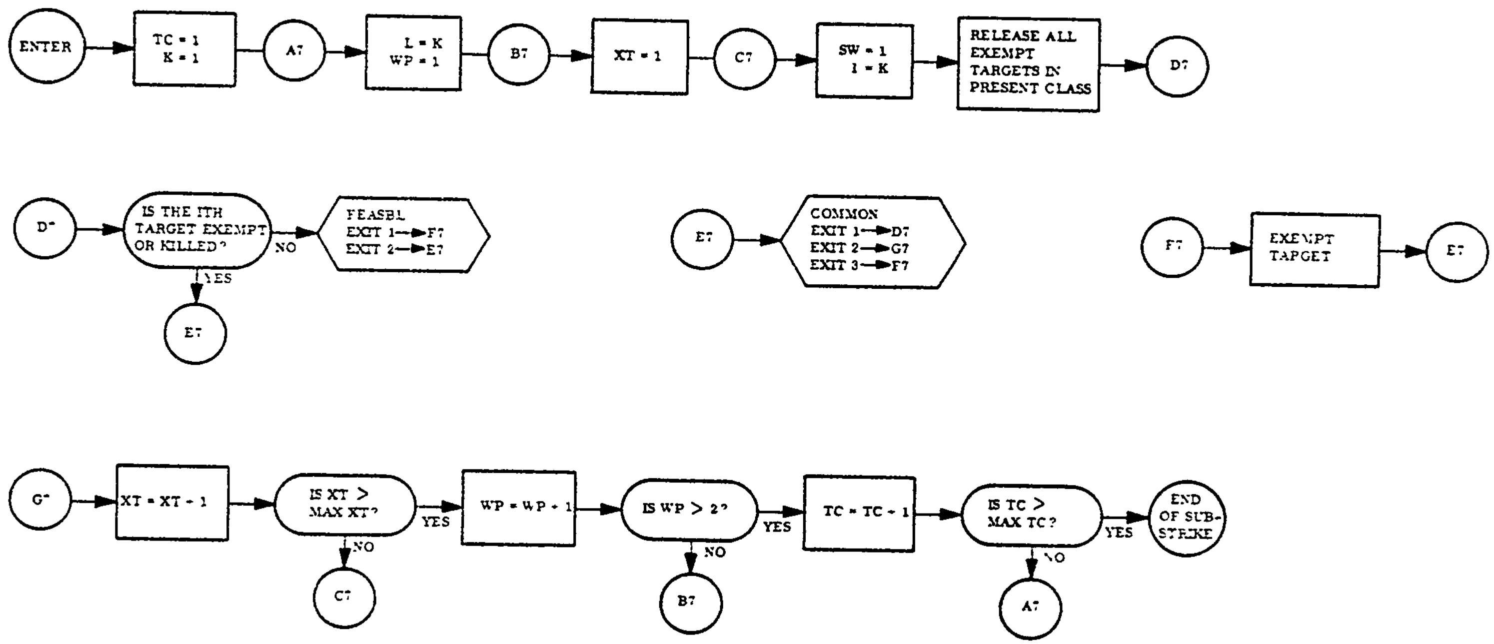
GROSS FLOW CHART FOR ROUTINE LIST 6



PLANNING SPECIFICATION

CROSS TARGET
TARGET CLASS
CANDIDATE/EXEMPT
WEAPON PRIORITY
BASE NOMINEE

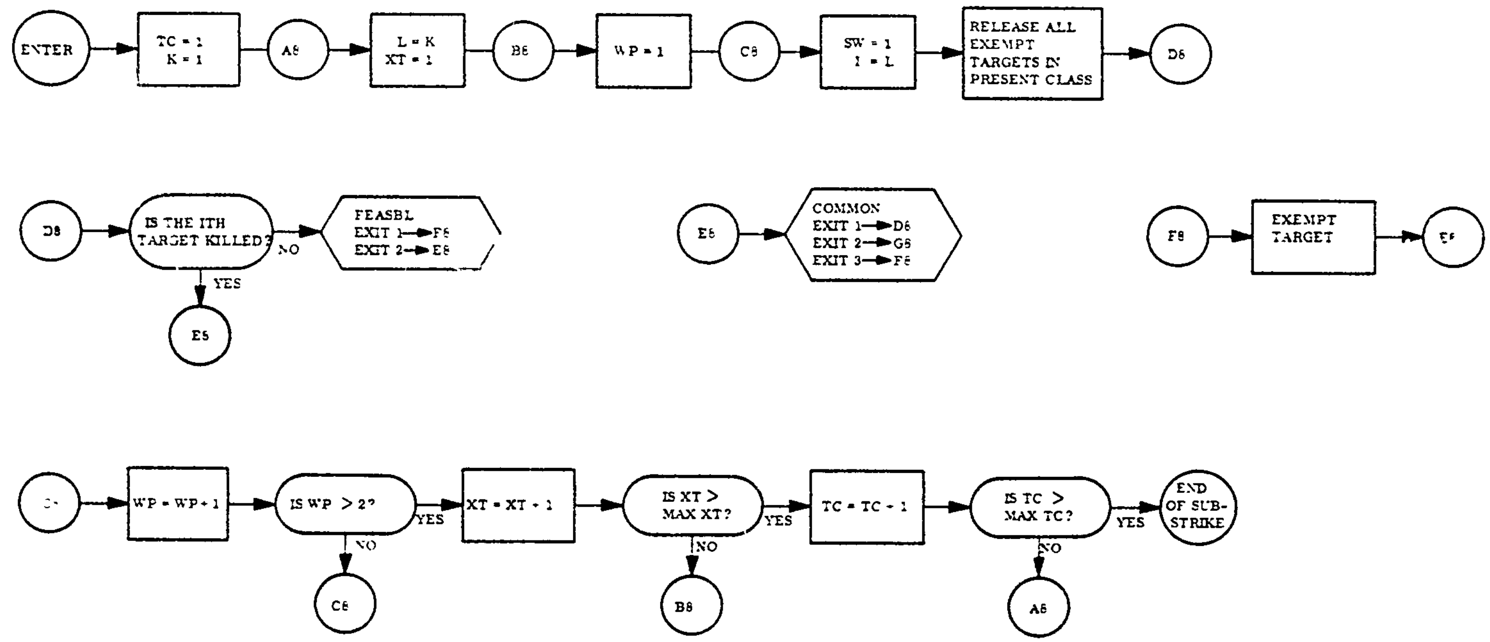
GROSS FLOW CHART FOR ROUTINE LIST 7



PLANNING SPECIFICATION

TARGET CLASS
WEAPON PRIORITY
CROSS TARGET
CANDIDATE/EXEMPT
BASE NOMINEE

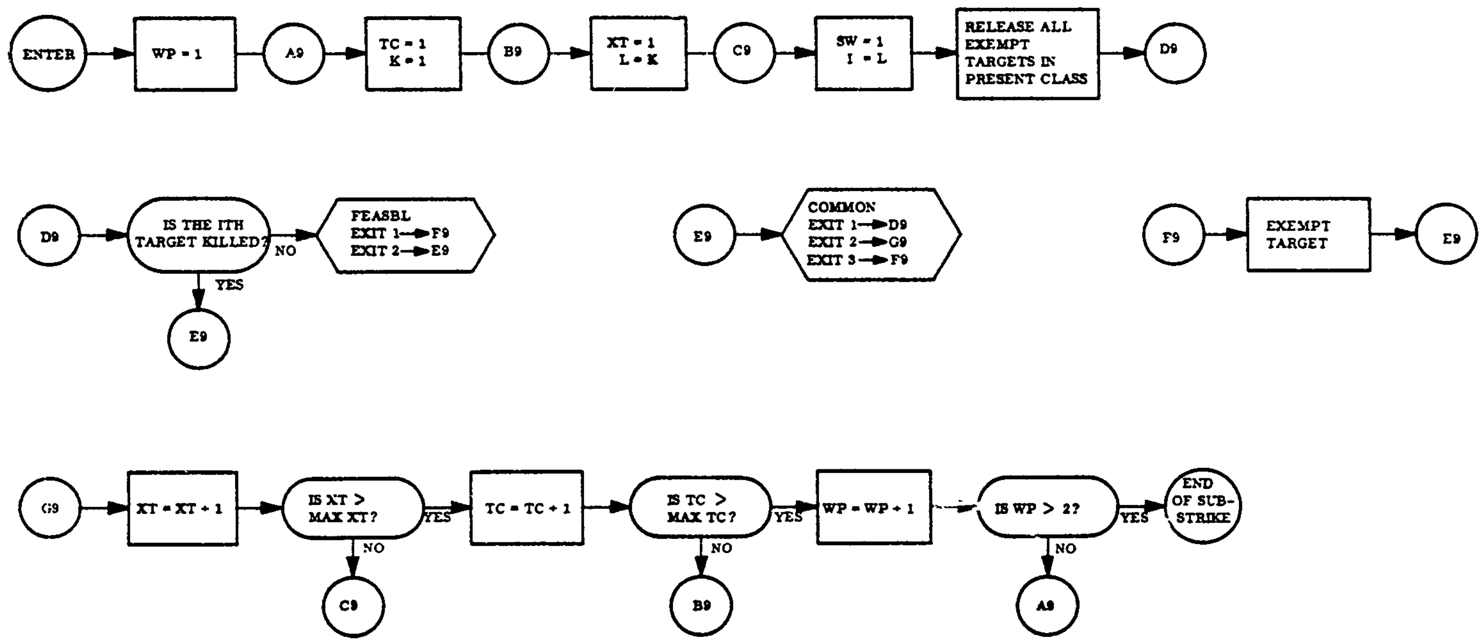
GROSS FLOW CHART FOR ROUTINE LIST 8



PLANNING SPECIFICATION

TARGET CLASS
CROSS TARGET
WEAPON PRIORITY
CANDIDATE/EXEMPT
BASE NOMINEE

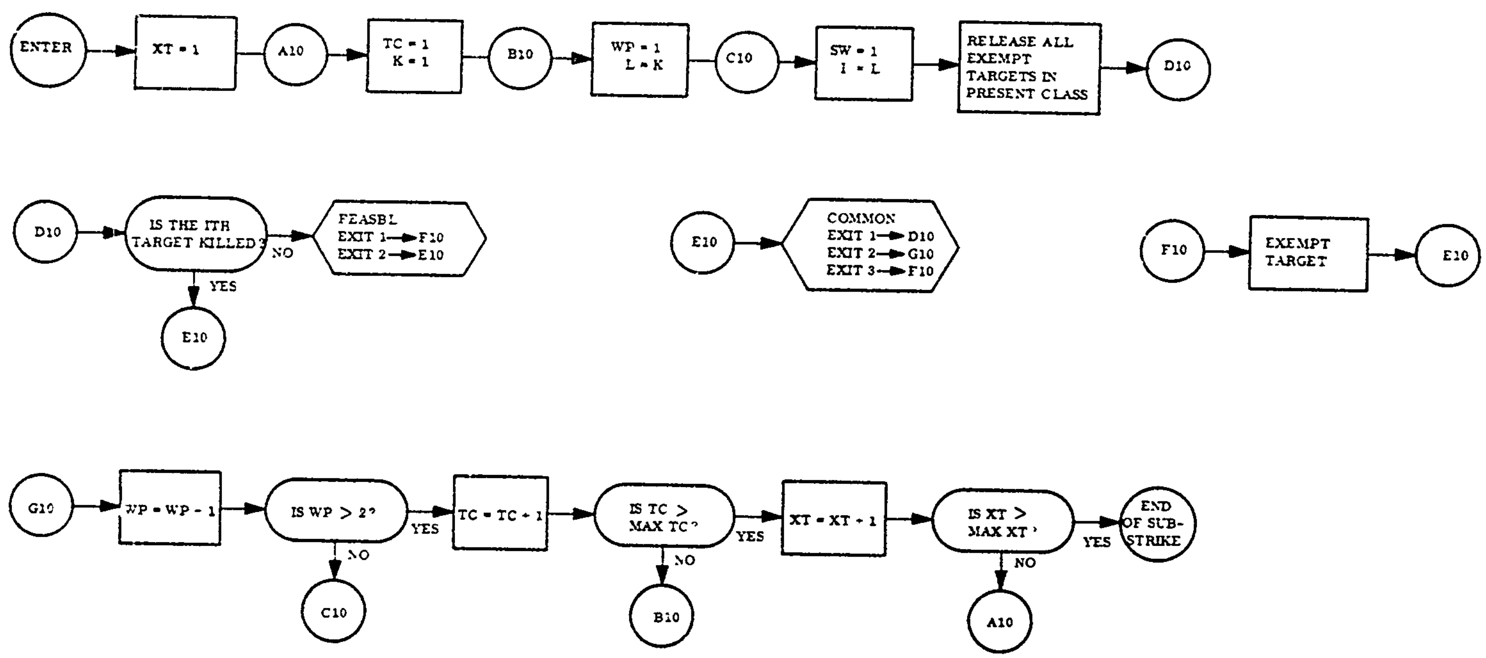
GROSS FLOW CHART FOR ROUTINE LIST 9



PLANNING SPECIFICATION

WEAPON PRIORITY
TARGET CLASS
CROSS TARGET
CANDIDATE/EXEMPT
BASE NOMINEE

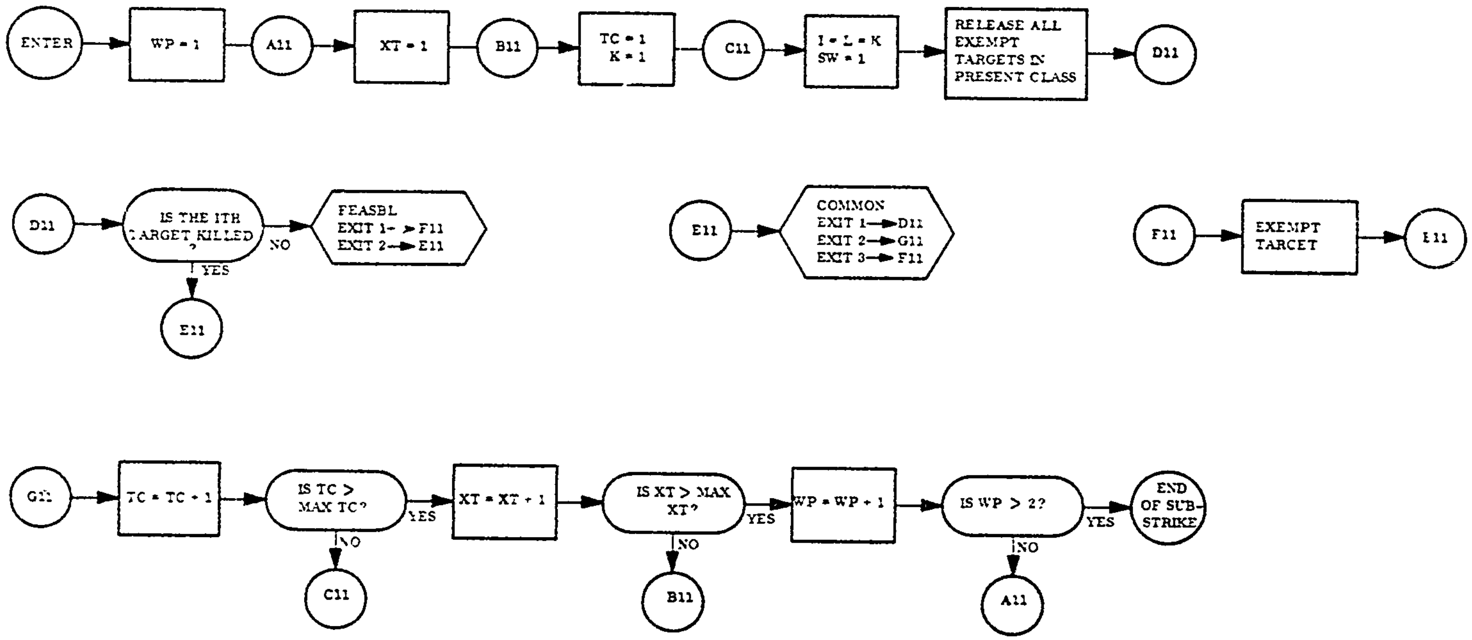
GROSS FLOW CHART FOR ROUTINE LIST 10



PLANNING SPECIFICATION

CROSS TARGET
TARGET CLASS
WEAPON PRIORITY
CANDIDATE/EXEMPT
BASE NOMINEE

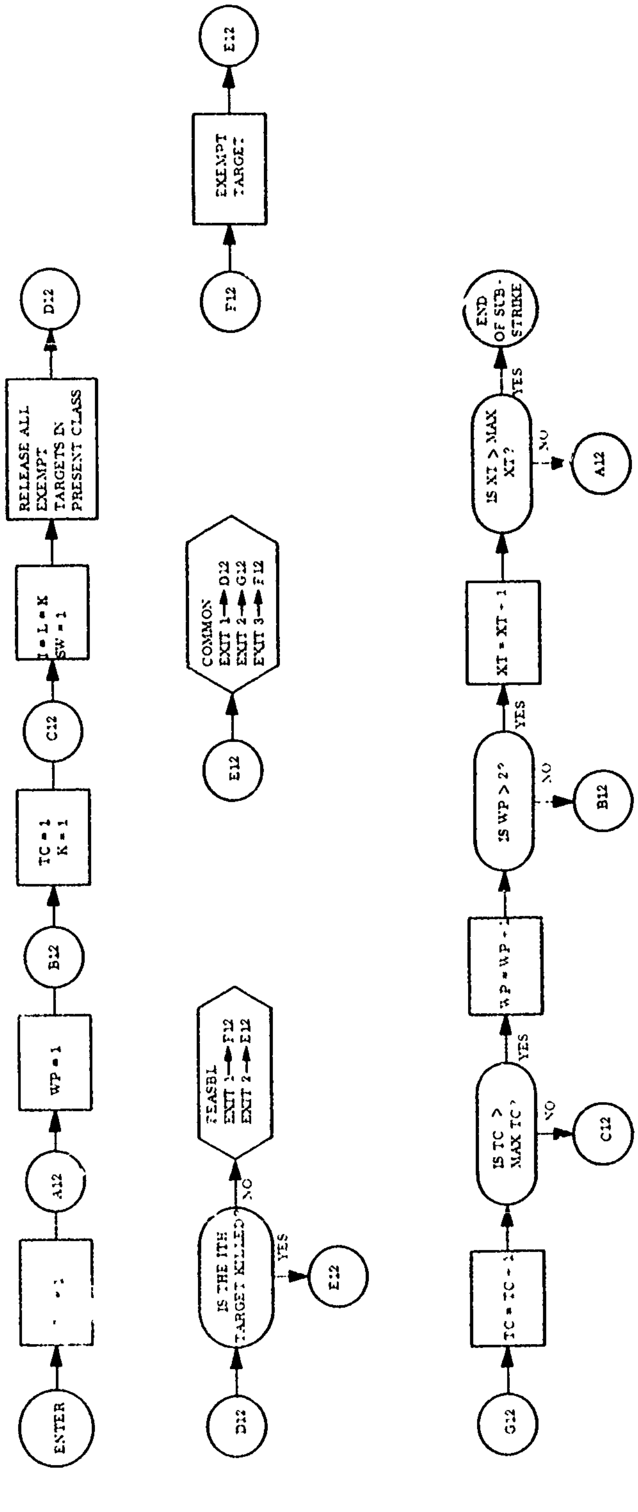
GROSS FLOW CHART FOR ROUTINE LIST 11



PLANNING SPECIFICATION

WEAPON PRIORITY
CROSS TARGET
TARGET CLASS
CANDIDATE, EXEMPT
BASE NOMINEE

GROSS FLOW CHART FOR ROUTINE LIST 12



PLANNING SPECIFICATION
CROSS TARGET
WEAPON PRIORITY
TARGET CLASS
CANDIDATE, EXEMPT
BASE NOMINEE

APPENDIX B

MISSILE ALLOCATION MODEL
USERS AND OPERATORS INSTRUCTIONS

MISSILE ALLOCATION MODEL USERS AND OPERATORS INSTRUCTIONS

INPUT PREPARATION

The inputs to the Missile Allocation Model consist of parameters and several lists of data. The parameters are read from cards, and the lists of data are stored in two reels of tape, the GAME tape and the PLAN tape.

The parameters are single value items that may vary from time to time. As an example, the version of all tables to be used must be input in a card that has the word VERSN keypunched in columns 1 to 5 and the version name keypunched starting in column 16 and not extending beyond column 21.

The GAME tape contains data that remain fairly constant. Inputs to the GAME tape consist of the TARGET, MIBASE, SSPKTB, PLTYPE, VNC and WEAPON tables.

The PLAN tape contains data that vary from substrike to substrike within a game. Tables SITARG and SIMIBA are input to the PLAN tape.

Following is a detailed description of all lists to be input to the Missile Allocation Model of the Plan Writer.

MISSILE BASE LIST. The Missile Base List must contain an entry for every missile base from which surface-to-surface missiles are programmed for launch. Each missile base is assigned an identification number, ranging between 1 and 1000.

Input Information.

Table name: MIBASE

Formats: A single input format is used. One card is input per missile base.

Number of Lines: 1000, maximum

Input to:	GAME tape
Card deck:	Arrangement - an INPOBJ card, followed by up to 1000 data cards, which are ended by a blank card.
Ordering:	Ascending missile base identification number.
Line numbers:	The Missile Base List cards need not have line numbers.
Side:	Each side should have its own Missile Base List.
Printed outputs:	A printed copy of the Missile Base List can be prepared by using the OUTOBJ operation of CL-I.
INPOBJ card:	Cols. 1 - 6 = INPOBJ 12 on = MIBASE/Version, ABMCPD/HHPOOP, TAPE/XY
OUTOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = MIBASE/Version, ABMCPD/HHPOOP, TPFILE/XY
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name, which can be any alphanumeric name of up to six characters.
Tape identification:	X stands for the data channel (A or B) and Y for the unit number (1 - 9), where the GAME tape is mounted during execution of INPOBJ or OUTOBJ operations.

TABLE MIBASE

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1MIBASE	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)1000		Yes
16-20	Missile base identification name		1(1)1000	MIBID	
22-27	Latitude	Deg., Min., Sec.		MILA	
29-36	Longitude	Deg., Min., Sec., E/W		MILO	
54-55	Plane type		1(1)31	MIBPTY	
57-58	Weapon type		1(1)31	MIBWT	
60-62	Unit number		1(1)255	MIBUN	
64-66	Number of missiles to be programmed		1(1)100	MIBNMG	
68-70	Total number of missiles		1(1)100	MIBNM	

MIBASE is the master list of all missile bases in game.

PLANE TYPE LIST. The Plane Type List is used to input the characteristics of the various types of surface-to-surface missiles.

Input Information.

Table name:	**PLTYPE**
Formats.	A single input format is used. Two cards are input per plane type.
Number of Lines:	10, maximum. The Plane Type List cannot be divided into multiple records.
Input to:	GAME tape
Card deck:	Arrangement - an INPOBJ card followed by up to 10 lines of data cards (two cards per line). The last data card is followed by a blank card.
Ordering:	See line numbers.
Line numbers:	The cards for table PLTYPE must both have line numbers and card numbers. Further, the cards must be ordered according to line number and card number within line. That is, line 1 card 1, line 1 card 2, line 2 card 1, etc. The use of line numbers does not imply any relationship between the line number and the plane type being described by the line of data.
Side:	Each side must have its own Plane Type List.
Printed outputs:	A printed copy of the Plane Type List can be prepared by using the OUTOBJ operation of CL-I.
INPOBJ card:	Cols. 1 - 6 = INPOBJ 12 on = PLTYPE/Version, ABMCPD/HHPOOP, TAPE/XY

OUTOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = PLTYPE/Version, ABMCPD/HHPOOP, TPFILE/XY
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It may be any alphanumeric name of up to six characters.
Tape identification:	X denotes the data channel (A or B) and Y the unit number (1 - 9), where the GAME tape is mounted during execution of INPOBJ and OUTOBJ operations.

TABLE PLTYPE

Card 1

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1PLTYPE	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)10		
15	Card number = 1		1		
17-18	Plane type		1(1)31	PLTID	
20-23	Over-all reliability factor		.01(.01)1.00	PLTREL	
25-27	Penetration capability factor		.01).01)1.00	PLTPCF	
29-33	Minimum range	Nautical Miles	1(1)16000	PLTMIN	
35-39	Maximum range	Nautical Miles	1(1)16000	PLTMAX	
41-45	Mode 1 maximum range	Nautical Miles	1(1)16000	DIST	
47-50	Mode 1 CEP	Tens of Feet	1(1)2047	CEP	
52-56	Mode 2 maximum range	Nautical Miles	1(1)16000	DIST2	
58-61	Mode 2 CEP	Tens of Feet	1(1)2047	CEP2	
63	Penetration point marker		0, 1	PLTPNT	
65	Guidance marker		0, 1	PLTCUI	

TABLE PLTYPE

Card 2

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1PLTYPE	STRING			
9	Side		1, 2		Yes
10-14	Line number		1(1)10		
15	Card number = 2		2		
19-23	Mode 3 maximum range	Naut. Miles	1(1)16000	DIST3	
25-28	Mode 3 CEP	Tens of Feet	1(1)2047	CEP3	
30-34	Mode 4 maximum range	Naut. Miles	1(1)16000	DIST4	
36-39	Mode 4 CEP	Tens of Feet	1(1)2047	CEP4	
41-45	Mode 5 maximum range	Naut. Miles	1(1)16000	DIST5	
47-50	Mode 5 CEP	Tens of Feet	1(1)2047	CEP5	
52-56	Mode 6 maximum range	Naut. Miles	1(1)16000	DIST6	
58-61	Mode 6 CEP	Tens of Feet	1(1)2047	CEP6	

SINGLE SHOT PROBABILITY OF KILL LIST. The Single Shot Probability of Kill List is used to input the single shot probabilities of kill as functions of the target vulnerability number, the weapon size, the missile type CEP for a given distance, and the height of burst.

Input Information.

Table name:	**SSPKTB**
Formats:	A single input format is used. One card is input for every feasible combination of target VN, weapon size, CEP, and height of burst.
Number of Lines:	3600, maximum, can be input. Table SSPKTB cannot be divided into multiple records.
Input to:	GAME tape
Card deck:	Arrangement - an INPOBJ card followed by up to 3600 data cards. The last data card must be followed by a blank card.
Ordering:	The cards must be ordered in ascending target VN codes, weapon size, CEP, and HOB sequence.
Line numbers:	The SSPKTB List cards need not have line numbers.
Side:	Each side must have its own SSPKTB List.
Printed outputs:	A printed copy of the Single Shot Probability of Kill List can be prepared by using the OUTOBJ CL-I operation.
INPOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = SSPKTB/Version, ABMCPD/HHPOOP, TAPE/XY
OUTOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = SSPKTB/Version, ABMCPD/HHPOOP, TPFILE/XY

Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can by any alphanumeric name of up to six characters.
Tape identification:	X denotes the data channel (A or B) and Y the unit number (1 - 9), where the GAME tape is mounted during execution of INPOBJ and OUTOBJ operations.

TABLE SSPKTB

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1SSPKTB	STRING			
9	Side		1, 2		Yes
10-14	Line number		1(1)3600		Yes
16-19	Target VN code		1(1)31	SSPVNC	
21-22	Bomb size		1(1)31	SSPBS	
24-27	CEP	Tens of Feet	1(1)2047	SSPCEP	
29	Height of burst		0, 1	SSPHOB	
31-33	Single shot kill probability		.001(.001).999	SSPK	

TARGET LIST. The Target List input to the Missile Allocation Model must contain an entry for every target referenced by the planner. It may also contain additional entries. Therefore, the Plan Writer Target List may be a Master Target List and have as many entries as desired. The list must be divided into records, each containing no more than 1200 targets.

Targets are identified by a target designator. Target designators are five alphanumeric characters. All of the characters must be non-blank. It is not necessary that the target designators have any meaning, but they can be used as a coded representation of target types.

Input Information.

Table name:	TARGET
Formats:	A single input format is used. One card is input per target.
Number of Lines:	1200, maximum, per record. The table TARGET may be divided into several records, each containing not more than 1200 lines.
Input to:	GAME tape
Card deck:	Arrangement - an INPOBJ card followed by up to 1200 data cards, followed by a DIVIDE card, followed by up to 1200 more data cards, etc., until all the data cards are included. The last data card is followed by a blank card, not a DIVIDE card.
Ordering:	The Target List cards must be ordered in ascending target code alphanumeric sequence.
Line number:	The Target List cards do not need to have line numbers.
Side:	Each side should have its own Target List.

Printed outputs: A printed copy of the Target List may be prepared by using the OUTOBJ CL-I operation.

INPOBJ card: Cols. 1 - 6 = INPOBJ

12 on = TARGET/Version, ABMCPD/HHPOOP, TAPE/XY

OUTOBJ card: Cols. 1 - 6 = OUTOBJ

12 on = TARGET/Version, ABMCPD/HHPOOP, TPFILE/XY

Version name: The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Tape identification: X stands for the data channel (A or B) and Y for the unit number (1 - 9), where the GAME tape is mounted during execution of INPOBJ and OUTOBJ operations.

TABLE TARGET

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1TARGET	STRING			
9	Side		1, 2		Yes
10-14	Line number		1(1)1200		Yes
16-20	Target designator	STRING	5 non-blank characters	TACODE	
22-27	Latitude	Deg., Min., Sec.		TALA	
29-36	Longitude	Deg., Min., Sec., E/W		TALO	
58	Height of burst		0, 1	TAHOB	
60-63	Vulnerability number	STRING	4 non-blank characters	TAVN	
65-67	Target prekill		0(.001).999	TAKILL	
69-70	Missile attrition factor		0(.01).99	TMATRF	

TARGET is the master list of all targets in game.

VULNERABILITY NUMBER CODE LIST. The Vulnerability Number Code List is used to assign numeric codes (1 to 31) to the target's vulnerability numbers.

Input Information.

Table name:	VNC
Formats:	A single input format is used.
Number of Lines:	31, maximum, can be input.
Input to:	GAME tape
Card deck:	Arrangement - an INPOBJ card followed by up to 31 data cards.
Ordering:	Ascending target hardness (VN).
Line numbers:	The Vulnerability Number Code List need not have line numbers.
Side:	Each side must have its own VNC List.
Printed outputs:	A printed copy of the VNC List can be prepared by using the CL-I OUTOBJ operations. The output is from the GAME tape.
INPOBJ card:	Cols. 1 - 6 = INPOBJ 12 on = VNC/Version, TAPE/XY
OUTOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = VNC/Version, TPFILE/XY
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any any alphanumeric name of up to six characters.
Tape identification:	X stands for the data channel (A or B) and Y for the unit number (1 - 9), where the GAME tape is stored during execution of INPOBJ and OUTOBJ operations.

Notes on Data. The numeric codes (1 to 31) must be assigned to the vulnerability numbers in an ascending order. That is, a VN for a soft target should be assigned a lower numeric code than a VN for a harder target.

TABLE VNC

Columns	Information	Units	Value Range	Symbol	Optional
1-5	Format and table = F1VNC	STRING			
9	Side		1, 2		Yes
10-14	Line number		1(1)31		Yes
16-19	VN	STRING	4 non-blank characters	VN	
21-22	VN code		1(1)31	VNCODE	

WEAPON LIST. The Weapon List is used to list the weapon characteristics that are required in detailed mission planning.

Input Information.

Table name:	**WEAPON**
Formats:	A single input format is used. One card is input per weapon type.
Number of Lines:	38, maximum, can be input.
Input to:	GAME tape
Card deck:	Arrangement -- an INPOBJ card followed by up to 38 data cards. The last data card must be followed by a blank card.
Ordering:	The Weapon List can be input in any order.
Line numbers:	The Weapon List cards need not have line numbers.
Side:	Each side must have its own Weapon List describing the weapon types which it releases.
Printed outputs:	A printed copy of the Weapon List can be prepared by using the OUTOBJ operation of CL-I.
INPOBJ card:	Cols. 1 - 6 = INPOBJ 12 on = WEAPON/Version, ABMCPD/HHPOOP, TAPE/XY
OUTOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = WEAPON/Version, ABMCPD/HHPOOP, TPFILE/XY
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Tape identification: X denotes the data channel (A or B), and Y the unit number (1 - 9), where the GAME tape is mounted during execution of INPOBJ and OUTOBJ information.

Notes on Data.

1. The first priority, first VN code and priority, and last VN code in priority give the range of target vulnerability number codes for which the weapon would be classified as a first priority weapon. The second priority, first and last VN codes give the range of the target vulnerability number codes within which the weapon would be a second priority weapon.

2. The first to sixth exceptions list target categories (first two characters of the target code) or groups of target categories beginning with the same character that should not be allocated to a weapon of this type even though their VNs are within the ranges considered acceptable for the weapon type.

TABLE WEAPON

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1WEAPON	STRING			
9	Si 'e		1, 2		Yes
10-14	Line number		1(1)38		Yes
16-20	Weapon identification:			WEID	
16-19	Weapon number (bomb or decoy size)		Bombs 1(1)31 Decoys 1(1)6	WEIDN	
20	Weapon type 0 = bomb 1 = ASM 2 = decoy		0, 1, 2	WETYPM	
22-24	Weight of weapon	Thous-ands of pounds	.1(.1)99.9	WEWT	
26-29	Range at which to launch for low altitude launch	Nautical miles	0(1)5000	WERNGL	For ASMs and decoys
31-34	Range at which to launch for high altitude launch	Nautical miles	0(1)5000	WERNGH	For ASMs and decoys
36-37	Plane type corresponding to ASM or decoy type		1(1)31	WEPTYP	For ASMs and decoys
39-41	Deviation for ASM Launch	Nautical miles	1(1)999	WEDEVT	
43-44	First priority first VN code		1(1)31	WVN11C	
46-47	First priority last VN code		1(1)31	WVN12C	
49-50	Second priority first VN code		1(1)31	WVN21C	
52-53	Second priority last VN code		1(1)31	WVN22C	
55-56	First exception	STRING	AA-ZZ or A-Z	WEXCP1	
58-59	Second exception	STRING	AA-ZZ or A-Z	WEXCP2	

TABLE WEAPON
(continued)

Columns	Information	Units	Value Range	Symbol	Optional
61-62	Third exception	STRING	AA-ZZ or A-Z	WEXCP3	
64-65	Fourth exception	STRING	AA-ZZ or A-Z	WEXCP4	
67-68	Fifth exception	STRING	AA-ZZ or A-Z	WEXCP5	
70-71	Sixth exception	STRING	AA-ZZ or A-Z	WEXCP6	

MISSILE BASE SUBSTRIKE INPUT LIST. The Missile Base Substrike Input List contains a listing of the missile bases to be considered in a substrike. It is not necessary to have an entry for every missile base. If a group of consecutive missile bases in the MIBASE List is to be input to a substrike, only the first and last missile bases in the group need be listed, provided that all other information input by the SIMIBA List is identical for all missile bases in the group.

