NAVAL POSTGRADUATE SCHOOL
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THESIS

EXPANSION OF THE SCAN ENDGAME PROGRAM FOR AIRCRAFT SURVIVABILITY STUDIES AND DEVELOPMENT OF A SUPPORTING USER'S GUIDE

by

Jean-Paul Fourny

December 1982

Thesis Advisor: R. E. Ball

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Expansion of the SCAN Endgame Program for Aircraft Survivability and Development of a Supporting User's Guide

by

Jean Paul Fourny
Captain, Canadian Armed Forces
B.S.C., Royal Military College, 1973

Submitted in partial fulfillment of the
requirement for the degree of

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December 1982

ABSTRACT

This study involved a detailed examination of the aircraft survivability analysis program called SCAN, and modification of the pre and post-processing graphics programs that support the program. The aim was the improvement of the originally installed version of SCAN at NPS by incorporating the graphics commands for the new IBM supported terminals, by increasing the speed of the display process, and by simplifying the input data preparation by making it more interactive. In addition, a comprehensive User's Guide was prepared for use by NPS students involved in aircraft survivability/warhead lethality studies.

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LIST OF VARIABLES

VARIABLES	DESCRIPTION
Fragment Parameters	
VMIN(I)	Fragment velocity at lower Polar Zone Boundary
UMAX(I)	Fragment velocity at upper Polar Zone Boundary
ZONMIN(I)	Lower angle of Polar Zone
ZONMAX(I)	Upper angle of Polar Zone
XWH(I)	Distance from warhead center to inertial fragment position
Fuzing Parameters	
FUZPOS	Distance from TDD to warhead center
FUZANG	Fuze look angle
RADMSL	Missile body radius
POSNOS	Distance from contact fuze to warhead center
POSTAL	Distance from warhead center to aft end of missile
Blast Envelope Parameters	
FUSBLR	Fuselage Blast Radius
FUSBL1	Distance from target CG to front of blast cylinder
FUSBL2	Distance from target CG to rear of blast cylinder
WNGBLR	Wing Blast Radius
WNGPT1(3)	End Point of wing blast centerline nearest fuselage
WNGPT2(3)	End Point of wing blast centerline nearest wing tip

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I. INTRODUCTION

This thesis examines in detail the SCAN package of programs as originally installed at the Naval Postgraduate School with the aim of improving the graphics capability, speed and ease of use. It investigates some of the limitations of the NPS version in relation to its usefulnes as a supplement to classroom instruction on the aircraft survivability/lethality courses and describes the development of the resulting program additions and changes. In addition, the development of a comprehensive User's Guide for NPS students was undertaken.

A. OVERVIEW OF SCAN MODEL

To better understand the purpose of this study, a brief overview of the SCAN application is in order. SCAN provides an analytical means of assessing aircraft survivability against a specified missile threat. The encounter between an airborne target and a fragmentation warhead known as the endgame is mathematically simulated and impact computations are carried out for all fragments impacting a geometrical representation of the target. This type of model, as opposed to a fragment collector model, is less efficient and more time consuming since it computes all impacts, not just those at critical points. However, it has the distinct

advantage of allowing the analyst to experiment with shielding, component relocation, and extended vulnerable components. The added benefits of comparing results against real experimental data and providing a more realistic graphical display of the encounter are also possible. SCAN provides computations of survival probabilities, target hit distributions, and processes the data for statistical summary and/or graphical output. The actual structure of this model allows user options in defining target geometry down to specific component level, vulnerability criteria, warhead configuration, fuzing parameters, blast envelope parameters, and encounter conditions. For the purposes of this study, the target geometric and vulnerability descriptors are taken as predetermined and fixed for use by students. However, additional target models are available with special permission, and these can be modified by more experienced users. The primary features of this model as listed above, are summarized as follows:

1. Target Geometric Representation - Analytical equations characterizing the basic shapes are used in the model and combined to represent the component structure of the target. Both internal and external components can be modeled, and the information used to dimensionalize the components, is contained in the various target geometry files stored on disk. Figure I-1 illustrates the basic concept. A

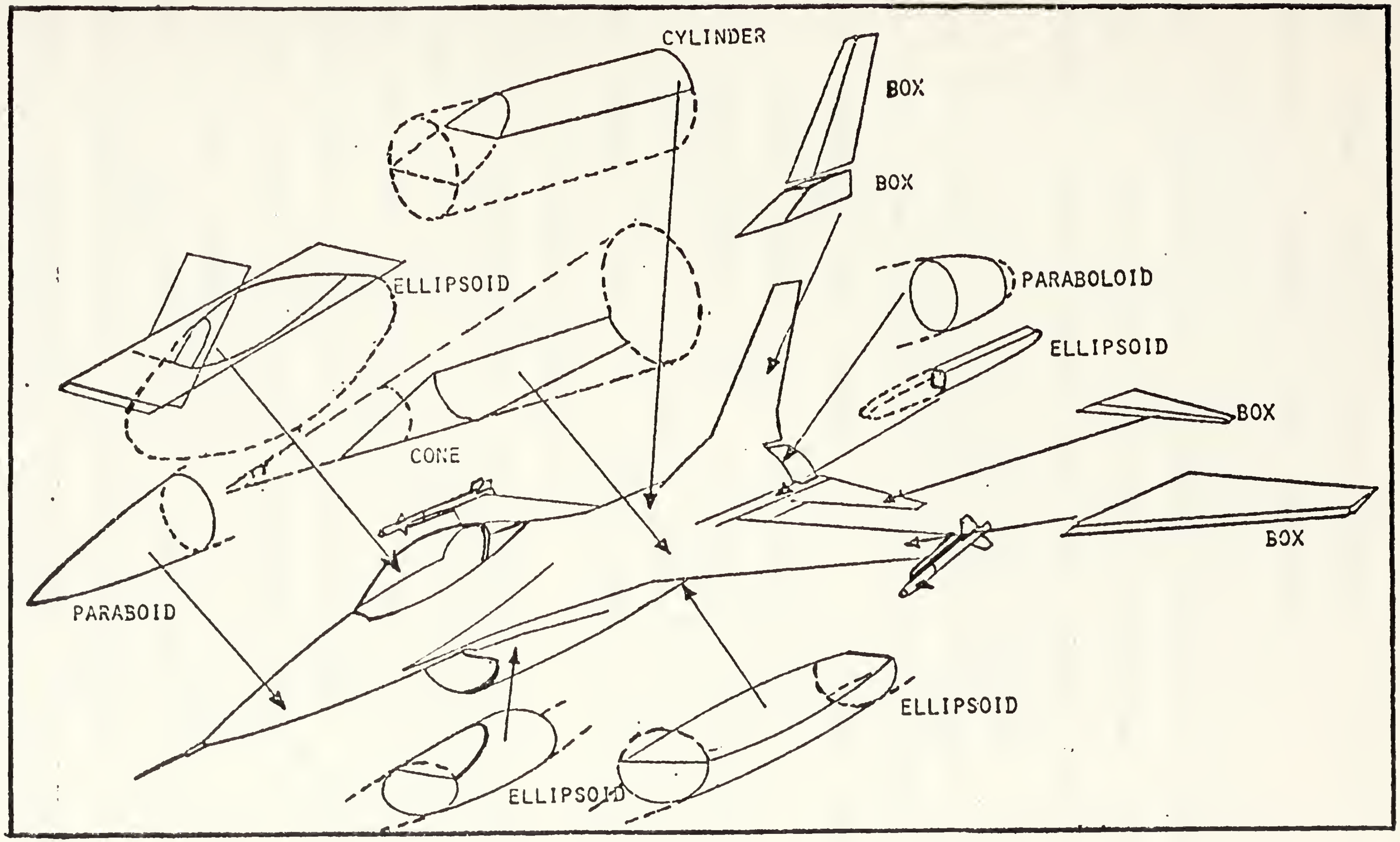


Figure I-1. Method of Target Modeling

detailed description of the geometric modelling is provided in SCAN, Volume I [Ref. 1] and an example of a geometry file is contained in the User's Guide, Appendix A.

2. Encounter Geometry - The modelling of the encounter scenario is done using four coordinate systems as depicted in Figure I-2. The features of primary importance include the kinematic and relational descriptors of the target and missile and the type of trajectory being simulated. The user has the option of specifying the miss distance of the missile at the time of detonation, or the miss distance from the aimpoint at the closest point of approach (CPA), with or without a Monte Carlo sampling specified by a circular error probable (CEP). Details of the encounter geometry modelling can be found in SCAN, Volume I [Ref. 1] and SCAN, Volume II [Ref. 2], and an example of the Case Data File is included in Appendix D.

3. Missile Representation - This feature is of primary importance to the student of a Warhead Lethality course, allowing him (her) the flexibility to redesign the missile warhead and fuze to a variety of specifications. Figures I-3a and b provide a pictorial representation of the warhead and fuze parameters used in the SCAN model. The warhead data file is also used to dimensionalize a blast envelope around the target, which can be extended or reduced by the user. The mathematical development of the damage mechanisms resulting from these parameter settings is

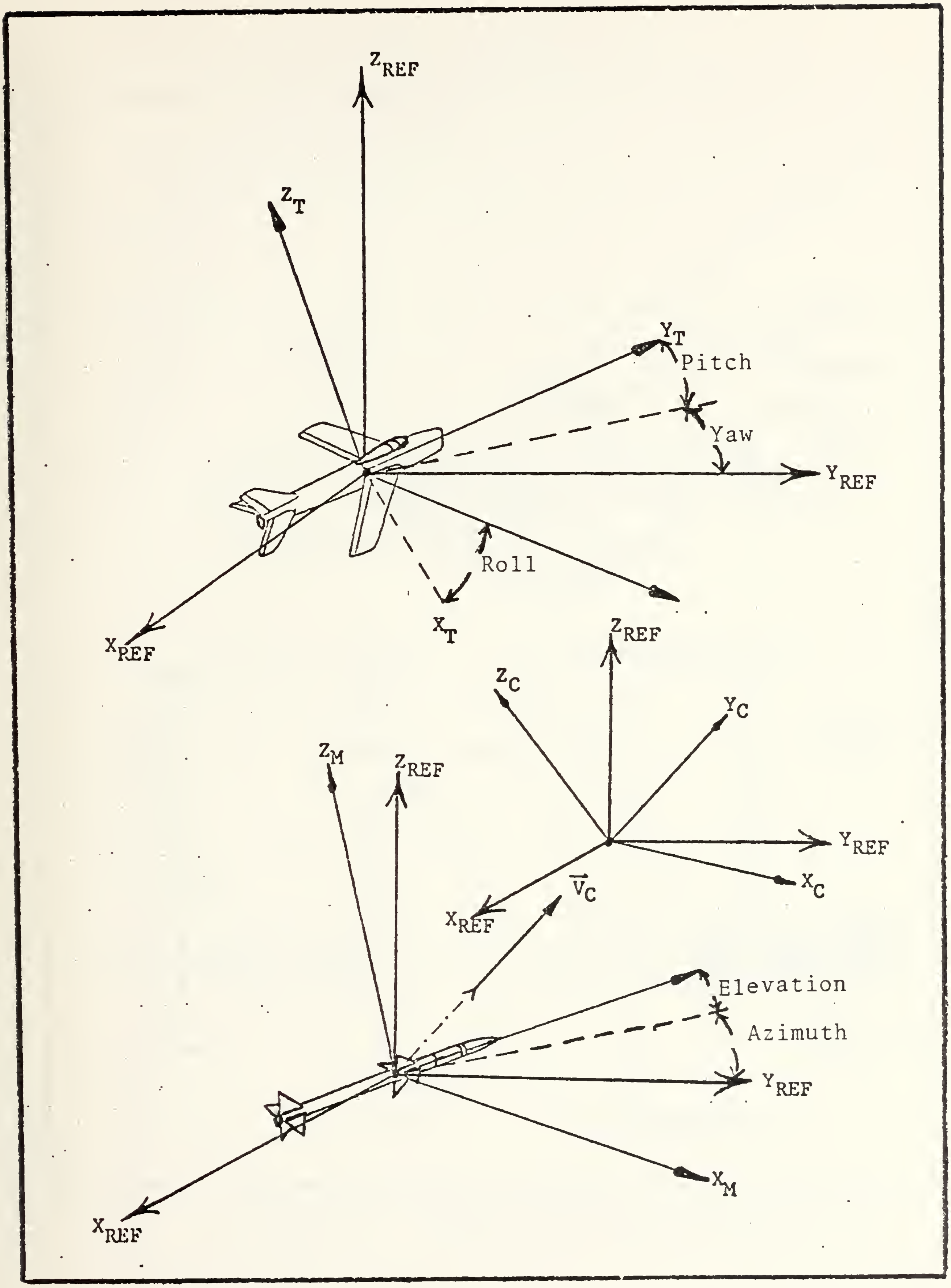


Figure I-2. Coordinate System Representation

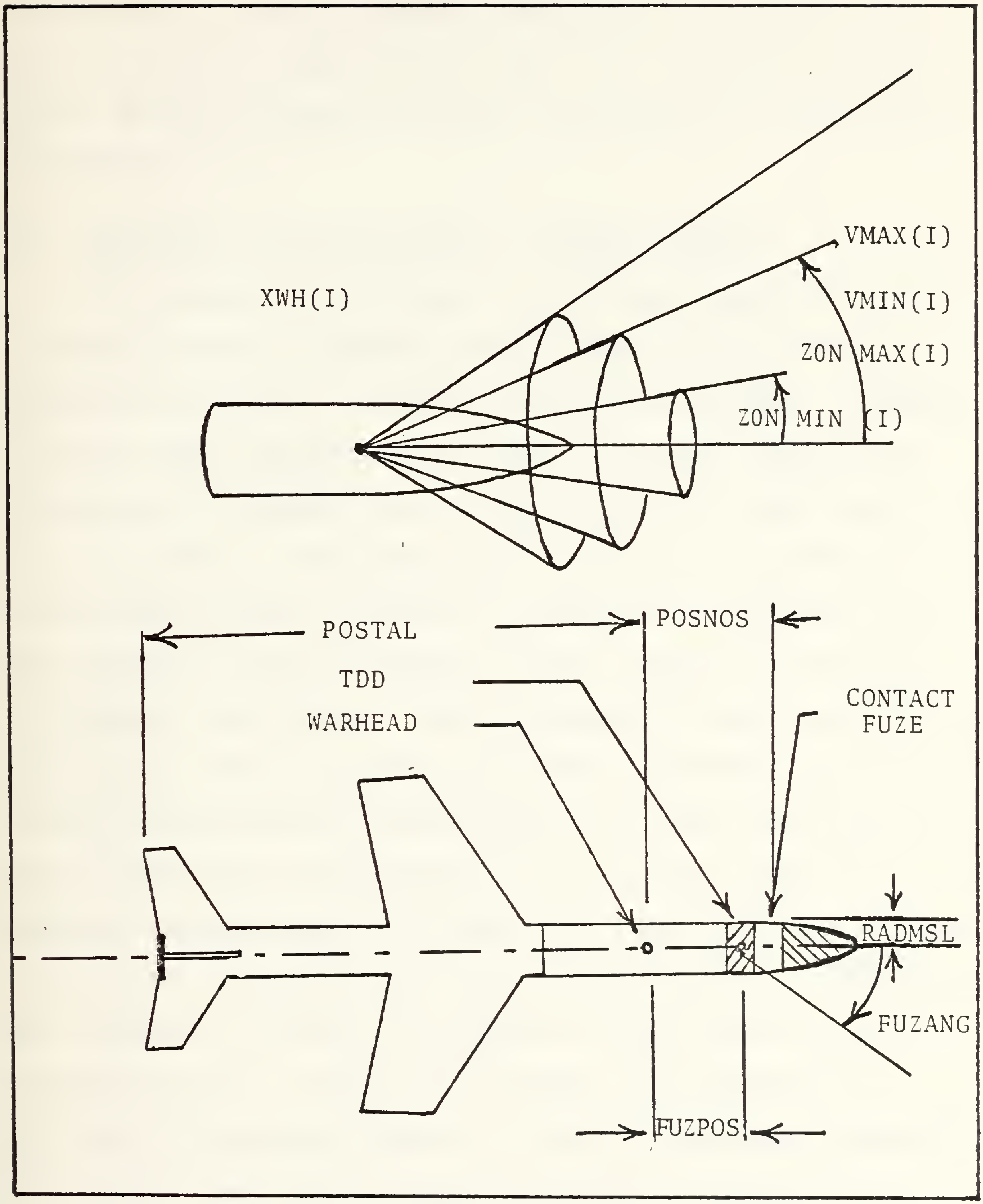


Figure I-3. Missile/Warhead Representation

thoroughly treated in SCAN, Volume II [Ref. 2]. A detailed description of these parameters and their interaction can also be found in [Ref. 3] and [Ref. 4]. The model for the blast envelope around the target is pictorially represented in Figure I-4.

B. STRUCTURE AND DESCRIPTION OF PROGRAM CHANGES

The structure of SCAN consists of three separate computer programs written in FORTRAN and developed at the Pacific Missile Test Center: SCANMAIN; SPLGEN and SPDRAW. SCANMAIN is the primary program and provides the actual analytical assessment of aircraft survivability against a specified missile threat. The program was installed at the Naval Postgraduate School in 1980 by Lieutenant J. Parr [Ref. 5]. The program is well documented and the support literature is abundant and current. The two graphics support programs installed at NPS are SPLGEN and SPDRAW. SPLGEN is the graphics pre-processor which accepts as inputs the target geometrical file and generates a target vector file for SPDRAW. SPDRAW accepts as input the target vector file from SPLGEN, and optionally the target impact file from SCANMAIN, and processes the data for graphical output based on user selected options. These two programs were installed at the Naval Postgraduate School in 1981 by Lieutenant Commander T. M. Hayes [Ref. 6]. Changes to these two programs and the creation of two file manipulation programs and an

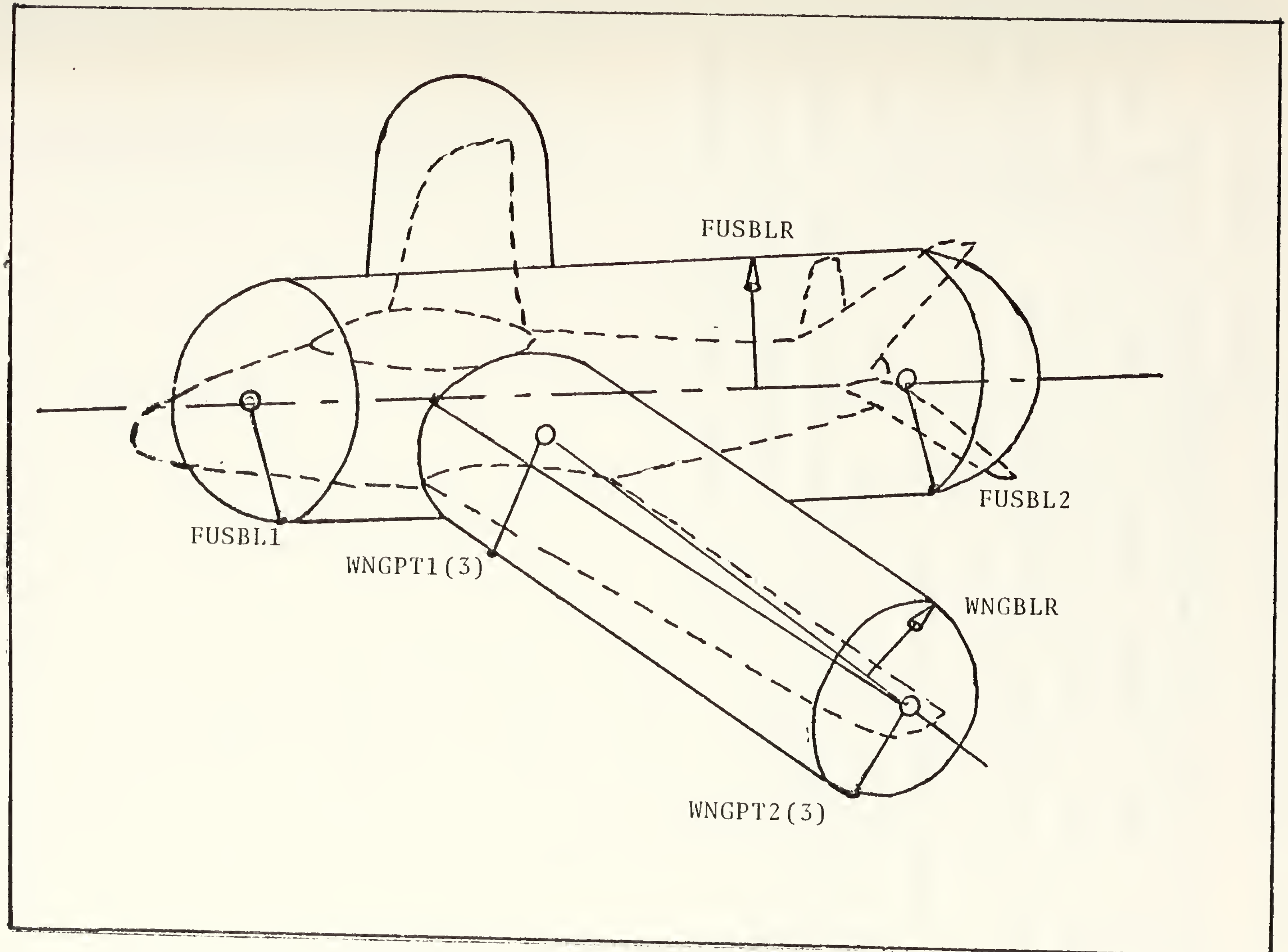


Figure I-4. Blast Envelope Representation

interactive control executive program were the major part of this thesis research.

Under the CMS timesharing system used at NPS, executive files can contain CMS or CP system commands or EXEC control statements and can be written and tailored to control special applications. Many of the burdensome system tasks required of a user can be eliminated by developing such a file as a control executive. This was done for the SCAN package at NPS and named NPSCAN. Figure I-5 summarizes the system commands required by the user on the original NPS version to run the entire application and the reduction of system commands to one on the revised version.

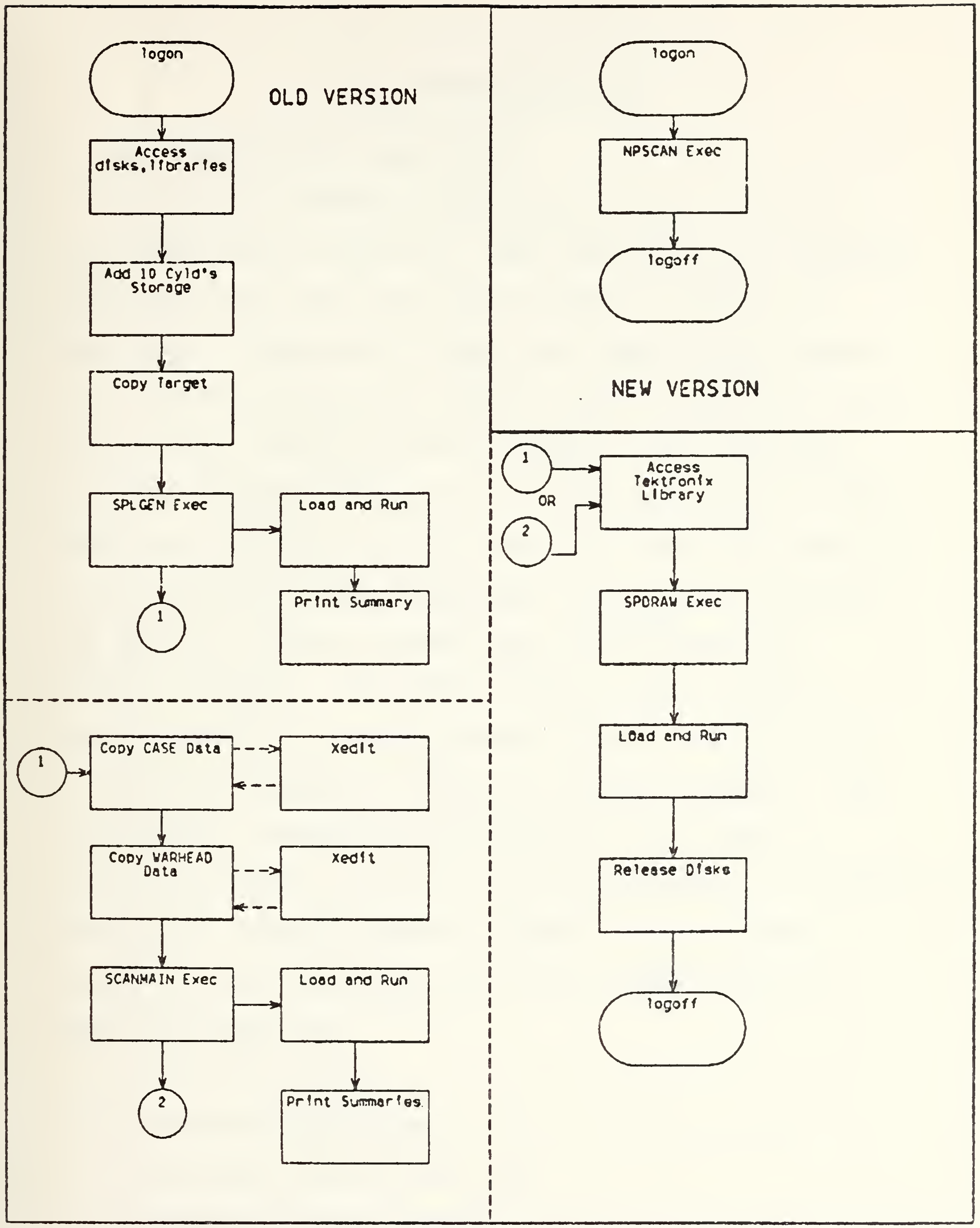


Figure I-5. Comparative Flowchart of User Required System Actions

II. ANALYSIS OF SCAN

A. NPS SCAN PACKAGE LIMITATIONS

The original SPDRAW program was written in FORTRAN for the CYBER computer and used a PMTC graphics system dependent language to drive the particular graphics terminal at Point Mugu. Appropriate changes were made to the program when initially installed at NPS to make it compatible with the IBM 3033, and the graphics commands were translated to PLOT10 languages for use on the Tektronix 4012 and 4081 Terminals. Since its installation, the School has acquired the new IBM Dual Screen Management workstations utilizing the IBM 3277 keyboard terminal and the Tektronix 618 graphics terminal. The DSM stations use the software dependent GRAF 77 language package and can also be driven by the ISSCO Telegraph or DISSPLA software packages. The SPDRAW PLOT10 commands were translated to the GRAF 77 primitive commands as part of the thesis effort. In addition, some of the original code was changed. These changes resulted in four advantages over the original version. These advantages are:

1. Increased Speed
2. Increased Flexibility
3. Increased Accessibility and
4. Improved Graphics Support

The specific subroutine changes and additions resulting from this translation are contained in Appendix C.

When the initial familiarization and program examination of SPDRAW was being undertaken at the beginning of the research period, the graphics plotting speed was noted as being extremely slow for a computer generated image. A small improvement in plotting time was noted when the translation to GRAF 77 was finished, mainly due to the utilization of hardwired terminals (9600 baud) vice a modem connected terminal (1200 baud). After further examination of the program logic, the discovery was made that the SPDRAW line generation routines were calculating individual vectors, checking their validity, and then plotting the single vector before going on to the next vector calculation. A similar procedure was followed for the target (fragment) impact file. To improve this situation, two additional storage files were added to the control executive and introduced into the generation routines to store all calculated data points prior to any plotting. In the revised application, all vectors are first calculated and stored. On completion of all calculations, the total file is sequentially plotted in one step. Additional information on this new procedure is provided in the design section, and the results are discussed in Chapter III.

Students at NPS, as with users in any environment, can possess widely differing computer experience. Lack of experience can adversely affect the ability of a user to successfully implement an application. For this reason, an interactive program should take into account the diverse backgrounds and make allowances for the inexperienced user. An important parallel to this concern is the experience of the user with the application itself, which must be taken into consideration if accessibility is to be given to students whose time is limited, whose familiarity with the topic is non-existent until the time of the course of study, and whose opportunity to use the program will be limited to a few weeks at the end of a course. The time factor is particularly important in view of the fact that SCAN is an extensive and complicated application. Running the three original programs required extensive reading by the author, which brings up another limitation of the SCAN package of programs, the lack of comprehensive documentation. Various components of the package were documented in different manuals, with the majority of the documentation on SCANMAIN. For example, Fair [Ref. 3] discusses the structure of the warhead and case data files and provides insight into the manipulation of these files for user defined encounter scenarios and warhead parameters. Hayes [Ref. 4] provides a useful guide for the control of

the complete application and summarizes the function of SPDRAW, including a descriptive listing of the available commands and user options. Specific examples are provided in Hayes' thesis, as well as documented results of a specific analysis carried out to demonstrate SCAN's capability. Prior to this thesis, no attempt has been made to compile these various sources into a comprehensive guide. This fact and the previously listed limitations, were all taken into account in the design and development of the resulting program changes and additions to be discussed in the next section.

B. DESIGN AND DEVELOPMENT OF PROGRAM CHANGES

As stated in Section A, the design of an interactive application should take into account its intended user's familiarity with computers, as well as their understanding of and experience with the application itself. Since familiarity with a package is dynamic and not static, and regular users quickly pass from a beginning stage to more demanding users, stepwise learnability was incorporated into the design changes applied to the NPS version of SCAN. The concept of stepwise learnability breaks up the amount of information the user must assimilate into a series of steps [Ref. 7]. Three distinct levels of interaction were decided upon during the development of the changes. The

following levels were incorporated in SPLGEN, SPDRAW, and the new control executive program NPSCAN;

1. Novice
2. Intermediary
3. Experienced

Simplicity was a key issue in the design of the control executive. At the same time, meaningful results were desired with minimal prerequisite knowledge. In order to maintain simplicity and clarity without sacrificing efficiency, the first design decision was to develop the control executive such that all administrative and technical requirements to run the programs would be handled automatically, requiring minimal computer experience by the user and eliminating the problem of bothersome typing errors. The application simplification is clearly depicted in Figure I-5. To maintain clarity, programmed instructions were provided at all levels of interaction, and the User's Guide was organized into segments corresponding to each user level to provide expansion and further explanation of these instructions. No more information than was required at each level was provided so as not to burden the user with confusing detail. To ensure efficiency was not sacrificed using this approach, each section in the application was restructured to provide a varying degree of sophistication and complexity dependent on the user level.

Minimal changes were required in SPLGEN, since the only interaction provided was for line density settings, target size extension, and debugging print switches. Setting the debugging switches provided for the Intermediary and Experienced level as an option rather than an annoying requirement. The option was not offered to the Novice level, and switches are automatically set to default. Line density option was reduced to a simple choice of normal or high density and is offered to all levels of user. The size extension setting was completely eliminated and is now automatically provided from within the Control EXEC and passed to the program as a self-loading parameter.

The SCANMAIN program is completely non-interactive, but the input data files to this program are of primary importance to the user. They are, in fact, the tools available to the user for exploring the capabilities of SCAN and for carrying out useful analysis. Their importance cannot be overemphasized, and the contents of these files should provide realistic specifications for the missile and target. A standard default file of each type (missile warhead, target, and case) was prepared and they are presented in Appendix D. These default files are automatically loaded at the Novice level in order to allow the user to proceed with the application

without having to prepare any input data. The Intermediary level user is provided with the choice of selecting the default files, or creating and utilizing custom files. Two programs were developed for this purpose; each program allows the user to change the primary descriptors within each file interactively and provides instructive messages and selective branching options. At the Experienced level, the user is allowed complete freedom of choice in manipulating the data files through the CMS XEDIT feature incorporated into the control executive. Guidance for manipulating each descriptor is provided in the User's Guide given in Appendix A. Details of the two file manipulation programs, are contained in Appendix B and are flowcharted in Figures II-1 and II-2.

The principle interactive program within the SCAN package is SPDRAW. This program underwent several modifications during the progress of the thesis. As outlined in Section A, translation of the graphics commands was the initial change, followed by the later amalgamation of both PLOT10 and GRAFF 77 into the same program, to allow the user the choice of terminal types. These changes are detailed in Appendix C.