Input Information.

Table name:	SIMIBA
Format:	A single input format is used. One card is input per missile base or group of consecutive missile bases.
Number of Lines:	100, maximum
Input to:	PLAN tape
Card deck:	Arrangement - an INPOBJ card followed by up to 100 data cards, ended by a blank card.
Ordering:	The Missile Base Substrike Input List can be input in any order.
Line number:	The SIMIBA List cards do not need to have line numbers.
Side:	Each side should have its own SIMIBA List.
Printed outputs:	A printed copy of the SIMIBA List can be prepared by using the OUTOBJ operation of CL-I. The output is from the PLAN tape.
INPOBJ card:	Cols. 1 - 6 = INPOBJ 12 on = SIMIBA/Version, ABMCPD/HHPOOP, TAPE/XY
OUTOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = SIMIBA/Version, ABMCPD/HHPOOP, TPFILE/XY

Version name: The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Tape identification: X stands for the data channel (A or B) and Y for the unit number (1 - 9), where the PLAN tape is mounted during execution of INPOBJ or OUTOBJ operations.

Notes on Data. When only one missile base is input per card, columns 21 to 24 of the data cards are left blank, and the missile base identification number is entered in columns 16 to 19. When several consecutive missile bases are input per card, the missile base in the group with the lowest identification number is entered in columns 16 to 19, and the one with the highest identification number is entered in columns 21 to 24.

TABLE SIMIBA

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1SIMIBA	STRING			
9	Side		1,2		Yes
10-14	Line number		1(1)100		Yes
16-19	First missile base identification name		1(1)1000	SIMB1	
21-24	Last missile base identification name		1(1)1000 or blanks	SIMB2	
26-28	Percentage of weapons		.01(.01)1.00	SIMPCT	
30-32	Base survival factor		.01(.01)1.00	SIBSF	
34	Time reference		0,1,2,3,4	SITREF	
36-39	First sortie time.			SITIME	
36-37	Hours	Hours	0(1)99	SIHRS	
38-39	Minutes	Minutes	0(1)59	SIMINS	
41-43	Time increment	Minutes	0(.1)99.9	SITINC	

SIMIBA is the planner's input of missile bases assigned to a substrike.

TARGET SUBSTRIKE INPUT LIST. The Target Substrike Input List contains a listing of the targets to be considered in a substrike. It is not necessary to have an entry for every target. If a group of consectuve targets in the TARGET List is to be input to a substrike, only the first and last targets in the group need be listed, provided that all targets in the group belong to the same target class, have identical minimum and maximum kill probabilities and the same relative worth factor.

Input Information.

Table name:	**SITARG**
Formats:	A single input format is used. One card is input per target or group of consecutive targets.
Number of lines:	100, maximum
Input to:	PLAN tape
Card deck:	Arrangement - an INPOBJ card followed by up to 100 data cards ended by a blank card.
Ordering:	The SITARG List must be ordered in ascending target class sequence. The first target class number must be 1, and no gaps in the numbering sequence are allowed.
Line numbers:	The SITARG List cards do not need to have line numbers.
Side:	Each side should have its own SITARG List.
Printed outputs:	A printed copy of the SITARG List can be prepared by using the OUTOBJ CL-I operation. The output is from the PLAN tape.
INPOBJ card:	Cols. 1 - 6 = INPOBJ 12 on = SITARG/Version, ABMCPD/HHPOOP, TAPE/XY
OUTOBJ card:	Cols. 1 - 6 = OUTOBJ 12 on = SITARG/Version, ABMCPD/HHPOOP, TPFILE/XY

Version name: The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Tape identification: X stands for the data channel (A or B) and Y for the unit number (1 - 9), where the PLAN tape is mounted during execution of INPOBJ or OUTOBJ operations.

Notes on Data. When only one target is input per card, columns 22 to 26 of the data cards are left blank, and the target identification name is entered in columns 16 to 20. When several consecutive targets are input per card, the target in the group with the lowest alphanumeric name is entered in columns 16 to 20, and the one with the highest alphanumeric name is entered in columns 22 to 26.

TABLE SITARG

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1SITARG	STRING			
9	Side		1, 2		Yes
10-14	Line number		1(1)100		Yes
16-20	First target identification name	STRING	5 non-blank characters	SITAR1	
22-26	Last target identification name	STRING	5 non-blank characters or 5 blanks	SITAR2	
28-29	Target class		1(1)50	SITARC	
31-33	Minimum kill probability		0(.001).999	SMINKP	
35-37	Maximum kill probability		0(.001).999	SMAXKP	
39-41	Relative worth factor		.01(.01)1.00	SITRWF	

SITARG is the planner's input of targets assigned to a substrike.

DISCUSSION OF COMPUTER OPERATIONS

The finished portion of the Missile Allocation Model has been designed and constructed using the CL-1 Programming System. The preparation of input tapes and the running of the Missile substrikes are done under control of the CL-I System.

INPUT PROCESSING. In order to construct the GAME and PLAN tapes, a process called TAPEID is used. This process leaves the selection of the data channel and unit up to the user. The only frames that cannot be designated are A1, A4, B2, B3, B4, and B5.

Both the GAME and the PLAN tapes are composed of two files. The first file is the tape identification file, and it contains one record that is made up of at least four, and no more than 10 words of which the first is the alphabetic word PWGAME for the GAME tape and PWPLAN for the PLAN tape. The other words are left at the option of the user. The second file of the GAME tape contains from 6 to 10 records: one for the Missile Base List, one for the Plane Type List, one for the Single Shot Probability of Kill List, from one to five records for the Target List, one for the Vulnerability Number Code List, and one for the Weapon List. The second file of the PLAN tape contains two records: the Missile Base Substrike Input List and the Target Substrike Input List.

The card deck arrangement for processing the GAME and PLAN tapes is as follows:

Columns 1 - 6	Columns 12 on
MFTPPR	7
TESTMF	PLNWTR
Δ	
EXCPRC	TAPEID
TAPEXY	

Columns 1 - 6	Columns 12 on
PWGAME	
(At least 3, no more than 9, non-blank cards)	
Δ	
Δ	
INPOBJ	MIBASE/Version, ABMCPD/HHPOOP
	TAPE/XY
(Up to 1000 MIBASE data cards)	
Δ	
INPOBJ	PLTYPE/Version, ABMCPD/HHPOOP,
	TAPE/XY
(Up to 10 lines of data cards, 2 cards per line)	
Δ	
INPOBJ	SSPKTB/Version, ABMCPD/HHPOOP,
	TAPE/XY
(Up to 3600 SSPKTB data cards)	
Δ	
INPOBJ	TARGET/Version, ABMCPD/HHPOOP,
	TAPE/XY
(Up to 1200 TARGET data cards)	
DIVIDE	
(Up to 1200 TARGET data cards)	
.	.
.	.
.	.
.	.
DIVIDE	
(Up to 1200 TARGET data cards)	

Columns 1 - 6	Columns 12 on
Δ	
INPOBJ	VNC/Version, TAPE/XY
(Up to 31 VNC data cards)	
INPOBJ	WEAPON/Version, ABMCPD/HHPOOP, TAPE/XY
(Up to 38 WEAPON data cards)	
Δ	
EXCPRC	TAPEID
TAPEXY	
PWPLAN	
(At least 3, no more than 9, non-blank cards)	
Δ	
Δ	
INPOBJ	SIMIBA/Version, ABMCPD/HHPOOP, TAPE/XY
(Up to 100 SIMIBA data cards)	
Δ	
INPOBJ	SITARG/Version, ABMCPD/HHPOOP, TAPE/XY
(Up to 100 SITARG data cards)	
Δ	
FINISH	
Δ	
Δ	

The first card after EXCPRC TAPEID designates the data channel (A or B) in column 5 and the unit number (1 - 9) in column 6. Units that cannot be selected are A1, A4, B2, B3, B4, and B5.

The operating instructions for processing the GAME and PLAN tapes are as follows:

1. Equipment required:
   a. Tapes: Two "A" channel frames, four "B" channel frames and two extra frames (either A or B).
   b. Card reader
   c. Printer
2. Operating steps:
   a. Tapes: A1 - Current CL-I System Program Tape
      A4 - Missile Allocation Routine
      Master File (reel M-187)
      B2 - Blank
      B3 - Blank; TAPOUT - to be printed
      B4 - Blank
      B5 - Blank
      B7 - Blank; PWPLAN tape - to be saved (could be any other frame)
      B8 - Blank; PWGAME tape - to be saved (could be any other frame)
   b. Sense switches: 1 and 4 down, the others up.
   c. Card reader: Load cards in card reader
   d. Clear core and load tape.

3. Expected stop: "FINISH" on the on-line printer.

4. Outputs: Save tape B3; mark "TAPOUT" for printing. Save tape B7; mark "PWPLAN"; for input to the Missile Allocation Routine. Save tape B8; mark "PWGAME"; for input to the Missile Allocation Routine. Save printer comment sheet.

5. Printer comments: The usual CL-I System comments appear.

RUNNING THE MISSILE ALLOCATION ROUTINE. The finished portion of the Missile Allocation Model is run by executing a process called NO1. The execution of this process requires the following card deck arrangement:

Columns 1 - 6	Columns 12 on
MFTPPR	7
TESTMF	PLNWTR
Δ	
EXCPRC	NO1
Δ	
VERSN	Version (same as version name in
Δ	PLAN and GAME tapes).
Δ	
OUTOBJ	STLB/Version, ABMCPD/HHPOOP,
Δ	TAPE/A6
EXCPRC	REWYND
Δ	
OUTOBJ	SSMIBA/Version, ABMCPD/HHPOOP,
Δ	TAPE/A7

Columns 1 - 6	Columns 12 on
EXCPRC	REWYND
Δ	
OUTOBJ	SSTARG/Version, ABMCPD/HHPOOP, TAPE/A7
Δ	
FINISH	
Δ	
Δ	

The operating instructions for running the finished portion of the Missile Allocation Routine follow below. The finished portion of the Missile Allocation Routine produces the Substrike List of Targets, the Substrike List of Missile Bases, and the Target List of Bases.

1. Equipment required:
   a. Tapes: Five"A" channel frames and six "B" channel frames.
   b. Card reader
   c. Printer

2. Operating steps:
   a. Tapes: A1 - Current CL-I System Program Tape
      A4 - Missile Allocation Routine Master File (reel M-187)
      A5 - Blank
      A6 - Blank
      A7 - Blank
      B2 - Blank
      B3 - Blank; TAPOUT - to be printed
      B4 - Blank
      B5 - Blank
      B7 - PWPLAN tape
      B8 - PWGAME tape

b. Sense switches: 1 and 4 down, the others up.

c. Card reader: Load cards in card reader.

d. Clear core and load tape.

3. Expected stop: "FINISH" on the on-line printer.

4. Outputs: Save tape B3; mark "TAPOUT"; for printing. Save printer comment sheet.

5. Printer comments: In addition to the usual CL-I System comments, appropriate error messages are printed if errors are found.

APPENDIX C

AIRCRAFT ALLOCATION MODEL

TABLE GENERATOR

USERS AND OPERATORS INSTRUCTIONS

APPENDIX C

AIRCRAFT ALLOCATION MODEL
TABLE GENERATOR
USERS AND OPERATORS INSTRUCTIONS

INTRODUCTION

This section presents a preliminary discussion of the Table Generator Computer Programs that have been coded and checked out. Included in Appendix C are: a description of the required input data; the necessary instructions for proper computer operations; an "English language" description of the computer programs for Tasks A and D; and a summary of Programmers Notes.

Many of the input tables and the computer programs used by Table Generator were developed for use in the Plan Writer Missile Allocation Model; whenever these similarities exist, the appropriate tables and/or programs (routines) will be mentioned.

TABLE GENERATOR INPUTS

GENERAL COMMENTS. In this section, the inputs will be indicated as coming from one of three sources:

- GAME Tape
- PLAN Tape
- Parameters

The GAME tape contains data that remain constant from game to game (i.e., from time to time). Examples of this are tables such as Target list, Base list, SSPK values, etc. The PLAN tape contains data that not only vary from game to game, but may change from substrike to substrike within a game. Examples of this are the Point list, Route list, planning factors, etc. The Parameters are single-valued items which may vary from time to time. Examples are value of an angle to be used in a particular test, versions of a table to be used, etc.

Both the GAME and PLAN tapes have the same physical structure, i.e., two files on a tape. The first file contains an identification record, the first word of which must be PWGAME for the GAME tape or PWPLAN for the PLAN tape. The second file contains instances of the necessary tables to be used. Within this second file the tables may be in any desired order, and tables not used by Plan Writer may also appear, if desired. The above mentioned PLAN and GAME tapes are common to both Table Generator and the Missile Allocation Model.

Both input tapes may be created during a single CL-I System run. The identification file can be placed on the tapes by using a process called TAPEID; the tables in the second file are placed on tape by using the TAPE/XY option of INPOBJ. A listing of the tapes can be obtained by using the TAPES option of ALLOUT. (A detailed description of process TAPEID is presented on page C-62.)

TABLE DESCRIPTIONS AND CARD FORMATS. In this section, the detailed table descriptions, including the necessary card formats are presented. Where applicable, additional comments are given to aid in preparing the input data.

The tables are stored on tape by using the INPOBJ operation of the CL-I System; a listing of the tables may be obtained by using the OUTOBJ operation of the CL-I System, or by executing process ALLOUT. If the OUTOBJ operation is used, the tape should be positioned at the beginning of the second file.

Base List. The Base List must contain an entry for at least every offensive manned aircraft base from which aircraft are programmed for takeoff.

Input Information.

Table Name:	**BASE**
Formats:	A single input format is used. One card is input per base.
Number of Lines:	700, maximum. The BASE table cannot be divided into multiple records.
Input to:	GAME Tape.
Card deck:	Arrangement - an INPOBJ card followed by up to 700 data cards. The last data card is followed by a blank card.
Ordering:	The Base List can be input in any order.
Line numbers:	The Base List cards do not need to have line numbers.
Side:	Each side must have its own Base List.
Printed outputs:	A printed copy of the Base List can be prepared by using the OUTOBJ L_p operation CL-I, or process ALLOUT. The output is from the GAME tape.
INPOBJ card:	Cols: 1 - 6 = INPOBJ 12 on = BASE/Version, ABMCPD/HHPOOP, TAPE/A6
OUTOBJ card:	Cols: 1 - 6 = OUTOBJ 12 on = BASE/Version, ABMCPD/HHPOOP, TPFILE/A6
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Several instances of table BASE can be on the GAME tape, providing they have different version names. This permits the same files to be used for several problems.

TABLE BASE

Columns	Information	Units	Value Range	Symbol	Optional
1-6	Format and table name = FIBASE	STRING			
9	Side		1, 2		Yes
10-15	Line number		1(1)700		Yes
16-20	Base identification		1(1)1000	BASIDN	
22-27	Latitude	Deg, Min, Sec.		BALA	
29-36	Longitude	Deg, Min, Sec, E/W		BALO	

INASTB List. The INASTB List is an input association list which specifies the bases (non-refueled), refueling areas, or air alert points associated with each cell. This list also contains the association of bases with refueling areas. The items in table INASTB refer to elements of other input lists, namely either BASE, REFUEL, or POINT Lists.

Input Information.

Table Name:	**INASTB**
Formats:	A single input format is used. One card is input for each line in the table.
Number of Lines:	200, maximum. The INASTB List cannot be divided into multiple records.
Input to:	PLAN Tape.
Card deck:	Arrangement - an INPOBJ card followed by up to 200 data cards. The last data card is followed by a blank card.
Ordering:	The cards in the INASTB List can be input in any order.
Line numbers:	The cards do not need to have line numbers.
Side:	Each side must have its own INASTB List.
Printed outputs:	A printed copy of the INASTB List can be prepared by using the OUTOBJ L_p operation of CL-I or process ALLOUT. The output is from the PLAN tape.
INPOBJ card:	Cols: 1 - 6 = INPOBJ 12 on = INASTB/Version, TAPE/A7
OUTOBJ card:	Cols: 1 - 6 = OUTOBJ 12 on = INASTB/Version, TPFILE/A7
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six ch[illegible]ters.

Several instances of table INASTB can be on the PLAN tape, providing they [illegible] different version names. This permits the same files to be used for several problems.

Notes on Data.

1. To associate non-refueled bases with cells, the base identification should be filled in, and up to 10 cells may be entered on a card. The air alert flag and the refueling area should be left blank.

2. To associate air alert points with cells, the air alert identification should be filled in, the air alert flag should be set equal to 1, and up to 10 cells may be entered on a card. The refueling area should be left blank.

3. To associate refueling areas with cells, the refueling area identification should be filled in, a base identification should be given, and up to 10 cells may be entered on a card. The air alert flag should be left blank.

4. If more than one base is to refuel at a given refueling area, then additional cards must be entered for each base. Each of these additional cards must contain both the refueling area identification and the cell identification(s).

5. A maximum of 10 cells may be entered on each card. If less than 10 cells are entered, they can be put in any of the appropriate columns for cell identification, since the entire card is scanned.

TABLE INASTB

Columns	Information	Units	Value Range	Symbol	Optional
1-6	Format and table name = FIINAS	STRING			
10-14	Line number		1(1)200		YES
16-20	Base or air alert point identification		1(1)1000	INBASE	
22	Air alert flag		0, 1	INAAFL	
24-28	Refueling area identification		1(1)600	INREF	YES
30-32	First cell		1(1)999	CELL 1	
34-36	Second cell		1(1)999	CELL 2	YES
38-40	Third cell		1(1)999	CELL 3	YES
42-44	Fourth cell		1(1)999	CELL 4	YES
46-48	Fifth cell		1(1)999	CELL 5	YES
50-52	Sixth cell		1(1)999	CELL 6	YES
54-56	Seventh cell		1(1)999	CELL 7	YES
58-60	Eighth cell		1(1)999	CELL 8	YES
62-64	Ninth cell		1(1)999	CELL 9	YES
66-68	Tenth cell		1(1)999	CELL 10	YES

Point List. The Point List is used to input the coordinates of any desired location. These locations can then be referred to by the point identification. Similar to the Sortie Programmer, routes are defined as sequences of points. The initial coordinates for air alert missions are specified by referencing a point on the Point List.

Input Information.

Table Name:	**POINT**
Formats:	A single input format is used. One card is input per point.
Number of Lines:	1300, maximum. The Point List cannot be divided into multiple records.
Input to:	PLAN Tape
Card Deck.	Arrangement - an INPOBJ card followed by up to 1300 data cards. The last data card is followed by a blank card.
Ordering:	The Point List cards can be input in any order.
Line numbers:	The Point List cards do not need line numbers.
Side:	Each side must have its own Point List.
Printed outputs:	A printed copy of the Point List can be obtained by using the OUTOBJ L_p operation of CL-I, or process ALLOUT. The output is from the PLAN tape.
INPOBJ card:	Cols: 1 - 6 = INPOBJ 12 on = POINT/Version, ABMCPD/HHPOOP, TAPE/A7
OUTOBJ card:	Cols: 1 - 6 = OUTOBJ 12 on = POINT/Version, ABMCPD/HHPOOP, TPFILE/A7
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Several instances of table POINT can be on the PLAN tape, providing they have different version names. This permits the same files to be used for several problems.

Notes on Data.

1. The Point List must contain an entry for every point appearing on a route specified in table ROUTE. The numbering systems must be consistent. It must also contain an entry for every point used as an air alert point.

2. Points may be superimposed; i.e., two or more points may have the same coordinates but different identifications. This may be necessary to provide for certain special cases of route overlaps (see table ROUTE).

3. Points which are to be referred to on the Route List must be identified by numbers between 1 and 999. Air alert points may use all possible values of the point identification name.

TABLE POINT

Columns	Information	Units	Value Range	Symbol	Optional
1-7	Format and table name = F1POINT	STRING			
9	Side		1, 2		YES
10-14	Line number		1(1)1300		YES
16-20	Point identification		1(1)1300	POID	
22-27	Latitude	Deg, Min, Sec.		POLA	
29-36	Longitude	Deg, Min, Sec. E/W		POLO	

Refueling Area List. The Refueling Area List is used to input the locations at which aerial refueling can occur.

Input Information.

Table Name:	REFUEL
Formats:	A single input format is used. One card is input per refueling area.
Number of Lines:	600, maximum. The Refueling Area List cannot be divided into multiple records.
Input to:	PLAN tape
Card deck:	Arrangement - an INPOBJ card followed by up to 600 data cards. The last data card is followed by a blank card.
Ordering:	The Refueling Area List can be input in any order.
Line numbers:	The Refueling Area List cards do not need to have line numbers.
Side:	Each side must have its own Refueling Area List.
Printed outputs:	A printed copy of the Refueling Area List can be obtained by using the OUTOBJ L_p operation of CL-I, or process ALLOUT. The output is from the PLAN tape.
INPOBJ card:	Cols: 1 - 6 = INPOBJ 12 on = REFUEL/Version, ABMCPD/HHPOOP, TAPE/A7
OUTOBJ card:	Cols: 1 - 6 = OUTOBJ 12 on = REFUEL/Version, ABMCPD/HHPOOP, TPFILE/A7
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Several instances of table REFUEL can be on the PLAN tape, providing they have different version names. This permits the same files to be used for several problems.

TABLE REFUEL

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = FIREFUEL	STRING			
9	Side		1, 2		YES
10-14	Line number		1(1)600		YES
16-20	Refueling area identification		1(1)600	REFIDN	
22-27	Latitude	Deg, Min, Sec.		RELA	
29-36	Longitude	Deg, Min, Sec. E/W		RELO	
38	Post strike marker		0, 1	REPSM	YES, not used in Table Generator

Route List. The Route List specifies routes which are used for penetration corridors. A route is specified by a sequence of points, the coordinates of which must appear in the Point List.

Input Information.

Table Name:	**ROUTE**
Formats:	A single input format is used. One card is input per route.
Number of Lines:	300, maximum, may be input. The table ROUTE cannot be divided into multiple records.
Input to:	PLAN Tape
Card deck:	Arrangement - an INPOBJ card followed by up to 300 data cards. The last data card is followed by a blank card.
Ordering:	The Route List can be input in any order.
Line numbers:	The Route List cards do not need to have line numbers.
Side:	Each side must have its own Route List describing the routes it will use.
Printed outputs:	A printed copy of the Route List can be prepared by using the OUTOBJ L_p operation of CL-I, or process ALLOUT. The output is from the PLAN tape.
INPOBJ card:	Cols: 1 - 6 = INPOBJ 12 on = ROUTE/Version, TAPE/A7
OUTOBJ card:	Cols: 1 - 6 = OUTOBJ 12 on = ROUTE/Version, TPFILE/A7
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Several instances of table ROUTE can be on the PLAN tape, providing they have different version names. This permits the same files to be used for several problems.

Notes on Data.

1. It is permissible to define two points in the same geographic location. These points can each appear on different routes.

2. A route must be written for each point which is a terminal point in a corridor.

3. If a point is a penetration (or depenetration) point on one route, then it must be a penetration (or depenetration) point on every route using it.

4. If a point is in friendly territory, then it must be so defined for every route using it.

5. If a point is the end of a high leg, then it must be so on every route using it. The restrictions on point usage can be avoided by using coincident points.

6. If it is desired to penetrate aircraft at a single point without flying through a corridor, then it is necessary to declare the point as a route.

7. The penetration point entry on table ROUTE does not need to be filled in if the entire route is over enemy territory.

8. All legs preceding the penetration point are in friendly territory.

9. The last high leg and the penetration point are both the identification numbers of points on the route.

10. The route identification is for both internal and external use. Any comments regarding a route will reference the route identification.

TABLE ROUTE

Columns	Information	Units	Value Range	Symbol	Optional
1-7	Format and table name = F1ROUTE	STRING			
9	Side		1, 2		YES
10-14	Line number		1(1)300		
16-20	Route identification		1(1)300	PNID	YES
23	Type of route 1 = penetration only 2 = depenetration only 3 = both penetration & depenetration		1, 2, 3	PNRTE	
25-27	First point on route		1(1)999	PNP1	
29-31	Second point on route		1(1)999	PNP2	YES
33-35	Third point on route		1(1)999	PNP3	YES
37-39	Fourth point on route		1(1)999	PNP4	YES
41-43	Fifth point on route		1(1)999	PNP5	YES
45-47	Sixth point on route		1(1)999	PNP6	YES
49-51	Seventh point on route		1(1)999	PNP7	YES
53-55	Eighth point on route		1(1)999	PNP8	YES
57-59	Ninth point on route		1(1)999	PNP9	YES
61-63	Tenth point on route		1(1)999	PNP10	YES
65-67	Penetration point		1(1)999	PNPEN	YES
69-71	Last high leg		1(1)999	PNLSTH	YES

Target Substrike Input List. The Target Substrike Input List contains a listing of the targets to be considered in a substrike. It is not necessary to have an entry for every target. If a group of consecutive targets in the TARGET List is to be input to a substrike, only the first and last targets in the group need be listed, provided that all targets in the group belong to the same target class, have identical minimum and maximum kill probabilities and the same relative worth factor.

Input Information.

Table Name:	**SITARG**
Format:	A single input format is used. One card is input per target or group of consecutive targets.
Number of Lines:	100, maximum
Input to:	PLAN tape
Card deck:	Arrangement - an INPOBJ card followed by up to 100 data cards ended by a blank card.
Ordering:	The SITARG List must be ordered in ascending target class sequence. The first target class number must be 1, and no gaps in the numbering sequence are allowed.
Line number:	The SITARG List cards do not need to have line numbers.
Side:	Each side should have its own SITARG List.
Printed outputs:	A printed copy of the SITARG List can be prepared by using the OUTOBJ CL-I operation, or process ALLOUT. The output is from the PLAN tape.
INPOBJ card:	Cols: 1 - 6 = INPOBJ 12 on = SITARG/Version, ABMCPD/HHPOOP, TAPE/A7
OUTOBJ card:	Cols: 1 - 6 = OUTOBJ 12 on = SITARG/Version, ABMCPD/HHPOOP, TPFILE/A7
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Notes on Data. When only one target is input per card, columns 22 to 36 of the data cards are left blank, and the target identification name is entered in columns 16 to 20. When several consecutive targets are input per card, the target in the group with the lowest alphanumeric name is entered in columns 16 to 20, and the one with the highest alphanumeric name is entered in columns 22 to 26.

TABLE SITARG

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1SITARG	STRING			
9	Side		1, 2		YES
10-14	Line number		1(1)100		YES
16-20	First target identification name	STRING	5 non-blank characters	SITAR1	
22-26	Last target identification name	STRING	5 non-blank characters or 5 blanks	SITAR2	
28-29	Target class		1(1)50	SITARC	
31-33	Minimum kill probability		0(.001).999	SMINKP	
35-37	Maximum kill probability		0(.001).999	SMAXKP	
39-41	Relative worth factor		.01(.01)1.00	SITRWF	

SITARG is the planner's input of targets assigned to a substrike.

Target List. The Target List input to the Missile Allocation Model must contain an entry for every target referenced by the planner. It may also contain addition entries. Therefore, the Plan Writer Target List may be a Master Target List and have as many entries as desired. The list must be divided into records, each containing no more than 1200 targets.

Targets are identified by a target designator. Target designations are five alphanumeric characters. All of the characters must be non-blank. It is not necessary that the target designators have any meaning, but they can be used as a coded representation of target types.

Input Information.

Table Name:	TARGET
Formats:	A single input format is used. One card is input per target.
Number of Lines:	1200, maximum, per record. The table TARGET may be divided into several records, each containing not more than 1200 lines.
Input to:	GAME tape
Card deck:	Arrangement - an INPOBJ card followed by up to 1200 data cards, followed by a DIVIDE card, followed by up to 1200 more data cards, etc., until all the data cards are included. The last data card is followed by a blank card, not a DIVIDE card.
Ordering:	The Target List cards must be ordered in ascending target code alphanumeric sequence.
Line number:	The Target List cards do not need to have line numbers.
Side:	Each side should have its own Target List.
Printed outputs:	A printed copy of the Target List may be prepared by using the OUTOBJ CL-I operation, or process ALLOUT. The output is from the GAME tape.

INPOBJ card: Cols: 1 - 6 = INPOBJ

12 on = TARGET/Version, ABMCPD/HHPOOP, TAPE/A6

OUTOBJ card: Cols: 1 - 6 = OUTOBJ

12 on = TARGET/Version, ABMCPD/HHPOOP, TPFILE/A6

Version name: The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

TABLE TARGET

Columns	Information	Units	Value Range	Symbol	Optional
1-8	Format and table name = F1TARGET	STRING			
9	Side		1, 2		YES
10-14	Line number		1(1)1200		YES
16-20	Target designator	STRING	5 non-blank characters	TACODE	
22-27	Latitude	Deg, Min, Sec.		TALA	
29-36	Longitude	Deg, Min, Sec. E/W		TALO	
56	Target defense marker		0, 1	TADEFM	
58	Height of burst		0, 1	TAHOB	
60-63	Vulnerability number	STRING	4 non-blank characters	TAVN	
65-67	Target prekill		0(.001).999	TAKILL	
69-70	Missile attrition factor		0(.01).99	TMATRF	

TARGET is the master list of all targets in game.

Vulnerability Number Code List. The Vulnerability Number Code List is used to assign numeric codes (1 to 31) to the target's vulnerability numbers.

Input Information.

Table Name:	**VNC**
Formats:	A single input format is used.
Number of Lines:	31, maximum,lines can be input.
Input to:	GAME tape
Card deck:	Arrangement - an INPOBJ card followed by up to 31 data cards.
Ordering:	Ascending target hardness (VN).
Line numbers:	The Vulnerability Number Code List need not have line numbers.
Side:	Each side must have its own VNC List.
Printed outputs:	A printed copy of the VNC List can be prepared by using the CL-I OUTOBJ operations, or process ALLOUT. The output is from the GAME tape.
INPOBJ card:	Cols: 1 - 6 = INPOBJ 12 on = VNC/Version, TAPE/A6
OUTOBJ card:	Cols: 1 - 6 = OUTOBJ 12 on = VNC/Version, TPFILE/A6
Version name:	The INPOBJ and OUTOBJ cards must both use the same version name. It can be any alphanumeric name of up to six characters.

Notes on Data. The numeric codes (1 to 31) must be assigned to the vulnerability numbers in an ascending order. That is, a VN for a soft target should be assigned a lower numeric code than a VN for a harder target.

TABLE VNC

Columns	Information	Units	Value Range	Symbol	Optional
1-5	Format and table name = F1VNC	STRING			
9	Side		1, 2		YES
10-14	Line number		1(1)31		YES
16-19	VN	STRING	4 non-blank characters	VN	
21-22	VN code		1(1)31	VNCODE	

COMPUTER OPERATIONS

The Table Generator programs have been designed and constructed using the CL-I Programming System and all portions of the program are operated under CL-I System Control. This section describes all pertinent information pertaining to the computer operations and is divided into the following subsections:

- Preparation of Data Tape
- Table Generator Runs
- Output Tables

PREPARATION OF DATA TAPES. This section describes the necessary card deck arrangement for preparing the two data tapes, the GAME and PLAN tapes. The following lists summarize on which tape the input tables must be placed:

GAME Tape	PLAN Tape
BASE	INASTB
TARGET	POINT
VNC	REFUEL
	ROUTE
	SITARG

The following sample decks shows the card arrangement necessary to prepare both the GAME and PLAN tapes, as well as the cards needed for obtaining a printout of these tapes:

Columns 1 - 6	Columns 8 - 10	Columns 12 on
NEWJOB		(any information desirable)
MFTPPR		7
TESTMF		PLNWTR
Blank Card		

Columns 1 - 6	Columns 8 - 10	Columns 12 on
EXCPRC		TAPEID
TAPE A6		
PWGAME		

(Following the PWGAME card, one to nine cards may be used; the information in columns 1 - 6 of these cards will form the rest of the ID record on the GAME tape.)

Blank Card		
Blank Card		
INPOBJ		BASE/Version, ABMCPD/HHPOOP, TAPE/A6
(Data Cards)		
Blank Card		
INPOBJ		TARGET/Version, ABMCPD/HHPOOP, TAPE/A6
(Data Cards)		
Blank Card		
INPOBJ		VNC/Version, ABMCPD/HHPOOP, TAPE/A6
(Data Cards)		
Blank Card		
DEFPRG		A6
	MVT	A6, REWIND
	END	
Blank Card		
EXCPRC		ALLOUT
TAPES		A6
Blank Card		
EXCPRC		TAPEID
TAPE A7		
PWPLAN		

Columns 1 - 6	Columns 8 - 10	Columns 12 on
(Following the PWPLAN card, one to nine cards may be used; the information in columns 1 - 6 of these cards will form the rest of the ID record on the PLAN tape.)		
Blank Card		
Blank Card		
INPOBJ		SITARG/Version, ABMCPD/HHPOOP, TAPE/A7
(Data Cards)		
Blank Card		
INPOBJ		ROUTE/Version, TAPE/A7
(Data Cards)		
Blank Card		
INPOBJ		POINT/Version, ABMCPD/HHPOOP, TAPE/A7
(Data Cards)		
Blank Card		
INPOBJ		INASTB/Version, TAPE/A7
(Data Cards)		
Blank Card		
INPOBJ		REFUEL/Version, ABMCPD/HHPOOP, TAPE/A7
(Data Cards)		
Blank Card		
DEFPRG		A7
	MVT	A7, REWIND
	END	
Blank Card		
EXCPRC		ALLOUT
TAPES		A7
Blank Card		
FINISH		

Columns 1 - 6	Columns 8 - 10	Columns 12 on
Blank Card		
Blank Card		

Two comments should be made about the above sample deck. First, it is not necessary to make both data tapes in a single run. Second, the order of the tables in the second file of the tapes is quite arbitrary; the above ordering is to serve only as an example.