The next change to SPDRAW was the restructuring of the line generation routines to enhance the speed of the graphics display process. This change required the addition of two temporary storage files to the file

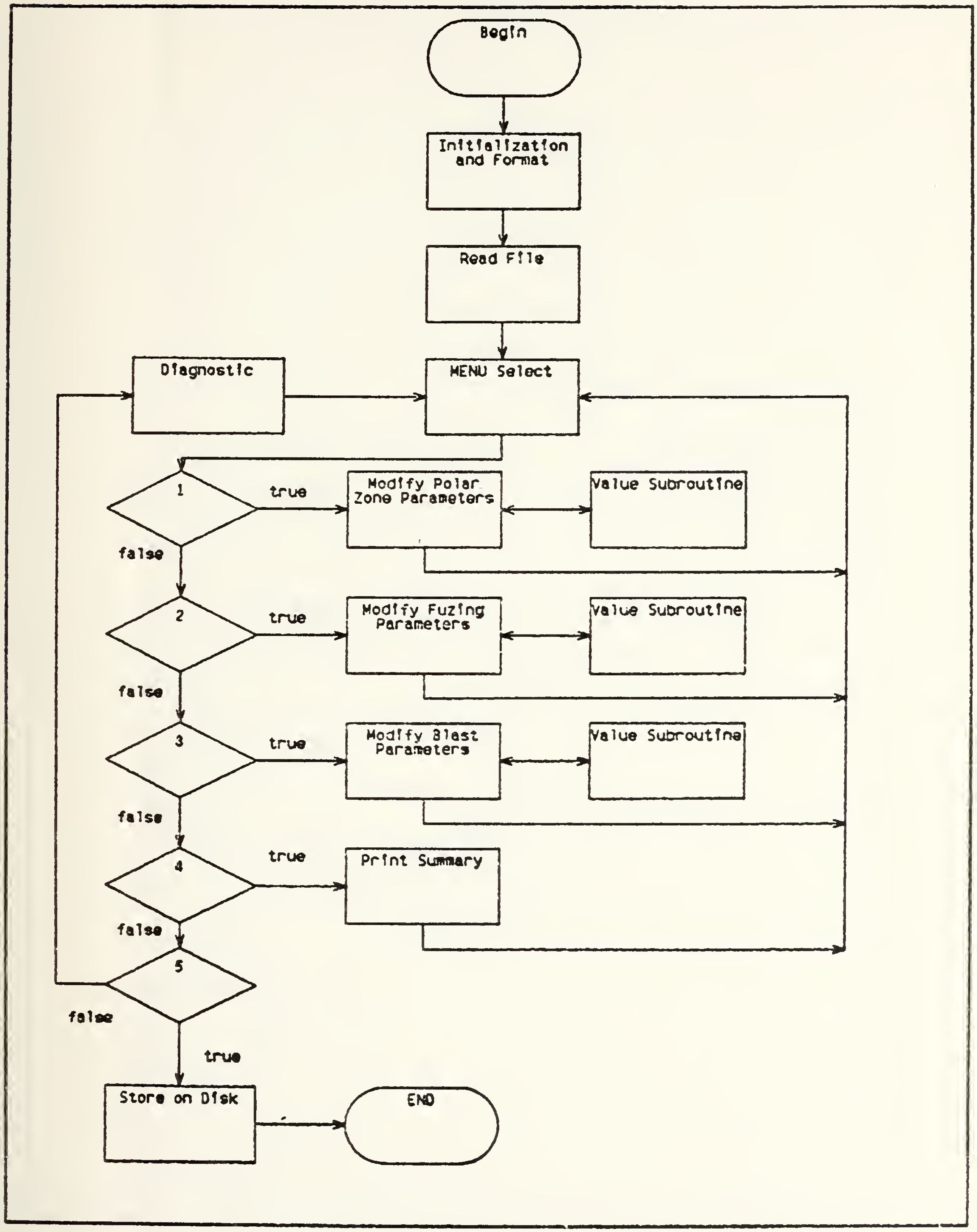


Figure II-1. Warhead Interactive Program Flowchart

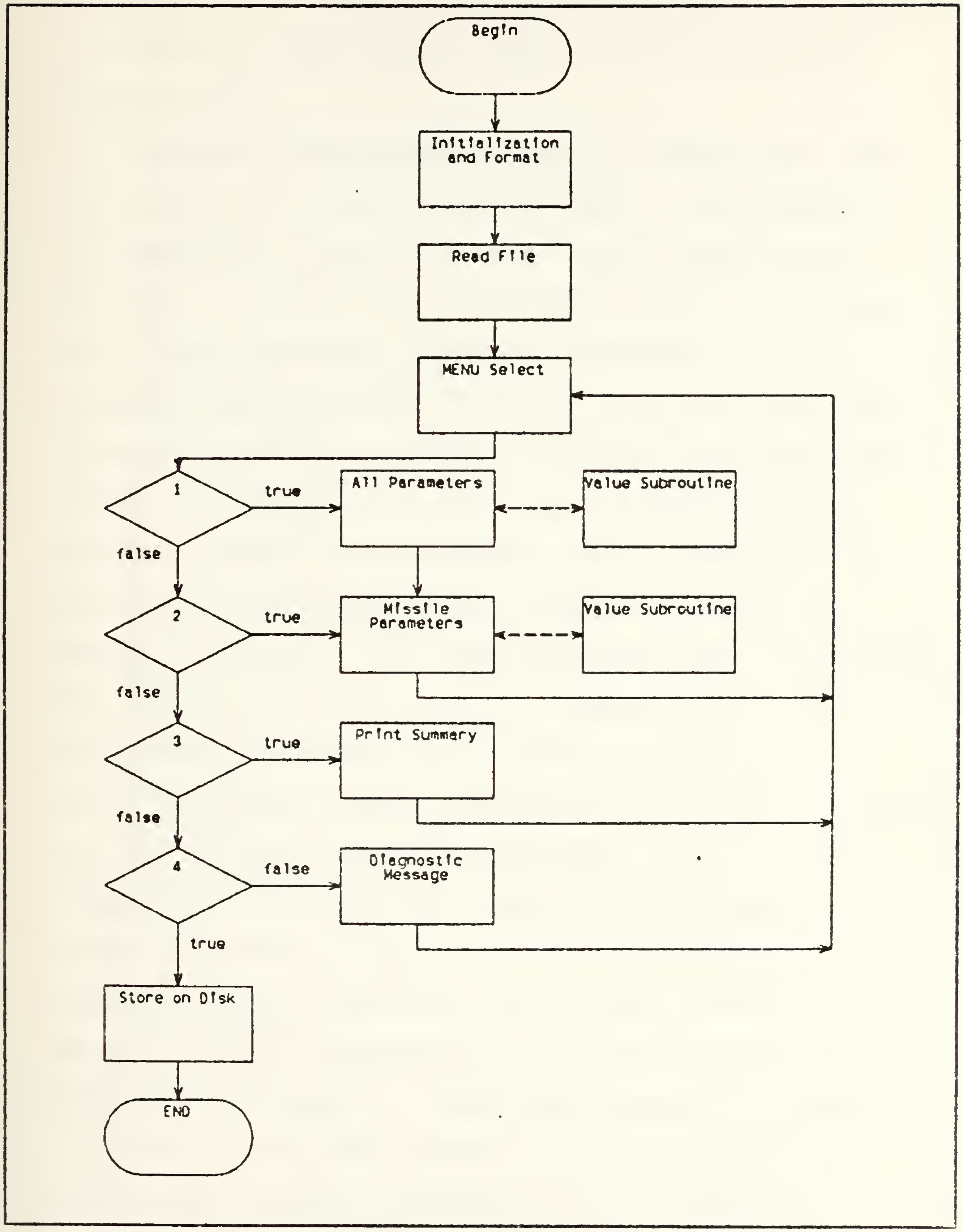


Figure II-2. Case Interactive Program Flowchart

definition for SPDRAW. A flowchart depicting the sequences of actions for the original and new version is found in Figure II-3.

The major additions and changes to SPDRAW were made to accomodate the three levels of user. The breakdown of command and option parameters for the three levels are shown in Figure II-4. The Novice level is provided with simple graphical capability including axes and fragment impact plotting. Control actions are provided through function key selection, with some numerical data entry. The Intermediary level user is provided with increased flexibility and options, while simplicity of selection is maintained using function keys and basic numeric data entry. The Experienced level user is provided the complete spectrum of graphic commands and options with control being maintained through more flexible typed command and option descriptors. All levels of user are provided with instructive messages, menu selection, diagnostics, and access to a newly written dynamic screen subroutine. This subroutine allows display manipulation without reentering a new PICTURE command. Details of this subroutine are flowcharted in Figure II-5. Additions and changes to SPDRAW are provided in Appendix C.

Another major contribution was the development of the control executive to replace the five original execs used with the NPS version [Ref. 4]. These five

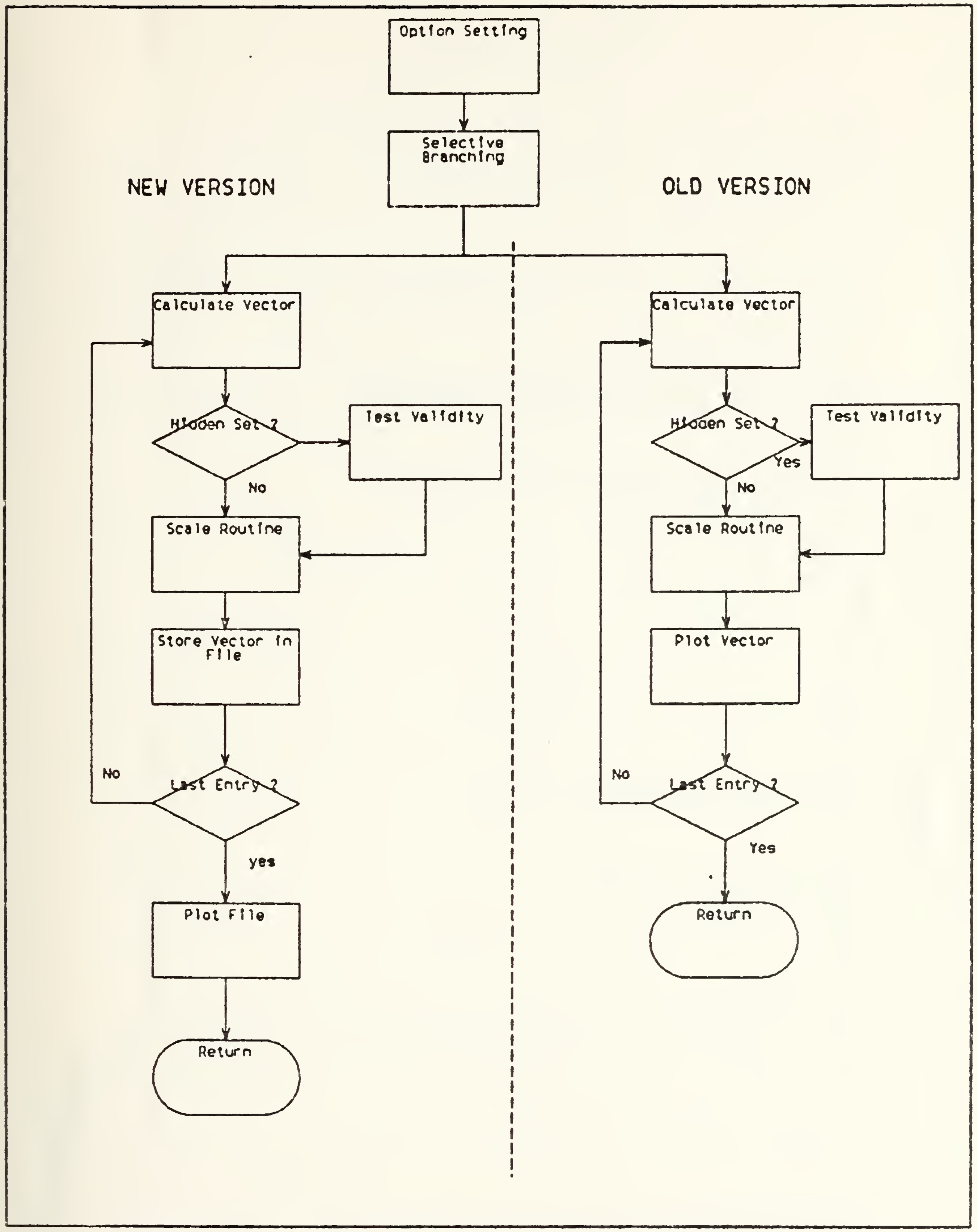


Figure II-3. Comparative Flowchart of Vector Plotting Sequence

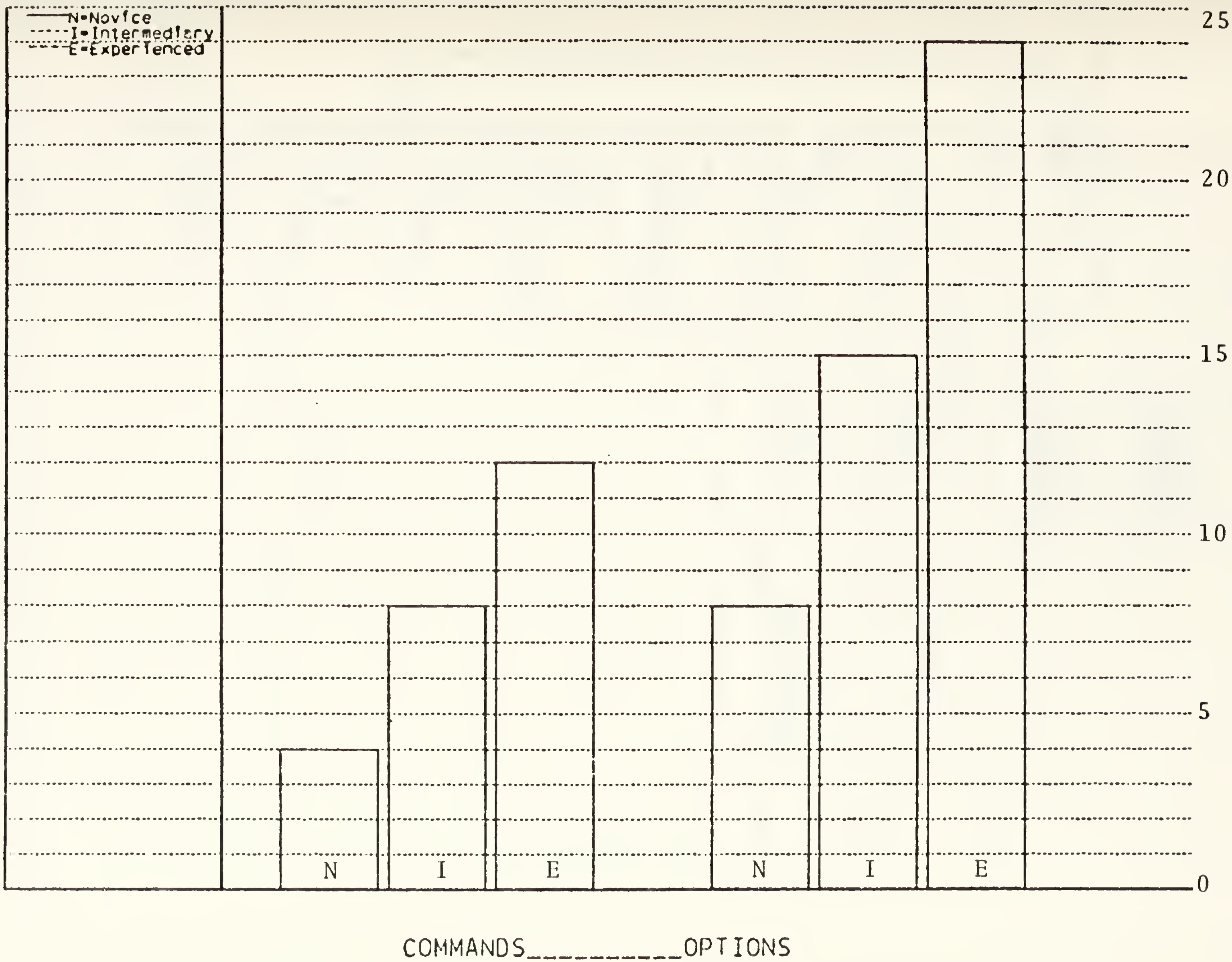


Figure II-4. User Level Accessability to Commands and Options

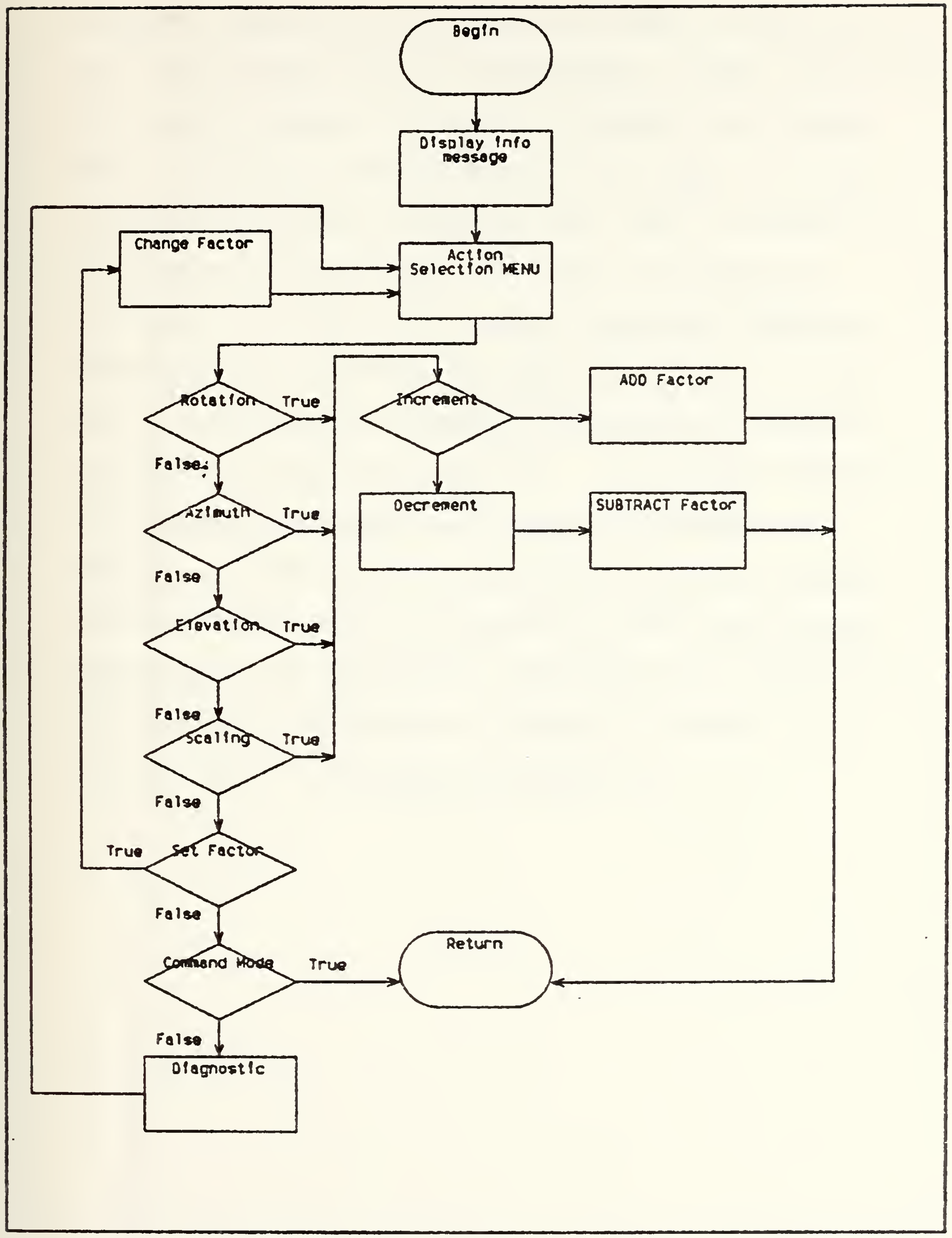


Figure II-5. Flowchart for Display Change Subroutine

programs ranged from three lines of code to ten lines of coce and provided the file definitions, global statements, and loading commands for SPLGEN, SCANMAIN, and SPDRAW. The new version, called NPSCAN, is ten pages in length, contains five hundred lines of code, and is designed to be completely interactive. The exec is written to encompass two (three with further expansion) graphics languages and a variety of graphics displays. It can also be used with the standard non-graphical terminals to provide statistical data only. It provides the user with maximum flexibility but requires minimum user knowledge of the system by providing automatic program control, three levels of interaction, and self-helping instructions and diagnostics throughout the application. The flowchart for NPSCAN is depicted in Figure II-6, and details are contained in Appendix B.

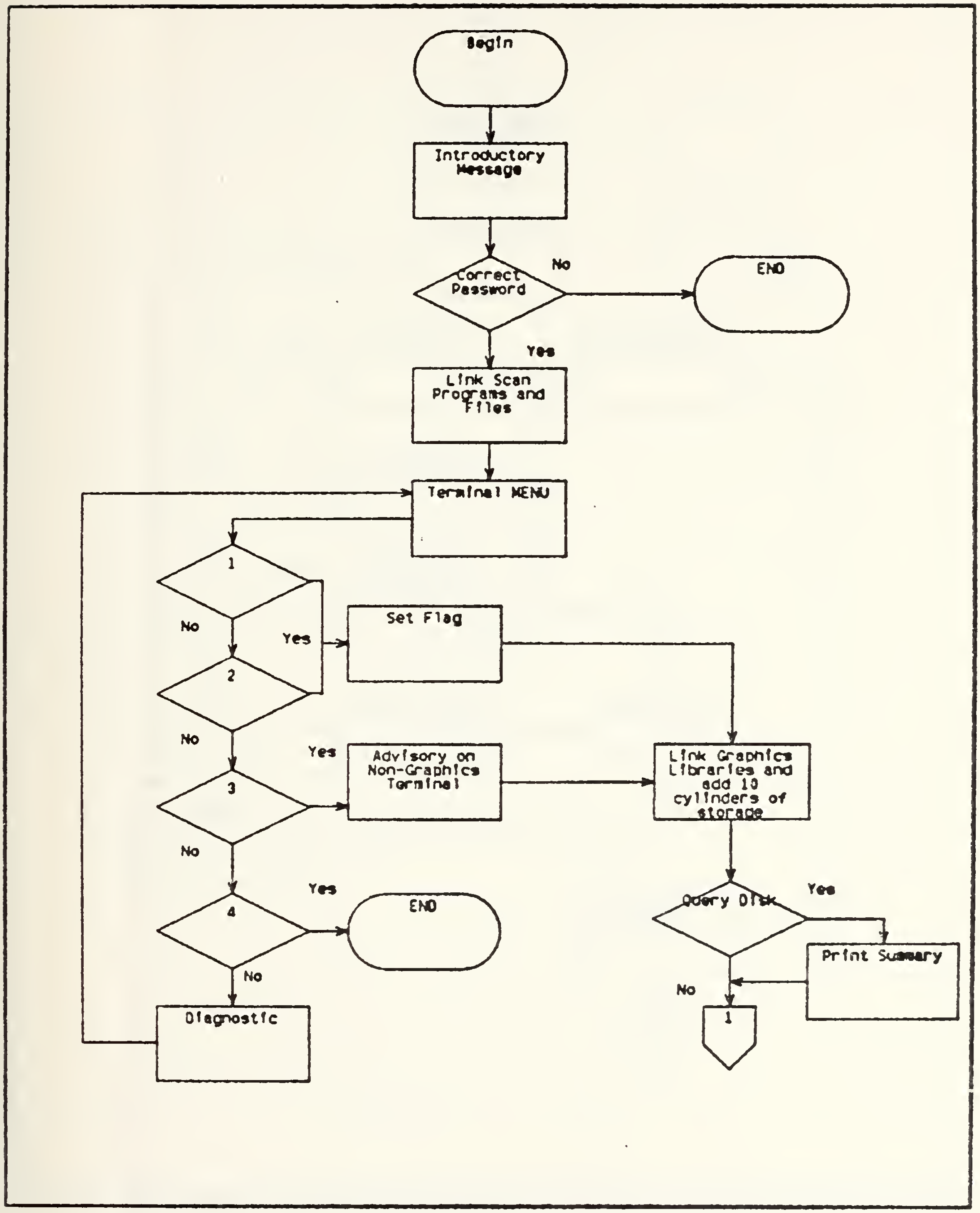


Figure II-6. NPSCAN Executive Flowchart

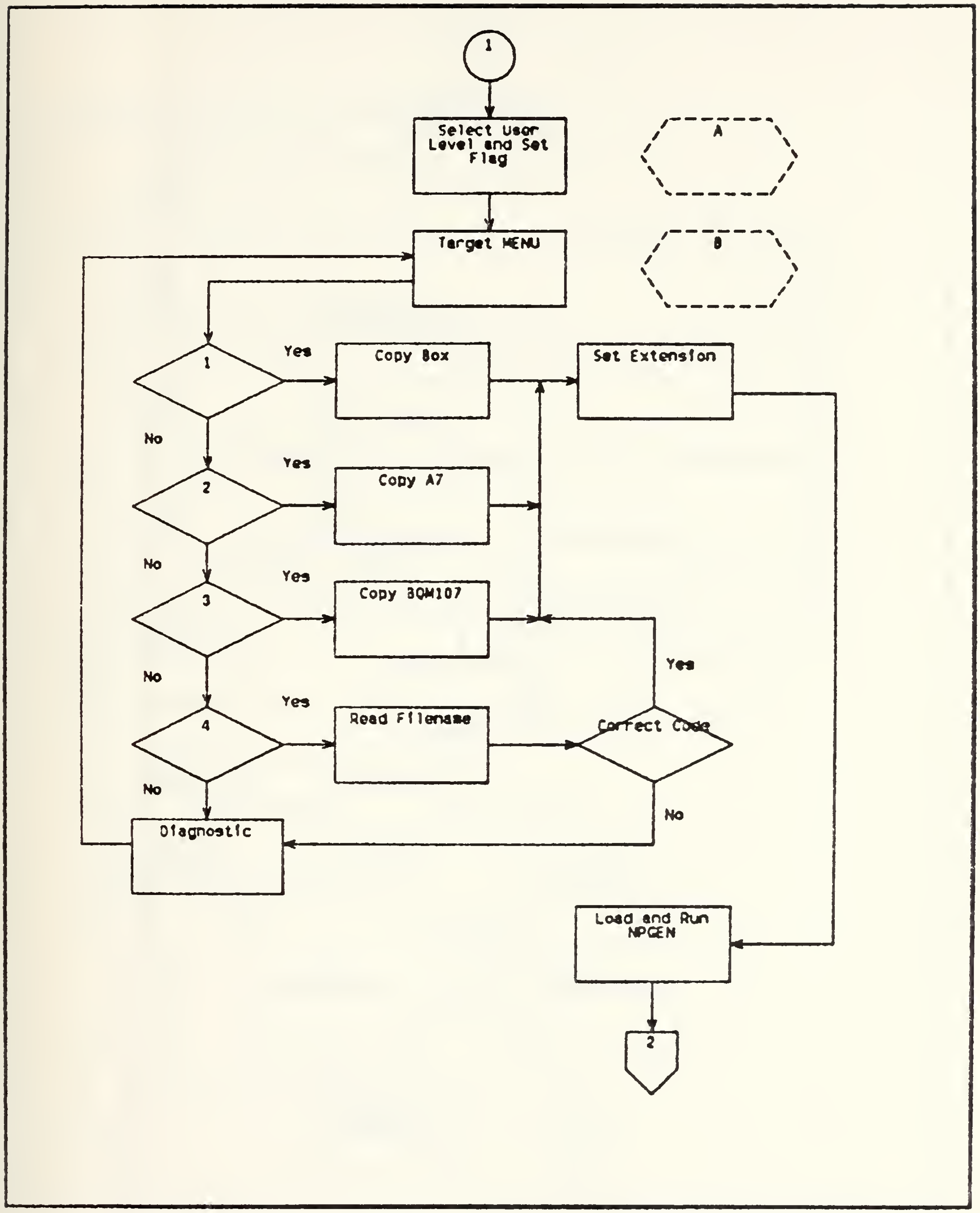


Figure II-6. (Continued)

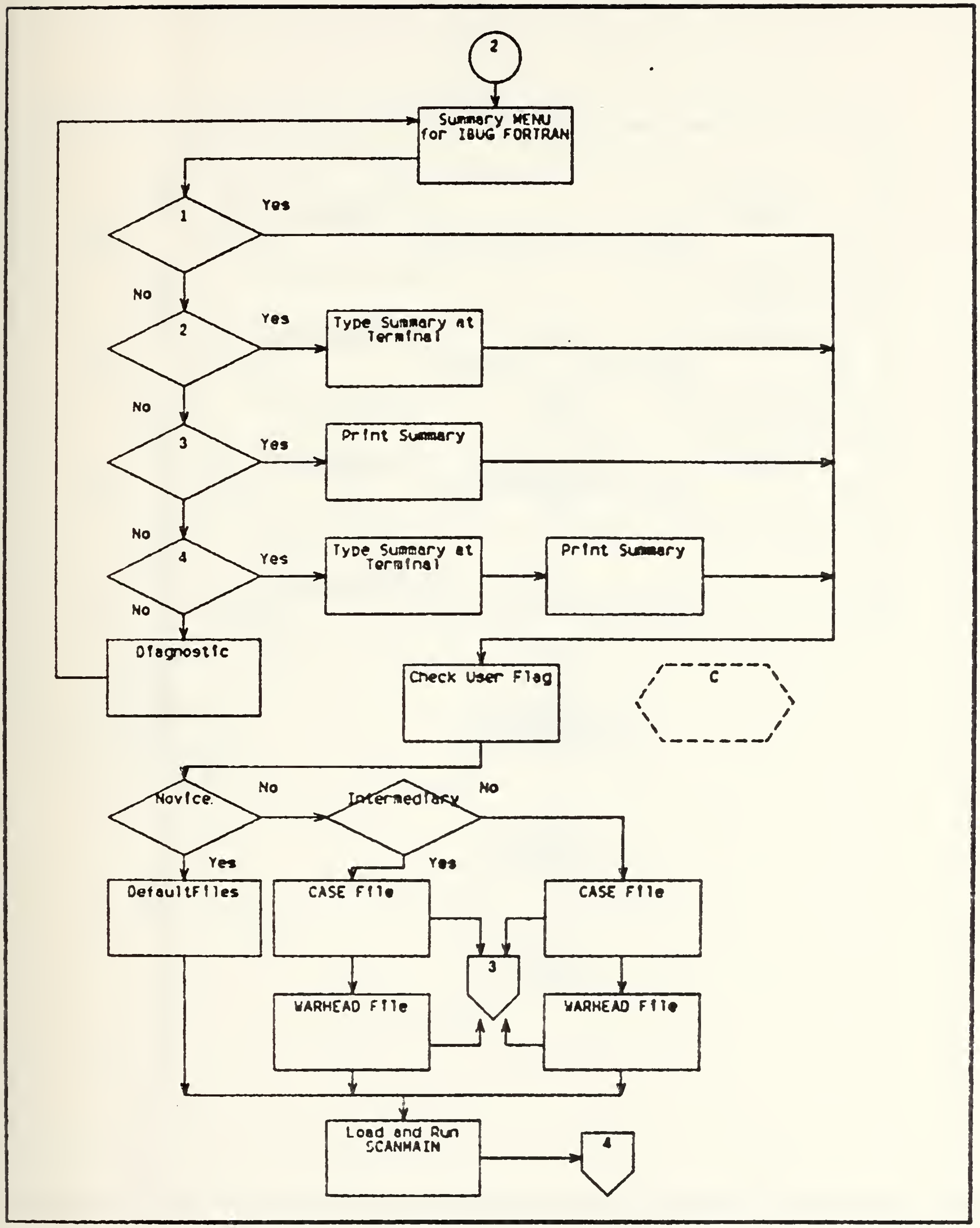


Figure II-6. (Continued)