A Summary of the tapes needed for such a run is given below:

A1	CL-I System Tape
A2	BCD input tape (if tape input)
A3	Blank, used by process ALLOUT
A4	Old Master File
A6	Blank, to be marked GAME Tape
A7	Blank, to be marked PLAN Tape
B1	Blank, used by process ALLOUT
B2	Blank, used by CL-I System
B3	Blank, output tape to be printed
B4	Blank, used by CL-I System
B5	New Master File

TABLE GENERATOR RUNS. The details of preparing the necessary card decks for running the two Table Generator tasks are summarized. Both tasks are run under normal CL-I control.

1. Card Deck for TASKA Operation

Columns 1 - 6	Columns 8 - 10	Columns 12 on	Columns 16 on
NEWJOB			
MFTPPR		7	
TESTMF		PLNWTR	
Blank Card			
EXCPRC		TSKA01	
(patch cards, if any)			
Blank Card			
PSITGT			Version (versionname for tables POINT and ROUTE)
(other parameters, if any)			
Blank Card			
Blank Card			
EXCPRC		TSKA02, CNTINU	
(patch cards, if any)			
Blank Card			
PTARGT			Version (version name for table TARGET)
PVNC			Version (version name for table VNC)
PSITGT			Version (version name for table SITARG)
(other parameters, if any)			
Blank Card			
Blank Card			
EXCPRC		TSKA03, CNTINU	
(patch cards, if any)			
Blank Card			

Columns 1 - 6	Columns 8 - 10	Columns 12 on	Columns 16 on	
NUM			Value	Values for these parameters may be input here, if desired. If not, the following values will be used: NUM = 2 PERCNT = 110 (110%) TSTANG = 60 (60°)
PERCNT			Value	
TSTANG			Value	
(other parameters, if any)				
Blank Card				
Blank Card				
EXCPRC		TSKA04, CNTINU		
(patch cards, if any)				
Blank Card				
(parameters, if any)				
Blank Card				
Blank Card				
DEFPRG		B7		
	MVT	B7, REWIND		
	END			
Blank Card				
EXCPRC		ALLOUT		
Δ TAPES		B7		
Blank Card				
FINISH				
Blank Card				
Blank Card				

2. Card Deck for TASKD Operations:

Columns 1 - 6	Columns 8 - 10	Columns 12 on	Columns 16 on
NEWJOB			
MFTPPR		7	
TESTMF		PLNWTR	
Blank Card			
EXCPRC		TSKA01	
(patch cards, if any)			
Blank Card			
PSITGT			Version (version name for tables POINT and ROUTE)
(other parameters, if any)			
Blank Card			
Blank Card			
EXCPRC		TSKD02, CNTINU	
(patch cards, if any)			
Blank Card			
PSITGT			Version (version name for tables REFUEL and INASTB)
PBASE			Version (version name for table BASE)
(other parameters, if any)			
Blank Card			
Blank Card			
DEFPRG		B7	
	MVT	B7, REWIND	
	END		
Blank Card			
EXCPRC		ALLOUT	

Columns 1 - 6	Columns 8 - 10	Columns 12 on	Columns 16 on
Δ TAPES		B7	
Blank Card			
FINISH			
Blank Card			
Blank Card			

The sample decks shown above indicate the following items:

- TASKA consists of four separate CL-I processes; the CNTINU option of EXCPRC must be used for the latter three processes, so that necessary tables will remain in core from process to process.
- TASKD consists of two separate CL-I processes; the CNTINU option of EXCPRC must be used for the second process.
- All five processes (TSKA01, -02, -03, -04, and TSKD02)were defined with the BLD and RDP options of DEFPRC. Therefore, it is necessary to include a blank card for each of these in the appropriate place following the EXCPRC card.
- Use of the CNTINU option of EXCPRC allows core to remain unchanged when a new process is about to be executed. However, this does not hold for the parameter block, since a new parameter block is brought in core for each process whether or not the CNTINU option has been used. Therefore, if the same parameter must be set in more than one process, it is necessary to read in that parameter in each process.

OUTPUT TABLES. The output tables from Table Generator are placed on a RESULT tape. The structure of this tape is similar to the structure of the input

GAME and PLAN tapes, i.e., two files. The first file contains the following four-word identification record:

"RESLTP TABGEN OUTPUT."

The second file contains all the output tables. The arrangement of the tables on this tape is given for Task A and Task D.

TASK A	TASK D
POINTR	POINTR
SSTARG	CELLAS
TGCOOR	REFAS
TIDLST	
TARCEL	
MTRC	

More than one record may appear for tables TARCEL and MTRC; for all other tables, only one record will appear.

A description of the information contained in each of the output tables is presented in the remainder of this section.

TABLE CELLAS

Information	Units	Value Range	Symbol
Line number		1(1)2000	
Cell identification		1(1)999	CELID
Cell link identification (either base, refueling area, or air alert point identification)		1(1)1300	CELINK
Cell flag which identifies CELINK 0 = refueling area 1 = air alert point 2 = base		0, 1, 2	CELFLG
Distance from cell to link	Naut. Mi.	1(1)(16000)	CELDIS

TABLE MTRC

Information	Units	Value Range	Symbol
Line number		1(1)1000	
Target identification number (= index in table SSTARG)		1(1)1000	MTARNO
Penetration route exit point		1(1)999	MPRXP
Cell that MPRXP is associated with		1(1)999	MCELL
Distance from point (MPRXP) to target	Naut. Mi.	1(1)32000	MDPTTG

TABLE POINTR

Information	Units	Value Range	Symbol
Line number (= point identification)		1(1)1300	
Latitude	Deg, Min, Sec.		PRLA
Longitude	Deg, Min, Sec. E/W		PRLO
Father of point		1(1)1000	PRFATH
Friendly territory flag (= 1 if point in friendly territory)		0, 1	PRFLG
Last high leg point flag (= 1 if point on last high leg portion of route)		0, 1	PRHGH
Penetration point Flag (= 1 if point is a penetration point)		0, 1	PRPEN
Cell (= penetration point) associated with route point		1(1)1000	PRCELL
Type of route that point is on: = 1 for penetration route; = 2 for depenetration route; = 3 for both types.		1, 2, 3	PRRUTE
Distance from point to associated penetration point.	Naut. Mi.	1(1)32768	PRDPEN
(For internal use only; if = 1, means point has appeared on previous route)		0, 1	PRFD
(For internal use only; if = 1, means point is no good and no distance calculations will be made)		0, 1	PROK
(Not used by program)		0	PRUSE

TABLE REFAS

Information	Units	Value Range	Symbol
Line number		1(1)200	
Refueling area identification		1(1)600	REFID
Base identification		1(1)1000	REFBAS

TABLE SSTARG

Information	Units	Value Range	Symbol
Line number		1(1)1000	
Target code	STRING	5 non-blank characters	SSTACO
Latitude	Deg, Min, Sec.		SSTALA
Longitude	Deg, Min, Sec. E/W		SSTALO
Height of burst		0, 1	SSTHOB
Vulnerability number code		1(1)31	SSTVNC
Relative worth factor		.01(.01)1.00	SSTRWF
Minimum kill probability		0(.001).999	SSMINK
Maximum kill probability		0(.001).999	SSMAXK
Missile attrition factor		0(.01).99	SSTMAF
Target prekill		0(.001).999	SSTAKL
Target defense marker		0, 1	SSTDFM

TABLE TARCEL

Information	Units	Value Range	Symbol
Line number			
Target code	STRING	5 non-blank characters	TARID
Penetration route exit point		1(1)999	PRXP
Cell that PRXP is associated with		1(1)999	TRCELL
Distance from point (PRXP) to target	Naut. Mi.	1(1)32000	DPTTG
Distance from penetration point to target	Naut. Mi.	1(1)32000	DPENTG
Distance flag which = 1 if DPENTG violates percent rule		0, 1	DFLAG
Input flag which = 1 if association was a manual input		0, 1	HANDFG

TABLE TGCOOR

Information	Units	Value Range	Symbol
Line number *		1(1)1000	
Target latitude	Deg, Min, Sec.		TGLA
Target longitude	Deg, Min, Sec, E/W		TGLO
* Line numbers have a one-to-one correspondence to those in table SSTARG.			

TABLE TIDLST

Information	Units	Value Range	Symbol
Line number *		1(1)1000	
Target code	STRING	5 non-blank characters	TIDCD
* Line numbers have a one-to-one correspondence to those in table SSTARG.			

DESCRIPTION OF TASK A

The function of Task A of Table Generator is to associate targets with penetration routes, i.e., with points on penetration routes. When this has been done for all targets, then cell lists are prepared. The cell lists contain the targets that are associated with the points on routes emanating from each penetration point (cell).

The computer programs to prepare this task have been divided into four processes which are described here.

PROCESS TSKA01. This process carries out two basic functions. The first of these, controlled by routine TSKA01, performs the following:

1. Checks GAME tape and PLAN tape identification records. If the wrong tapes are mounted, the proper comment is made on-line and the computer is halted. After the proper tapes are mounted, processing may be resumed. The two routines that do the checking were written for the Missile Allocation Model.

2. The second file of both tapes is scanned, and a table of contents is made of both the GAME tape (table GMTABL) and the PLAN tape (table PLTABL). These two tables are used in subsequent processes when a request for an input table is made. The program keeps track of the position of each input tape, and therefore, a tape can be positioned at the beginning of the proper record with the minimum amount of tape movement.

If no errors are encountered, the program transfers control to routine TSKA02 to carry out the second basic function. (If errors are found, processing ceases.)

3. The desired version of the POINT and ROUTE lists are read into core from the PLAN tape. The version to be used is

specified by setting the value of parameter, PSITGT. The version names of the desired instances of POINT and ROUTE must be the same.

4. The coordinates of the points in the POINT list are transferred from the input table to a table called POINTR; the latter table contains the coordinates of point X in line X of the table. Before transferring the data, the following error checks are made:

   a. Each point must have a non-zero identification which must be less than 1300 (maximum size of POINT list and POINTR list).

   b. The coordinates for each point must be specified.

   c. There can be no duplication of point identifications.

   If any errors are found, comments will be made on the normal output tape, B3. If sense switch 2 is down, the comments will appear on-line.

5. Additional information concerning each point is also placed in POINTR by analyzing the structure of the ROUTE list. This analysis yields the following information about each point:

   "Father" or predecessor of point
   Cell that point is in
   Distance from point to its penetration point
   Whether point is on last-high-leg portion of route
   Whether point is in friendly territory
   Whether point is a penetration (or depenetration) point
   Type of route that point is on (either penetration only, depenetration only, or both).

During the scanning of the ROUTE list, various error checks are made, some of which are listed below:

a. Point can have only one father.

b. Point mentioned in ROUTE list must have input coordinates in POINT list.

c. Point identified as penetration point (or depenetration point) must be so defined on all routes containing that point.

d. Point identified as either being on last-high-leg portion of route, or in friendly territory must be so defined for all routes containing that point.

e. There can be no gaps (i. e. , points with ID equal to zero) in any route.

f. For points appearing on more than one route, the routes must be of the same type.

Similar to above, if any errors are found, comments will be made on either B3 or on-line. The program will continue to check the entire input POINT and ROUTE lists, even if any errors are found as described in 4 or 5 above.

6. After all routes have been processed, an identification file is written on the result tape (RESULT), and table POINTR is placed in the second file of the tape.

When an error is found during any part of the execution of process TSKA01, the parameter STOPER is set non-zero. Upon completing routine TSKA02, the value of STOPER is checked. If STOPER is found to be non-zero, then sense light 4 is turned on to indicate to succeeding processes that errors have been found and that processing is to be ignored. If STOPER is found to have a value of zero, the status of sense light 4 is not changed. (At the beginning of process TSKA01, all sense lights are turned off.)

To summarize, the duties of process TSKA01 are:

1. Check PLAN and GAME tapes identification.
2. Prepare table of contents of two input tapes.
3. Read in POINT and ROUTE lists.
4. Prepare table POINTR, and place it on RESULT tape.

Following is a list of the tables that are referenced by this process and their use/function:

Table Name	Use and/or Function
CHKTBL/EMPTY	Utility table for recording I/O errors; used by subroutine TAPCHK.
DESHIS/TABGEN	Utility table containing information about the objects used in the Table Generator Program; for each table, contains name, maximum number of lines, number of blocks, and number of unindexed words.
PLTABL	Contains table of contents of PLAN tape.
GMTABL	Contains table of contents of GAME tape.
POINTR	Combination of ROUTE and POINT lists; information for point X is in line X of the table.
ROUTE	Input route list (from PLAN tape).
POINT	Input point list (from PLAN tape).
HELP1	Internal working table used by the routines which prepare POINTR.

PROCESS TSKA02. This process prepares the list of targets to be used during a substrike, i.e., the targets that will be placed in the cells. The detailed items performed in this process, which is controlled by routine PRETGT, are as follows:

1. The status of sense light 4 is checked; if the light is on, it is kept on and an immediate exit is made from the process.

2. The desired version of tables SITARG, VNC, and TARGET are read into core, the former table from the PLAN tape and the latter two from the GAME tape. The desired versions to be used are specified by the values of the following parameters:

   Parameter PSITGT for table SITARG.
   Parameter PVNC for table VNC.
   Parameter PTARGT for table TARGET.

   All three of these tables are the same as those developed for missile routine.

3. The number of records of the desired version of table TARGET are counted and stored in parameter INSTNO.

4. The entire contents of table SSTARG are initialized, i.e., all lines are set equal to zero.

5. Using a routine (MAKSST) written for the Missile Allocation Program, information is transferred from tables SITARG, TARGET, and VNC into SSTARG.

6. Tables TGCOOR and TIDLST are initialized.

7. The target codes are transferred from table SSTARG to table TIDLST; the target coordinates are transferred from table SSTARG to table TGCOOR.

8. Tables SSTARG, TIDLST, and TGCOOR are written out on the RESULT tape.

If any errors are found during this process, the parameter STOPER is set non-zero. At the completion of process TSKA02, the value of STOPER is checked, and if it is found to be non-zero, sense light 5 is turned on.

To summarize, the duties of process TSKA02 are:

1. Read in SITARG, VNC, and TARGET lists.
2. Prepare substrike lists of targets, table SSTARG.
3. From SSTARG, prepare tables TIDLST and TGCOOR.
4. Write tables SSTARG, TIDLST, and TGCOOR on the result tape.

Following is a list of the tables referenced by this process and their use/function:

Table Name	Use and/or Function
CHKTBL/EMPTY DESHIS/TABGEN PLTABL GMTABL	These tables remain in core from the previous process, TSKA01.
POINTR	This table remains in core from the previous process, even though it is not used by process TSKA02.
SSTARG	List of targets to be used during the substrike; prepared from tables SITARG, TARGET and VNC.
SITARG	Input list of targets for substrike (from PLAN tape).

Table Name	Use and/or Function
TARGET	Input target list (from GAME tape).
VNC	Input vulnerability number/code list (from GAME tape).
TGCOOR*	List of coordinates for targets to be used during the substrike.
TIDLST*	List of target codes for targets to be used during the substrike.

* Tables TGCOOR and TIDLST are prepared from table SSTARG; line numbers in these tables have a one-to-one correspondence to line numbers in SSTARG.

PROCESS TSKA03. This process performs the actual selection of cells for each target. The process is controlled by routine TSKA03 and performs the following:

1. The status of sense light 4 is checked; if the light is on, it is kept on and an immediate exit is made from the process.
2. Table POINTR is searched to find suitable points to be used in the target-route point association part of the program. To qualify as suitable, a point must be on a penetration route and must not be in friendly territory. The identification of all such points is placed in a table called TGLST.
3. The name, version, and number of blocks are set-up for tables TARCEL and MTRC.
4. The value of parameter NUM is checked. If NUM is not within the following limits,

$$0 < NUM \leq 7,$$

it is given the value of 5.

5. Table TARCEL is initialized.

6. For each target, the following steps are done:

   a. The distance between the target and each point in TGLST is calculated and stored in TGLST.

   b. Table TGLST is then sorted on distance.

   c. Using the input values of parameter ANGLE, each target is placed in NUM cells. The information concerning these cells is placed in table TARCEL.

   d. Using the input value of parameter PERCNT, cells other than the basic cell are checked to determine if they meet the distance percentage rule. If not, element DFLAG in the appropriate line of TARCEL is set non-zero.