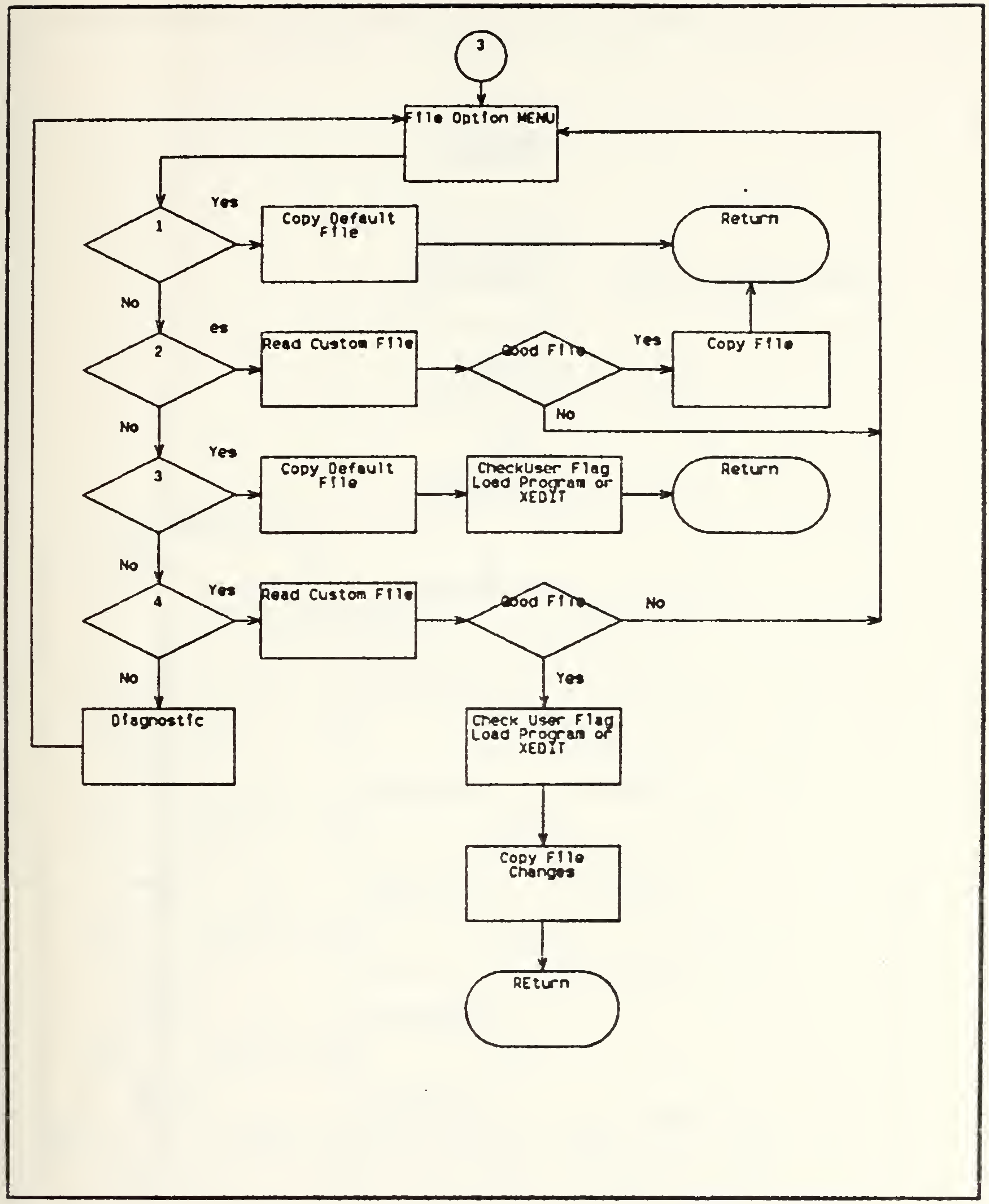


Figure II-6. (Continued)

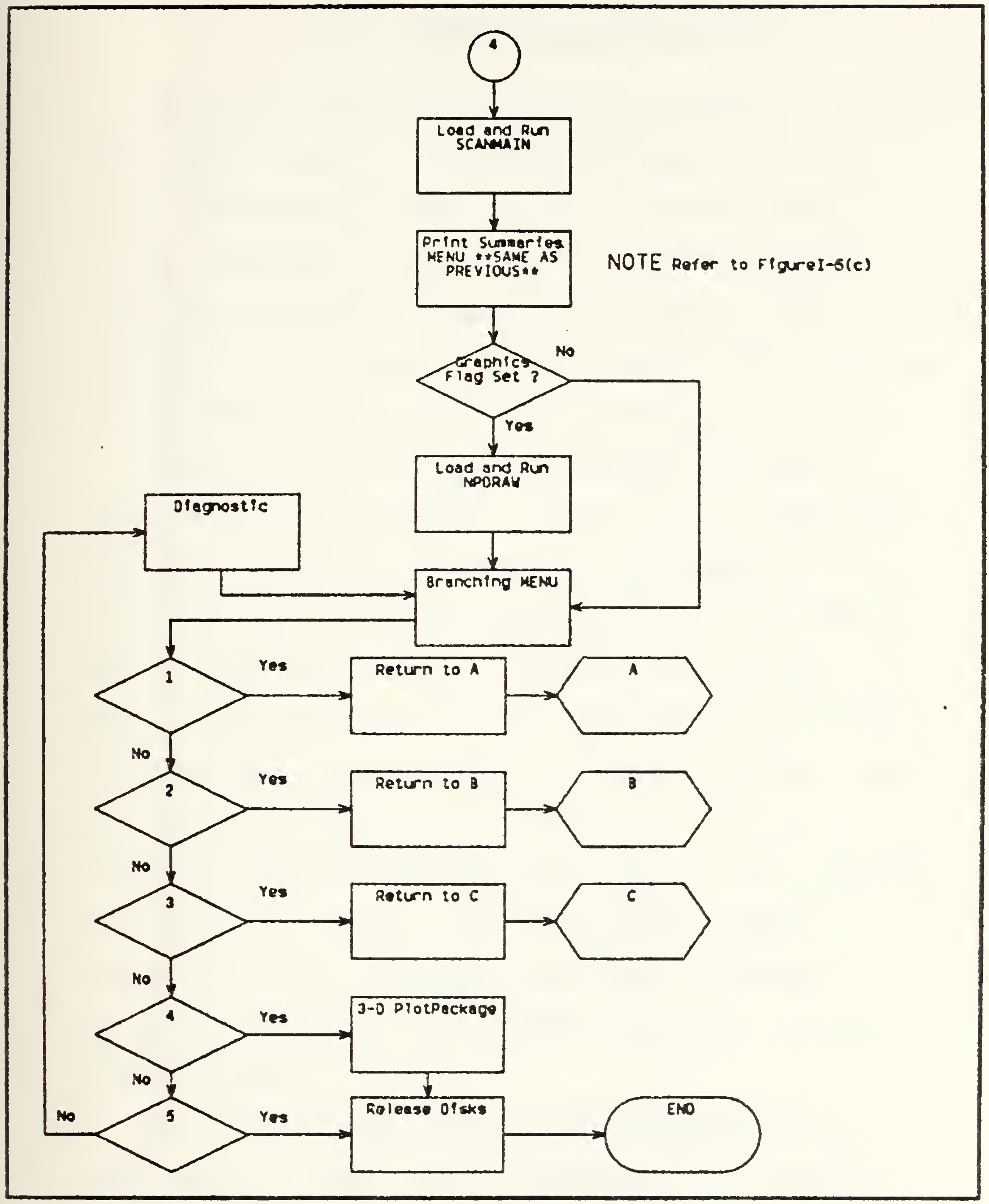


Figure II-6. (Continued)

III. RESULTS AND CONCLUSIONS

The SCAN package of programs is a valuable tool to the Endgame analyst, and with the changes and additions to the NPS version, should provide a useful and easy to use supplement to the Warhead Lethality and Aircraft Survivability courses taught at the School. The objectives of this study outlined in the Introduction were achieved and a summary of the results is given below.

Translation of the graphics commands to GRAF 77 resulted in four advantages. First of all, additional flexibility with the addition of a new language is evident by the increased useability, not only at NPS, but at other institutions. Second, accessibility at NPS is improved because of the large number of new IBM terminals that were acquired for the NPS system. Third, increased data transmission speed over that of the modem connected terminals was achieved since all IBM terminals are hardwired. Fourth, improved graphics support available for the new system terminals, although not optimal at present, will increase and improve as the system matures.

Restructuring the vector generation routines to calculate all values before commencing the plotting sequence had a significant effect on the speed of the

display process. An example of some of the observed time differences is as follows: display of a simple box target using the old version, PLOTIO (1200 baud terminal) was 69 seconds; the new version GRAF 77 (hardwired) used 1 second; for a complicated A-7 target display, the old version took 257 seconds; the new version took 24 seconds (these times include the fragment impact and axes generation). Testing times were taken during non-duty hours when computer usage was not heavy.

Development of three user levels will ensure that SCAN can be used to obtain desired results with minimum prerequisite knowledge and to provide flexibility and increased sophistication for the more experienced user. A breaking-in period of application usage by non-experienced users is necessary in order to assess effectively the achievement of this aim. Further refinement may be required at a later date after the revised version has been implemented and used.

The objectives of simplicity, clarity, and efficiency were achieved through the development of NPSCAN Control Program and the file manipulation programs. User knowledge of the computer system has been minimized. The addition of instructional messages and diagnostics to all interactive segments should prove useful even to the most seasoned users of SCAN.

The documentation that was compiled will provide each level of user with only that information that is necessary at that level and will eliminate the need to research additional sources, except of course in the case of the more advanced users.

One final note is concerning the research done to translate the graphics commands for DISSPLA and implement its use in the application. A custom executive was designed and incorporated into the Control Exec and used successfully in running a simple test program. When it was more carefully analyzed, it proved to be unsuitable for an interactive program such as SPDRAW, and was discarded, However, its use in development of a 3-D Plot Package at the conclusion of the application session could prove most useful and is recommended for further research.

APPENDIX A

NPSCAN USER'S GUIDE

SECTION

I. GENERAL DESCRIPTION

A. Introduction

NPSCAN refers to the Naval Postgraduate School version of SCAN and specifically represents the control executive used to drive the application programs herein referred to as:

1. SCANMAIN - Survivability assessment program
2. NPGEN - Graphics pre-processor
3. NPDRAW - Graphics post-processor
4. PROG1 - Interactive case file magnipulation program
5. PROG2 - Interactive warhead file manipulation program

SCAN was originally developed at the Pacific Missile Test Center for the purposes of analyzing aircraft survivability to missile threats and providing detailed damage estimates down to the component level. Users of the NPS version have access to three target models and with special permission can obtain codenames for additional models. Figures A-1 and A-2 depict a 3-D view of the A7 and BQM107 models that students can work with. In addition, a simple BOX model is provided and is recommended for first time users to familiarize themselves with the commands and options in NPDRAW. It should be noted that BOX has external components only. Figures A-3 and A-4 depict an internal representation of the A7 target and its computer generated counterpart.

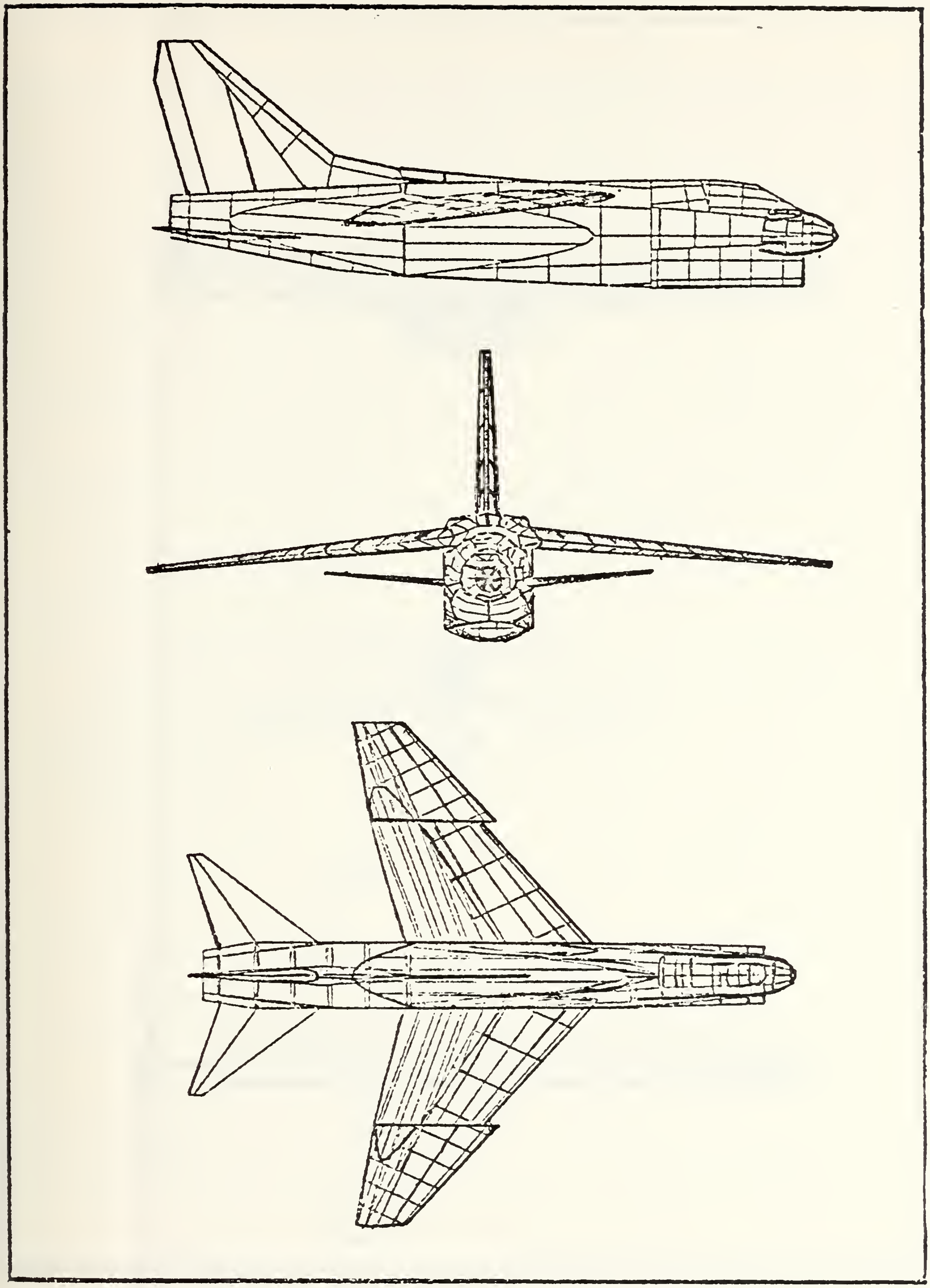


Figure A-1. 3-D Representation of A-7 Target Model

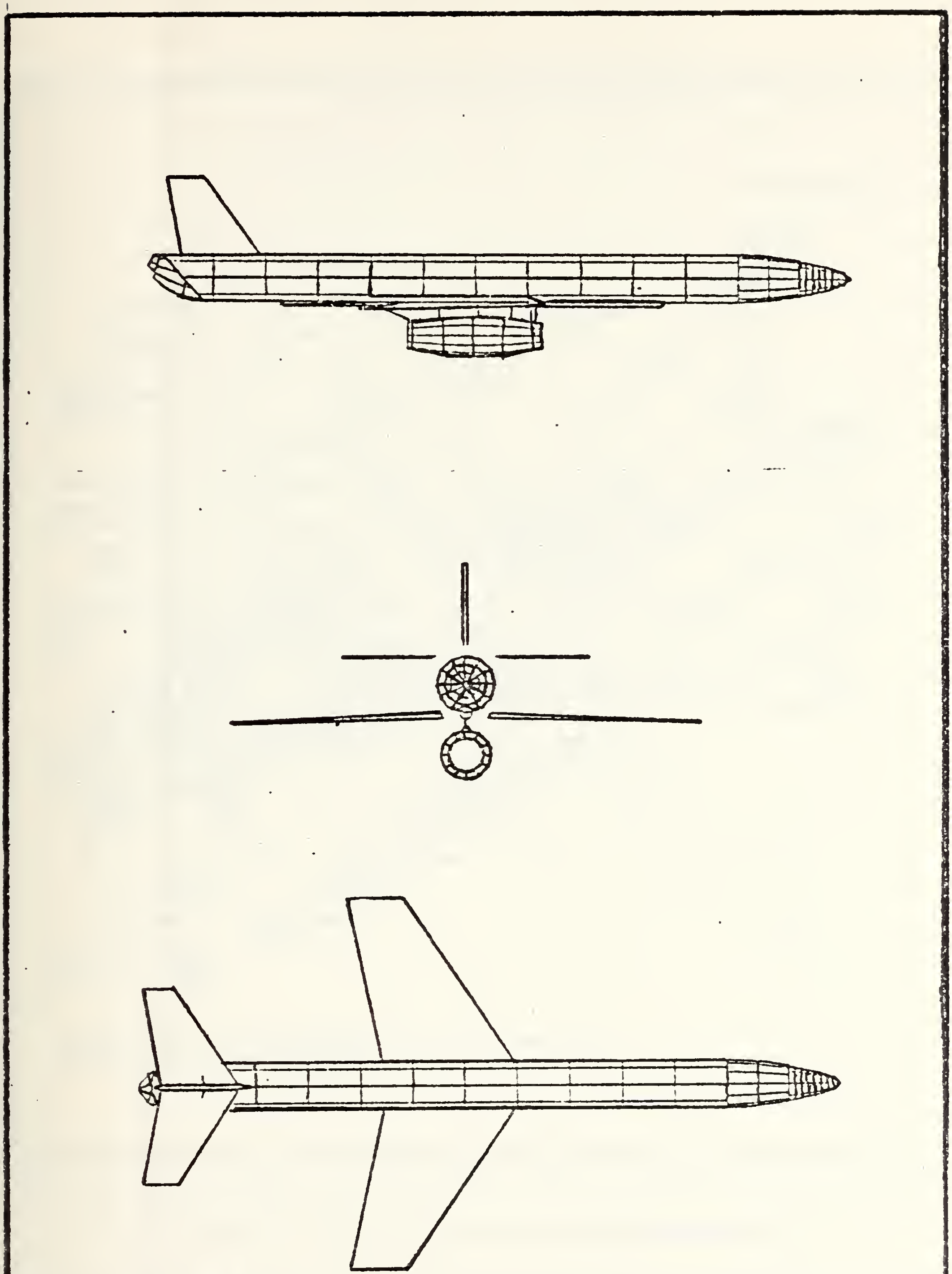
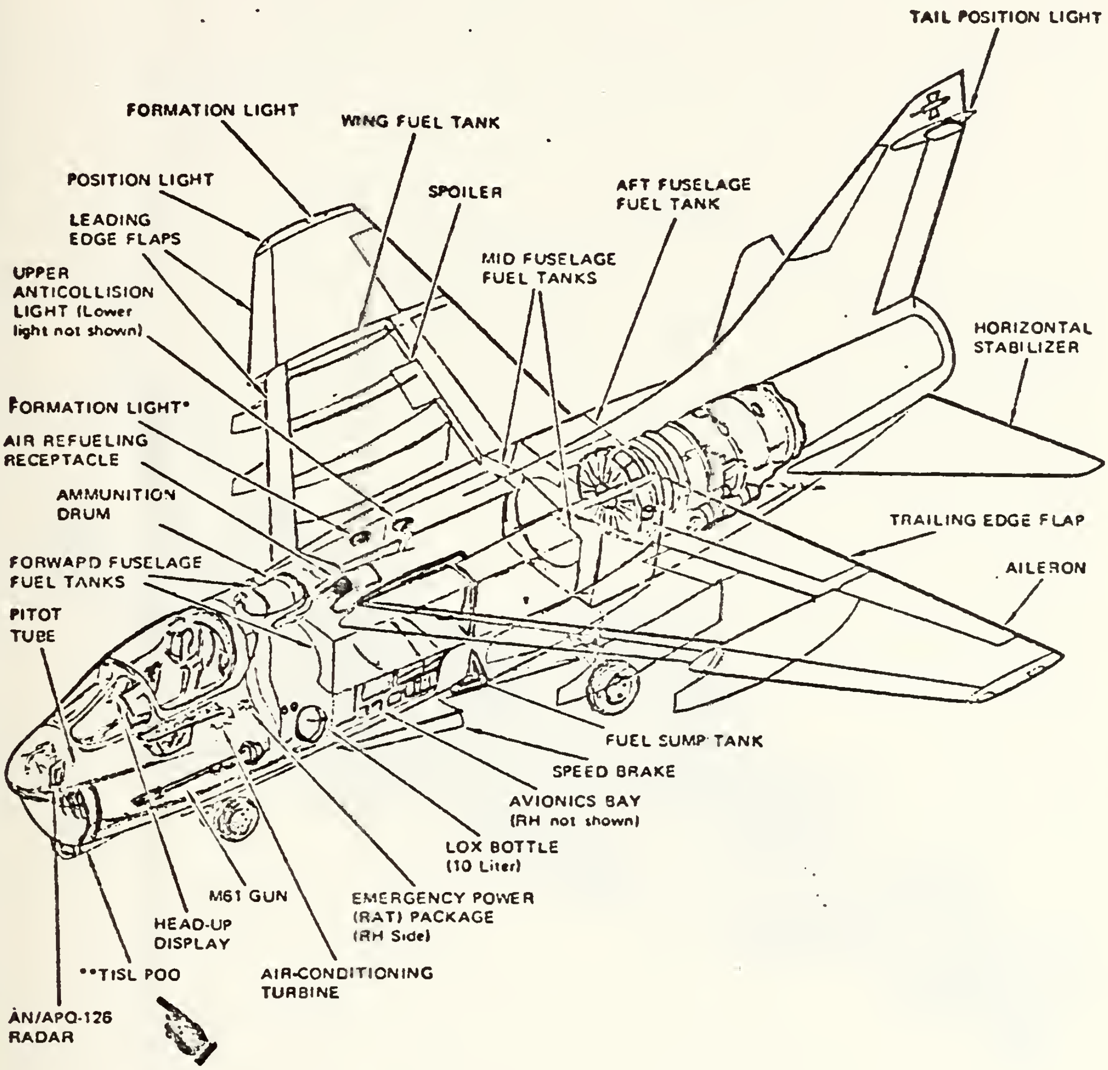


Figure A-2. 3-D Representation of BQM107 Target Model



*On aircraft → [26] center wing formation light is aft and to left of anticollision light.
**On aircraft [27] → [459] after T.O. 1A-7D-620

Figure A-3. A-7 Internal Representation

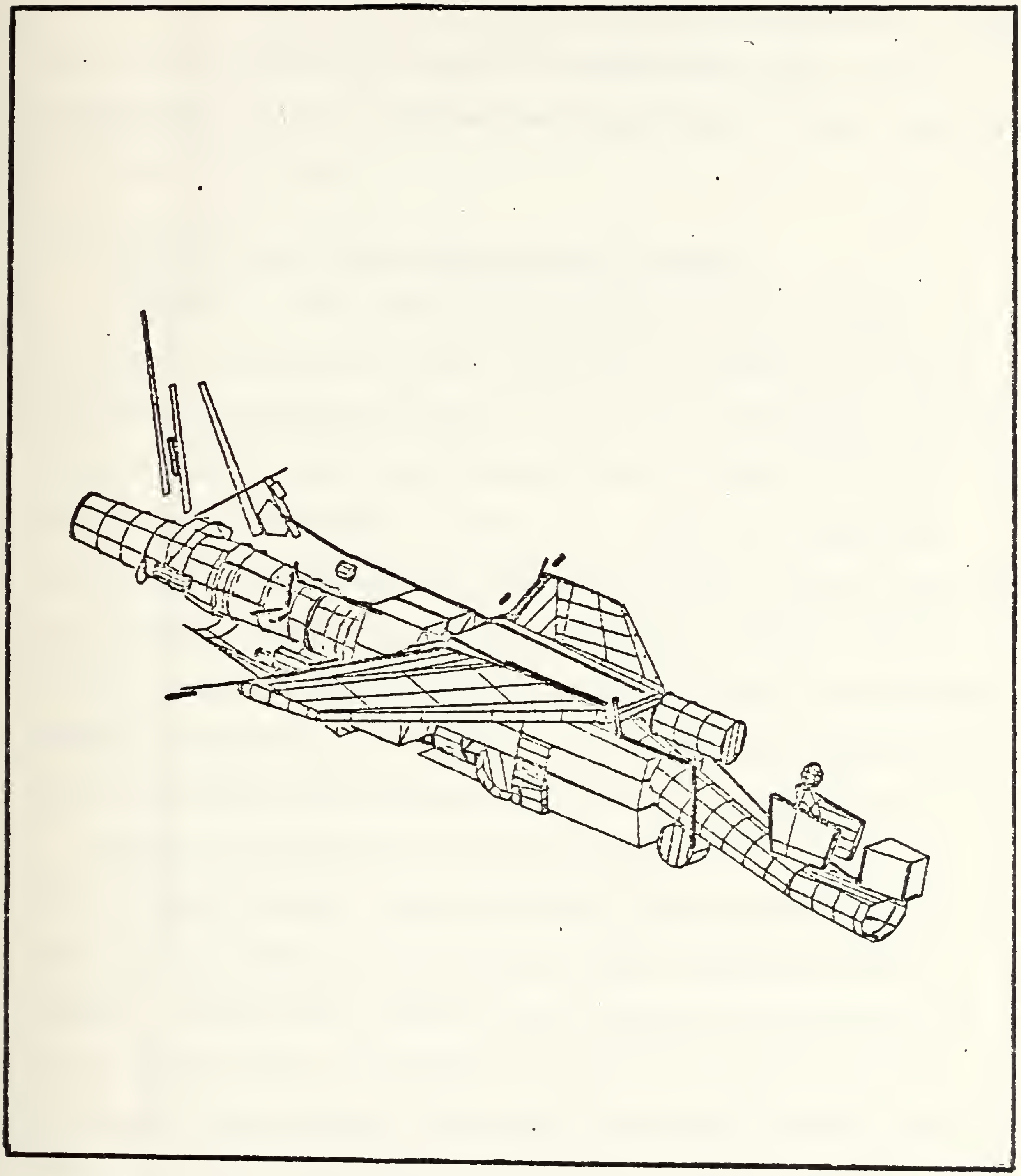


Figure A-4. A-7 Computer Generated Representation

Two files are provided to the user to describe the encounter scenario and the missile/warhead parameters. These are the case data file and the warhead data file. More information will be provided on these files in the respective user level sections.

B. Description of the Application Programs

SCANMAIN is the principle program in this package. It simulates the missile-target encounter mathematically and computes the expected damage. The three previously mentioned files (target, case, and warhead) are the input to this program and the output includes two printable summaries called SCAN1 and SCAN2, and the machine coded impact data used for NPDRAW. SCAN1 provides a descriptive summary of the target geometry, and SCAN2 is a summary of all the inputted endgame parameters, the damage results for the components, and the system and subsystem survivability statistics.

NPGEN is the graphics pre-processor for the package. This program accepts the predefined target geometry file as input and sets up the machine coded target data for NPDRAW. If desired, the user can obtain an echo print of the inputted file at the end of program execution. This print will also contain the number of target vectors generated and can provide additional statistics on line generation if debugging switches are preset (this is a user dependent option).

NPDRAW is the actual graphics processor. It accepts the two machine-coded files generated by NPGEN and SCANMAIN as input and provides the user with a graphical display of the target and fragment impacts. It contains a variety of commands and options for the user which vary in complexity depending on user level selected.

PROG1 and PROG2 file manipulation programs allow the Intermediary user the ability to interactively modify the principle parameters in the case and warhead files to his own design specifications. These programs will be described in more detail in Section III.

C. NPSCAN Executive Program

NPSCAN was developed to automatically control the CP/CMS system commands on the IBM 3033 required to run the above listed programs, thus removing this burden from the student. It will handle the graphics application in PLOT10 or GRAFF77 graphics languages, depending on which terminal type the student logs in on, or alternatively, will generate statistical data only if logged on to a standard data media terminal without graphics capability. The program is written to be used interactively to provide simplicity and clarity, however, the user can experience difficulty or program crash if data is incorrectly entered. Typical causes of user problems are discussed in Section V - TROUBLE SHOOTING. The procedure to be followed to get a copy of the NPSCAN EXEC on your disk is as follows:

1. Link to the SCAN disk.

   Type - CP LINK 0559P 191 192 RR - and enter

2. When prompted for the pass word type - XXXX - and enter

   Type - ACC 192 B - and enter

3. Copy the executive onto your A disk.

   Type - COPY NPSCAN EXEC B = = A - and enter

4. Release the SCAN disk.

   Type - REL 192 (DET - and enter

Once you have a copy of NPSCAN, simply enter NPSCAN and the program will automatically run. It begins by requesting the same password used in the previous procedure, which is "XXXX". Applicable libraries and applications programs will be linked. The primary terminal keys required to operate this package are the CLEAR (PAGE) key, ENTER (RETURN) key, and numeric keypad at the top of the keyboard, as depicted in Figure A-5. The numeric keypad doubles as a function key select when followed by ENTER. Do not confuse these with PF keys which have no use in this application. On the modem connected terminals, such as the TEKTRONIX 4114, the alphanumeric portion of the screen can be cleared using the scrolling knobs. Other non-hardwired terminals are not recommended for two reasons: first the screen alphanumerics tend to overwrite the graphics, making the application display cluttered and confusing; second, all modem connected terminals including the 4114 are much slower than the hardwired terminals.

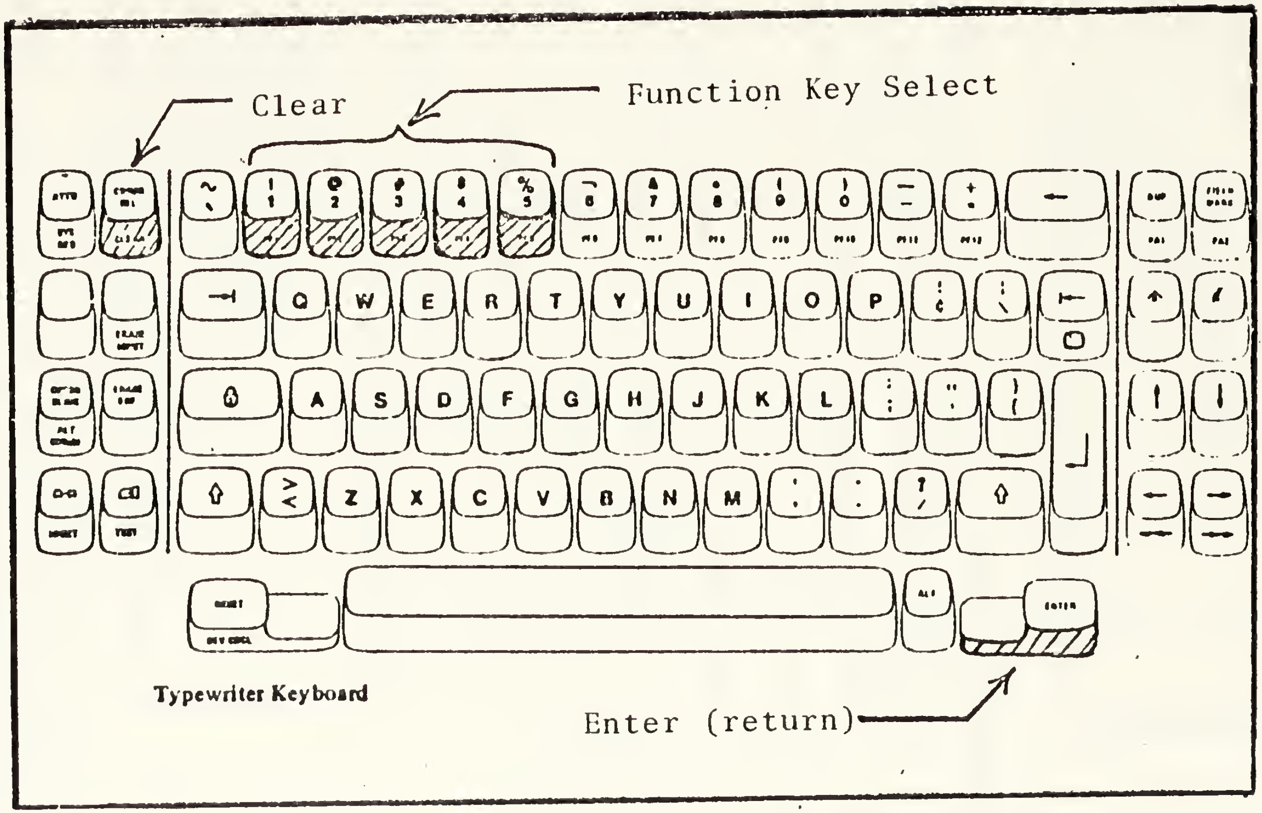


Figure A-5. Principle Keys Used With NPSCAN Application

Users begin an application run by selecting the numeric key corresponding to the terminal type being used and is self-explanatory.

```
*******************************************
*                                         *
*  TEKTRONIX   618                  1     *
*                                         *
*  TEKTRONIX   4012,4081,4114       2     *
*                                         *
*  NONE OF THE ABOVE                3     *
*                                         *
*  EXIT PROGRAM                     4     *
*                                         *
*******************************************
```

The program will then access ten extra cylinders of storage space and link to the applicable graphics libraries for the application. This procedure will vary in time depending on how busy the system is. Upon completion of the setup, the next menu block allows the user the choice of viewing his revised disk space allocation before continuing.

The user will then be requested to select the level he wishes to use. Beginners should always start at the Novice level to avoid confusing details and options.

```
****************************************
*                                      *
*  NOVICE LEVEL                1       *
*                                      *
*  INTERMEDIARY LEVEL          2       *
*                                      *
*  EXPERIENCED LEVEL           3       *
*                                      *
*  EXIT PROGRAM                4       *
*                                      *
****************************************
```

After the user level has been selected, the target model menu is presented. As previously mentioned, users should select the simplest model to familiarize themselves with

the program before continuing with a more complicated target, since the other models require much more computer time to simulate. Returning to the simplest model should be repeated each time a new level is selected so that valuable computer time is not wasted in the NPDRAW segment experimenting with new options and commands.

```
*************************************
*                                   *
*   BOX                         1   *
*                                   *
*   A-7                         2   *
*                                   *
*   BQM-107                     3   *
*                                   *
*   SPECIAL (SEE PROF. BALL FOR     *
*                                   *
*   AUTHORITY FIRST)            4   *
*                                   *
*************************************
```

Choice of targets is self-explanatory for 1, 2 or 3. The Special Target Option, 4, can be used if the correct codename and required maximum extension are obtained from Professor Ball. The program will the load and execute NPGEN. At its conclusion, a summary menu for the printable output which is self-explanatory will appear.

```
*******************************************
*                                         *
*   NO SUMMARY                      1     *
*                                         *
*   SUMMARY AT TERMINAL ONLY        2     *
*                                         *
*   SUMMARY AT PRINTER ONLY         3     *
*                                         *
*   SUMMARY AT TERMINAL AND PRINTER 4     *
*                                         *
*   EXIT PROGRAM                    5     *
*                                         *
*******************************************
```

The next segment involves the case and warhead file selection, and since program flow is dependent on user level,

it will be discussed in detail within each of the user level sections (II, III, and IV). At the conclusion of file selection, the primary program SCANMAIN will be loaded and executed. On completion of the execution, two summary menus will appear sequentially for each of the printable output files discussed in the Introduction (SCAN1 and SCAN2). The summary options are identical in format to those shown above for the NPGEN program. At this point, the program will either branch to the final menu if the user is logged on to a non-graphics terminal, or load and execute NPDRAW prior to branching if a graphics terminal is being used. The final menu will allow the user to return to any one of several locations in the package or to exit the program. The options are as follows:

```
****************************************
*                                      *
*     SELECT NEW USER LEVEL       1    *
*                                      *
*     SELECT NEW TARGET           2    *
*                                      *
*     MODIFY MISSILE FILES        3    *
*                                      *
*     RE-LOAD NPDRAW              4    *
*                                      *
*     3-D PLOT PACKAGE            5    *
*                                      *
*     EXIT PROGRAM                6    *
*                                      *
****************************************
```

Option 3, Modify Missile Files, is useful only to the Intermediary and Experienced levels. When the program executive is exited correctly, the previously accessed disks and libraries will be released. In case of a program crash anywhere during the application, refer to Section V.

II. NOVICE LEVEL

A. Introduction

The Novice level is intended to quickly introduce the new user to the overall application and familiarize him with the basic capabilities of SCANMAIN and NPDRAW. All non-selectable options will be automatically set to default values, and predefined case and warhead files are generated at this level. In addition to the information already outlined in Section I, the user is provided with the subsequent guide for NPGEN and NPDRAW programs.

B. NPGEN Program

This program contains the pre-processing necessary to set up the target vector file. At the Novice level, the debugging switches mentioned in Section I are not available to the user and therefore are set to default values. The target extension is automatically loaded from the executive program, and the user is given the choice of selecting either normal or high density for line drawings as depicted below.

```
**********************************
*                                *
*   NORMAL DENSITY          1    *
*   HIGH DENSITY            2    *
*                                *
**********************************
```

At the end of program execution, the user is offered the option of printed summary.

C. NPDRAW Program

Four commands and eight drawing options are made available through use of Function keys and standard numerical data input. These functions are purposefully restricted, but are sufficient to allow the user to understand the primary functions of NPDRAW and manipulate the more important parameters.

```
                     Command MENU
***********************************
*                                 *
*   DRAW TARGET              1    *
*   SET OPTIONS              2    *
*   LIST AXES                3    *
*   EXIT PROGRAM             4    *
*                                 *
***********************************
```

1. DRAW TARGET is enabled by entering numeric key 1. It will prompt the user to enter desired values of azimuth, elevation, and rotation for the display. These angles may range from 0 to 360 degrees and can be entered in either real or integer format. An optional value can be entered for size, but is not required. After the picture has been displayed, a special menu will appear. Function keys in this menu allow the user to increment or decrement the azimuth, elevation or rotation by a ten degree (default value) factor without having to re-enter the draw command parameters. The user may also reset this increment factor to any number between 0 and 90 degrees or reduce the screen display scale to one-half, one-third or one-quarter the preset full screen size.

```
*****************************************************
*                                                   *
*   INCREMENT --- (FK) **** DECREMENT --- (FK)      *
*                                                   *
*   AZIMUTH        1        AZIMUTH        2        *
*   ELEVATION      3        ELEVATION      4        *
*   ROTATION       5        ROTATION       6        *
*   SCALING        7        SCALING        8        *
*   NEW COMMAND    9     RESET INCREMENT  10        *
*                                                   *
*****************************************************
```

2. SET OPTIONS is enabled by entering numeric key 2. It will shift the user from the command mode to the option mode. The user will be presented a descriptive summary of current option settings as shown in the example.

"1" - A one follows a component type that is set on for display. There are two component types, external and internal.

"0" - A zero follows a component type that is set off and not to be displayed.

"T" - A T follows an option descriptor that is currently true.

"F" - An F follows an option descriptor that is currently false.

Example of Option Setting Display:

```
                    CURRENT OPTIONS

   "1" = ON     "0" = OFF     "T" = TRUE    "F" = FALSE

EXTERNAL COMPS  1    INTERNAL COMPS  0    ERASE BACK LINES  F
SPECIAL OPTIONS OFF  T    PLOT IMPACTS  F    DRAW AXES  F
```

This describes a display that will plot external target components without erasing hidden lines and that has no special options. Following the option setting display, the option menu will appear.

```
                    Option MENU
************************************
*                                  *
*   EXTERNAL COMPS  *          1   *
*   INTERNAL COMPS             2   *
*   DRAW ALL LINES  *          3   *
*   REMOVE HIDDEN LINES        4   *
*   NO MORE CHANGES            5   *
*   S PLOT IMPACTS             6   *
*   S DRAW AXES                7   *
*   CANCELL S OPTIONS  *       8   *
*                                  *
************************************
```

Items suffixed by an "asterisk (*)" refer to original default settings when the program is loaded. Items prefixed by an "S" refer to special options.

a. EXTERNAL COMPS is used to set display for plotting external components only.

b. INTERNAL COMPS is used to set display for plotting internal components only.

c. DRAW ALL LINES draws applicable component type with all vectors found in target file.

d. REMOVE HIDDEN LINES tests each vector for from user's perspective and erases all hidden lines before plotting.

e. NO MORE CHANGES returns the user to command mode.

f. S PLOT IMPACTS enables the plotting of fragment impacts over the target as calculated by SCANMAIN.

g. S DRAW AXES superimposes an XYZ axes through the target model center. Tick spacing can be adjusted through the LIST AXES command.

h. CANCELL S OPTIONS turns off all previously set special options and returns them to false.

3. LIST AXES is enabled by entering numeric key 3 from the command menu. This provides the user with the current XYZ grid extensions, origin, and tick spacing. The user may adjust the tick space value. The default value is "1.0".

4. EXIT PROGRAM is enabled by entering numeric key 4, This returns the user to the NPSCAN executive program and provides the final branching menu described in Section I.

III. INTERMEDIARY LEVEL

A. Introduction

The Intermediary level provides the user with two extensions to the application. First and foremost is access to the case and warhead files. The user can modify and customize the principle parameters contained in these files interactively. Second, expanded command and option descriptors are available for display. The format for data entry is the same as described for the Novice level. If you have not already run the application at the Novice level, it is recommended that you go back and do so before reading on.

B. NPGEN Program

In addition to the choice of line density setting, the intermediary user has access to a set of debugging switches which will provide additional line generation statistics at the end of program execution. The listing of debugging switches is shown below and is strictly optional.

2 - All prints concerned with line generation

3 - Line generation of bounding planes

4 - Line generation of elliptic cylinders

5 - Line generation of ellipsoids

6 - Line generation of paraboloids

7 - Line generation of elliptic cones

8 - Line generation of parabolic cylinders

9 - Line generation of hyperboloid 1

10 - Line generation of hyperboloid 2

11 - Line generation of parobolic hyperboloid

12 - Line generation of hyperbolic bounding planes

13 - Line generation of parabolic bounding planes

14 - Line generation of elliptical bounding planes

16 - Listing of target vectors

19 - Retrieval of components from target array

20 - Maximum extents, optical centers and number of lines for each component

0 - Null setting no activation takes place

Typing in the integer number representing switch will activate it. The user will be prompted ten times. However, if the user wishes only to activate a few switches, these should be entered first, followed by "0" for all remaining prompts. Following this, the program will continue with normal execution. If the user wishes to have a printed listing concerning a specific component, the component number is entered as a negative value to distinguish it from other switches. For example -2002 will turn on all line generation prints for Quadric No. 2.

C. PROG1 and PROG2

These two programs provide the intermediary user with interactive control of the case and warhead data files. The user will be provided with a file manipulation menu prior to each file selection.

```
*************************************
*                                   *
*     USE DEFAULT FILE        1     *
*     USE CUSTOM FILE         2     *
*     MODIFY DEFAULT FILE     3     *
*     MODIFY CUSTOM FILE      4     *
*                                   *
*************************************
```

1. USE DEFAULT FILE will copy the applicable default file from disk and load it into SCANMAIN as was done at the Novice level.

2. USE CUSTOM FILE will copy and load a user defined file that was previously created and saved under a user defined name.

3. MODIFY DEFAULT FILE will copy the applicable default file and load it into the PROG1 or PROG2 program. The user will then be given instructions on flipping through the file parameters and selectively changing or saving current values. The formats are as follows for the two program Menus.

```
       PROG1 (Warhead File)                 PROG2 (Case File)
********************************** **************************
*                                * *                        *
* FRAGMENT PARAMETERS          1 * *ALL PARAMETERS        1 *
* FUZING PARAMETERS            2 * *MISSILE PARAMETERS    2 *
* BLAST ENVELOPE PARAMETERS    3 * *PRINT SUMMARY         3 *
* PRINT SUMMARY                4 * *EDITING COMPLETE      4 *
* EDITING COMPLETE             5 * *                        *
********************************** **************************
```

To assist the user in identifying specific parameters, Tables A-1 through A-9 are provided in Section V. These include

the parameter description, units of measure, and in some cases a pictorial representation. Once the user has selected a parameter segment from the particular menu, the current values from the file will be given in sequence with their definition and a request to accept the value or change it to a new value.

```
***************************
*                         *
*  CHANGE VALUE       1   *
*                         *
*  NO CHANGE          2   *
***************************
```

On completion of one segment of parameters, the user will be returned to the selection menu to select the next segment, view a summary of parameters, or exit the program. These segments can be accessed in any order and as often as desired until the user is satisfied with all changes. The EDITING COMPLETE key is final and terminates the program. Therefore, it is recommended that the user carefully check all values using the PRINT SUMMARY option first. Once the program is exited, the user will be given the choice of making a permanent copy of the modified file on his A-disk. To avoid confusion, the user should not give it the same name as the default files, but should select a name that is similar for easy recall. Also, clear distinction between the filenames of a case-type file and warhead-type file should be maintained by the user to prevent inadvertent loading of a customized case file into the warhead program (PROG1) or vice-versa, resulting in a system crash.

4. MODIFY CUSTOM FILE will load a previously saved file into the PROG1 or PROG2 programs for further modification, after checking the validity of the file. The same procedure described in MODIFY DEFAULT FILE is followed for accessing and changing parameter values.

D. NPDRAW Program

The intermediary user is provided with eight commands and fifteen options. The command menu is as follows:

```
*********************************
*                               *
*    DRAW TARGET           1    *
*    SET OPTIONS           2    *
*    EXIT PROGRAM          3    *
*    SET APERTURE          4    *
*    HIDDEN LINE LENGTH    5    *
*    SET LINE TOLERANCE    6    *
*    SET ANGLE TOLERANCE   7    *
*    LIST AXES             8    *
*                               *
*********************************
```

1. DRAW TARGET is enabled in the same manner as described in the Novice level section, however, the type of data to be input by the user will depend on the options that are currently set and will be discussed in detail below.

2. SET OPTIONS will transfer the user to the option mode, provide him with the current listing of option settings, and present an option menu that is somewhat expanded from the Novice level.

Option MENU (Intermediary)

EXTERNAL COMPS	1	CARTESIAN COORDS	9
INTERNAL COMPS	2	SPHERICAL COORS	10
DRAW ALL LINES	3	***SPECIAL OPTIONS********	
ERASE HIDDEN LINES	4	S DRAW WITH DOTS	11
OPTICAL CENTER	5	S PLOT IMPACTS	12
EXPLICIT CENTER	6	S DRAW AXES	13
PARALLEL PROJ	7	CANCELL S OPTIONS	14
PERSPECTIVE PROJ	8	NO MORE CHANGES	15

"0", "1", "T", and "F" have the same significance as with the Novice level. "2" signifies the applicable component type is set on and to be displayed with dots vice interconnected vectors. Options 1, 2, 3, 4, 12, 13, 14 and 15 are the same as described in the Novice level. Only the new options will be discussed in this section.

a. OPTICAL CENTER is the default setting and places the display center or origin in the center of the target.

b. EXPLICIT CENTER allows the user to specify the XYZ center of the plot during picture sequences.

c. PARALLEL PROJ is the default projection option and displays the target at optimum viewing distance from the viewer so that it fills the full screen on each projection. This can be overridden by the user during a picture sequence

in two ways; by specifying the optional size parameter, or by changing the screen scaling. When set, this option will result in user prompts for azimuth, elevation and rotation.

d. PERSPECTIVE PROJ requires the user to specify the range in addition to the azimuth, elevation, and rotation.

e. SPHERICAL COORDS is the default setting and is applicable with either of the two previously mentioned options.

f. CARTESIAN COORDS overrides the three previous options and requires the user to provide XYZ viewer coordinates prior to the picture sequence. Rotation and optional size remain in effect.

g. DRAW WITH DOTS will set the component type to "2" and display the components with dots instead of the normal vectors. The spacing of dots will depend on the line segment setting and is normally more time consuming to draw.

3. SET APERTURE command displays the current viewing aperture and allows the user to reset this value. The default setting is ten degrees. For rectangular plotting surfaces it is mapped to the full length of the smaller side.

4. HIDDEN LINE LENGTH displays the current maximum length of a line segment to be drawn or removed based on the visibility of its midpoint. The default value is 10.0 inches and can be reset by the user.

5. SET LINE TOLERANCE displays the current scale factor for hidden line removal and prevents adjacent surfaces or far side open surfaces from being eliminated during hidden line removal. The default value is 0.500 and can be reset by the user.

6. SET ANGLE TOLERANCE displays the minimum angular limit for hidden line removal and is used to check line segments of quadric surfaces only if the angle between the line of sight and surface normal is greater than this limit. The default value is 98 degrees and can be reset by the user.

7. EXIT PROGRAM and LIST AXES commands are the same as those described in Section II.

IV. EXPERIENCED LEVEL

A. Introduction

The experienced level provides the user with the full range of commands and options available. Program control is achieved by function keys, numerical data entry, and a more flexible set of typed commands in the NPDRAW program. The manipulation of case and warhead files is done by the direct Xedit feature built into the control executive. Therefore, normal Xedit commands used with the CP/CMS system are fully usable. Care must be taken when making changes to files to ensure that integers are right justified and placed in the correct columns. Tables A-1 through A-9 provide all the necessary information to assist the user with this segment of the package. NPGEN features are identical to those described at the intermediary level.

B. Listing of Abbreviations

The following listing of abbreviations is to be used in conjunction with the examples given to describe each of the experienced level commands in NPDRAW. All values are free format.

Abbreviation	Description
AZ	Azimuth value in degrees
EL	Elevation value in degrees
ROT	Rotation value in degrees
R	Range value used with spherical coordinates
SZ	Size extension given as an optional parameter
SN	Debugging switch ID number
XC,YC,ZC	XYZ coordinates for center of plot
XV,YV,ZV	XYZ coordinates for viewer location
XL,YL,ZL	XYZ extensions from the origin
NV	New value entered by user to replace a default value
FR#	Number of frames used in a SCENE sequence
D**	D preceeding any other parameter represents an incremental change in that parameter
CT	Component type; examples are B(OX), Q(UADRIC), P(OLYGON)
CN	Component identification number
TS	Tick spacing value for axes drawing
T	Viewing time in a SCENE command

C. NPDRAW Program

The commands available to the user are described in the subsequent paragraphs. They are shown in upper-case leters with their optional parts in parenthesis.

1. EN(D) terminates the execution of NPDRAW and returns control to the executive program.

2. P(ICTURE) is the basic drawing command and may be used alone or with numeric parameters as illustrated in the examples. If typed without parameters, the appropriate prompts will be given to the user interactively.

Example 1: P <u>AZ</u> <u>EL</u> <u>ROT</u> (<u>SZ</u>)

Current option setting; parallel projection; spherical coordinates; optical center.

Example 2: P <u>R</u> <u>AZ</u> <u>EL</u> <u>ROT</u> (<u>SZ</u>)

Current option setting; perspective projection; spherical coordinates; optical center.

Example 3: P <u>XV</u> <u>YV</u> <u>ZV</u> <u>XC</u> <u>YC</u> <u>ZC</u> <u>ROT</u> (<u>SZ</u>)

Current option setting; cartesian coordinates; explicit center.

3. SC(ENE) allows the user to view a sequence of frames and can be set like PICTURE in a variety of ways dependent on current options. Prior to initializing the first SCENE command, FRAMECOUNT 0 must be typed in. Following this, SCENE is initialized by typing it in alone or with the appropriate numerical parameters. Next, type in FRAMECOUNT 1, after which another SCENE command or a STEP command must be used. If followed by SCENE, the program will display the initial scene followed by the user specified number of frames in sequence up to and including the final scene specified

in the second SCENE command. Alternatively if STEP is used, the program will display the initial scene followed by the user specified number of frames in sequence, with each frame varying by some specified parameter change(s). See examples for clarification.

Example 1 (Using Scene command twice):

FR 0

SC <u>T</u> <u>R</u> <u>AZ</u> <u>EL</u> <u>ROT</u> (<u>SZ</u>)

FR 1

SC <u>FR#</u> <u>R</u> <u>AZ</u> <u>EL</u> <u>ROT</u> (<u>SZ</u>)

Current option setting; cartesian coordinates; optical center.

Example 2 (Using Scene command twice):

FR 0

SC <u>T</u> <u>XV</u> <u>YV</u> <u>ZV</u> <u>ROT</u> (<u>SZ</u>)

FR 1

SC <u>FR#</u> <u>XV</u> <u>YV</u> <u>ZV</u> <u>ROT</u> (<u>SZ</u>)

Current option setting; cartesian coordinates; optical center.

Example 3 (Using Scene and Step command):

FR 0

SC <u>T</u> <u>XV</u> <u>YV</u> <u>ZV</u> <u>ROT</u> (<u>SZ</u>)

FR 1

ST <u>FR#</u> <u>DXV</u> <u>DYZ</u> <u>DZV</u> <u>DXC</u> <u>DYC</u> <u>DZC</u> <u>DROT</u> <u>DSZ</u>

Current option setting; cartesian coordinates; optical center.

Any one or more numerical parameters may be varied in the STEP command, but all must be specified.

4. SY(STEM) or SU(BSYSTEM) allows the user to specify a list of components and display them as an independent subsystem. To create the list the user must specify those components by type and component number following the command, as illustrated in subsequent examples. If the command is typed without a listing of parameters, it will display the currently defined subsystem list if one exists.

Example: SY CT CN CT CN1 CN2, etc.

CT and CN must correspond to existing component types and identification numbers in the current target being simulated.

5. AX(ES) allows the user to either display the current origin, extensions, and tick increments, or change them accordingly. To actually view the axes, the AXIS option must first be set to true before using the P(ICTURE) or SC(ENE) command.

Example: AX TS XC YC ZC XL YL ZL

To change the current setting from:

CENTER AT	0.0	0.0	0.0
LENGTH	50.0	50.0	10.0
TICK SPACE	1.0		

to the following;

CENTER	5.0	5.0	0.0
LENGTH	100.0	100.0	10.0
TICK SPACE	5.0		

the user would type in:

AX <u>5</u> <u>5</u> <u>5</u> <u>0</u> <u>100</u> <u>100</u> <u>0</u>

6. D(EBUG) allows the user to set a variety of debug switches similar to those discussed in NPGEN when working with a new target model. The swtiches are set by entering the integer number representing the switch following the command. Typing the command alone will provide a listing of the current switches. Useful switches available to the user are as follows:

Switch	Description
1	Command text analysis.
15	Trace of target line data as it is read.
17	Hidden line removal, line segment generation.
18	Hidden line removal, hidden algorithm results.
19	Hidden line removal, component retrieval.
21	Cross section intermediate results.
25	Axes intermediate results.

Example: D <u>SN</u> will output DEBUGGING SWITCHES SN and will list the results prior to the next graphics display.

7. O(PTION) is the most versatile command in this grouping and allows the user to reset any one or more of twenty-four different option parameters. The parameter(s) is typed in after the command O(PTION) and is followed by a descriptive summary of the current option settings. Available options to the experienced user are listed below:

Parameter	Description
EXTL	Draw external components with lines.
EXTD	Draw external components with dots.
NOEX	Do not draw external components.
INTL	Draw internal components with lines.
INTD	Draw internal components with dots.
NOI	Do not draw internal components.
DR	Draw all vectors in target file.
HI	Remove vectors hidden from viewer perspective.
CTRO	Optical center of target = center of plot.
CTRE	User specified center = center of plot.
NOP	Generate parallel projection
P	Generate perspective projection.
SP	Viewer position given in spherical coordinates with 3-D plot center as origin.
CA	Viewer position given in target model coordinate system.
NOS	Cancels all special plot options.
	Special Options
AX	Draw cartesian axes through target model.
SU	Draw user defined component system
DO	Draw user defined system using dots.
MSKI	Save the current frame and store in file 35.

Parameter	Description
MSKD	Draw the previously saved rame.
IM	Plot impacts generated by SCANMAIN.
NOEJ	Inhibits normal screen erasure allowing multiple pictures on same frame.
EXP	Generates exploded view above center of plot.
X	Draw a cross-sectional view by passing a plane through the target model.

Example: O HI AX IM will set the drawing for hidden line removal and superimpose a cartesian axis and generated impacts over the target model.

8. AP(ERTURE) is used to display or reset the aperture setting as described in the intermediary level. It can be typed in alone to display the current setting or with a new value.

9. HL(ENGTH) is used to display or reset the incremental length for hidden line removal.

10. HTL is used to display or reset the scale factor for hidden line removal.

11. HTA is used to display or reset the angular limit factor for hidden line removal.

12. EJ(ECT) allows the user to advance a frame when in multiple picture mode.

13. HE(LP) allows the user to list a descriptive summary of each of the above commands. Typed in alone it will simply

recopy the complete list of available commands already given. Followed by a specific command, it will provide the user with instructions about using that command.

Example: HE O will provide the user with information on the O(PTION) command.

V. TROUBLE SHOOTING

A. Principle Parameter Tables for Case and Warhead Files

These tables provide a detailed listing of all case/warhead file parameters together with descriptive and pictorial information to assist the intermediary and experienced level users.

B. Common System Difficulties

When working with a complex application, it is easy to make errors. Errors can result in program diagnostics with standard fix-up, system diagnostic with program crash or worse, an application crash. This brief section will attempt to describe some of the more common pitfalls to avoid when using NPSCAN.

1. The SCAN password is incorrectly typed and an improper access occurs. The program will malfunction during the application. The user must exit with the first EXIT PROGRAM function key and restart the application.

2. Insufficient storage space is available because the system is too busy. The user must exit the program at the next menu block containing an EXIT PROGRAM function key.

3. User inputs a non-existent function key number. A diagnostic will appear and return the user to reselect a correct function key.

4. The user inputs a letter or a real number when an integer function key is required. The program will crash. If the user is returned to CMS, immediately type in the command CLERE to release the previously accessed disks and libraries before restarting the program. If the user is returned to the control executive, exit the program at the next menu block and restart.

5. User inputs an integer when a real is expected or a real when an integer is expected during a numeric data entry sequence. Standard fix-up will be taken and the program will continue. Problems in 4 and 5 can b easily avoided if the user slows down and checks each entry before hitting the ENTER key.

6. System incorrectly accesses disk space; program will malfunction during the application. This has been known to happen on rare occasions, and the user should always make use of the Query Disk function key provided at the beginning of the application. If the following two entries are not as shown below, he should exit the program and restart.

BALL	192	B	R/O	8	3330	1024	(Additional numeric information)
TEMP	193	C	R/W	10	3350	1024	(Additional numeric information)

7. Numeric data is incorrectly formatted while using NPDRAW commands. Diagnostic appears and the user reinstates the command procedure correctly.

TABLE A-1
Warhead Data File Line One

User Level	Column	Parameter	Units	Range of Values	Format	Description
I	1-10	NUMZON	-	1-6	I10	Number of static polar zones in warhead
E	1-10	NUMZON	-	1-36	I10	
E	11-20	NMASS	-	1-36	I10	Number of mass classes for each polar zone One mass class only at intermediary level.

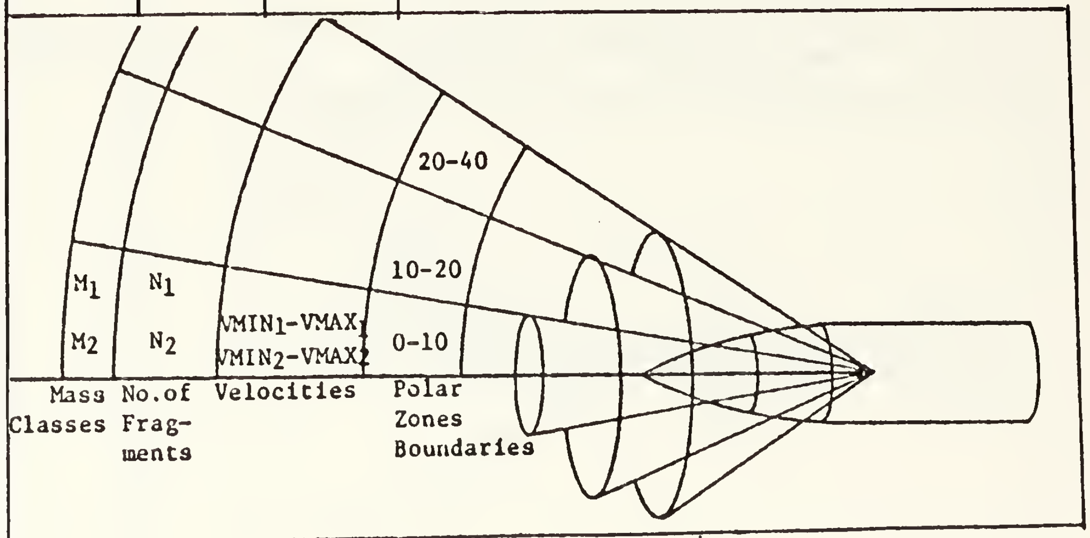


TABLE A-2

Warhead Data File Line Two

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-10	ZONMIN (I)	Degrees	0-180	F10.3	Lower angle boundary of Ith static polar zone
I,E	11-20	ZONMAX (I)	Degrees	0-180	F10.3	Upper angle boundary of Ith static polar zone
I	21-30	VMIN (I)	Ft/Sec	≥ 0	F10.3	Speed of fragments at lower boundary of Ith zone
I	31-40	VMAX (I)	Ft/Sec	≥ 0	F10.3	Speed of fragments at upper boundary of Ith zone
E	21-30	VMIN (N,I)	Ft/Sec	≥ 0	F10.3	Speed of fragments of Nth mass class at lower boundary of Ith polar zone
E	31-40	VMAX (N,I)	Ft/Sec	≥ 0	F10.3	Speed of fragments of Nth mass class at upper boundary of Ith polar zone

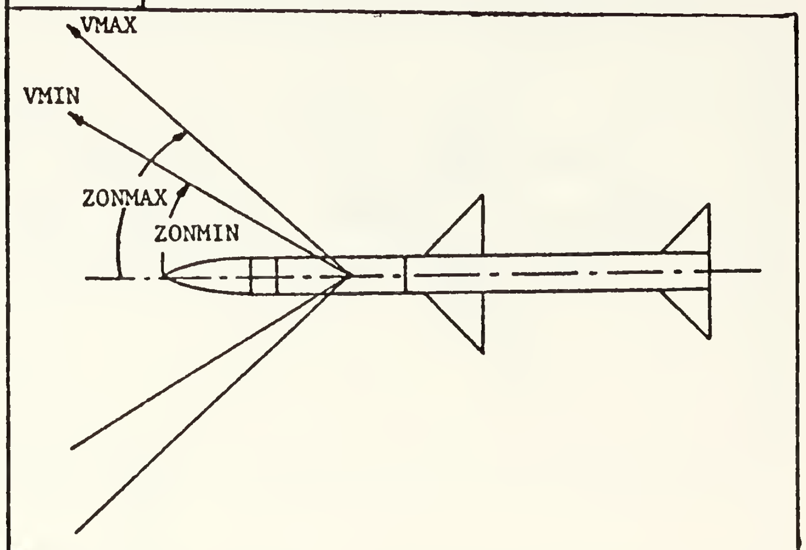


TABLE A-2

Warhead Data File Line Two (continued)

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	41-50	FRAGMS (N,I)	Grains	≥ 0	F10.3	Average mass per fragment of Nth mass class in Ith polar zone. At Intermediary level N = 1.
I,E	51-60	FRAGNO (N,I)	-	≥ 0	F10.3	Total number of fragments of Nth mass class in Ith polar zone. At intermediary level N = 1.
I,E	61-70	XWH (N,I)	Ft		F10.3	Initial position of the fragments of the Nth mass class and Ith polar zone with respect to center of warhead measured along missile axis at intermediary level N = 1.