   Steps (a) through (d) are eventually repeated for all targets in the substrike.

7. After performing steps (a) through (d) for a given target, a check is made to determine whether table TARCEL is "full". If it is, an instance of TARCEL is written on the result tape. Then, information is transferred from table TARCEL to table MTRC. During this transformation, identification of targets is changed from a five-character string identification to a numeric index which is the corresponding line number in table TIDLST. Also, while information is being placed in MTRC, any line in TARCEL in which the element DFLAG is non-zero is by-passed. After the transformation is complete, table MTRC is written on an intermediate tape (TAPEIN). Table TARCEL is then initialized again, and item 6 above resumes for the next target.

8. After all targets have been processed, a check is made to see if any instances of table MTRC have been written on tape TAPEIN. If no records have been written on this tape, it implies that only one record of this table was prepared and still remains in core. In this case, parameter ONERC is set non-zero. If, however, instances of MTRC have been placed on tape TAPEIN, two end-of-files are written on the tape, and it is rewound.

Similar to the previous processes, at the end of process TSKA03, sense light 4 is turned on if parameter STOPER is found to be non-zero. Also the status of parameter ONERC is checked; if this parameter is non-zero, then sense light 1 is turned on.

The major function of process TSKA03 is to place each target in the required number of cells, if possible. The results of this association appear in two output tables. Table TARCEL presents the route points and cells chosen for each target, along with pertinent distances. It also contains a marker to indicate which cells exceed the percentage rule. Table MTRC contains a subset of the information that appears in TARCEL and is in a form more suitable for use by the computer.

Following is a list of the tables referenced by this process and their use/function.

Table Name	Use and/or Function
CHKTBL/EMPTY	These tables remain in core from the previous process, TSKA02.
DESHIS/TABGEN	
PLTABL	
GMTABL	
POINTR	
TGCOOR	
TIDLST	

Table Name	Use and/or Function
TGLST	List of all suitable points on penetration route that targets can be associated with.
TARCEL	Target list of cells; list of cells chosen for each target.
MTRC	Modified TARCEL list; an internal table which is a subset of table TARCEL.

The following three parameters are used by this process:

NUM	Maximum number of cells in which a target will be placed; input value should be $0 < \text{NUM} \leq 7$.
ANGLE	The value of the angle to be used in the angle-association rule; input value may range from 0° to 180°.
PERCNT	The percentage by which the distance along an alternate route may exceed the distance along the basic route and still be satisfactory; input value can range from 50 - 200%.

The cell lists that are eventually prepared by Table Generator are very much influenced by the values of the above parameters.

PROCESS TSKA04. This is the fourth and last process which comprises Task A of Table Generator. Its purpose is to sort table MTRC to produce a cell list that is in a form which will be more suitable for an Aircraft Allocation Model. The process is controlled by routine TSKA04 and the following is done:

1. The status of sense light 4 is checked; if the light is on, it is kept on and an immediate exit is made from the process.

2. The status of sense light 1 is checked. If the light is on, a transfer is made to routine ONLY1 (see step 3 below). If the light is off, the program proceeds to step 4 below.

3. If sense light 1 was on, this means that only one record of table MTRC was prepared and that record is still in core. In this case, the table is sorted using routine SORTD on the following items:

   Cell Identification
   Penetration Route Exit Point (PRXP)
   Distance, PRXP to Target
   Target Number

   After the table is sorted it is written on the RESULT tape, and the program transfers to the end of the process. (Routine ONLY1 refers to a table called XXMTRC; this table is exactly the same as table MTRC, and XXMTRC occupies the same position in core that MTRC had in the previous process.)

4. If sense light 1 was off, this means that more than one record of table MTRC was prepared and that all records are on tape TAPEIN. In this case, table MTRC is sorted using routine SORTH. The table is sorted on the same items as described in item 3 above.

5. When the sorting is complete, the record(s) of MTRC appear in the first file of an intermediate tape called HIST1. The program then proceeds to transfer the records from this tape to the RESULT tape. When this has been completed, the program transfers to the end of the process.

To summarize, the duties of process TSKA04 are simply to sort table MTRC and place the resulting sorted table on the RESULT tape. If, initially, only one record of MTRC exists, the sorting is done by routine SORTD; if more than one record existed, the sorting is done by routine SORTH.

Following is a list of the tables referenced by this process and their use/function.

Table Name	Use and/or Function
CHKTBL/EMPTY DESHIS/TABGEN	These tables remain in core from the previous process, TSKA03.
PLTABL GMTABL	These tables also remain in core from the previous process, even though they are not used by process TSKA04.
XXMTRC MTRC	These two tables are exactly the same and correspond to table MTRC that was described in the discussion of process TSKA03. Two different names are needed for the CL-I System at process definition time.

This complete the discussion of Task A.

DESCRIPTION OF TASK D

The function of Task D of Table Generator is to calculate distances between various geographical points which appear in various input lists. During the process of obtaining items from pertinent tables, many error checks are made.

The computer programs used to prepare this task have been divided into two processes. One of these processes (TSKA01) is exactly the same as that used for Task A of Table Generator. The other process, TSKD02, is described below.

PROCESS TSKD02. The main control routine of this process is called ASTB1 which used five subcontrol routines. The over-all functions performed by this process are outlined below:

1. The status of sense light 4 is checked; if the light is on, it is kept on, and an immediate exit is made from the process.
2. The desired versions of tables BASE, REFUEL, and INASTB are read into core (via routine RDINP3), the former table from the GAME tape and the latter two from the PLAN tape. The desired verions to be used are specified by the values of the following parameters:

   Parameter PBASE for table BASE
   Parameter PSITGT for table REFUEL
   Parameter PSITGT for table INASTB
3. Table INASTB is then sorted on air alert flag, refuel identification, and base (or air alert) identification.
4. The input information contained in table INASTB is transferred to tables CELLAS and REFAS (via routine ASTB2).

5. The name, version, and number of blocks are set up for tables CELLAS and REFAS. Also, the keywords are formed for these two tables.

6. Table REFAS is sorted on refuel identification and base identification.

7. Table CELLAS is sorted on cell identification.

8. Using routine ASTB3, tables BASER and RFUELR are initialized. Then the coordinates of the bases in the input BASE list are transferred to table BASER; the latter table contains the coordinates of base X in line X of the table. Prior to transferring the data, the following error checks are made:

   a. Each base must have a non-zero identification which must be less than 1000 (maximum allowable base identification).

   b. The coordinates for each base must be specified.

   c. There can be no duplication of base identifications.

   If any errors are found, comments will be made on the normal output tape, B3. If sense switch 2 is down, the comments will appear on-line. Similar to the above, the coordinates of the refueling areas in the input REFUEL list are transferred to table RFUELR. The same type of error checks are made as discussed above.

9. Using routine ASTB4, the distances between the cells and the various cell links (either bases, refueling areas or air alert points) are calculated.

10. Table CELLAS is sorted again on cell identification, link type, and distance from cell to link.

11. Finally, tables CELLAS and REFAS are written on the RESULT tape (via routine ASTB5).

If any errors are detected during any part of the execution of process TSKD02, parameter STOPER is set non-zero. Upon completing routine ASTB1, the value of STOPER is checked and if found to be non-zero, sense light 4 is turned on.

To summarize, the duties of process TSKD02 are:

1. Read in BASE, REFUEL, and INASTB lists.
2. Transfer information from table INASTB to tables CELLAS and REFAS.
3. Calculate distance between cells and associated links.
4. Write tables CELLAS and REFAS on the result tape.

Following is a list of the tables referenced by this process and their use/function:

Table Name	Use and/or Function
CHKTBL/EMPTY DESHIS/TABGEN PLTABL GMTABL POINTR	These tables remain in core from the previous process, TSKA01.
BASE	Input base list (from GAME tape)
REFUEL	Input refueling area list (from PLAN tape)
INASTB	Input association (from PLAN tape)
BASER	Modified version of base list
RFUELR	Modified version of refueling area list

Table Name	Use and/or Function
CELLAS	Cell association list which contains air alert points, refueling areas, and bases (non-refueled) associated with each cell.
REFAS	Refueling area association list which contains bases associated with each refueling area.
CELLXX	Internal working table used by routines ASTB2 and SWCELL.

PROGRAMMERS NOTES

This section contains incidental programming notes which are included to provide a complete documentation of the Table Generator Computer Program.

MISCELLANEOUS INPUT TABLES. Besides the input tables discussed earlier, two additional input tables, CHKTBL and DESHIS, are referenced by the program, but these are prepared by the programming staff and need not concern the user.

Table CHKTBL is a utility table for recording I/O errors and is referenced by subroutine TAPCHK. A null version of the table (CHKTBL/EMPTY) appears on the Table Generator Master File, and this instance is allocated in process TSKA01.

Table DESHIS contains pertinent information about the particular tables (objects) used in the Table Generator program and the version contained on the Master File, DESHIS/TABGEN, is also allocated in process TSKA01. If any of the tables used in Table Generator are changed, then DESHIS/TABGEN may have to be modified. The information contained in table DESHIS is given below:

Columns	Information	Units	Value Range	Symbol	Optional
1 - 6	Format and table name = F1DESH	STRING			
10 - 14	Line number		1(1)125		
17 - 22	Name of table	STRING	1-6 non-blank characters	DENAM	
25 - 30	Maximum number of lines		1(1)32000	DEMXLN	
33 - 34	Number of blocks		1(1)50	DENBLK	
36 - 37	Number of unindexed words		1(1)50	DEUNIN	
39	Table Monitor		0, 1	DUMP	Yes, not used in Table Generator

TAPE ASSIGNMENTS. The following is a list of the necessary tape assignments for making a Table Generator run. A maximum of 15 tapes is needed but, in some runs, as few as 10 can be used. Where pertinent, the corresponding parameter names for the various tapes are given.

Channel/Unit	Parameter Name	Tape Identification/Use
A1		CL-I System Tape
A2	WKTAP2	Work tape used by routine SORTH
A3	WKTAP4	Work tape used by routine SORTH. (Also used by process ALLOUT.)
A4		Old Master File (Input)
A5	TAPEIN	Intermediate tape used by processes TSKA03 and TSKA04.
A6	GAMETP	Input GAME Tape
A7	PLANTP	Input PLAN Tape
B1	WKTAP1	Work tape used by routine SORTH. (Also used by process ALLOUT.)
B2		CL-I Work Tape
B3		CL-I Output Tape
B4		CL-I Work Tape
B5		New Master File (Output)
B6	WKTAP3	Work tape used by routine SORTH.
B7	RESLTP	Output RESULT Tape
B8	HIST1	Intermediate tape used by routine SORTH.

Modification of Tape Assignments. If it is necessary to modify the above tape assignments, the following list indicates which processes reference the various tapes:

Parameter Name	Processes in which Tape is referenced
GAMETP	TSKA01, TSKA02, TSKD02
PLANTP	TSKA01, TSKA02, TSKD02
TAPEIN	TSKA03, TSKA04
HIST1	TSKA04
WKTAP1	
WKTAP2	
WKTAP3	TSKA04
WKTAP4	
RESLTP	TSKA01, TSKA02, TSKA03, TSKA04, TSKD02

INTERNAL TABLES. The following is a brief description of the items contained in some of the internal tables used in Table Generator.

1. BASER - Modified Base List, in which the coordinates of the Base with an identification of N are in line N of the table.

2. CELLXX - Contains the cell identifications from each line in table INASTR.

3. GMTABL - GAME tape table of contents; this tape contains:

   - Number of records in second file of GAME tape.
   - Current position of tape.
   - Name and version of each record on GAME tape.

4. HELP1 - This table is used for temporary storage of miscellaneous items during process TSKA01.

5. PLTABL - PLAN tape table of contents; this tape contains:

   - Number of records in second file of PLAN tape.
   - Current position of tape.
   - Name and version of each record on PLAN tape.

6. RFUELR - Modified REFUELING AREA List in which the coordinates of the refueling area having an identification of N are in line N of the table.

7. TGLST - This table contains the identification of the points that will be used in the route association portion of the program. As each target is considered, the distance from the target to each point will be placed in this table.

8. XXMTRC - This table is exactly the same as output table MTRC.

PROCESS TAPEID. The process TAPEID is similar to process HEDTP2 which is also used to create data tapes. TAPEID is a modification of the latter process and allows more than one data tape to be made during a single CL- m. Like HEDTP2, TAPEID will normally place the ID file on B6. However, if the first card following the - EXCPRC TAPEID - card is of the form TAPEXY (in columns 1-6), where X specifies a data channel (ARB) and Y specifies a tape unit (1-9), then the ID file will be put on tape XY instead of B6. Of course, the user must be sure that the XY used in the TAPE/XY option of INPOBJ is the same as the XY used in the TAPEXY card following the - EXCPRC TAPEID - card.