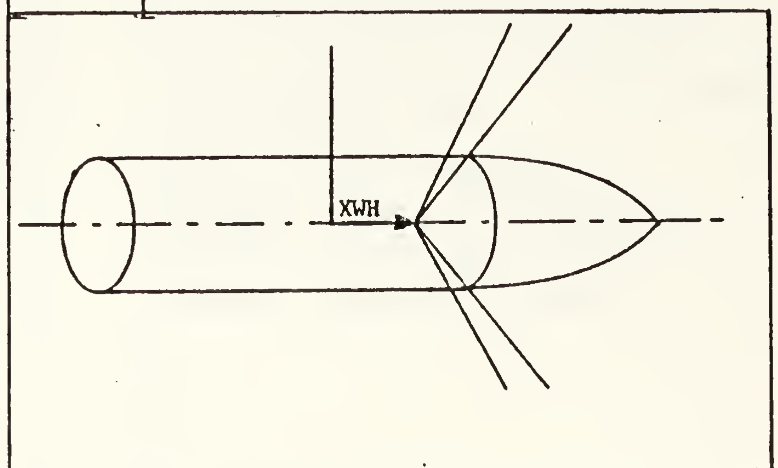


TABLE A-2

Warhead Data File Line Two (continued)

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	71-74	NMAT(N,I)	—	1,...,10	I4	Material code indicating the type of material of which the fragment is composed. The following values are used: 1 - magnesium 2 - aluminum 2024T 3 - titanium alloy 4 - face hardened steel 5 - mild steel 6 - hard steel 7 - lexan 8 - stretched plexiglass 9 - doron 10 - bullet resistant glass at the intermediary level N = 1
E	75-80	SHAP	—	CUBE SPHERE RECTAN IRREGU	A6	The fragment shape. The following values are available for input: CUBE - cubical fragments SPHERE - spherical fragments RECTAN - rectangular fragments IRREGU - irregular fragments

TABLE A-3

Warhead Data File Line Three

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-10	FUZTYP	—	0,1,2	I10	Specifies which type of fuze model is to be simulated 0 - instantaneous detection, no fuze simulated 1 - fuze on IR source only 2 - fuze on any reflected target source
I,E	11-20	FUZPOS	Ft.	all	F10.3	Position of the proximity fuze target detection device with respect to the warhead center. This value is along the missile axis.
I,E	21-30	DELAY	Sec.	≥ 0	F10.3	Delay time between target detection and warhead detonation.
I,E	31-40	FUZANG	Degrees	0°-180°	F10.3	Mean value of proximity fuze cone half-angle measured from the missile centerline.
E	41-50	SIGFUZ	Degrees	0°-180°	F10.3	Standard deviation of the fuze cone half angle assuming a normal distribution of angles.
I,E	51-60	FUZRAN	Ft.	≥ 0	F10.3	Proximity fuze cut off range. If FUZRAN = 0 no fuze cut off is to be simulated.
I,E	61-66	RADMSL	Ft.	≥ 0	F6.2	Radius of missile cylindrical body.

Table A-3

Warhead Data File Line Three (continued)

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	67-72	POSNOS	Ft	≥ 0	F6.2	Position of missile contact fuze or nose with respect to warhead center
I,E	72-78	POSTAL	Ft	≥ 0	F6.2	Distance of missile aft end from warhead center.

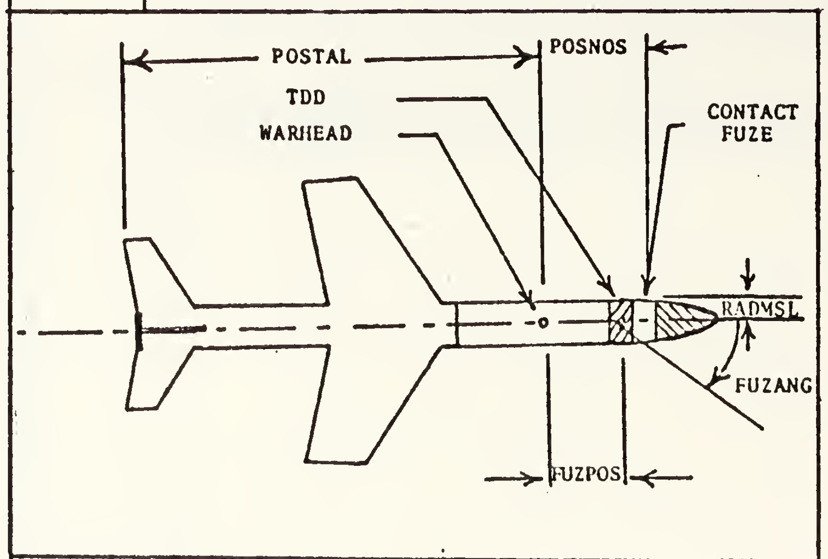


TABLE A-4

Warhead Data File Line Four

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-10	FUSBLR	Ft.	≥ 0	F10.2	Fuselage blast radius is the maximum distance from the target centerline at which detonation will cause catastrophic structural failure.
I,E	11-20	FUSBL1	Ft.	≥ 0	F10.2	Distance of target CG to front of fuselage blast cylinder.
I,E	21-30	FUSBL2	Ft.	≥ 0	F10.2	Distance of target CG to back of fuselage blast cylinder.
I,E	31-40	WNGBLR	Ft.	≥ 0	F10.2	Wing blast radius is the maximum distance from wing centerline at which detonation will cause catastrophic structural failure.
I,E	41-70	WNGPT1(3)	Ft.	≥ 0	3F10.2	X,Y,Z components of the endpoint of the wing blast centerline closest to the target fuselage and measured from target CG.

TABLE A-5

Warhead Data File Line Five

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-30	WNGPT2 (3)	Ft	≥ 0	3 F10.2	X, Y, Z components of the endpoint of the wing blast centerline closest to the wing tip and measured from target CG.

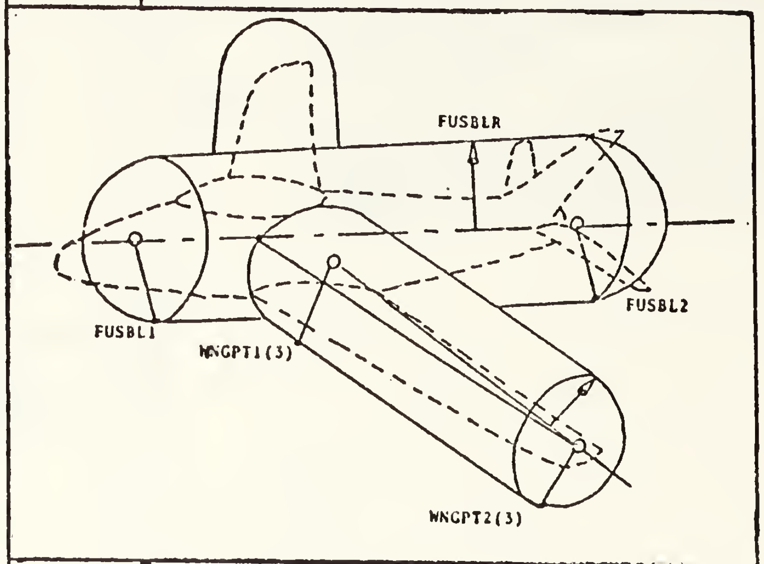


TABLE A-6

Case Data File Line One

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-10	ITRAJ	—	1,2,3	I10	Flag which indicates the type of missile trajectory to be simulated. ITRAJ = 1, indicates a fixed trajectory which is specified by an initial missile position measured from the aircraft CG. ITRAJ = 2, indicates a trajectory with a fixed missile guidance error (or miss distance). ITRAJ = 3, indicates a trajectory in which the missile guidance error is computed from a normally distributed sample with a given circular probable error, CEP.

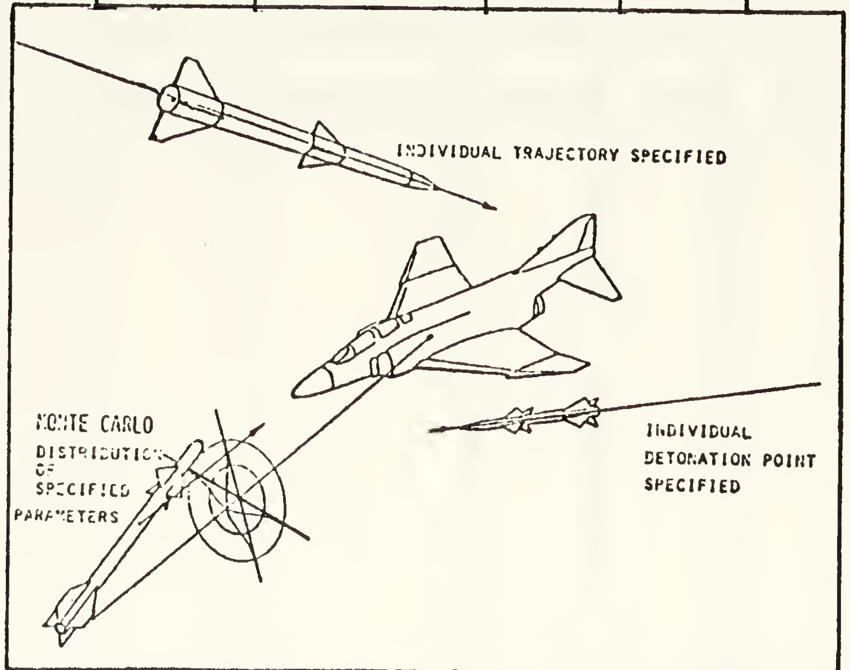


TABLE A-7

Case Data File Line Two

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-10	JNUM (NUMMSL)	—		I10	The number of missile trajectories to be considered.
E	11-20	TSPD (VTARG)	Ft/Sec	>0	F10.3	The target speed at time of intercept.
E	21-30	TROL (PSIT)	Degrees	0-360	F10.3	The roll angle of target at intercept. Ψ
E	31-40	TPIT (THETAT)	Degrees	$\pm$ 90-0	F10.3	The pitch angle of target at intercept. Θ
E	41-50	TYAW (PHIT)	Degrees	0-360	F10.3	The yaw angle of target at intercept. $\emptyset$

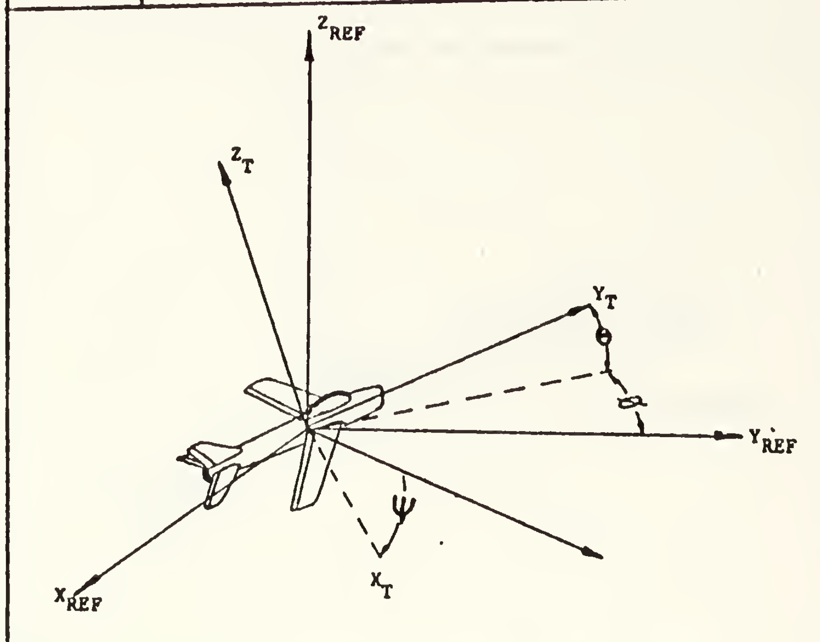


TABLE A-7

Case Data File Line Two (continued)

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	51-60	MSP (VMIS)	Ft/Sec	> 0	F10.3	The missile speed at intercept.
I,E	61-70	MAA (ATTANG)	Degrees	≥ 0	F10.3	A mean value for the missile angle of attack.
E	71-80	MAAS'(SIGMAA)	Degrees	≥ 0	F10.3	The standard deviation of the missile angle of attack.

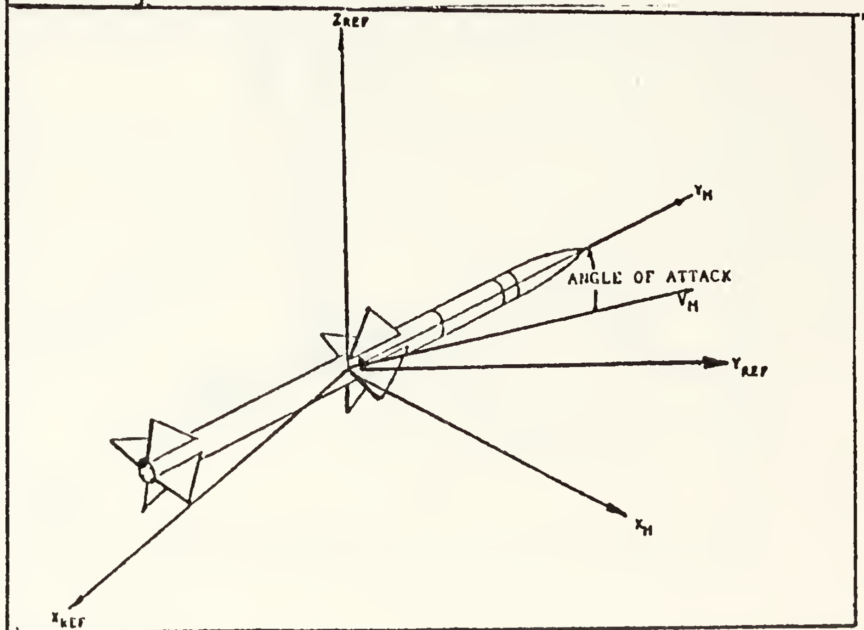


TABLE A-8

Case Data File Line Three

User Level	Column	Parameter	Units	Range of Values	Format	Description
E	1-10	MPA (ELEVAT)	Degrees	± 90-0	F10.3	The mean elevation angle of the missile measured with respect to a flat earth.
E	11-20	MPAS (SIGMAE)	Degrees	≥ 0	F10.3	The standard deviation of the missile elevation angle.
E	21-30	MAZ (AZIMUT)	Degrees	0-360	F10.3	The mean azimuth angle of the missile measured with respect to a flat earth.
E	31-40	MAZS (SIGMAZ)	Degrees	≥ 0	F10.3	The standard deviation of the missile azimuth angle.

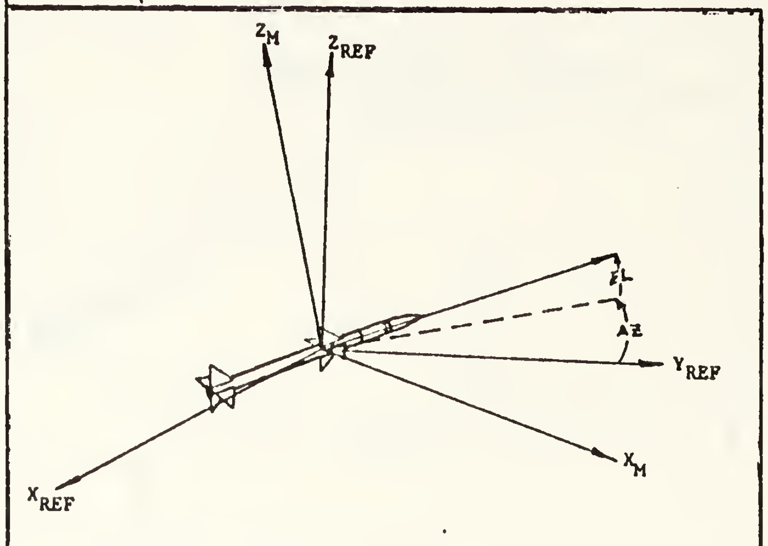


TABLE A-8

Case Data File Line Three (continued)

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	41-50	ALT	Ft.	≥ 0	F10.3	The altitude above sea level at which the engagement takes place.
E	51-80	AIMX AIMY AIMZ (AIMPT (3))	Ft.	all	3F10.3	The nominal value of the missile aimpoint measured with respect to the target CG

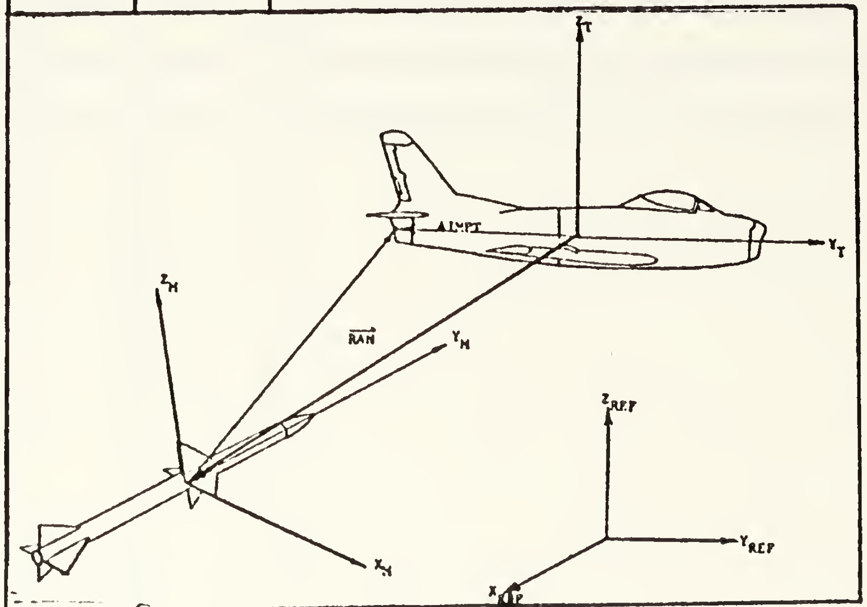


TABLE A-9

Case Data File Line Four

This line is used when ITRAJ = 1 on Case Data File Line One

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-30	MISX MIXY MISZ (RAN(3))	Ft.	all	3F10.3	The initial position (range) of the missile measured in aircraft coordinate system. The values are input when detonation point is specified by user and not computed by the program.
I,E	31-40	TAOA(AOAT)	Degrees	$\pm$90-0	F10.3	The target angle of attack at intercept.
I,E	41-50	TSS(SST)	Degrees	$\pm$90-0	F10.3	The target sideslip at intercept.
I,E	51-60	MAOA(AOAM)	Degrees	$\pm$90-0	F10.3	The missile angle of attack at intercept.
I,E	61-70	MSS(SSM)	Degrees	$\pm$90-0	F10.3	The missile sideslip at intercept.

TABLE A-9

Case Data File Line Four-A

This line is used when ITRAJ = 2 on Case Data File Line One

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-10	CPA(TCPA)	Ft.	≥ 0	F10.3	The closest point of approach of the missile trajectory to the specified nominal aimpoint. This value is input when it is desired to determine the average survival probability for a fixed guidance miss distance.
I,E	11-21	TAOA(AOAT)	Degrees	± 90-0	F10.3	The target angle of attack at intercept.
I,E	21-30	TSS(SST)	Degrees	± 90-0	F10.3	The target sideslip at intercept.

TABLE A-9

Case Data File Line Four-B

This line is used when ITRAJ = 3 on Case Data File Line One

User Level	Column	Parameter	Units	Range of Values	Format	Description
I,E	1-10	CEP(TCEP)	Ft.	≥ 0	F10.3	The missile circular probable error. (The radius of a circle within which 50% of the missile trajectories chosen from a normally distributed sample must pass) This card is input instead of card type 4 or 4A for situations in which the user desires the simulation to generate the initial engement geometry from a distribution of encounter conditions and in which the miss distance for individual trajectories is drawn from a bi-variant normal distribution of specified CEP.
I,E	11-20	TAOA(AOAT)	Degrees	± 90-0	F10.3	The target angle of attack at intercept.
I,E	21-30	TSS(SST)	Degrees	± 90-0	F10.3	The target sideslip at intercept.