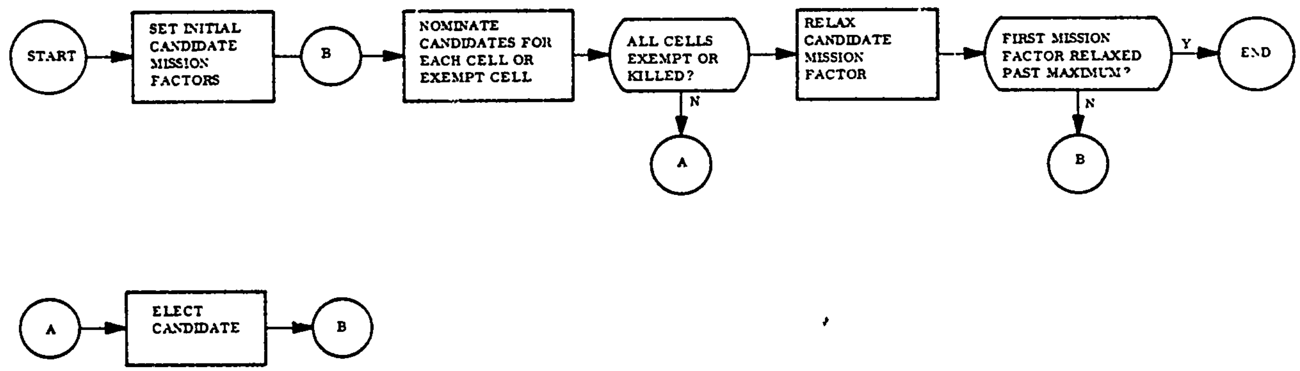
APPENDIX D

AIRCRAFT ALLOCATION MODEL

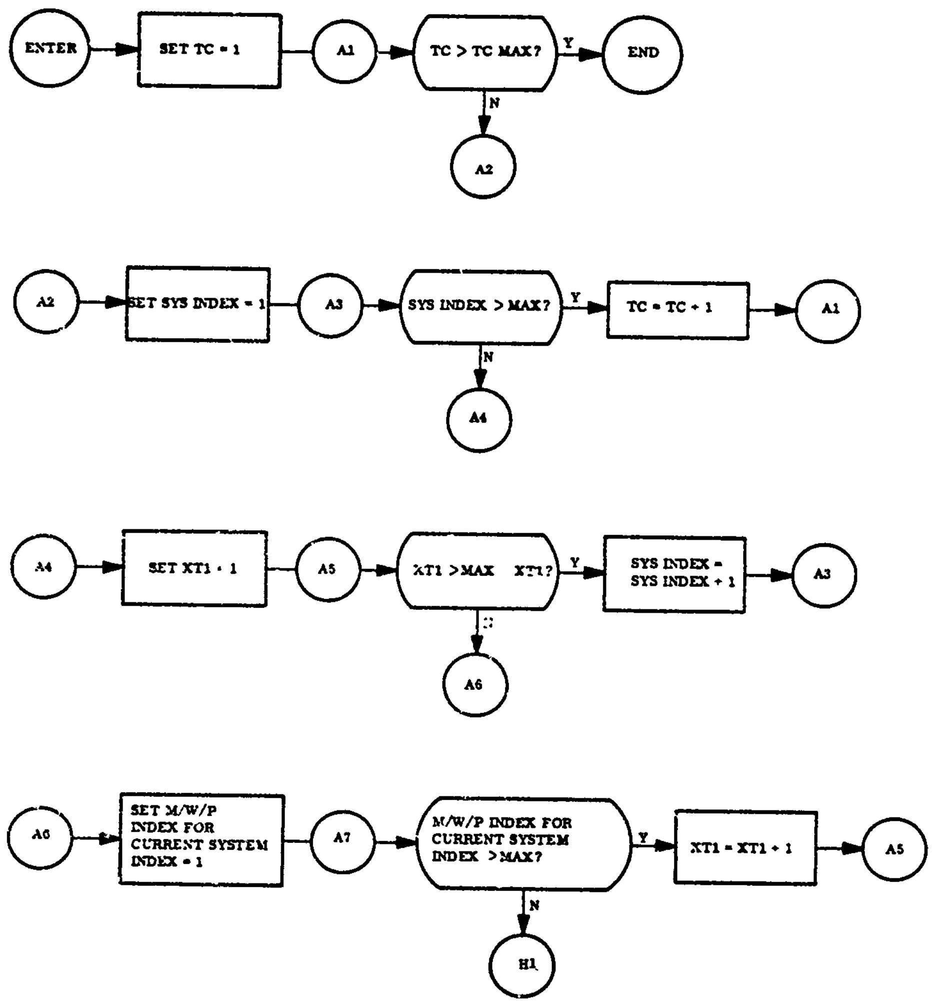
MAIN ALLOCATION PROGRAM

GROSS FLOW CHARTS

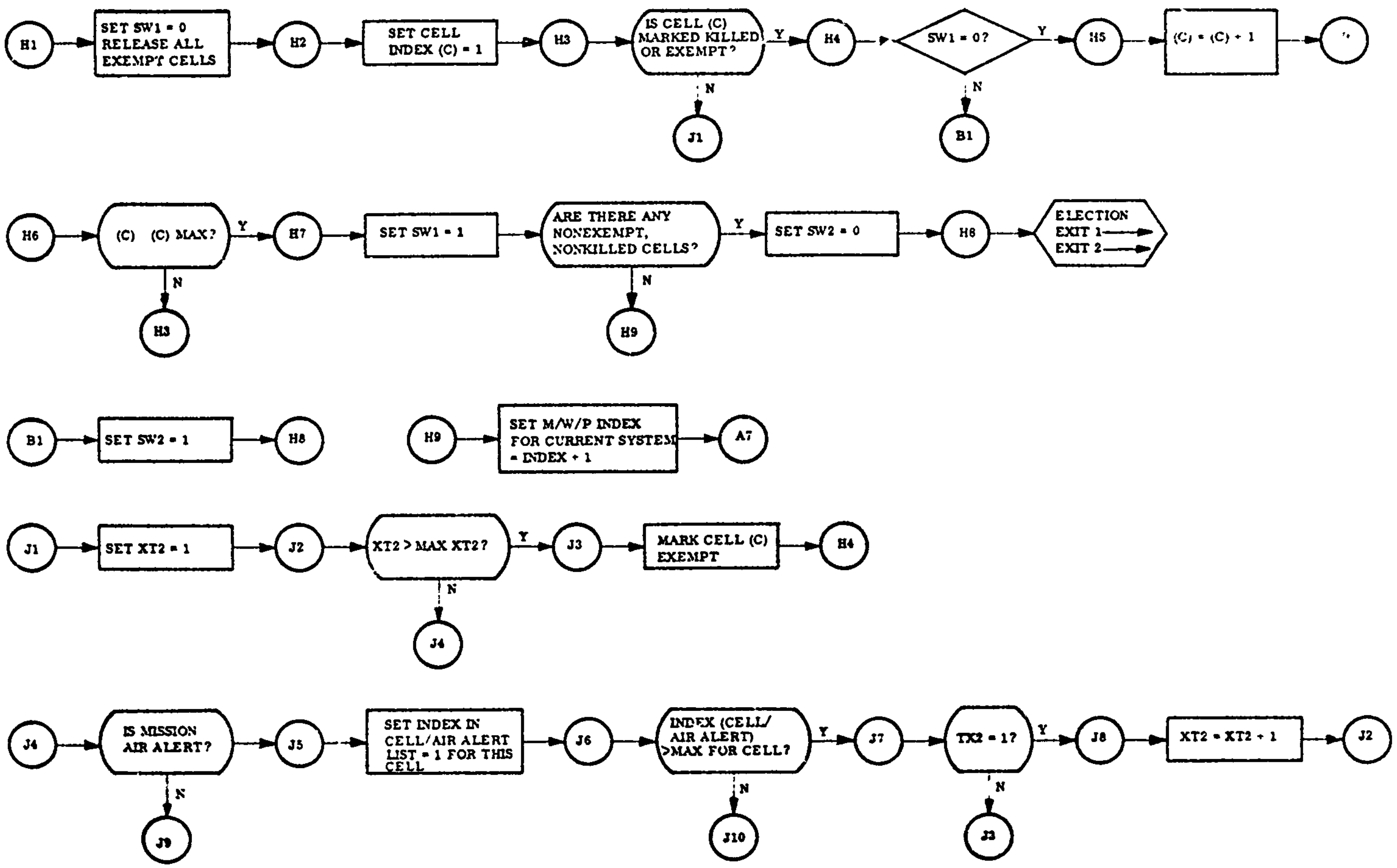
GENERAL FLOW OF AIRCRAFT ALLOCATION MODEL



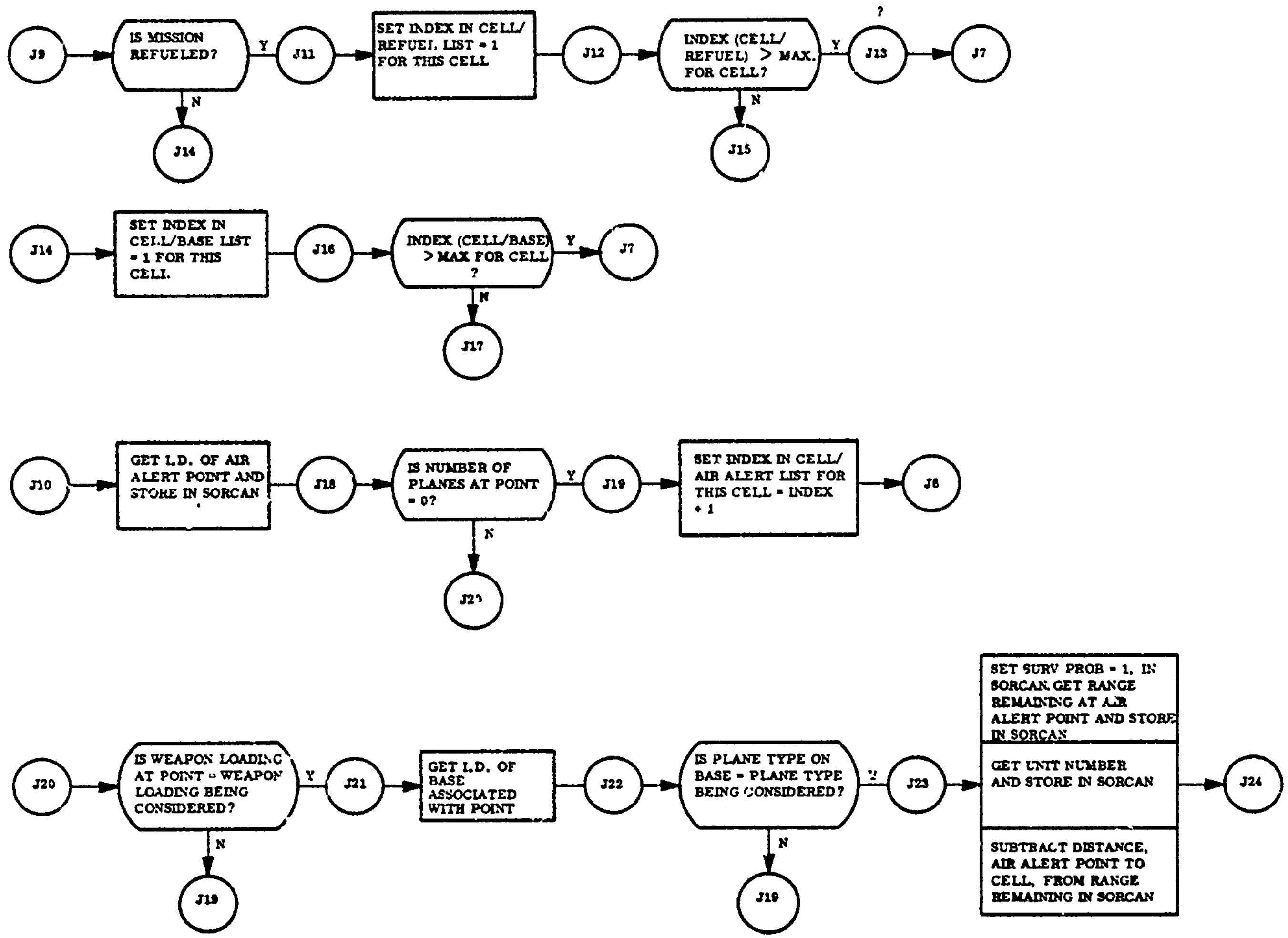
GROSS FLOW OF AIRCRAFT ALLOCATION MODEL – CANDIDATE MISSION FACTORS

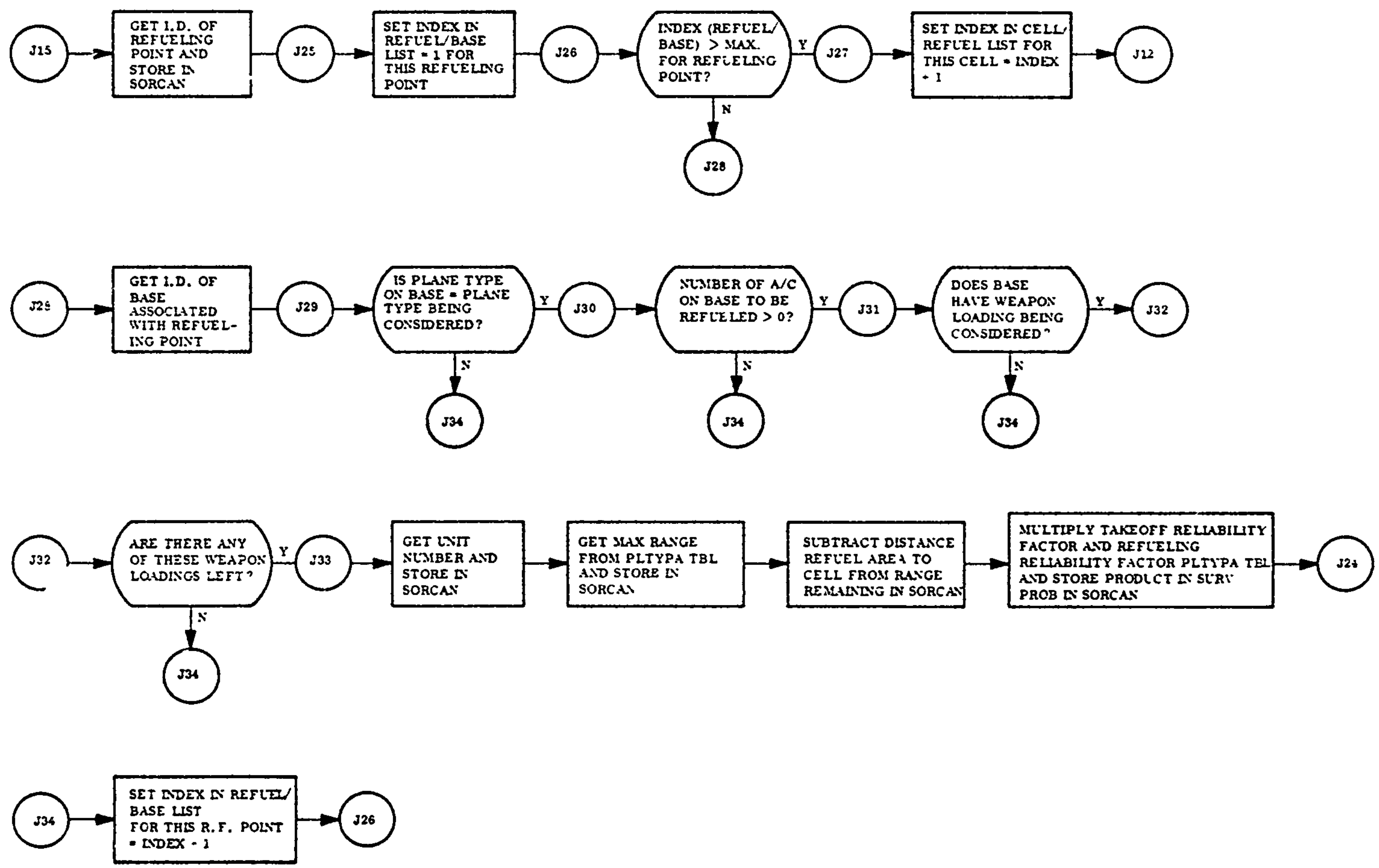


GROSS FLOW OF AIRCRAFT ALLOCATION MODEL — VARIABLE MISSION FACTORS

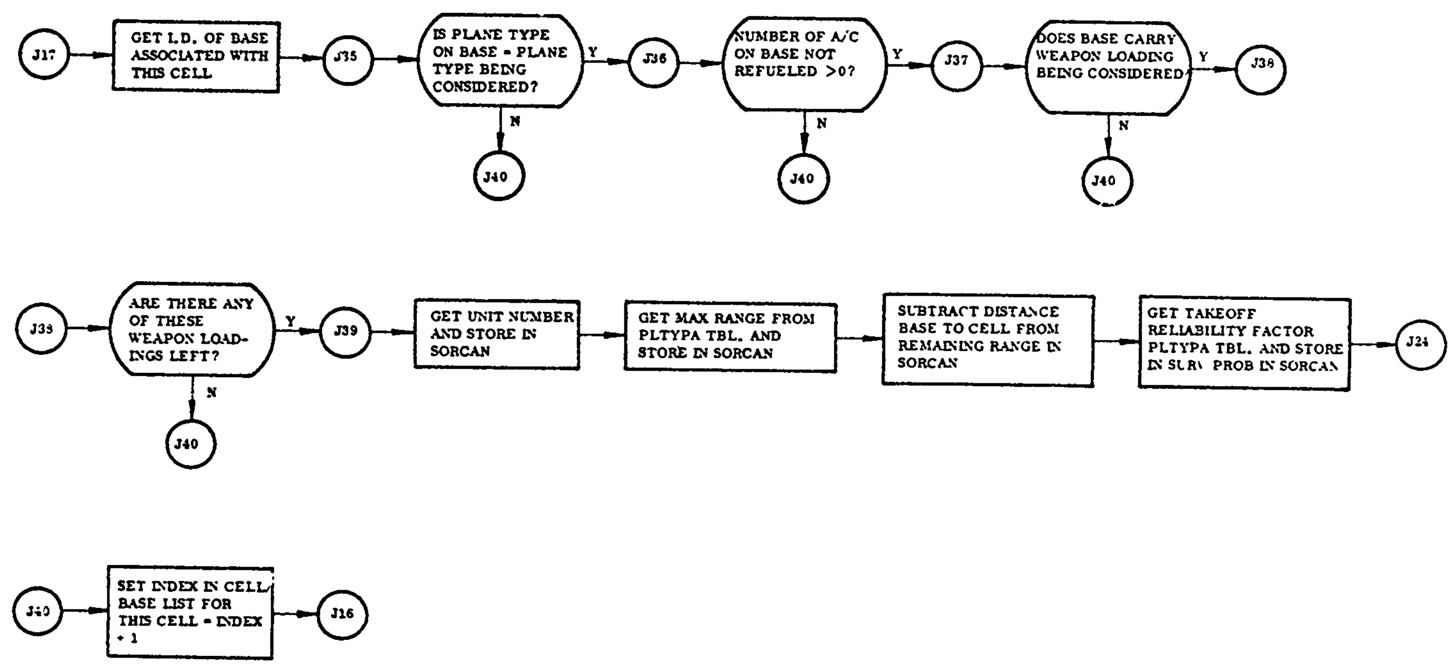


GROSS FLOW OF AIRCRAFT ALLOCATION MODEL — VARIABLE MISSION FACTORS

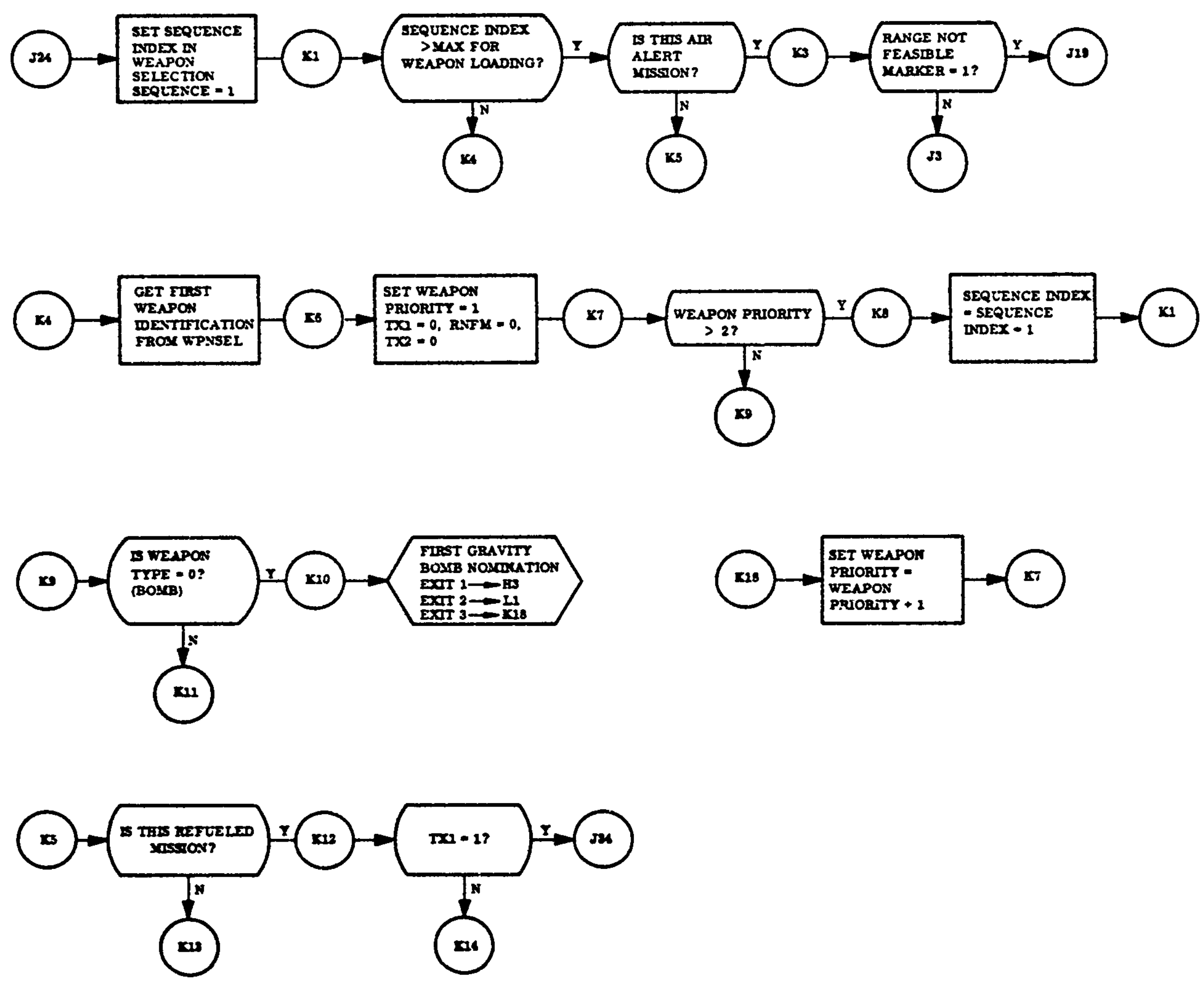



J15
GET I.D. OF REFUELING POINT AND STORE IN SORCAN
J25
SET INDEX IN REFUEL/BASE LIST = 1 FOR THIS REFUELING POINT
J26
INDEX (REFUEL/BASE) > MAX. FOR REFUELING POINT?
Y
N
J27
J28
SET INDEX IN CELL/REFUEL LIST FOR THIS CELL = INDEX + 1
J12
J28
GET I.D. OF BASE ASSOCIATED WITH REFUELING POINT
J29
IS PLANE TYPE ON BASE = PLANE TYPE BEING CONSIDERED?
Y
N
J30
J34
NUMBER OF A/C ON BASE TO BE REFUELED > 0?
Y
N
J31
J34
DOES BASE HAVE WEAPON LOADING BEING CONSIDERED?
Y
N
J32
J34
J32
ARE THERE ANY OF THESE WEAPON LOADINGS LEFT?
Y
N
J33
J34
GET UNIT NUMBER AND STORE IN SORCAN
GET MAX RANGE FROM PLTYPA TBL AND STORE IN SORCAN
SUBTRACT DISTANCE REFUEL AREA TO CELL FROM RANGE REMAINING IN SORCAN
MULTIPLY TAKEOFF RELIABILITY FACTOR AND REFUELING RELIABILITY FACTOR PLTYPA TBL AND STORE PRODUCT IN SURV PROB IN SORCAN
J24
J34
SET INDEX IN REFUEL/BASE LIST FOR THIS R.F. POINT = INDEX + 1
J26

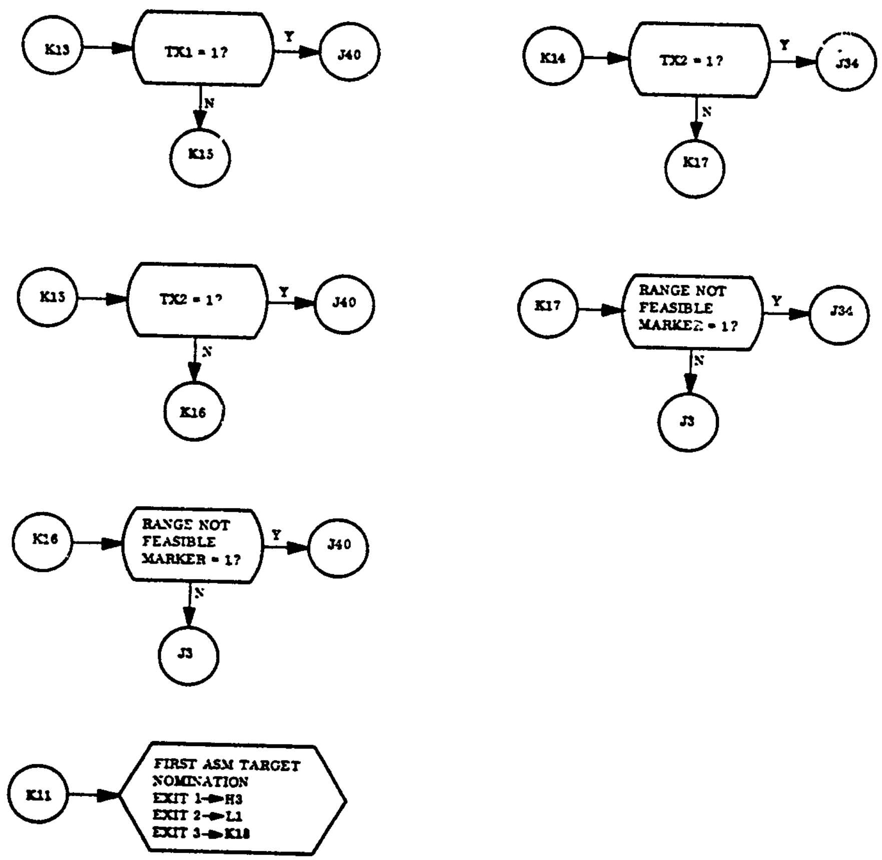
GROSS FLOW OF AIRCRAFT ALLOCATION MODEL — VARIABLE MISSION FACTORS



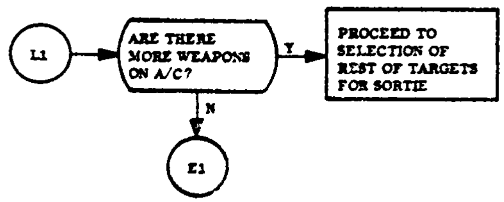
GROSS FLOW OF AIRCRAFT ALLOCATION MODEL — VARIABLE MISSION FACTORS



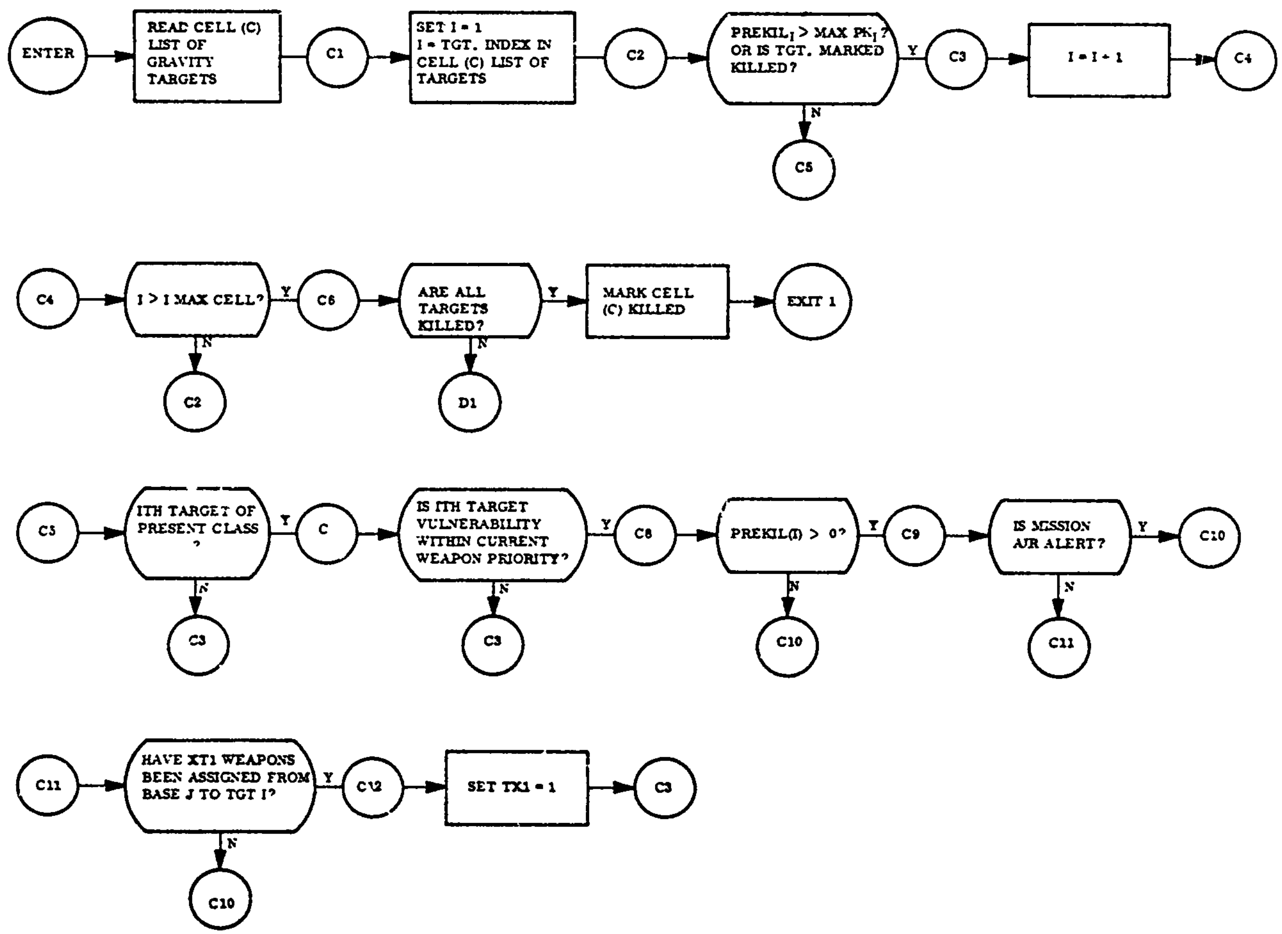
GROSS FLOW OF AIRCRAFT ALLOCATION MODEL — VARIABLE MISSION FACTORS

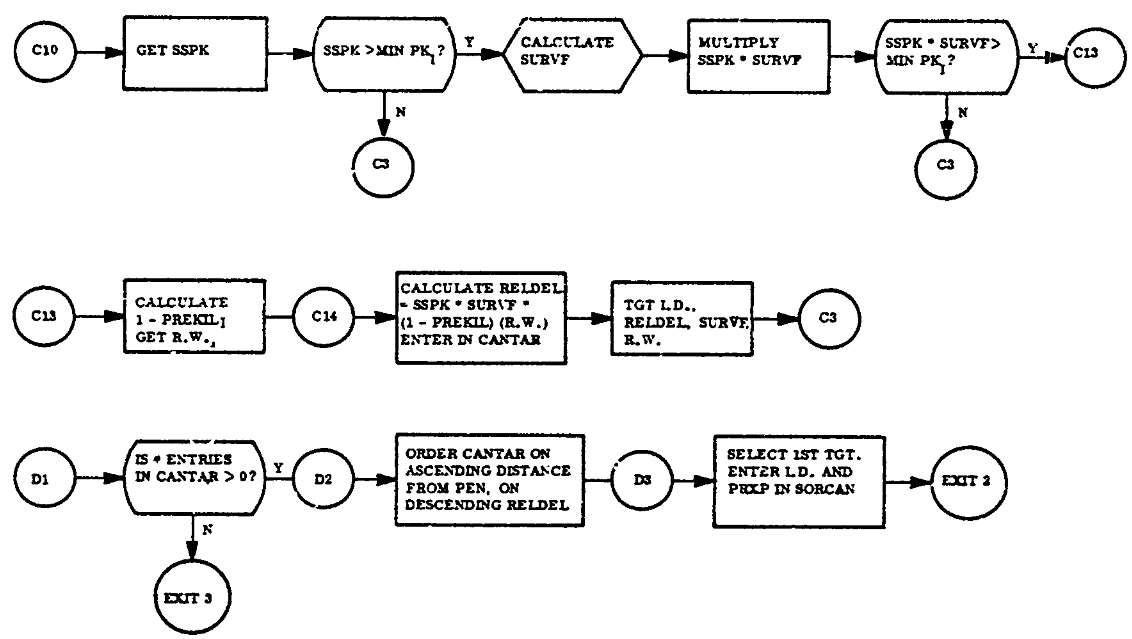


GROSS FLOW OF AIRCRAFT ALLOCATION MODEL — VARIABLE MISSION FACTORS

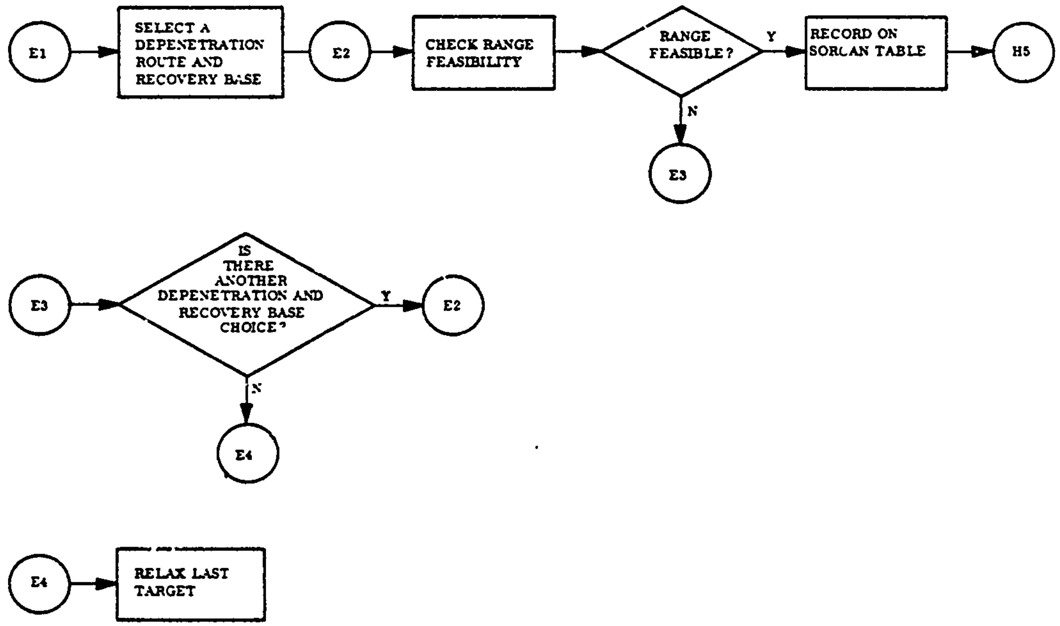


FIRST GRAVITY BOMB TARGET NOMINATION




C10
GET SSPK
SSPK > MIN PK$_I$?
Y
N
C3
CALCULATE SURVF
MULTIPLY SSPK * SURVF
SSPK * SURVF > MIN PK$_I$?
Y
C13
N
C3
C13
CALCULATE 1 - PREKIL$_I$ GET R.W.$_I$
C14
CALCULATE RELDEL = SSPK * SURVF * (1 - PREKIL) (R.W.) ENTER IN CANTAR
TGT I.D., RELDEL, SURVF, R.W.
C3
D1
IS # ENTRIES IN CANTAR > 0?
Y
D2
N
EXIT 3
ORDER CANTAR ON ASCENDING DISTANCE FROM PEN, ON DESCENDING RELDEL
D3
SELECT 1ST TGT. ENTER I.D. AND PEXP IN SORCAN
EXIT 2

FIRST GRAVITY BOMB TARGET NOMINATION



Rpt. No. TR 65-2

Abellon, Esther M.
Hansen, William
Ratner, Elliot Z.
Schaider, Leonard P.

STAGE 64: PLAN WRITER

Technical Operations Research
Washington, D. C.
Air Battle Analysis Center
Washington, D. C.

June 1965
<u>220</u> pp. incl <u>1</u> illus., <u>25</u> flow charts

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2. Plan inputs
3. Missile Allocation Model
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6. ABAC, Directorate of Plans and Operations
7. Contract AF 49(638)-1179

Unclassified Report

This report provides documentation of the work accomplished on the Plan Writer. The Plan Writer is a method for allocating strategic weapons systems to enemy targets and for developing outline sortie plans. A general discussion of the method, concepts, Missile Allocation Model, and Aircraft Allocation Model is contained in the main body of the report. Appendices contain users and operators instructions and gross flow charts. The material contained herein documents an incomplete Plan Writer. Therefore, some of the material, discussions, and flow charts will be less thorough than desired, but as complete as the particular circumstances permit.

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