APPENDIX B

APPLICATION ADDITIONS

```
&TRACE ON                                                               MYT00040
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*       MYT00050
*                                                                       MYT00060
* NPSCAN IS THE DRIVER EXEC FOR NPGS SCAN APPLICATION.IT HAS BEEN       MYT00070
* WRITTEN TO ENCOMPASS SEVERAL LANGUAGES FOR THE GRAPHICS AND           MYT00080
* WILL RUN ON ALL THE TERMINALS CONNECTED TO THE IBM 3033 AT THE        MYT00090
* TIME OF WRITING. THE EXEC IS DESIGNED TO PROVIDE THE USER WITH        MYT00100
* MAXIMUM FLEXIBILITY BY PROVIDING AUTOMATIC PROGRAM CONTROL,THREE      MYT00110
* LEVELS OF INTERACTION, AND SELF-HELPING INSTUCTIONS AND DIAGNOSTICS.  MYT00120
* --------------------------------------------------------------------- MYT00130
*                                                                       MYT00140
CLRSCRN                                                                 MYT00150
&BEGTYPE -STAT1                                                         MYT00160
  THE NPGS SCAN APPLICATION IS DESIGNED TO PROVIDE THE USER WITH        MYT00170
  MAXIMUM FLEXIBILITY BY PROVIDING AUTOMATIC PROGRAM CONTROL,THREE      MYT00180
  LEVELS OF INTERACTION, AND SELF-HELPING INSTUCTIONS AND DIAGNOSTICS.  MYT00190
                                                                        MYT00200
  TO USE SCAN YOU MUST FIRST OBTAIN THE PASSWORD FROM PROF. BALL AND    MYT00210
  THE AIRBORNE TARGET YOU WILL BE CONDUCTING YOUR EVALUATION ON.        MYT00220
  LINKING WILL TAKE ABOUT FIFTEEN SECONDS TO COMPLETE.                  MYT00230
-STAT1                                                                  MYT00240
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*       MYT00250
*                                                                       MYT00260
*  LINK APPLICABLE PROGRAMS AND DATA FILES FOR APPLICATION              MYT00270
*  -------------------------------------------------------              MYT00280
*                                                                       MYT00290
CP LINK 0559F 191 192 RR                                                MYT00300
ACC 192 B                                                               MYT00310
CLRSCRN                                                                 MYT00320
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*       MYT00330
*                                                                       MYT00340
*    SELECT TERMINAL AND SET TERMINAL FLAG                              MYT00350
* ---------------------------------------                               MYT00360
*                                                                       MYT00370
&BEGTYPE -STAT3                                                         MYT00380
  USER INPUT REQUIREMENTS WILL BE IN THE FORM OF PROMPTS AND WILL REQUIRMYT00390
  EITHER A FUNCTION KEY SELECTION OR KEYBOARD INPUT DEPENDING ON THE    MYT00400
  LEVEL OF USER AND TYPE OF DATA REQUIRED.  FOR CONSISTENCY NUMERIC     MYT00410
  KEYS 0 THRU 9 ON THE KEYBOARD WILL DOUBLE AS FUNCTION KEYS AT ALL     MYT00420
  TERMINALS.  WHEN YOU ARE READY TO BEGIN ENTER THE CORRESPONDING       MYT00430
  FUNCTION KEY(INTEGER) FOR THE GRAPHICS TERMINAL YOU ARE USING.        MYT00440
    *******************************************                         MYT00450
    *   GRAPHICS TERMINALS      FUNCTION KEY    *                       MYT00460
    *   ------------------      ------------    *                       MYT00470
    *   TEKTRONIX 618             -   ENTER 1    *                      MYT00480
    *   TEKTRONIX 4012,4081,4114  -   ENTER 2    *                      MYT00490
    *   NONE OF THE ABOVE         -   ENTER 3    *                      MYT00500
    *   EXIT THE PROGRAM          -   ENTER 4    *                      MYT00510
```

```
    ************************************************
-STAT3
&READ VARS &PRM1
&IF &PRM1 = 1 &GOTO -SETT
&IF &PRM1 = 2 &GOTO -SETT
&IF &PRM1 = 3 &GOTO -NOGRPH
&IF &PRM1 = 4 &GOTO -FIN1
&TYPE I NEED A 1,2,OR 3 TO MAKE SELECTION
&GOTO -STAT3
-NOGRPH
CLRSCRN
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*   INFO MESSAGE TO USER TO ADVISE NON-GRAPHICS CAPABILITY
*
* -------------------------------------------------------------
*
&BEGTYPE -REF
  SINCE YOU ARE NOT CONNECTED TO ONE OF THE GRAPHICS TERMINALS LISTED
  YOU WILL BE UNABLE TO UTILIZE THE GRAPHICS ROUTINES FOR THIS
  APPLICATION.  YOU CAN HOWEVER STILL SIMULATE THE MISSILE/TARGET
  ENCOUNTER AND GENERATE STATISTICAL DATA FOR THE TERMINAL OR
  PRINTER.  DO YOU STILL WISH TO CONTINUE.
        **********************************
        *   REPLY          FUNCTION KEY   *
        *                                 *
        *  CONTINUE        ------------   *
        *  EXIT PROGRAM          1        *
        *                        2        *
        **********************************
  ENTER THE CORRESPONDING FUNCTION KEY(INTEGER)
-REF
&READ VARS &ANS
&IF &ANS = 1 &GOTO -SETT
&IF &ANS = 2 &GOTO -FIN1
&TYPE I NEED A 1,OR 2
&GOTO -REP
-SETT
CLRSCRN
*********************************
&BEGTYPE -STAT2
  SCAN WAS DEVELOPED TO PREDICT THE PROBABILITY THAT AN AIRCRAFT WILL
  SURVIVE AN ATTACK BY A MISSILE ARMED WITH A FRAGMENTATION WARHEAD.
  THE PROGRAM SIMULATES THE ENCOUNTER BETWEEN A MISSILE AND AN AIRBORNE
  TARGET MATHEMATICALLY AND COMPUTES EXPECTED FRAGMENT IMPACT AND
  RESULTING DAMAGE.  YOU WILL BE PROVIDED WITH NECESSARY INSTRUCTIONS
  THROUGHOUT THE PROGRAM.

  BEFORE COMMENCING IT IS NECESSARY TO ACCESS TEN(10) ADDITIONAL
  CYLINDERS TO RUN THE PROGRAM.  THIS PROCEDURE IS BEING AUTOMATICALLY
```

```
  UNCERTAKEN FOR YOU AT PRESENT.

  ACCESS TIME VARIES FROM 30 TO 180 SECCNDS DEPENDING ON SYSTEM USAGE.
  *********************************************************************
                        *  PLEASE WAIT  *
                        *****************
-STAT2
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-CCMMENT-COMMENT*
*
*  ACCESS TEXT LIBRARIES AND LINK TO TEKTRONIX AND GRAF77 DISKS
*
* ---------------------------------------------------------------
CP DEFINE T3350 AS 193 CYL 10
&BEGSTACK -END1
YES
TEMP
-END1
SET CMSTYPE HT
FCRMAT 193 C
SET CMSTYPE RT
GETFMADR
&READ VARS &STAR &MODE2 &CUU
CP LINK GRAF77 191 &CUU RR
ACC &CUU &MODE2
GETFMADR
&READ VARS &STAR &MODE3 &CUU
CP LINK MAINTEK 191 &CUU RR
ACC &CUU &MODE3
&LB1 = GRAFLIB
&LB2 = TEKTRCN
GLOBAL TXTLIB MOD2EEH FCRTMOD2 NONIMSL CMSLIB IMSLSP &LB1 &LB2
&TYPE  ... ACCESS IS NOW COMPLETE ...
&TYPE  ******************************
&PRM2 = 1
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-CCMMENT-COMMENT*
*
*  USER DISK QUERY OPTICN
*
* ------------------------
&BEGTYPE -INST
  DO YOU WANT A SUMMARY OF YOUR DISK SPACE ALLOCATION
            *******************************
            *   REPLY      FUNCTION KEY   *
            *   -----      ------------   *
            *    YES            1         *
            *    NC             2         *
            *******************************
  ENTER THE CORRESPONDING FUNCTION KEY(INTEGER)
```

```
-INST
&READ VARS &DISKP
&IF &DISKP = 1 &GOTO -QUER1
&IF &DISKP = 2 &GOTO -QUER2
&TYPE I NEED A 1, OR 2
&GOTO -INST
-QUER1
CLRSCRN
QUERY DISK
&TYPE   HIT THE 'ENTER' KEY WHEN YOU ARE READY TO CONTINUE
&TYPE   ***********************************************
&READ VARS &KEY3
-QUER2
*************************************
CLRSCRN
&BEGTYPE -STAT5
  THE FOLLOWING LEVELS OF USER FAMILIARITY ARE TAKEN INTO CONSIDERATION
  *** NOVICE ** INTERMEDIARY ** EXPERIENCED ***
 *THE NOVICE LEVEL IS RECOMMENDED FOR FIRST TIME USERS UNTIL AN
  UNDERSTANDING OF THE BASIC COMMANDS AND FAMILIARITY WITH AVAILABLE
  OUTPUT DATA IS ACHEIVED.
 *INTERMEDIARY LEVEL WILL PROVIDE ADDITIONAL CAPABILITY OF USER DESIGNED
  WARHEAD AND ENCOUNTER CONDITIONS AS WELL AS ADDITIONAL GRAPHICS
  OPTIONS.
 *EXPERIENCED LEVEL WILL ALLOW XEDIT CAPABILITY OF DATA FILES DIRECTLY
  AND FULL FLEXIBILITY OF COMMANDS AND OPTIONS.
       ***************************************
       *  USER LEVEL        FUNCTION KEY   *
       *  ----------        ------------   *
       *  NOVICE                 1         *
       *  INTERMEDIARY           2         *
       *  EXPERIENCED            3         *
       *  EXIT THE PROGRAM       4         *
       ***************************************
  SELECT THE CORRESPONDING FUNCTION KEY.
 -STAT5
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*    IDENTIFY USER LEVEL AND SET USER FLAGS
* ----------------------------------------------
*
&READ VARS &LEVL
&IF &LEVL GE 4 &GOTO -DIAG
&IF &LEVL LT 1 &GOTO -DIAG
&GOTO -CONT
-DIAG
&IF &LEVL = 4 &GOTO -FIN
&TYPE  I NEED A 1,2,3,OR 4
```

```
&GOTO -STAT5                                                          MYT01960
-CONT                                                                 MYT01970
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*     MYT01980
*                                                                     MYT01990
*  SELECT APPROPRIATE TARGET AND AND COPY TO GEOM FILE                MYT02000
*                                                                     MYT02010
* -------------------------------------------------------             MYT02020
CLRSCRN                                                               MYT02030
&BEGTYPE -STAT4                                                       MYT02040
  THE FOLLOWING AIRBORNE TARGETS ARE AVAILABLE FOR YOUR SELECTION     MYT02050
        *************************************                         MYT02060
        *     TARGET              FUNCTION KEY  *                     MYT02070
        *                                       *                     MYT02080
        *     BOX                      1        *                     MYT02090
        *     A-7                      2        *                     MYT02100
        *     BQM-107                  3        *                     MYT02110
        *     SPECIAL TARGET (*SEE PROF.BALL    *                     MYT02120
        *     FOR AUTHORITY FIRST)     4        *                     MYT02130
        *************************************                         MYT02140
  ENTER THE CORRESPONDING FUNCTION KEY(INTEGER)                       MYT02150
-STAT4                                                                MYT02160
&READ VARS &TAR                                                       MYT02170
&IF &TAR = 1 &GOTO -TARG1                                             MYT02180
&IF &TAR = 2 &GOTO -TARG2                                             MYT02190
&IF &TAR = 3 &GOTO -TARG3                                             MYT02200
&IF &TAR = 4 &GOTO -TARG4                                             MYT02210
&TYPE  I NEED A 1,2,OR 3                                              MYT02220
&GOTO -STAT4                                                          MYT02230
-TARG1                                                                MYT02240
COPY BOX DATA B GEOM DATA C                                           MYT02250
&SIZE = 17.0                                                          MYT02260
&GOTO -LDGEN                                                          MYT02270
-TARG2                                                                MYT02280
COPY A7 DATA B GEOM DATA C                                            MYT02290
COPY GEOM DATA C = = =(UNPA REPL                                      MYT02300
&SIZE = 272.0                                                         MYT02310
&GOTO -LDGEN                                                          MYT02320
-TARG3                                                                MYT02330
COPY BQM107 DATA B GEOM DATA C                                        MYT02340
COPY GEOM DATA C = = =(UNPA REPL                                      MYT02350
&SIZE = 110.0                                                         MYT02360
&GOTO -LDGEN                                                          MYT02370
-TARG4                                                                MYT02380
&TYPE TYPE IN THE CODED NAME OF YOUR TARGET                           MYT02390
&TYPE *************************************                           MYT02400
&READ STRING &TNME                                                    MYT02410
STATE &TNME DATA B                                                    MYT02420
&IF &RC ¬= 0 &GOTO -NOTRG                                             MYT02430
```

```
COPY &TNME BATA B GEOM DATA C
CCPY GEOM DATA C = = =( UNPA REPL
&TYPE TYPE IN THE MAXIMUM EXTENSION OF YOUR TARGET
&TYPE ***************************************************
&READ VARS &SIZE
&GCTC -LDGEN
-NOTRG
CLRSCRN
&TYPE THERE IS NC TARGET &TNME STORED ON DISK
&GOTC -CONT
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  SET FILE CEFINITIONS FOR NPGEN PROGRAM
*  ------------------------------------------------
*
-LDGEN
FILEDEF 1 TERMINAL (PERM
FILEDEF 5 DISK GEOM DATA C (PERM
FILEDEF 6 DISK IBUG FORTRAN C (RECFM FA BLOCK 131 PERM
FILEDEF 7 TERMINAL (PERM
FILEDEF 30 DISK TARGET DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*   LOAC IN TARGET LINE GENERATOR NPGEN
*  ---------------------------------------------
*
CLRSCRN
&TYPE  THE GRAPHICS PREPROCESSOR IS NOW LOADING AUTOMATICALLY
&TYPE  *********************************************************
&STACK &SIZE
&STACK &LEVL
LOAD MYGEN
START *
CLRSCRN
&BEGTYPE -STAT7
  A SUMMARY CF GENERATED TARGET LINES IS AVAILABLE
        ********************************************
        *                              FUNCTION KEY  *
        *                              ------------  *
        *   NC SUMMARY/CCNTINUE              1       *
        *   SUMMARY AT TERMINAL ONLY         2       *
        *   SUMMARY AT PRINTER ONLY          3       *
        *   SUMMARY AT PTR AND TERM          4       *
        *   EXIT THE PROGRAM                 5       *
        ********************************************
  SELECT CORRESPCNDING FUNCTION KEY
-STAT7
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
```

```
*
*   DETERMINE IF IBUG SUMMARY DESIRED BY USER
*
* ------------------------------------------------
*
&READ VARS &SUM1
&IF &SUM1 = 1 &GOTO -CONT1
&IF &SUM1 = 2 &GOTO -CLST1
&IF &SUM1 = 3 &GOTO -PLST1
&IF &SUM1 = 4 &GOTO -CLST1
&IF &SUM1 = 5 &GOTO -FIN
&TYPE I NEED A 1,2,3,4,OR 5
&GOTO -STAT7
-CLST1
TYPE IBUG FORTRAN C
&TYPE    HIT THE 'ENTER' KEY WHEN YOU ARE READY TO CONTINUE
&TYPE    ***********************************************
&READ VARS &KEY1
&IF &SUM1 ¬= 4 &GOTO -CONT1
-PLST1
&TYPE  SUMMARY 'IBUG ' IS NOW BEING SENT TO PRINTER AS REQUESTED
PRINT IBUG FORTRAN C
-CONT1
*GOTO -CONT4
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  BEGIN MISSILE FILE MANIPULATION BASED ON USER LEVEL FLAG
*
* ------------------------------------------------------------
*
-JMP2
CLRSCRN
&IF &LEVL = 1 &GOTO -STAT11
&IF &LEVL = 3 &GOTO -STAE2
&IF &LEVL = 2 &BEGTYPE -STAE1
  AT THE INTERMEDIARY LEVEL YOU HAVE THE OPTION OF MANIPULATING THE CASE
  AND WARHEAD FILES THROUGH AN INTERACTIVE PROGRAM CALLED "CHANGE".
  FUNCTION KEYS ARE PROVIDED TO CONTROL THE EDITING PROCEDURE.

  WE WILL BEGIN WITH THE "CASE DATA " FILE
  ****************************************
-STAE1
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  INTERMEDIARY USER LEVEL
*
* --------------------------
*
&CALL -SUB1 CASE
CLRSCRN
&TYPE  WE WILL NOW SELECT THE "WARHEAD" DATA FILE
```

```
&TYPE   ********************************************
&CALL -SUB1 WARHEAD
&GOTO -CONT3
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  EXPERIENCED USER LEVEL
* ------------------------
*
-STAE2
&BEGTYPE -STAE3
  AT THE EXPERIENCED LEVEL YOU HAVE THE OPTION OF MANIPULATING THE CASE
  AND WARHEAD FILES DIRECTLY.  FUNCTION KEYS ARE PROVIDED ONLY TO ACCESS
  THE FILES AND PLACE YOU IN THE XEDIT MODE.

    SELECTION OF " CASE FILE "
    **************************
-STAE3
&CALL -SUB1 CASE
CLRSCRN
&TYPE      SELECTION OF "WARHEAD FILE"
&TYPE      ***************************
&CALL -SUB1 WARHEAD
&GOTO -CONT3
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  SUBROUTINE INTERACTION AND CONTROL FOR TWO UPPER LEVELS OF USER
* ----------------------------------------------------------------------
*
-SUB1
-SUBB
&BEGTYPE -STAE4
       ************************************
       *      FILES             FUNCTION KEY  *
       *      -----             ------------  *
       * USE DEFAULT FILE            1        *
       * USE CUSTOM FILE             2        *
       * MODIFY DEFAULT FILE         3        *
       * MODIFY A CUSTOM FILE        4        *
       * EXIT THE PROGRAM            5        *
       ************************************
SELECT THE CORRESPONDING FUNCTION KEY
-STAE4
&READ VARS &EDT
&IF &EDT = 1 &GOTO -SDEF
&IF &EDT = 2 &GOTO -STAE5
&IF &EDT = 3 &GOTO -STAE6
&IF &EDT = 4 &GOTO -STAE7
&IF &EDT = 5 &GOTO -FIN
```

```
&TYPE I NEED A 1,2,3,4,OR 5                                                MYT03880
&GOTO -STAE4                                                               MYT03890
*CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC                       MYT03900
-STAE5                                                                     MYT03910
&TYPE TYPE IN THE FILENAME OF YOUR CUSTOM FILE ???                         MYT03920
&TYPE *******************************************                         MYT03930
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*          MYT03940
*                                                                          MYT03950
*  CHECK VALIDITY OF USER FILENAME                                         MYT03960
*                                                                          MYT03970
* -----------------------------------------------------------------        MYT03980
&READ STRING &FNME                                                         MYT03990
STATE &FNME DATA A                                                         MYT04000
&IF &RC ¬= 0 &GOTO -NOFILE                                                 MYT04010
COPY &FNME DATA A &1 DATA C                                                MYT04020
CLRSCRN                                                                    MYT04030
&RETURN                                                                    MYT04040
-NOFILE                                                                    MYT04050
CLRSCRN                                                                    MYT04060
&TYPE THERE IS NO FILE &FNME DATA A ON YOUR DISK                           MYT04070
&GOTO -SLBB                                                                MYT04080
*CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC                        MYT04090
-STAE6                                                                     MYT04100
COPY &1 DATA B = = C                                                       MYT04110
&IF &LEVL = 2 &GOTO -STAS1                                                 MYT04120
XEDIT &1 DATA C                                                            MYT04130
&RETURN                                                                    MYT04140
-STAS1                                                                     MYT04150
&IF &1 = CASE &GOTO -LODE1                                                 MYT04160
FILEDEF 5 TERMINAL (PERM                                                   MYT04170
FILEDEF 6 TERMINAL (PERM                                                   MYT04180
FILEDEF 12 DISK WARHEAD DATA C (PERM                                       MYT04190
LOAD FROG1                                                                 MYT04200
START *                                                                    MYT04210
&BEGTYPE -STAE8                                                            MYT04220
   DO YOU WANT A PERMANENT COPY OF THIS MODIFIED FILE ON YOUR A DISK       MYT04230
                **************************                                 MYT04240
                *       YES      1       *                                 MYT04250
                *        NO      2       *                                 MYT04260
                **************************                                 MYT04270
   SELECT FUNCTION KEY                                                     MYT04280
-STAE8                                                                     MYT04290
&READ VARS &WEDT                                                           MYT04300
&IF &WEDT = 1 &GOTO -CPYFW                                                 MYT04310
&IF &WEDT = 2 &GOTO -WRET                                                  MYT04320
&TYPE I NEED A 1,OR 2                                                      MYT04330
&GOTO -STAE8                                                               MYT04340
-WRET                                                                      MYT04350
```

```
&RETURN
*CCMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  CCPY MODIFIED FILE ON USER'S A DISK
*
* ---------------------------------------------------------------------
-CPYFW
&TYPE TYPE IN THE NAME YOU WANT TO CALL THIS NEW FILE
&TYPE ***********************************************
&READ STRING &FNME
COPY &1 DATA C &FNME DATA A
&RETURN
-LCDE1
FILEDEF 5 TERMINAL (PERM
FILEDEF 6 TERMINAL (PERM
FILEDEF 10 DISK CASE DATA C (PERM
LCAD PROG2
START *
&BEGTYPE -STAE8
   DO YCU WANT A PERMANENT COPY OF THIS MODIFIED FILE CN YCUR A DISK
              ***************************
              *      YES      1         *
              *       NO      2         *
              ***************************
   SELECT FUNCTICN KEY
-STAE8
&READ VARS &CEDT
&IF &CEDT = 1 &GCTO -CPYFC
&IF &CEDT = 2 &GCTO -CRET
&TYPE I NEED A 1,CR 2
&GOTO -STAE8
-CRET
&RETURN
*CCMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-CCMMENT*
*
*  CCPY MCDIFIED FILE ON USER'S A DISK
*
* ---------------------------------------------------------------------
-CPYFC
&TYPE TYPE IN THE NAME YOU WANT TO CALL THIS NEW FILE
&TYPE ***********************************************
&READ STRING &FNME
COPY &1 DATA C &FNME DATA A
&RETURN
*CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
-STAE7
&TYPE TYPE IN THE NAME CF YOUR CUSTOM FILE ???
&TYPE *****************************************
```

```
&READ STRING &FNME
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  CHECK VALIDITY OF USER FILENAME
*  ---------------------------------------------------------------------
*
STATE &FNME CATA A
&IF &RC ¬= 0 &GOTO -NOFILE
&IF &LEVL = 2 &GCTO -STAS2
XEDIT &FNME CATA A
COPY &FNME DATA A &1 DATA C
&RETURN
-STAS2
&IF &1 = CASE &GOTO -LODE1
FILEDEF 5 TERMINAL (PERM
FILEDEF 6 TERMINAL (PERM
FILECEF 12 DISK &FNME DATA A (PERM
LCAD PROG2
START *
CCPY &FNME DATA A &1 DATA C
&RETURN
-LODE1
FILEDEF 5 TERMINAL (PERM
FILEDEF 6 TERMINAL (PERM
FILECEF 10 DISK &FNME DATA A (PERM
LCAD PROG1
START *
COPY &FNME DATA A &1 DATA C
&RETURN
*****************************
-SDEF
CCPY &1 DATA B = = C
&RETURN
-STAT11
COPY CASE DATA B = = C
CCPY WARHEAD DATA B = = C
&TYPE A DEFAULT SET OF WARHEAD AND CASE FILES WAS GENERATED FOR YOU.
&TYPE ***************************************************************
*********************************
-CONT3
CLRSCRN
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  FILE DEFINITIONS FOR SCANMAIN PROGRAM
*  ----------------------------------------
*
FILECEF 1 DISK SCAN1 FORTRAN C (RECFM FA BLOCK 131 PERM
FILEDEF 5 DISK CASE DATA C (PERM
```

```
FILEDEF 6 DISK SCAN2 FORTRAN C (RECFM FA BLOCK 131 PERM                    MYT05320
FILEDEF 11 DISK GEOM DATA C (PERM                                          MYT05330
FILEDEF 12 DISK WARHEAD DATA C (PERM                                       MYT05340
FILEDEF 19 DISK IMPACT DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM          MYT05350
FILEDEF 30 DISK FILE DATA C (PERM                                          MYT05360
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*          MYT05370
*                                                                          MYT05380
*  LOAD SCANMAIN AND CALCULATE HIT DATA FOR STATS AND GRAPHICS             MYT05390
* -------------------------------------------------------------            MYT05400
*                                                                          MYT05410
&TYPE  THE MISSILE ENCOUNTER SIMULATOR AND SHOT-LINE GENERATOR ARE NOW     MYT05420
&TYPE  READY TO BE LOADED                                                  MYT05430
&TYPE  ***************************************************************     MYT05440
&BEGTYPE -EXMSG1                                                           MYT05450
  DO YOU WANT TO CONTINUE WITH THE APPLICATION                             MYT05460
             ******************************                                MYT05470
             *   REPLY       FUNCTION KEY   *                              MYT05480
             *   -----       ------------   *                              MYT05490
             *    YES              1        *                              MYT05500
             *    NO               2        *                              MYT05510
             ******************************                                MYT05520
  ENTER THE CORRESPONDING FUNCTION KEY(INTEGER)                            MYT05530
-EXMSG1                                                                    MYT05540
&READ VARS &XANS1                                                          MYT05550
&IF &XANS1 = 1 &GOTO -LDSC                                                 MYT05560
&IF &XANS1 = 2 &GOTO -FIN                                                  MYT05570
&TYPE I NEED A 1, OR 2                                                     MYT05580
&GOTO -EXMSG1                                                              MYT05590
-LDSC                                                                      MYT05600
LOAD SCANMAIN                                                              MYT05610
START *                                                                    MYT05620
CLRSCRN                                                                    MYT05630
&BEGTYPE -STAT6                                                            MYT05640
  A SUMMARY OF TARGET DATA IS AVAILABLE                                    MYT05650
          ****************************************                         MYT05660
          *        SCAN1                FUNCTION KEY  *                    MYT05670
          *                                           *                    MYT05680
          *  NO SUMMARY/CONTINUE        ------------  *                    MYT05690
          *  SUMMARY AT TERMINAL ONLY         1       *                    MYT05700
          *  SUMMARY AT PRINTER ONLY          2       *                    MYT05710
          *  SUMMARY AT PTR AND TERM          3       *                    MYT05720
          *  EXIT THE PROGRAM                 4       *                    MYT05730
          ****************************************    5                    MYT05740
  SELECT CORRESPONDING FUNCTION KEY                                        MYT05750
-STAT6                                                                     MYT05760
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*          MYT05770
*                                                                          MYT05780
*   DETERMINE IF SCAN1 SUMMARY DESIRED BY USER                             MYT05790
```

```
*  -----------------------------------------------                MYT05800
*                                                                 MYT05810
&READ VARS &SUM2                                                  MYT05820
&IF &SUM2 =  1 &GCTC -CONT2                                       MYT05830
&IF &SUM2 =  2 &GCTO -CLST2                                       MYT05840
&IF &SUM2 =  3 &GCTO -PLST2                                       MYT05850
&IF &SUM2 =  4 &GCTO -CLST2                                       MYT05860
&IF &SUM2 =  5 &GOTO -FIN                                         MYT05870
&TYPE I NEED A 1,2,3,4, OR 5                                      MYT05880
&GOTC -STAT6                                                      MYT05890
-CLST2                                                            MYT05900
TYPE SCAN1 FCRTRAN C                                              MYT05910
&TYPE   HIT THE 'ENTER' KEY WHEN YOU ARE READY TO CONTINUE        MYT05920
&TYPE   *******************************************************   MYT05930
&READ VARS &KEY2                                                  MYT05940
&IF &SUM2 ¬= 4 &GOTO -CCNT2                                       MYT05950
-PLST2                                                            MYT05960
&TYPE  SUMMARY 'SCAN1' IS NOW BEING SENT TO PRINTER AS REQUESTED  MYT05970
PRINT SCAN1 FORTRAN C                                             MYT05980
-CONT2                                                            MYT05990
CLRSCRN                                                           MYT06000
&BEGTYPE -STAT8                                                   MYT06010
  A SUMMARY CF MISSILE DATA AND SURVIVAL PROBABILITIES IS AVAILABLE  MYT06020
         ******************************************************   MYT06030
         *       SCAN2                      FUNCTION KEY  *       MYT06040
         *                                                *       MYT06050
         *  NC SUMMARY/CONTINUE                  1        *       MYT06060
         *  SUMMARY AT TERMINAL ONLY             2        *       MYT06070
         *  SUMMARY AT PRINTER ONLY              3        *       MYT06080
         *  SUMMARY AT PTR AND TERM              4        *       MYT06090
         *  EXIT THE PROGRAM                     5        *       MYT06100
         ******************************************************   MYT06110
  SELECT CORRESPONDING FUNCTION KEY                               MYT06120
-STAT8                                                            MYT06130
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-CCMMENT-COMMENT* MYT06140
*                                                                 MYT06150
*   DETERMINE IF SCAN2 SUMMARY DESIRED BY USER                    MYT06160
*   ------------------------------------------                    MYT06170
*                                                                 MYT06180
&READ VARS &SUM3                                                  MYT06190
&IF &SUM3 =  1 &GCTO -CONT4                                       MYT06200
&IF &SUM3 =  2 &GCTO -CLST3                                       MYT06210
&IF &SUM3 =  3 &GCTO -PLST3                                       MYT06220
&IF &SUM3 =  4 &GCTO -CLST3                                       MYT06230
&IF &SUM3 =  5 &GCTO -FIN                                         MYT06240
&TYPE I NEED A 1,2,3,4,CR 5                                       MYT06250
&GOTO -STAT8                                                      MYT06260
-CLST3                                                            MYT06270
```

```
TYPE SCAN2 FORTRAN C
&TYPE   HIT THE 'ENTER' KEY WHEN YOU ARE READY TO CONTINUE
&TYPE   **************************************************
&READ VARS &KEY2
&IF &SUM3 ¬= 4 &GOTO -CONT4
-PLST3
&TYPE  SUMMARY 'SCAN2' IS NOW BEING SENT TO PRINTER AS REQUESTED
PRINT SCAN2 FORTRAN C
-CONT4
&IF &PRM1 = 3 &GOTO -CMPL1
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  FILE DEFINITIONS FOR NPDRAW PROGRAM
*  ----------------------------------
*
FILEDEF 5 TERMINAL (PERM
FILEDEF 6 TERMINAL (PERM
FILEDEF 19 DISK  IMPACT DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
FILEDEF 20 DISK  FRAG DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
FILEDEF 30 DISK  TARGET DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
FILEDEF 31 DISK  STORE DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
FILEDEF 35 DISK  MASK DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
FILEDEF 37 DISK  TEMTGT DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
FILEDEF 38 DISK  TEMEXP DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
FILEDEF 39 DISK  TEMHIT DATA C (RECFM VBS LRECL 127 BLOCK 131 PERM
CLRSCRN
&TYPE THE GRAPHICS DRIVER IS NOW BEING LOADED
&TYPE ****************************************
&BEGTYPE -EXMSG2
  DO YOU WANT TO CONTINUE WITH THE APPLICATION
           *******************************
           *   REPLY       FUNCTION KEY  *
           *   -----       ------------  *
           *    YES             1        *
           *    NO              2        *
           *******************************
  ENTER THE CORRESPONDING FUNCTION KEY
-EXMSG2
&READ VARS &XANS2
&IF &XANS2 = 1 &GOTO -LDSP
&IF &XANS2 = 2 &GOTO -FIN
&TYPE I NEED A 1, OR 2
&GOTO -EXMSG2
-LDSP
&STACK &LEVL
&STACK &PRM1
&STACK &PRM2
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
```

```
*
*  LOAD THE MAIN GRAPHICS PROGRAM NPDRAW
* ---------------------------------------
*
LOAD MYDRAW
START *
-CMPL1
CLRSCRN
&BEGTYPE -CMPL2
  THIS COMPLETES THE SCAN APPLICATION.  YOU MAY BRANCH BACK TO SELECT
  A NEW TARGET IF YOU HAVE AUTHORIZATION OR MODIFY YOUR WARHEAD AND
  CASE DATA FOR DIFFERENT MISSILE DESIGN OR GENERATE A 3-D PROBABILITY
  ENVELOPE IF YOU HAVE PLENTY OF TIME.
         *************************************
         *        BRANCH           FUNCTION KEY  *
         *        ------           ------------  *
         *    CHANGE USER LEVEL         1
         *    SELECT NEW TARGET         2        *
         *    MODIFY MISSILE DATA       3        *
         *    RELOAD GRAPHICS PROGRAM   4
         *    3-D PLOTTING              5        *
         *    EXIT PROGRAM              6        *
         *************************************
-CMPL2
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  SELECT BRANCHING OPTIONS FOR RERUNS OR 3-D PLOTS
* -----------------------------------------------------
*
&READ VARS &PRM3
&IF &PRM3 = 1 &GOTO -BRCH1
&IF &PRM3 = 2 &GOTO -BRCH2
&IF &PRM3 = 3 &GOTO -BRCH3
&IF &PRM3 = 4 &GOTO -LDSP
&IF &PRM3 = 5 &GOTO -PLOT
&IF &PRM3 = 6 &GOTO -FIN
&TYPE I NEED A 1,2,3,4,5,OR 6
&GOTO -CMPL2
-BRCH1
ERASE GEOM DATA C
ERASE CASE DATA C
ERASE WARHEAD DATA C
&GOTO -QUER2
-BRCH2
ERASE GEOM DATA C
ERASE CASE DATA C
ERASE WARHEAD DATA C
&GOTO -CONT
```

```
-BRCH3
ERASE CASE DATA C
ERASE WARHEAD DATA C
&GOTO -JMP2
-PLOT
&TYPE PLOT PACKAGE NOT YET WRITTEN
-FIN
*COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT-COMMENT*
*
*  RELEASE PREVIOSLY ACCESSED DISKS AND LIBRARIES
*  -----------------------------------------------------
*
REL 193 (DET
REL &MODE2 (DET
REL &MODE3 (DET
-FIN1
REL 192 (DET
CLRSCRN
&EXIT
C
C     THIS PROGRAM INTERACTIVELY CHANGES THE WARHEAD DATA FILE PARAMETER
C
C
      COMMON /TAPSTW/  NUNWT
      REWIND NUNWT
      COMMON/BLST/FUSBLR,FUSBL1,FUSBL2,WNGBLR,WNGPT1(3),WNGPT2(3)
      COMMON/FUSE/FUZTYP,FUZPOS,DELAY,FUZANG,SIGFUZ,FUZRAN
      COMMON/WARHD/ZONMIN(6),ZONMAX(6),VMIN(6),VMAX(6),FRAGMS(6),
     *FRAGNO(6),NMAT(6),XWH(6),NUMZON,NMASS
C     DIMENSION SHAP(4)
      INTEGER FUZTYP,NUMZON,NZON,ADZON,NMASS,NMAT,SET
      NZON=100
C  ***************************************************************
C  *                                                             *
C  *     FORMAT STATEMENTS FOR FRAGMENT PARAMETERS               *
C  *                                                             *
C  ***************************************************************
 1000 FORMAT(2X,'THE WARHEAD DATA FILE CONTAINS FRAGMENT SPRAY PARAME',
     *'TERS,'/2X,'FUZING PARAMETERS AND BLAST ENVELOPE GEOMETRY AROUND',
     *' THE TARGET.'/2X,'AT THE INTERMEDIARY LEVEL YOU HAVE THE OPTION',
     *' OF SELECTIVELY'/2X,'MODIFYING ANY ONE OR MORE OF THE SEGMENTS ',
     *'BELOW WHICH CONTAIN'/2X,'THE PRIMARY WARHEAD PARAMETERS.')
 1010 FORMAT(2X,'ERROR IN WARHEAD DATA FILE')
 1020 FORMAT(2X,'CURRENT VALUE IS ',I10)
 1030 FORMAT(6X,'*****************************'/6X,'* CHANGE VALUE    1    ',
     *'   *'/6X'*   NO CHANGE      2      *'/6X'****************************'
     */2X'SELECT FUNCTION KEY')
 1040 FORMAT(2X,'ENTER NEW VALUE')
```

```
1060 FORMAT(2X,'I NEED A 1,OR 2')
1050 FORMAT(2X,'POLAR ZONE MUST BE AN INTEGER VALUE BETWEEN 1 AND 6')
1015 FORMAT(8X,'---INTEGER VALUE---'/3X,'NUMBER OF POLAR ZONES')
1100 FORMAT(8X,'----REAL VALUE----'/3X,'LOWER ANGLE OF POLAR ZONE',I2)
1150 FORMAT(9X,'----REAL VALUE----'/3X,'UPPER ANGLE OF POLAR ZONE',I2)
1200 FORMAT(9X,'----REAL VALUE----'/3X,'LOWER FRAGMENT VELOCITY-FT/S')
1250 FORMAT(9X,'----REAL VALUE----'/3X,'UPPER FRAGMENT VELOCITY-FT/S')
1300 FORMAT(9X,'----REAL VALUE----'/3X,'FRAGMENT MASS IN GRAINS')
1350 FORMAT(9X,'----REAL VALUE----'/3X,'NUMBER OF FRAGMENTS')
1400 FORMAT(9X,'----REAL VALUE----'/3X,'INITIAL FRAGMENT CENTER POSIT',
    *'ION WRT WARHEAD CENTER')
1450 FORMAT(9X,'---INTEGER VALUE---'/9X,'FRAGMENT MATERIAL TYPE'/2X,
    *'1=MAGNESIUM 2=ALUMINUM 3=TITANIUM 4=FACE HARDENED STEEL 5=MILD',
    *' STEEL'/2X,'6=HARDENED STEEL 7=LEXAN 8=PLEXIGLASS 9=DORAN 10=',
    *'BULLET RESISTANT GLASS')
C1500 FORMAT(9X,'--CHARACTER VALUE--'/3X,'FRAG SHAPE')
C    ****************************************
C    *                                      *
C    *    INPUT/OUTPUT FORMAT STATEMENTS    *
C    *                                      *
C    ****************************************
 2000 FORMAT(2I10)
 2005 FORMAT(I10)
 2010 FORMAT(F10.3)
 2015 FORMAT(F6.2)
 2020 FORMAT(I4)
 2025 FORMAT(A4)
 2030 FORMAT(F10.2)
 2100 FORMAT(7F10.3,I4,A4)
 2200 FORMAT(I10,5F10.3,3F6.2)
 2300 FORMAT(7F10.3/3F10.2)
C    **************************************************
C    *                                                *
C    *    FORMAT STATEMENTS FOR FUZING PARAMETERS     *
C    *                                                *
C    **************************************************
 3100 FORMAT(9X,'---INTEGER VALUE---'/3X,'FUZE TYPE')
 3150 FORMAT(9X,'----REAL VALUE----'/3X,'TDD POSITION WRT WARHEAD ',
    *' CENTER IN FEET')
 3200 FORMAT(9X,'----REAL VALUE----'/3X,'FUZE DELAY IN SECONDS')
 3250 FORMAT(9X,'----REAL VALUE----'/3X,'FUZE CONE HALF-ANGLE-DEGREES')
 3300 FORMAT(9X,'----REAL VALUE----'/3X,'STANDARD DEVIATION OF ANGLE')
 3350 FORMAT(9X,'----REAL VALUE----'/2X,'FUZE CUTOFF RANGE IN FEET***',
    *'IF FUZE TYPE IS 0 THEN FCR=0.0')
 3400 FORMAT(9X,'----REAL VALUE----'/3X,'MISSILE BODY RADIUS IN FEET')
 3450 FORMAT(9X,'----REAL VALUE----'/3X,'DISTANCE FROM WARHEAD CENTER',
    *' TO CONTACT FUZE IN FEET')
 3500 FORMAT(9X,'----REAL VALUE----'/3X,'DISTANCE FROM WARHEAD CENTER',
```

```
     *' TO TAIL END IN FEET')                                           MYT08200
C    *************************************************                  MYT08210
C    *                                               *                  MYT08220
C    *     FORMAT STATEMENTS FOR BLAST ENVELOPE      *                  MYT08230
C    *                                               *                  MYT08240
C    *************************************************                  MYT08250
 3550 FORMAT(9X,'----REAL VALUE----'/3X,'FUSELAGE BLAST RADIUS IN FEET')MYT08260
 3600 FORMAT(9X,'----REAL VALUE----'/3X,'FUSELAGE BLAST LENGTH FROM CG',MYT08270
     *' FORWARD IN FEET')                                               MYT08280
 3650 FORMAT(9X,'----REAL VALUE----'/3X,'FUSALAGE BLAST LENGTH FROM CG',MYT08290
     *' AFT IN FEET')                                                   MYT08300
 3700 FORMAT(9X,'----REAL VALUE----'/3X,'WING BLAST RADIUS IN FEET')    MYT08310
C    *************************************************                  MYT08320
C    *                                               *                  MYT08330
C    *     FORMAT STATEMENTS FOR PRINT SUMMARY       *                  MYT08340
C    *                                               *                  MYT08350
C    *************************************************                  MYT08360
 4100 FORMAT(9X,'----REAL VALUE----'/3X,'ENDPOINT OF WING BLAST CENTER',MYT08370
     *'LINE NEAR TARGET FUSELAGE'/3X,'X-COMPONENT')                     MYT08380
 4150 FORMAT(9X,'----REAL VALUE----'/3X,'ENDPOINT OF WING BLAST CENTER',MYT08390
     *'LINE NEAR TARGET FUSELAGE'/3X,'Y-COMPONENT')                     MYT08400
 4200 FORMAT(9X,'----REAL VALUE----'/3X,'ENDPOINT OF WING BLAST CENTER',MYT08410
     *'LINE NEAR TARGET FUSELAGE'/3X,'Z-COMPONENT')                     MYT08420
 4250 FORMAT(9X,'----REAL VALUE----'/3X,'ENDPOINT OF WING BLAST CENTER',MYT08430
     *'LINE NEAREST WING TIP'/3X,'X-COMPONENT')                         MYT08440
 4300 FORMAT(9X,'----REAL VALUE----'/3X,'ENDPOINT OF WING BLAST CENTER',MYT08450
     *'LINE NEAREST WING TIP'/3X,'Y-COMPONENT')                         MYT08460
 4350 FORMAT(9X,'----REAL VALUE----'/3X,'ENDPOINT OF WING BLAST CENTER',MYT08470
     *'LINE NEAREST WING TIP'/3X,'Z-COMPONENT')                         MYT08480
 4800 FORMAT(2X,'THIS CONCLUDES THE WARHEAD DATA INPUT')                MYT08490
 4805 FORMAT(6X,'************************************'/6X,              MYT08500
     *'* MODIFY FRAGMENT PARAMETERS    1  *'/6X,                        MYT08510
     *'*  MODIFY FUZING PARAMETERS     2  *'/6X,                        MYT08520
     *'*  MODIFY BLAST ENVELOPE        3  *'/6X,                        MYT08530
     *'*  PRINT SUMMARY OF FILE        4  *'/6X,                        MYT08540
     *'*  EDITING COMPLETED            5  *'/6X,                        MYT08550
     *'************************************')                           MYT08560
 4815 FORMAT(2X,'I NEED A 1,2,OR 3')                                    MYT08570
 4850 FORMAT(2X,'NUMBER OF POLAR ZONES ON FILE',I2)                     MYT08580
 4860 FORMAT(/15X,'POLAR ZONE NUMBER',I2/5X,'LOWER ANGLE',F10.2,'DEG.', MYT08590
     *'DEGREES'/5X,'UPPER ANGLE',F10.2,'DEGREES'/5X,'LOWER VELOCITY OF',MYT08600
     *' FRAGMENTS',F10.2,'FT/SEC'/5X,'UPPER VELOCITY OF FRAGMENTS',F9.2,MYT08610
     *'FT/SEC'/5X,'FRAGMENT MASS',F10.2,'GRAINS'/5X,'NUMBER OF FRAGMEN',MYT08620
     *'TS IN POLAR ZONE',F10.2/5X,'INITIAL FRAGMENT CENTER POSITION',   MYT08630
     *F10.2,'FEET'/5X,'FRAGMENT MATERIAL TYPE',I2)                      MYT08640
 4870 FORMAT(/2X,'ENTER A NUMERIC KEY TO CONTINUE'/10X,'***********')   MYT08650
 4880 FORMAT(5X,'FUZE TYPE',I2/5X,'TDD POSITION WRT TO WARHEAD CENTER', MYT08660
     *F10.2,'FEET'/5X,'FUZE DELAY',F10.2,'SECONDS'/5X'FUZE CONE HALF-', MYT08670
```

```
     *'ANGLE',F10.2,'DEGREES'/5X,'STANDARD DEVIATION OF ANGLE',F10.2,
     *'DEGREES'/5X,'FUZE CUTTOFF RANGE',F10.2,'FEET'/5X,'MISSILE RAD',
     *'IUS',F10.2,'FEET'/5X,'FUZE TO WARHEAD CENTER',F10.2,'FEET'/5X,
     *'TAIL TO WARHEAD CENTER',F10.2,'FEET')
      CALL FRTCMS('CLRSCRN ')
 4890 FORMAT(5X,'FUSELAGE BLAST RADIUS',F6.2,'FEET'/5X,'BLAST LENGTH',
     *' FORWARD OF CG',F6.2,'FEET'/5X,'BLAST LENGTH AFT OF CG',F6.2,
     *'FEET'/5X,'WING BLAST RADIUS',F6.2,'FEET'/5X,'ENDPOINT OF WING',
     *' BLAST CENTERLINE NEAREST FUSELAGE'/5X,' X=',F6.2,' Y=',F6.2,
     *' Z=',F6.2/5X,'ENDPOINT OF WING BLAST CENTERLINE NEAREST WING',
     *' TIP'/5X,' X=',F6.2,' Y=',F6.2,' Z=',F6.2)
C
C
C    ****************************************
C    *                                      *
C    *    READ IN NUMBER OF POLAR ZONES     *
C    *                                      *
C    ****************************************
      WRITE(6,1000)
 10   CONTINUE
      READ(NUNWT,2000) NUMZON,NMASS
C
      IF (NUMZON.LE.0) GO TO 40
      IF (NUMZON.GT.0) GO TO 50
 40   WRITE(6,1010)
      GO TO 5000
 50   CONTINUE
      DO 100 I=1,NUMZON
       READ(NUNWT,2100) ZONMIN(I),ZONMAX(I),VMIN(I),VMAX(I),FRAGMS(I),
     * FRAGNC(I),XWH(I),NMAT(I),SHAP
 100  CONTINUE
       READ(NUNWT,2200)FUZTYP,FUZPOS,DELAY,FUZANG,SIGFUZ,FUZRAN,PADMSL,
     *POSNOS,POSTAL
      READ(NUNWT,2300)FUSBLR,FUSBL1,FUSBL2,WNGBLR,WNGPT1(1),WNGPT1(2),
     *WNGPT1(3),WNGPT2(1),WNGPT2(2),WNGPT2(3)
      GO TO 3806
C    ******************************************
C    *                                        *
C    *    SELECT NEW VALUE OF POLAR ZONE      *
C    *                                        *
C    ******************************************
 105  CALL FRTCMS('CLRSCRN ')
      WRITE(6,1015)
      WRITE(6,1020) NUMZON
      WRITE(6,1030)
 120  CONTINUE
      READ(5,*) J
      IF (J.EQ.1) GO TO 160
```

```
      IF (J.EQ.2) GO TO 170                                             MYT09160
      WRITE (6,1060)                                                    MYT09170
      GO TO 120                                                         MYT09180
  160 WRITE(6,1040)                                                     MYT09190
  165 CONTINUE                                                          MYT09200
      READ(5,*) NZON                                                    MYT09210
      GO TO 175                                                         MYT09220
  170 CONTINUE                                                          MYT09230
      NZON=NUMZON                                                       MYT09240
C   ******************************************************************  MYT09250
C   *                                                                *  MYT09260
C   *     CALCULATE DIFFERENCE BETWEEN OLD AND NEW                   *  MYT09270
C   *     NUMZON VALUE AND SELECTIVELY BRANCH                        *  MYT09280
C   *                                                                *  MYT09290
C   ******************************************************************  MYT09300
  175 SET=NZON-NUMZON                                                   MYT09310
C     WRITE(6,2005) SET                                                 MYT09320
      IF (SET.LT.-2.OR.SET.GT.3) GO TO 200                              MYT09330
      IF (SET.LE.0) GO TO 300                                           MYT09340
      GO TO 400                                                         MYT09350
  200 WRITE(6,1050)                                                     MYT09360
      GO TO 165                                                         MYT09370
C   ************************************************************************ MYT09380
C   *                                                                      * MYT09390
C   *     NO CHANGE IN NUMZON/DETERMINE FRAGMENT PARAMETERS               * MYT09400
C   *                                                                      * MYT09410
C   ************************************************************************ MYT09420
  300 DO 350 I=1,NZON                                                   MYT09430
      WRITE(6,1100) I                                                   MYT09440
      RMVAL=ZONMIN(I)                                                   MYT09450
      CALL CHR(RMVAL)                                                   MYT09460
      ZONMIN(I)=RMVAL                                                   MYT09470
      WRITE(6,1150) I                                                   MYT09480
      RMVAL=ZONMAX(I)                                                   MYT09490
      CALL CHR(RMVAL)                                                   MYT09500
      ZONMAX(I)=RMVAL                                                   MYT09510
      WRITE(6,1200)                                                     MYT09520
      RMVAL=VMIN(I)                                                     MYT09530
      CALL CHR(RMVAL)                                                   MYT09540
      VMIN(I)=RMVAL                                                     MYT09550
      WRITE(6,1250)                                                     MYT09560
      RMVAL=VMAX(I)                                                     MYT09570
      CALL CHR(RMVAL)                                                   MYT09580
      VMAX(I)=RMVAL                                                     MYT09590
      WRITE(6,1300)                                                     MYT09600
      RMVAL=FRAGMS(I)                                                   MYT09610
      CALL CHR(RMVAL)                                                   MYT09620
      FRAGMS(I)=RMVAL                                                   MYT09630
```

```
      WRITE(6,1350)
      RMVAL=FRAGNO(I)
      CALL CHR(RMVAL)
      FRAGNO(I)=RMVAL
      WRITE(6,1400)
      RMVAL=XWH(I)
      CALL CHR(RMVAL)
      XWH(I)=RMVAL
      WRITE(6,1450)
      IMVAL=NMAT(I)
      CALL CHI(IMVAL)
      NMAT(I)=IMVAL
  350 CONTINUE
      GO TO 3805
C   *****************************************************************
C   *                                                               *
C   *    NUMZON VALUE CHANGED/DETERMINE FRAGMENT PARAMETERS         *
C   *                                                               *
C   *****************************************************************
  400 I=1
  405 IF (I.GT.NZON) GO TO 3805
      IF (I.GT.NUMZON) GO TO 425
      WRITE(6,1100) I
      RMVAL=ZONMIN(I)
      CALL CHR(RMVAL)
      ZONMIN(I)=RMVAL
      WRITE(6,1150) I
      RMVAL=ZONMAX(I)
      CALL CHR(RMVAL)
      ZONMAX(I)=RMVAL
      WRITE(6,1200)
      RMVAL=VMIN(I)
      CALL CHR(RMVAL)
      VMIN(I)=RMVAL
      WRITE(6,1250)
      RMVAL=VMAX(I)
      CALL CHR(RMVAL)
      VMAX(I)=RMVAL
      WRITE(6,1300)
      RMVAL=FRAGMS(I)
      CALL CHR(RMVAL)
      FRAGMS(I)=RMVAL
      WRITE(6,1350)
      RMVAL=FRAGNO(I)
      CALL CHR(RMVAL)
      FRAGNO(I)=RMVAL
      WRITE(6,1400)
      RMVAL=XWH(I)
```

```
      CALL CHR(RMVAL)                                                    MYT10120
      XWH(I)=RMVAL                                                       MYT10130
      WRITE(6,1450)                                                      MYT10140
      IMVAL=NMAT(I)                                                      MYT10150
      CALL CHI(IMVAL)                                                    MYT10160
      NMAT(I)=IMVAL                                                      MYT10170
      I=I+1                                                              MYT10180
      GO TO 405                                                          MYT10190
  425 IF (I.GT.NZON) GO TO 3805                                          MYT10200
      WRITE(6,1100)                                                      MYT10210
      CALL CRETR(RMVAL)                                                  MYT10220
      ZCNMIN(I)=RMVAL                                                    MYT10230
      WRITE(6,1150)                                                      MYT10240
      CALL CRETR(RMVAL)                                                  MYT10250
      ZCNMAX(I)=RMVAL                                                    MYT10260
      WRITE(6,1200)                                                      MYT10270
      CALL CRETR(RMVAL)                                                  MYT10280
      VMIN(I)=RMVAL                                                      MYT10290
      WRITE(6,1250)                                                      MYT10300
      CALL CRETR(RMVAL)                                                  MYT10310
      VMAX(I)=RMVAL                                                      MYT10320
      WRITE(6,1300)                                                      MYT10330
      CALL CRETR(RMVAL)                                                  MYT10340
      FRAGMS(I)=RMVAL                                                    MYT10350
      WRITE(6,1350)                                                      MYT10360
      CALL CRETR(RMVAL)                                                  MYT10370
      FRAGNO(I)=RMVAL                                                    MYT10380
      WRITE(6,1400)                                                      MYT10390
      CALL CRETR(RMVAL)                                                  MYT10400
      XWH(I)=RMVAL                                                       MYT10410
      WRITE(6,1450)                                                      MYT10420
      CALL CRETI(IMVAL)                                                  MYT10430
      NMAT(I)=IMVAL                                                      MYT10440
      I=I+1                                                              MYT10450
      GO TO 405                                                          MYT10460
C ***************************                                            MYT10470
C *                         *                                            MYT10480
C *   FUZING PARAMETERS     *                                            MYT10490
C *                         *                                            MYT10500
C ***************************                                            MYT10510
  500 CALL FRTCMS('CLRSCRN ')                                            MYT10520
      WRITE(6,3100)                                                      MYT10530
      IMVAL=FUZTYP                                                       MYT10540
      CALL CHI(IMVAL)                                                    MYT10550
      FUZTYP=IMVAL                                                       MYT10560
      WRITE(6,3150)                                                      MYT10570
      RMVAL=FUZPCS                                                       MYT10580
      CALL CHR(RMVAL)                                                    MYT10590
```

```
      FUZPOS=RMVAL                                                      MYT10600
      WRITE(6,3200)                                                     MYT10610
      RMVAL=DELAY                                                       MYT10620
      CALL CHR(RMVAL)                                                   MYT10630
      DELAY=RMVAL                                                       MYT10640
      WRITE(6,3250)                                                     MYT10650
      RMVAL=FUZANG                                                      MYT10660
      CALL CHR(RMVAL)                                                   MYT10670
      FUZANG=RMVAL                                                      MYT10680
C     WRITE(6,3300)                                                     MYT10690
C     RMVAL=SIGFUZ                                                      MYT10700
C     CALL CHR(RMVAL)                                                   MYT10710
C     SIGFUZ=RMVAL                                                      MYT10720
      WRITE(6,3350)                                                     MYT10730
      RMVAL=FUZRAN                                                      MYT10740
      CALL CHR(RMVAL)                                                   MYT10750
      FUZRAN=RMVAL                                                      MYT10760
      WRITE(6,3400)                                                     MYT10770
      RMVAL=RADMSL                                                      MYT10780
      CALL CHR(RMVAL)                                                   MYT10790
      RADMSL=RMVAL                                                      MYT10800
      WRITE(6,3450)                                                     MYT10810
      RMVAL=POSNOS                                                      MYT10820
      CALL CHR(RMVAL)                                                   MYT10830
      POSNOS=RMVAL                                                      MYT10840
      WRITE(6,3500)                                                     MYT10850
      RMVAL=POSTAL                                                      MYT10860
      CALL CHR(RMVAL)                                                   MYT10870
      POSTAL=RMVAL                                                      MYT10880
      GO TO 3805                                                        MYT10890
C ********************                                                  MYT10900
C *                  *                                                  MYT10910
C *  BLAST ENVELOPE  *                                                  MYT10920
C *                  *                                                  MYT10930
C ********************                                                  MYT10940
 600  CALL FRTCMS('CLRSCRN ')                                           MYT10950
      WRITE(6,3550)                                                     MYT10960
      RMVAL=FUSBLR                                                      MYT10970
      CALL CHR(RMVAL)                                                   MYT10980
      FUSBLR=RMVAL                                                      MYT10990
      WRITE(6,3600)                                                     MYT11000
      RMVAL=FUSBL1                                                      MYT11010
      CALL CHR(RMVAL)                                                   MYT11020
      FUSBL1=RMVAL                                                      MYT11030
      WRITE(6,3650)                                                     MYT11040
      RMVAL=FUSBL2                                                      MYT11050
      CALL CHR(RMVAL)                                                   MYT11060
      FUSBL2=RMVAL                                                      MYT11070
```

```
      WRITE(6,3700)
      RMVAL=WNGBLR
      CALL CHR(RMVAL)
      WNGBLR=RMVAL
      WRITE(6,4100)
      RMVAL=WNGPT1(1)
      CALL CHR(RMVAL)
      WNGPT1(1)=RMVAL
      WRITE(6,4150)
      RMVAL=WNGPT1(2)
      CALL CHR(RMVAL)
      WNGPT1(2)=RMVAL
      WRITE(6,4200)
      RMVAL=WNGPT1(3)
      CALL CHR(RMVAL)
      WNGPT1(3)=RMVAL
      WRITE(6,4250)
      RMVAL=WNGPT2(1)
      CALL CHR(RMVAL)
      WNGPT2(1)=RMVAL
      WRITE(6,4300)
      RMVAL=WNGPT2(2)
      CALL CHR(RMVAL)
      WNGPT2(2)=RMVAL
      WRITE(6,4350)
      RMVAL=WNGPT2(3)
      CALL CHR(RMVAL)
      WNGPT2(3)=RMVAL
C
C
C
C
C   ******************************
C   *                            *
C   *    SELECT USER ACTION      *
C   *                            *
C   ******************************
 3805 CALL FFTCMS('CLRSCRN ')
 3806 WRITE(6,4805)
 3808 CONTINUE
      READ(5,*) IANS
      IF (IANS.EQ.1) GO TO 105
      IF (IANS.EQ.2) GO TO 500
      IF (IANS.EQ.3) GO TO 600
      IF (IANS.EQ.4) GO TO 3810
      IF (IANS.EQ.5) GO TO 3815
      WRITE(6,4815)
      GO TO 3808
```

```
C    ***************************************
C    *                                     *
C    *     PRINT SUMMARY OF CURRENT VALUES *
C    *                                     *
C    ***************************************
 3810 IF (NZON.EQ.100) NZON=NUMZON
      CALL FRTCMS('CLRSCRN ')
      WRITE(6,4850) NZON
 3812 DO 3814 I=1,NZON
      WRITE(6,4860) I,ZONMIN(I),ZONMAX(I),VMIN(I),VMAX(I),FRAGMS(I),
     *FRAGNO(I),XWH(I),NMAT(I)
      WRITE(6,4870)
      READ(5,*) J
      CALL FRTCMS('CLRSCRN ')
 3814 CONTINUE
      WRITE(6,4880) FUZTYP,FUZPOS,DELAY,FUSANG,SIGFUZ,FUZRAN,RADMSL,
     *POSNOS,POSTAL
      WRITE(6,4870)
      READ(5,*) J
      CALL FRTCMS('CLRSCRN ')
      WRITE(6,4890) FUSBLR,FUSBL1,FUSBL2,WNGBLR,WNGPT1(1),WNGPT1(2),
     *WNGPT1(3),WNGPT2(1),WNGPT2(2),WNGPT2(3)
      WRITE(6,4870)
      READ(5,*) J
      CALL FRTCMS('CLRSCRN ')
      GO TO 3805
C    ********************************
C    *                              *
C    *   RECAP FILE AND STORE ON DISK *
C    *                              *
C    ********************************
 3815 IF (NZON.EQ.100) NZON=NUMZON
      REWIND NUNWT
      WRITE(NUNWT,2000) NUMZON,NMASS
      DO 3850 I=1,NZON
      WRITE(NUNWT,2100) ZONMIN(I),ZONMAX(I),VMIN(I),VMAX(I),FRAGMS(I),
     * FRAGNO(I),XWH(I),NMAT(I),SHAP
 3850 CONTINUE
      WRITE(NUNWT,2200) FUZTYP,FUZPOS,DELAY,FUZANG,SIGFUZ,FUZRAN,RADMSL,
     *POSNOS,POSTAL
      WRITE(NUNWT,2300) FUSBLR,FUSBL1,FUSBL2,WNGBLR,WNGPT1(1),WNGPT1(2),
     *WNGPT1(3),WNGPT2(1),WNGPT2(2),WNGPT2(3)
      ENDFILE NUNWT
 5000 CONTINUE
      STOP
      END
C    ************************************************************
C    *                                                          *
```

```
C  *     SUB TO HANDLE INTEGER VALUE CHANGES TO WARHEAD FILE    *          MYT12040
C  *                                                           *          MYT12050
C  *************************************************************          MYT12060
      SUBROUTINE CHI(INTVL)                                               MYT12070
C                                                                         MYT12080
      WRITE(6,1020) INTVL                                                 MYT12090
      WRITE(6,1030)                                                       MYT12100
 50   CONTINUE                                                            MYT12110
      READ(5,*) J                                                         MYT12120
      IF (J.EQ.1) GO TO 55                                                MYT12130
      IF (J.EQ.2) GO TO 60                                                MYT12140
      WRITE (6,1060)                                                      MYT12150
      GO TO 50                                                            MYT12160
 55   WRITE(6,1040)                                                       MYT12170
      READ(5,*) INTVL                                                     MYT12180
 60   CONTINUE                                                            MYT12190
      CALL FFTCMS('CLRSCRN ')                                             MYT12200
      RETURN                                                              MYT12210
 1020 FORMAT(2X,'CURRENT VALUE IS ',I10)                                  MYT12220
 1030 FORMAT(4X,'  ************************'/6X,'* CHANGE VALUE   1     ',MYT12230
     *'*'/6X,'*    NO CHANGE   2     *'/6X,'************************',   MYT12240
     */2X'SELECT FUNCTION KEY')                                           MYT12250
 1040 FORMAT(2X,'ENTER NEW VALUE')                                        MYT12260
 1060 FORMAT(2X,'I NEED A 1,OR 2')                                        MYT12270
      END                                                                 MYT12280
C  *********************************************************              MYT12290
C  *                                                       *              MYT12300
C  *     SUB TO HANDLE REAL VALUE CHANGES TO WARHEAD FILE  *              MYT12310
C  *                                                       *              MYT12320
C  *********************************************************              MYT12330
      SUBROUTINE CHR(RELVL)                                               MYT12340
C                                                                         MYT12350
      REAL RELVL                                                          MYT12360
      WRITE(6,1020) RELVL                                                 MYT12370
      WRITE(6,1030)                                                       MYT12380
 50   CONTINUE                                                            MYT12390
      READ(5,*) J                                                         MYT12400
      IF (J.EQ.1) GO TO 55                                                MYT12410
      IF (J.EQ.2) GO TO 60                                                MYT12420
      WRITE (6,1060)                                                      MYT12430
      GO TO 50                                                            MYT12440
 55   WRITE(6,1040)                                                       MYT12450
      READ(5,*) RELVL                                                     MYT12460
 60   CONTINUE                                                            MYT12470
      CALL FFTCMS('CLRSCRN ')                                             MYT12480
      RETURN                                                              MYT12490
 1020 FORMAT(2X,'CURRENT VALUE IS ',F10.2)                                MYT12500
 1030 FORMAT(4X,'  ************************'/6X,'* CHANGE VALUE   1     ',MYT12510
```

```
     *'*'/6X,'*    NO CHANGE   2     *'/6X,'************************',
     */2X'SELECT FUNCTICN KEY')
 1040 FORMAT(2X,'ENTER NEW VALUE')
 1060 FORMAT(2X,'I NEED A 1,OR 2')
C2010 FCRMAT(F10.2)
      END
C   ***************************************************************
C   *                                                             *
C   *    SUB TO CREATE NEW REAL VALUES FCR WARHEAD FILE           *
C   *                                                             *
C   ***************************************************************
      SUBROUTINE CRETR(RELVL)
C
      WRITE(6,1040)
      READ(5,*) RELVL
      CCNTINUE
      CALL FRTCMS('CLRSCRN ')
      RETURN
 1040 FCRMAT(2X,'ENTER NEW VALUE')
C2010 FORMAT(F10.3)
      END
C   ******************************************************************
C   *                                                                *
C   *    SUB TO CREATE NEW INTEGER VALUES FOR WARHEAD FILE           *
C   *                                                                *
C   ******************************************************************
      SUBROUTINE CRETI(INTVL)
C
      WRITE(6,1040)
      READ(5,*) INTVL
      CONTINUE
      CALL FRTCMS('CLRSCRN ')
      RETURN
 1040 FORMAT(2X,'ENTER NEW VALUE')
      END
C
      BLOCK DATA
      CCMMON /TAPSTW/  NUNWT
      DATA NUNWT/ 12 /
      END
C
C     THIS PROGRAM INTERACTIVELY CHANGES THE CASE DATA FILE PARAMETERS
C
C
      COMMON /TAPSTC/  NUNCT
      REWIND NUNCT
      INTEGER SENT
      REAL MSP,MSS,MAOA,MAA,MAAS,MPA,MPAS,MAZ,MAZS,MISX,MISY,MISZ
```

```
C     ****************************************
C     *                                      *
C     *      INITIALIZATION OF VARIABLES     *
C     *                                      *
C     ****************************************
      SENT=0
      MISX=5C.0
      MISY=5C.0
      MISZ=5C.0
      TCPA=3C.0
      TCEP=3C.0
C     ******************************************
C     *                                        *
C     *      INTERACTIVE FORMAT STATEMENTS     *
C     *                                        *
C     ******************************************
 1000 FORMAT(2X,'THE CASE DATA FILE CONTAINS THE PARAMETERS FOR THE',
     *' ENCOUNTER SCENARIO.'/2X,'THREE(3) TYPES OF TRAJECTCRY CAN BE',
     *' SIMULATED AND UP TO SIX(6) POLAR'/2X,'ZONES CAN BE SPECIFIED',
     *' AT THE INTERMEDIARY LEVEL.')
 1010 FCRMAT(2X,'ERROR IN CASE DATA FILE')
 1020 FCRMAT(2X,'CURRENT VALUE IS ',I10)
 1030 FORMAT(4X,'  ***********************'/6X,'* CHANGE VALUE    1   ',
     *'*'/6X,'*    NO CHANGE    2    *'/5X,' ***********************',
     */2X'SELECT FUNCTICN KEY')
 1040 FORMAT(2X,'ENTER NEW VALUE')
 106C FORMAT(2X,'I NEED A 1,OR 2')
 1050 FORMAT(2X,'CASE DATA IS COMPLETE')
 1015 FCRMAT(8X,'---INTEGER VALUE---'/8X,'TRAJECTORY TYPE'/3X,'1= SPEC',
     *'IFY DETONATION PCINT'/3X,'2= SPECIFY CPA'/3X,'3= SPECIFY CEP')
 1100 FORMAT(8X,'---INTEGER VALUE---'/3X,'NUMBER OF ENCOUNTERS')
 1150 FCRMAT(9X,'----REAL VALUE----'/3X,'TARGET SPEED')
 1200 FORMAT(9X,'----REAL VALUE----'/3X,'MISSILE SPEED')
 1250 FORMAT(9X,'----REAL VALUE----'/3X,'MISSILE ANGLE OF ATTACK')
 1300 FORMAT(9X,'----REAL VALUE----'/3X,'MISSILE SIDESLIP')
 1350 FORMAT(9X,'----REAL VALUE----'/3X,' TARGET ANGLE OF ATTACK')
 1400 FCRMAT(9X,'----REAL VALUE----'/3X,' TARGET SIDESLIP')
 1450 FORMAT(9X,'----REAL VALUE----'/3X,'ENCOUNTER ALTITUCE')
 1500 FORMAT(9X,'----REAL VALUE----'/3X,'X-COMPONENT DETONATION POINT')
 1550 FCRMAT(9X,'----REAL VALUE----'/3X,'Y-COMPONENT DETONATION POINT')
 1600 FORMAT(9X,'----REAL VALUE----'/3X,'Z-CONPONENT CETONATION POINT')
 1650 FORMAT(9X,'----REAL VALUE----'/3X,'CPA ')
 17CC FCRMAT(9X,'----REAL VALUE----'/3X,'CEP ')
C     ********************************************
C     *                                          *
C     *      INFUT/CUTPUT FORMAT STATEMENTS      *
C     *                                          *
C     ********************************************
```

```
2000 FORMAT(I10,I5)                                                     MYT13480
2005 FCRMAT(I10)                                                        MYT13490
2100 FORMAT(I1C,7F10.3/8F10.3/7F10.3)                                   MYT13500
2200 FORMAT(I1C,7F10.3/8F10.3/3F10.3)                                   MYT13510
 210 FORMAT(I1C,7F10.3/8F10.3/7F10.3)                                   MYT13520
 220 FORMAT(I1C,7F10.3/8F10.3/3F10.3)                                   MYT13530
C    *****************************************************              MYT13540
C    *                                                   *              MYT13550
C    *      FORMAT STATEMENTS FOR PRINT SUMMARY          *              MYT13560
C    *                                                   *              MYT13570
C    *****************************************************              MYT13580
4810 FORMAT(2X,'NUMBER OF TRAJECTORIES',I10/2X,'TARGET SPEED',F10.3/2X,MYT13590
    *'MISSILE SPEED',F10.3/2X,'ANGLE OF ATTACK--- TARGET',F10.3,3X,     MYT13600
    *'MISSILE',F10.3/2X,'SIDESLIP ANGLE---TARGET',F10.3,3X,             MYT13610
    *'MISSILE',F10.3/2X,'ENCOUNTER ALTITUDE',F10.3/2X,'X POINT CF ',    MYT13620
    *'DETONATION',F10.3/2X,'Y POINT OF DETONATION',F10.3/2X,'Z POINT', MYT13630
    *' OF DETONATION',F10.3)                                            MYT13640
4820 FORMAT(2X,'NUMBER OF TRAJECTORIES',I10/2X,'TARGET SPEED',F10.3/2X,MYT13650
    *'MISSILE SPEED',F10.3/2X,'ANGLE OF ATTACK--- TARGET',F10.3,3X,     MYT13660
    *'MISSILE',F10.3/2X,'SIDESLIP ANGLE---TARGET',F10.3/2X,             MYT13670
    *'ENCOUNTER ALTITUCE',F10.3/2X,'CPA FOR ENCOUNTFR',F10.3)           MYT13680
4830 FORMAT(2X,'NUMBER CF TRAJECTORIES',I10/2X,'TARGET SPEED',F10.3/2X,MYT13690
    *'MISSILE SPEED',F10.3/2X,'ANGLE OF ATTACK--- TARGET',F10.3,3X,     MYT13700
    *'MISSILE',F10.3/2X,'SIDESLIP ANGLE---TARGET',F10.3/2X,             MYT13710
    *'ENCOUNTER ALTITUDE',F10.3/2X,'CPA FOR ENCOUNTER',F10.3)           MYT13720
4850 FORMAT(2X,'TYPE OF TRAJECTORY',I10)                                MYT13730
4855 FORMAT(6X,'**************************************'/6X,            MYT13740
    *'*   MOCIFY ALL PARAMETERS          1   *'/6X,                     MYT13750
    *'* MODIFY MISSILE PARAMETRERS       2   *'/6X,                     MYT13760
    *'*   PRINT FILE SUMMARY             3   *'/6X,                     MYT13770
    *'*   EDITING COMPLETED              4   *'/6X,                     MYT13780
    *'**************************************')                          MYT13790
4865 FCRMAT(2X,'ENTER ANY NUMERIC KEY TO CONTINUE'/10X,'***********')   MYT13800
4880 FORMAT(2X,'I NEED A 1,2,3,OR 4')                                   MYT13810
C    *************************************                              MYT13820
C    *                                   *                              MYT13830
C    *      READ IN TYPE CF TRAJECTORY   *                              MYT13840
C    *                                   *                              MYT13850
C    *************************************                              MYT13860
     CALL FFTCMS('CLRSCRN ')                                            MYT13870
     WRITE(6,10CC)                                                      MYT13880
10   CCNTINUE                                                           MYT13890
     READ(NUNCT,2000) ITRAJ,NPRT                                        MYT13900
C    ***********************************************                    MYT13910
C    *                                             *                    MYT13920
C    *      READ IN SELECTED TRAJECTORY FILE       *                    MYT13930
C    *                                             *                    MYT13940
C    ***********************************************                    MYT13950
```

```
      IF (ITRAJ.LT.0) GO TO 40
      IF (ITRAJ.GT.0) GO TO 50
      WRITE(6,1050)
      GO TO 5000
 40   WRITE(6,1010)
      GO TO 5000
 50   CONTINUE
      IF (ITRAJ.EQ.1) GO TO 180
      IF (ITRAJ.EQ.2) GO TO 280
      IF (ITRAJ.EQ.3) GO TO 380
 180  READ(NUNCT,2100) JNUM,TSPD,TROL,TPIT,TYAW,MSP,MAA,MAAS,MFA,MPAS,
     *MAZ,MAZS,ALT,AIMX,AIMY,AIMZ,MISX,MISY,MISZ,TACA,TSS,MAOA,MSS
      GO TO 480
 280  READ(NUNCT,2200) JNUM,TSPD,TROL,TPIT,TYAW,MSP,MAA,MAAS,MPA,MPAS,
     *MAZ,MAZS,ALT,AIMX,AIMY,AIMZ,TCPA,TACA,TSS
      GO TO 480
 380  READ(NUNCT,2200) JNUM,TSPD,TROL,TPIT,TYAW,MSP,MAA,MAAS,MPA,MPAS,
     *MAZ,MAZS,ALT,AIMX,AIMY,AIMZ,TCEP,TACA,TSS
 480  WRITE(6,1015)
      WRITE(6,1020) ITRAJ
      WRITE(6,1030)
 580  CONTINUE
      READ(5,*) J
      IF (J.EQ.1) GO TO 60
      IF (J.EQ.2) GO TO 65
      WRITE (6,1060)
      GO TO 580
 60   WRITE(6,1040)
      READ(5,*) ITRAJ
 65   CONTINUE
      IF (ITRAJ.GT.3) GO TO 60
C    *********************************
C    *                               *
C    *     SELECT USER ACTION        *
C    *                               *
C    *********************************
 1800 CALL FRTCMS('CLRSCRN ')
      WRITE(6,4855)
 1820 CONTINUE
      READ(5,*) J
      IF (J.EQ.1) GO TO 1900
      IF (J.EQ.2) GO TO 3000
      IF (J.EQ.3) GO TO 3100
      IF (J.EQ.4) GO TO 3200
      WRITE(6,4880)
      GO TO 1820
C    ******************************************
C    *                                        *
```

```
C    *      MODIFY ALL CASE FILE PARAMETERS              *
C    *                                                   *
C    *****************************************************
 1900 WRITE(6,1150)
      RMVAL=TSPD
      CALL CHR(RMVAL)
      TSPD=RMVAL
      WRITE(6,1350)
      RMVAL=TAOA
      CALL CHR(RMVAL)
      TAOA=RMVAL
      WRITE(6,1400)
      RMVAL=TSS
      CALL CHR(RMVAL)
      TSS=RMVAL
      WRITE(6,1450)
      RMVAL=ALT
      CALL CHR(RMVAL)
      ALT=RMVAL
C    ****************************************************
C    *                                                  *
C    *      MODIFY MISSILE PARAMETERS ONLY              *
C    *                                                  *
C    ****************************************************
 3000 WRITE(6,1100)
      IMVAL=JNUM
      CALL CHI(IMVAL)
      JNUM=IMVAL
      WRITE(6,1200)
      RMVAL=MSP
      CALL CHR(RMVAL)
      MSP=RMVAL
      WRITE(6,1250)
      RMVAL=MAOA
      CALL CHR(RMVAL)
      MAOA=RMVAL
 3010 IF (ITRAJ.EQ.1) GO TO 3020
      IF (ITRAJ.EQ.2) GO TO 3030
      IF (ITRAJ.EQ.3) GO TO 3040
 3020 WRITE(6,1300)
      RMVAL=MSS
      CALL CHR(RMVAL)
      MSS=RMVAL
      WRITE(6,1500)
      RMVAL=MISX
      CALL CHR(RMVAL)
      MISX=RMVAL
      WRITE(6,1550)
```

```
      RMVAL=MISY                                                        MYT14920
      CALL CHR(RMVAL)                                                   MYT14930
      MISY=RMVAL                                                        MYT14940
      WRITE(6,1600)                                                     MYT14950
      RMVAL=MISZ                                                        MYT14960
      CALL CHR(RMVAL)                                                   MYT14970
      MISZ=RMVAL                                                        MYT14980
      GO TO 1800                                                        MYT14990
 3030 WRITE(6,1650)                                                     MYT15000
      RMVAL=TCPA                                                        MYT15010
      CALL CHR(RMVAL)                                                   MYT15020
      TCPA=RMVAL                                                        MYT15030
      GO TO 1800                                                        MYT15040
 3040 WRITE(6,1700)                                                     MYT15050
      RMVAL=TCEP                                                        MYT15060
      CALL CHR(RMVAL)                                                   MYT15070
      TCEP=RMVAL                                                        MYT15080
      GO TO 1800                                                        MYT15090
C     ****************************************************              MYT15100
C     *                                                  *              MYT15110
C     *       PRINT SUMMARY OF CURRENT VALUES            *              MYT15120
C     *                                                  *              MYT15130
C     ****************************************************              MYT15140
 3100 IF (ITRAJ.EQ.1) GO TO 3110                                        MYT15150
      IF (ITRAJ.EQ.2) GO TO 3120                                        MYT15160
      IF (ITRAJ.EQ.3) GO TO 3130                                        MYT15170
 3110 WRITE(6,4850) ITRAJ                                               MYT15180
      WRITE(6,4810) JNUM,TSPD,MSP,MAOA,MSS,TAOA,TSS,ALT,MISX,MISY,MISZ  MYT15190
      GO TO 3140                                                        MYT15200
 3120 WRITE(6,4850) ITRAJ                                               MYT15210
      WRITE(6,4820) JNUM,TSPD,MSP,MAOA,TAOA,TSS,ALT,TCPA                MYT15220
      GO TO 3140                                                        MYT15230
 3130 WRITE(6,4850) ITRAJ                                               MYT15240
      WRITE(6,4830) JNUM,TSPD,MSP,MAOA,TAOA,TSS,ALT,TCEP                MYT15250
 3140 WRITE(6,4865)                                                     MYT15260
      READ(5,*) J                                                       MYT15270
      GO TO 1800                                                        MYT15280
C     *******************************************                       MYT15290
C     *                                         *                       MYT15300
C     *       RECAP FILE AND STORE ON DISK      *                       MYT15310
C     *                                         *                       MYT15320
C     *******************************************                       MYT15330
 3200 IF (ITRAJ.EQ.1) GO TO 3210                                        MYT15340
      IF (ITRAJ.EQ.2) GO TO 3220                                        MYT15350
      IF (ITRAJ.EQ.3) GO TO 3230                                        MYT15360
 3210 REWIND NUNCT                                                      MYT15370
      WRITE(NUNCT,2005) ITRAJ                                           MYT15380
      WRITE(NUNCT,210) JNUM,TSPD,TROL,TPIT,TYAW,MSP,MAA,MAAS,MPA,MPAS,  MYT15390
```

```
     *MAZ,MAZS,ALT,AIMX ,AIMY,AIMZ,MISX,MISY,MISZ,TACA,TSS,MAOA,MSS
      GO TO 5000
 3220 REWIND NUNCT
      WRITE(NUNCT,2005) ITRAJ
      WRITE(NUNCT,220) JNUM,TSPD,TROL,TPIT,TYAW,MSP,MAA,MAAS,MFA,MPAS,
     *MAZ,MAZS,ALT,AIMX ,AIMY,AIMZ,TCPA,TAOA,TSS
      GO TO 5000
 3230 REWIND NUNCT
      WRITE(NUNCT,2005) ITRAJ
      WRITE(NUNCT,220) JNUM,TSPD,TRCL,TPIT,TYAW,MSP,MAA,MAAS,MFA,MPAS,
     *MAZ,MAZS,ALT,AIMX,AIMY,AIMZ,TCEP,TAOA,TSS
C
C
 5000 CONTINUE
      WRITE(NUNCT,2005) SENT
      ENDFILE NUNCT
      STOP
      END
C    ****************************************************************
C    *                                                              *
C    *      SUB HANDLES INTEGER VALUE CHANGES TO CASE FILE          *
C    *                                                              *
C    ****************************************************************
      SUBROUTINE CHI(INTVL)
C
      WRITE(6,1020) INTVL
      WRITE(6,1030)
 50   CONTINUE
      READ(5,*) J
      IF (J.EQ.1) GO TO 55
      IF (J.EQ.2) GO TO 60
      WRITE (6,1060)
      GO TO 50
 55   WRITE(6,1040)
      READ(5,*) INTVL
 60   CONTINUE
      CALL FFTCMS('CLRSCRN ')
      RETURN
 1020 FORMAT(2X,'CURRENT VALUE IS ',I10)
 1030 FORMAT(4X,'  ***********************'/6X,'* CHANGE VALUE    1    ',
     *'*'/6X,'*    NO CHANGE     2    *'/5X,' ************************',
     */2X'SELECT FUNCTION KEY')
 1040 FORMAT(2X,'ENTER NEW VALUE')
 1060 FORMAT(2X,'I NEED A 1,OR 2')
      END
C    **********************************************************
C    *                                                        *
C    *      SUB HANDLES REAL VALUE CHANGES TO CASE FILE       *
```

```
C    *                                                         *
C    ***********************************************************
      SUBROUTINE CHR(RELVL)
C
      REAL RELVL
      WRITE(6,1020) RELVL
      WRITE(6,1030)
 50   CONTINUE
      READ(5,*) J
      IF (J.EQ.1) GO TO 55
      IF (J.EQ.2) GO TO 60
      WRITE (6,1060)
      GO TO 50
 55   WRITE(6,1040)
      READ(5,*) RELVL
 60   CONTINUE
      CALL FRTCMS('CLRSCRN ')
      RETURN
 1020 FORMAT(2X,'CURRENT VALUE IS ',F10.3)
 1030 FORMAT(4X,'  ************************'/6X,'* CHANGE VALUE    1   ',
     *'*'/6X,'*     NO CHANGE    2    *'/5X,' ************************',
     */2X'SELECT FUNCTION KEY')
 1040 FORMAT(2X,'ENTER NEW VALUE')
 1060 FORMAT(2X,'I NEED A 1,OR 2')
C2010 FORMAT(F10.3)
      END
C
      BLOCK DATA
      COMMON /TAPSTC/  NUNCT
      DATA NUNCT/ 10 /
      END
```

APPENDIX C

APPLICATION CHANGES

```
C
C   THE FOLLOWING CODE REFLECTS THE CHANGES MADE TC SPLGEN AND SPDRAW
C   PROGRAMS TO INCLUDE THREE INTERACTIVE USER LEVELS AND GRAPHICS IN
C   THE PLOT10 AND GRAF77 LANGUGES.  COMMENT ADDITIONS ARE NOT INCLUDED.
C
C
C     CHANGES MADE TO SPDRAW
C     *********************
C
      COMMON /MYFILE/ MFIL
      COMMON /MYSCLE/ JSZE
      COMMCN /EXCUT/ LEVL,TERM,LANG
      INTEGER EXT,TYPE,LEVL,TERM,LANG,JSZE
      REAL NWAPT,NWTLA
      READ(5,*)LEVL,TERM,LANG
      CALL FRTCMS('CLRSCRN ')
      IF (TERM.EQ.2) GO TO 10
      IXCTR=2048
      IYCTR=1536
      IDELX=2047
      IDELY=1535
      GO TO 15
   10 IXCTR=512
      IYCTR=390
      IDELX=511
      IDELY=389
   15 CONTINUE
C
C       FORMAT STATEMENTS FOR NOVICE USER OPTION KEYS
C      ***********************************************
C
 1050 FORMAT(3X,'AT THE NOVICE LEVEL, YOU HAVE THE CAPABILITY OF ',
     *'MANIPULATING THE BASIC TARGET'/3X,'PARAMETERS THROUGH USE ',
     *'OF FUNCTION KEYS TO CONTROL SIMPLE COMMANDS AND OPTIONS.')
 1060 FORMAT(31X,'CURRENT OPTIONS'/25X,
     *'"1"=ON "0"=OFF T=TRUE F=FALSE'/8X,
     *'EXTERNAL CCMPS      ',I1,'   INTERNAL COMPS  ',I1,' ERASE BACK ',
     *'LINES  ',L1/6X,'SPECIAL OPTIONS OFF  ',L1,'     PLOT IMPACTS   ',
     *L1,'     DRAW AXES      ',L1)
 1062 FORMAT(3X,'CCNTROL OF GRAPHICS ON THE SCREEN DEPENDS ON USER SET',
     *' OPTIONS. DEFAULT OPTIONS    '/3X,'AT THE BEGINNING OF THE PROG',
     *'RAM ARE SUFFIXED BY AN "*".  SPECIAL OPTIONS ARE'/3X,'PREFIXED',
     *' BY AN "S".'/3X,'SELECT CORRESPONDING FUNCTION KEY')
 1064 FORMAT(9X,'************************************'/9X,
     *'*    CPTIONS        FUNCTION KEYS *'/9X,
     *'*    -------        -------------  *'/9X,
     *'* EXTERNAL COMPS *         1        *'/9X,
     *'* INTERNAL COMPS           2        *'/9X,
```

```
     *'* DRAW ALL LINES *          3       *')
1066 FORMAT(9X,'* REMOVE HIDDEN LINES      4          *'/9X,
     *'* NO MORE CHANGES           5       *'/9X,
     *'* S PLOT IMPACTS            6       *'/9X,
     *'* S DRAW AXES               7       *'/9X,
     *'* CANCEL S OPTIONS *        8       *'/9X,
     *'************************************')
C
C       FORMAT STATEMENTS FOR INTERMEDIARY USER OPTION KEYS
C      ***************************************************
C
1070 FORMAT(3X,'AT THE INTERMEDIARY LEVEL THE USER HAS AN INCREASED',
     *' NUMBER OF'/3X,'AVAILABLE OPTIONS AND COMMANDS.  CONTROL OF ',
     *'THESE PARAMETERS IS'/3X,'THROUGH FUNCTION KEYS AND NUMERICAL ',
     *'INPUT.')
1080 FORMAT(31X,'CURRENT OPTIONS'/22X,
     *'"1"OR"2"=ON "0"=OFF T=TRUE F=FALSE'/4X
     *'EXTERNAL COMPS     ',I1,'   INTERNAL COMPS  ',I1,' ERASE BACK ',
     *'LINES  ',L1/4X,'SPECIAL OPTIONS OFF  ',L1,'    PLOT IMPACTS   ',
     *L1,'      DRAW AXES       ',L1/4X,'CARTESIAN COORDS      ',L1,' PER',
     *'SPECTIVE PROJ ',L1,'  EXPLICIT CENTRE  ',L1/4X,'DRAW WITH DOTS',
     *'       ',L1)
1082 FORMAT(2X,'"S" DENOTES SPECIAL --- "*" DENOTES DEFAULT SETTING'/)
1084 FORMAT(4X,'**********************************************',
     *'**********'/4X,
     *'*    OPTIONS        FUNC KEY     OPTIONS,       FUNC KEY  *'/4X,
     *'*                   --------                    --------  *'/4X,
     *'* EXTERNAL COMPS *     1    * CARTESIAN COORDS *    9     *'/4X,
     *'* INTERNAL COMPS       2    * SPHERICAL COORDS     10     *'/4X,
     *'* DRAW ALL LINES *     3    * ---- SPECIAL  OPTIONS ---- *')
1086 FORMAT(4X,'* ERASE HIDDEN LINES  4    * S DRAW WITH DOTS      ',
     *'11     *'/4X,
     *'* OPTICAL CENTRE *     5    * S PLOT IMPACTS        12    *'/4X,
     *'* EXPLICIT CENTRE      6    * S  DRAW AXES          13    *'/4X,
     *'* PARALLEL PROJ *      7    * CANCELL SPECIAL OPTS 14    *'/4X,
     *'* PERSPECTIVE PROJ     8    *  NO MORE CHANGES      15    *'/4X,
     *'**********************************************************')
C
C    FORMAT STATEMENTS FOR INTERMEDIARY USER COMMANDS
C   ************************************************
C
1092 FORMAT(3X,'ENTER YOUR NEW VALUE (REAL NUMBER).')
1093 FORMAT(3X,'YOU HAVE THE OPTION OF CHANGING TICK SPACE VALUE')
1094 FORMAT(F7.1)
1095 FORMAT(F10.4)
1096 FORMAT(//6X,'*******************************'/6X,
     *'*    ACTION       FUNCTION KEY *'/6X,
     *'*    ------       ------------ *'/6X,
```

```
     *'*  NO CHANGE           1        *'/6X,                                MYT01000
     *'* CHANGE VALUE         2        *'/6X,                                MYT01010
     *'******************************')                                      MYT01020
 1097 FORMAT(2X,'I NEED A 1, OR 2')                                          MYT01030
C                                                                            MYT01040
C      FORMAT STATEMENTS FOR EXPERIENCED USER OPTIONS                        MYT01050
C     **********************************************                         MYT01060
C                                                                            MYT01070
 2030 FORMAT(31X,'CURRENT OPTIONS'/22X,                                      MYT01080
     *'"1"OR"2"=ON "0"=OFF  T=TRUE F=FALSE'/4X,                              MYT01090
     *' EXTERNAL COMPS  ',I2,' INTERNAL COMPS ',I2,'    TYPE      ',I1/4X,MYT01100
     *'ERASE BACK LINES ',L2,' EXPLICIT CENTER',L2,' CARTESIAN   ',L2/4X,MYT01110
     *'PERSPECTIVE VIEW ',L2,' PLOT IMPACTS    ',L2,' DRAW AXES   ',L2/4X,MYT01120
     *' EXPLODED VIEW   ',L2,' XSECTIONAL VIEW',L2,' SAVE SCREEN',L2/4X,MYT01130
     *'DRAW SAVED SCREEN',L2,' NO SCREEN ERASE',L2,' SUBSYSTENS ',L2/4X,MYT01140
     *'DRAW SUBSYSTEMS W/DOTS ',L1)                                          MYT01150
 2050 FORMAT(4X,'          OPTION                   OPTION DESCRIPTORS'/4X,  MYT01160
     *'          ------                   ------------------'/4X,            MYT01170
     *'VECTORS DRAWN   ---  DR(AWALL)/HI(DDEN LINES REMOVE)'/4X,             MYT01180
     *'TYPE PROJECTION ---  NOP(ERSPECTIVE)/P(ERSPECTIVE)'/4X,               MYT01190
     *'TYPE OF COORDS  ---  SP(HERICAL)/CA(RTESIAN)'/4X,                     MYT01200
     *'TYPE OF CENTER  ---  CTRO(PTICAL)/CTRE(XPLICIT)'/4X,                  MYT01210
     *'COMPONENTS  ---  EXTL(EXTERNAL-LINES)/INTL(INTERNAL-LINES)'/4X,       MYT01220
     *'                  EXTD(EXTERNAL-DOTS)/INTD(INTERNAL-DOTS)'/4X,        MYT01230
     *'                    NOEX(NO EXTERNAL)/NOIN(NO INTERNAL)')             MYT01240
 2055 FORMAT(4X,'CANCELL SPECIAL OPTIONS  ---  NOS(PECIAL OPTIONS)'/4X,      MYT01250
     *'SPECIAL OPTIONS ---  EX(PLODE VIEW)/X(SECTIONAL VIEW)'/4X,            MYT01260
     *'                     IM(PACTS PLOT)/AX(ES DRAW)'/4X,                  MYT01270
     *'                 MSKI(SAVE SCREEN)/MSKD(DRAW SAVED SCREEN)'/4X,       MYT01280
     *'                 SU(BSYSTEMS DRAW)/DO(TS FOR SUBSYSTEMS)'/4X,         MYT01290
     *'                             NOEJ(ECTION OF SCREEN)')                 MYT01300
C                                                                            MYT01310
C    FORMAT STATEMENTS FOR EXPERIENCED USER COMMANDS                         MYT01320
C   ***********************************************                          MYT01330
C                                                                            MYT01340
 1090 FORMAT(3X,'AT THE EXPERIENCED LEVEL THE USER HAS THE FULL SET OF',MYT01350
     *' COMMANDS'/3X,'AND OPTIONS AT HIS DISPOSAL.  CONTROL OF PARAMET',MYT01360
     *'ERS IS THROUGH'/3X,'COMMAND AND NUMERICAL ENTRY.')                    MYT01370
 2000 FORMAT('1',60HA COMMAND HAS AN IDENTIFIER FOLLOWED BY OPTIONAL PARMYT01380
     *AMETERS./79H EACH PARAMETER IS SEPARATED FROM THE OTHER BY EITHER MYT01390
     *A SPACE, COMMA, OR EQUAL /77H SIGN (OR ANY NUMBER OF THEM).  NUMERMYT01400
     *IC DATA CAN BE ALSO SEPARATED BY PLUS OR/79H MINUS SIGNS.  ALL NUMMYT01410
     *ERIC INPUT IS POSITIONALLY ASSOCIATED WITH ITS PARAMETER./        MYT01420
     *         67H TYPING A PERCENT SIGN (%) IN ANY RESPONSE TO 'COMMANMYT01430
     *D?' WILL CAUSE/28H REJECTION OF ENTIRE STRING.)                    MYT01440
 2002 FORMAT(77HOLIST OF COMMANDS (OPTIONAL CHARACTERS IN PARENS, COMMANMYT01450
     *DS MARKED DISPLAY CAN/5X,55HSHOW CURRENT VALUES BY ENTERING JUST TMYT01460
     *HE COMMAND NAME):)                                                     MYT01470
```

```
2003 FORMAT(5X,39HEN(D) - TERMINATES EXECUTION OF PROGRAM)
2004 FORMAT(5X,39HO(PTION) - DISPLAY/SET PLOTTING OPTIONS)
2005 FORMAT(5X,56HP(ICTURE) - DRAWS PICTURE OF MODEL USING CURRENT OPTI
    *ONS)
2006 FORMAT(5X,36HSC(ENE) - DRAWS SEQUENCE OF PICTURES)
2007 FORMAT(5X,25HST(EP) - SIMILAR TO SCENE)
2008 FORMAT(5X,8HSY(STEM)/5X,68H   OR        - DISPLAY/DEFINE (ADD TO) C
    *URRENT USER DEFINED SUBSYSTEM/5X,11HSU(BSYSTEM))
2009 FORMAT(5X,47HAX(ES) - DISPLAY/DEFINE AXIS DRAWING PARAMETERS)
2010 FORMAT(5X,46HD(EBUG) - DISPLAY/SET DEBUGGING PRINT SWITCHES)
2012 FORMAT(5X,43HAP(ERATURE) - DISPLAY/SET VIEWING APERATURE)
2013 FORMAT(5X,58HFR(AMESPEED) - DISPLAY/SET FRAMESPEED IN FRAMES PER S
    *ECOND)
2014 FORMAT(5X,71HHL(ENGTH) - DISPLAY/SET HIDDEN LINE SEGMENT LENGTH (I
    *N PLOTTER RASTERS))
2015 FORMAT(5X,71HHTL - DISPLAY/SET HIDDEN LINE REMOVAL LINEAR TOLERANC
    *E (IN MODEL UNITS))
2016 FORMAT(5X,65HHTA - DISPLAY/SET HIDDEN LINE REMOVAL ANGULAR TOLERAN
    *CE (DEGREES))
2017 FORMAT(5X,61HEJ(ECT) - ADVANCES FRAME (ONLY WHEN IN MULTIPLE PICTU
    *RE MODE))
2018 FORMAT(5X,70HHE(LP) - PRODUCES THIS LIST.  FURTHER INFORMATION ON
    *SPECIFIC COMMANDS/5X,76HIS REQUESTED BY TYPING THE IDENTIFIER OF T
    *HE COMMAND AFTER THE WORD 'HELP,'.)
2020 FORMAT(1X,'COMMAND ?'/1X,'*********')
2025 FORMAT(3X,'OPTIONS ARE SET BY TYPING "O" FOLLOWED BY OPTION DES',
    *'CRIPTOR.')
2040 FORMAT(6X,'**************************************'/6X,
    *'* ACCESS COMMAND DESCRIPTORS    1  *'/6X,
    *'* ACCESS OPTION DESCRIPTORS     2  *'/6X,
    *'**************************************')
2045 FORMAT(3X,'I NEED A 1,OR 2')
C
      MDTS=.FALSE.
      SPOP=.TRUE.
      JSZE=1
C
C     DETERMINE USER LEVEL
C     ********************
C
      IF (LEVL.EQ.1)GO TO 61
      IF (LEVL.EQ.2)GO TO 63
      WRITE(6,1090)
      WRITE(6,2000)
      WRITE(6,2002)
      WRITE(6,2025)
      WRITE(6,2040)
   55 CONTINUE
```

```
      READ(5,*) J
      IF (J.EQ.1) GO TO 68
      IF (J.EQ.2) GO TO 750
      WRITE(6,2045)
      GO TO 55
C
C      SELECT FUNCTION KEY FROM MENU AND ACTION
C      ELSE SEND DIAGNOSTIC
C      ****************************************
C
   60 IF (LEVL.EQ.1) GO TO 62
      IF (LEVL.EQ.2)GO TO 65
      GO TO 68
   61 WRITE(6,1050)
C  62 CALL FRTCMS('CLRSCRN ')
   62 CALL FKNV(L)
      GO TO (82,72,320,230),L
   63 WRITE(6,1070)
   65 CALL FKINT(L)
      GO TO (82,74,320,292,242,252,262,230),L
   68 CALL FRTCMS('CLRSCRN ')
      WRITE(6,2003)
      WRITE(6,2005)
      WRITE(6,2004)
      WRITE(6,2006)
      WRITE(6,2007)
      WRITE(6,2008)
      WRITE(6,2009)
      WRITE(6,2010)
      WRITE(6,2012)
      WRITE(6,2013)
      WRITE(6,2014)
      WRITE(6,2015)
      WRITE(6,2016)
      WRITE(6,2017)
      WRITE(6,2018)
      WRITE(6,2020)
C   *************************************
C   *                                   *
C   *      SELECT OPTION SEQUENCE       *
C   *                                   *
C   *************************************
   70     CALL SETFLG(CARD,I)
  700     CALL FRTCMS('CLRSCRN ')
          WRITE(6,2030)  EXT,INT,TYPE,HID,CEN,CART,PERSP,IMPX,AXES,
     *EXPLO,XSEC,MSKI,MSKD,NOEJ,SUBS,DOTS
          WRITE(6,2040)
      ICURP = 0
```

```
725     CONTINUE                                                          MYT02440
        READ(5,*) J                                                       MYT02450
      IF (J.EQ.1) GO TO 68                                                MYT02460
      IF (J.EQ.2) GO TC 750                                               MYT02470
      WRITE(6,2045)                                                       MYT02480
      GO TO 725                                                           MYT02490
750     CALL FRTCMS('CLRSCRN ')                                           MYT02500
        WRITE(6,2050)                                                     MYT02510
        WRITE(6,2055)                                                     MYT02520
        WRITE(6,2025)                                                     MYT02530
        WRITE(6,2020)                                                     MYT02540
        GO TO 69                                                          MYT02550
C       GO TO 60                                                          MYT02560
 72     CALL FRTCMS('CLRSCRN ')                                           MYT02570
        WRITE(6,1060)  EXT,INT,HID,SPOP,IMPX,AXES                         MYTC2580
        WRITE(6,1C62)                                                     MYT02590
        WRITE(6,1064)                                                     MYT02600
        WRITE(6,1066)                                                     MYT02610
        READ(5,*) JJ                                                      MYT02620
        GO TO(500,510,520,530,570,540,550,560),JJ                         MYT02630
500     EXT=1                                                             MYT02640
        INT=0                                                             MYT02650
        GO TO 72                                                          MYT02660
51C     INT=1                                                             MYT02670
        EXT=0                                                             MYT02680
        GO TO 72                                                          MYT02690
520     HID=.FALSE.                                                       MYT02700
        GO TO 72                                                          MYT02710
530     HID=.TRUE.                                                        MYT02720
        GO TO 72                                                          MYT02730
540     IMPX=.TRUE.                                                       MYT02740
        SPOP=.FALSE.                                                      MYT02750
        GO TO 72                                                          MYT02760
55C     AXES=.TRUE.                                                       MYT02770
        SPOP=.FALSE.                                                      MYT02780
        GO TO 72                                                          MYT02790
560     IMPX=.FALSE.                                                      MYT02800
        SPOP=.TRUE.                                                       MYT02810
        AXES=.FALSE.                                                      MYT02820
        GO TO 72                                                          MYT02830
570   ICURP = 0                                                           MYT02840
        CALL FRTCMS('CLRSCRN ')                                           MYTC2850
        GO TO 60                                                          MYT02860
 74     CALL FRTCMS('CLRSCRN ')                                           MYT02870
        WRITE(6,1C80)  EXT,INT,HID,SPOP,IMPX,AXES,CART,PERSP,CEN,MDTS     MYTC2880
        WRITE(6,1082)                                                     MYT02890
        WRITE(6,1C84)                                                     MYTC2900
        WRITE(6,1C86)                                                     MYTC2910
```

```
      READ(5,*) JJ                                                      MYT02920
      GO TO(600,605,610,615,620,625,630,635,640,645,650,655,660,       MYT02930
     *665,670),JJ                                                       MYT02940
  600 EXT=1                                                             MYT02950
      INT=0                                                             MYT02960
      GO TO 74                                                          MYT02970
  605 INT=1                                                             MYT02980
      EXT=0                                                             MYT02990
      GO TO 74                                                          MYT03000
  610 HIC=.FALSE.                                                       MYT03010
      GO TO 74                                                          MYT03020
  615 HIC=.TRUE.                                                        MYT03030
      GO TO 74                                                          MYT03040
  620 CEN=.FALSE.                                                       MYT03050
      GO TO 74                                                          MYT03060
  625 CEN=.TRUE.                                                        MYT03070
      GO TO 74                                                          MYT03080
  630 PERSP=.FALSE.                                                     MYT03090
      GO TO 74                                                          MYT03100
  635 PERSP=.TRUE.                                                      MYT03110
      GO TO 74                                                          MYT03120
  640 CART=.TRUE.                                                       MYT03130
      GO TO 74                                                          MYT03140
  645 CART=.FALSE.                                                      MYT03150
      GO TO 74                                                          MYT03160
  650 MDTS=.TRUE.                                                       MYT03170
      IF (INT.EQ.0) EXT=2                                               MYT03180
      IF (EXT.EQ.0) INT=2                                               MYT03190
      GO TO 74                                                          MYT03200
  655 IMPX=.TRUE.                                                       MYT03210
      SPCP=.FALSE.                                                      MYT03220
      GO TO 74                                                          MYT03230
  660 AXES=.TRUE.                                                       MYT03240
      SPCP=.FALSE.                                                      MYT03250
      GO TO 74                                                          MYT03260
  665 IMPX=.FALSE.                                                      MYT03270
      SPCP=.TRUE.                                                       MYT03280
      AXES=.FALSE.                                                      MYT03290
      MDTS=.FALSE.                                                      MYT03300
      IF (EXT.EQ.2) EXT=1                                               MYT03310
      IF (INT.EQ.2) INT=1                                               MYT03320
      GO TO 74                                                          MYT03330
  670 ICURP = 0                                                         MYT03340
      CALL FRTCMS('CLRSCRN ')                                           MYT03350
      GO TO 60                                                          MYT03360
      TPR=.FALSE.                                                       MYT03370
C     WRITE(6,*) TPR                                                    MYT03380
      CALL INCR(Y,Z,SPIN,TPR)                                           MYT03390
```

```
      IF (TPR) GO TC 85
C
      SUBROUTINE FKNV(J)
C     ******************
C
      WRITE(6,100)
      WRITE(6,110)
 20   CONTINUE
      READ(5,*) J
      IF (J.LT.1.CR.J.GT.4) GO TO 25
      RETURN
 25   WRITE(6,150)
      GO TO 20
 100  FORMAT(9X,'***********************************'/9X,
     *'*  CCMMAND          FUNCTION KEYS   *'/9X,
     *'*                   -------------   *'/9X,
     *'* DRAW TARGET            1          *'/9X,
     *'* SET OPTICNS            2          *'/9X,
     *'* EXIT PROGRAM           3          *'/9X,
     *'* LIST AXES              4          *'/9X,
     *'***********************************')
 110  FORMAT(3X,'SELECT CORRESPONDING FUNCTION KEY')
 150  FORMAT(3X,'I NEED A 1,2,3,OR 4')
      END
C
      SUBROUTINE FKINT(J)
C     *******************
C
      WRITE(6,100)
      WRITE(6,110)
 20   CONTINUE
      READ(5,*) J
      IF (J.LT.1.OR.J.GT.8) GO TO 25
      RETURN
 25   WRITE(6,150)
      GO TO 20
 100  FORMAT(9X,'***********************************'/9X,
     *'*  COMMAND          FUNCTION KEYS   *'/9X,
     *'*                   -------------   *'/9X,
     *'* DRAW TARGET            1          *'/9X,
     *'* SET OPTICNS            2          *'/9X,
     *'* EXIT PROGRAM           3          *')
 110  FORMAT(9X,'* SET APERTURE            4          *'/9X,
     *'* HIDDEN LINE LENGTH     5          *'/9X,
     *'* SET LINE TOLERANCE     6          *'/9X,
     *'* SET ANGLE TOLERANCE    7          *'/9X,
     *'* LIST AXES              8          *'/9X,
     *'***********************************'/3X,
```

```
     *'SELECT CORRESPONDING FUNCTION KEY.')
 150  FORMAT(3X,'I NEED A 1,2,3,4,5,6, OR 7')
      END
C
C
      SUBROUTINE INCR(S,T,RCT,TPR)
C     ****************************
C
      COMMON /MYSCLE/ JSZE
      LOGICAL TPR
      REAL DELTA
      DELTA=10.0
C     JSZE=1
 8    WRITE(6,100) DELTA
      WRITE(6,110)
 100  FORMAT(2X,' SELECT A FUNCTION KEY TO DYNAMICALLY CHANGE YOUR',
     *'DISPLAY'/2X,'OR RETURN TO COMMAND MODE.  CURRENT DEGREE SETTING',
     *' IS ',F3.1,/2X,'DEFAULT SCALING IS FULL SCREEN(1/2,1/4,1/8 ARE ',
     *'AVAILABLE).')
 110  FORMAT(//5X,'*** INCREMENT--(FK)****DECREMENT--(FK)'/5X,
     *'AZIMUTH       1       AZIMUTH     2    '/5X,
     *'ELEVATION     3       ELEVATION   4    '/5X,
     *'ROTATION      5       ROTATION    6    '/5X,
     *'SCALING       7       SCALING     8    '/5X,
     *'NEW COMMAND   9    SET INCREMENT  10   '/5X,
     *'****************************************')
 120  FORMAT(5X,'ENTER A REAL VALUE BETWEEN 0.0 AND 90.0 DEGREES TO'/5X,
     *' CHANGE THE CURRENT INCREMENT/DECREMENT VALUE.'/5X,
     *'**************************************************')
C130  FORMAT(F3.1)
      READ(5,*) JJ
      IF (JJ.EQ.1) GO TO 10
      IF (JJ.EQ.2) GO TO 20
      IF (JJ.EQ.3) GO TO 30
      IF (JJ.EQ.4) GO TO 40
      IF (JJ.EQ.5) GO TO 50
      IF (JJ.EQ.6) GO TO 60
      IF (JJ.EQ.7) GO TO 70
      IF (JJ.EQ.8) GO TO 80
      IF (JJ.EQ.9) GO TO 90
      IF (JJ.EQ.10) GO TO 85
      GO TO 8
 10   S=S+DELTA
      IF (S.GT.360.0) S=S-360.0
      TPR=.TRUE.
      GO TO 90
 20   S=S-DELTA
      IF (S.LT.0.0) S=S+360.0
```

```
      TPR=.TRUE.                                                        MYT04360
      GO TO 90                                                          MYT04370
   30 T=T+DELTA                                                         MYT04380
      IF (T.GT.360.0) T=T-360.0                                         MYT04390
      TPR=.TRUE.                                                        MYT04400
      GO TO 90                                                          MYT04410
   40 T=T-DELTA                                                         MYT04420
      IF (T.LT.0.0) T=T+360.0                                           MYT04430
      TPR=.TRUE.                                                        MYT04440
      GO TO 90                                                          MYT04450
   50 ROT=ROT+DELTA                                                     MYT04460
      IF (ROT.GT.360.0) ROT=ROT-360.0                                   MYT04470
      TPR=.TRUE.                                                        MYT04480
      GO TO 90                                                          MYT04490
   60 ROT=ROT-DELTA                                                     MYT04500
      IF (ROT.LT.0.0) ROT=ROT+360.0                                     MYT04510
      TPR=.TRUE.                                                        MYT04520
      GO TO 90                                                          MYT04530
   70 JSZE=JSZE-1                                                       MYT04540
      IF (JSZE.LT.1) JSZE=4                                             MYT04550
      TPR=.TRUE.                                                        MYT04560
      GO TO 90                                                          MYT04570
   80 JSZE=JSZE+1                                                       MYT04580
      IF (JSZE.GT.4) JSZE=1                                             MYT04590
      TPR=.TRUE.                                                        MYT04600
      GO TO 90                                                          MYT04610
   85 CALL FRTCMS('CLRSCRN ')                                           MYT04620
      WRITE(6,120)                                                      MYT04630
      READ(5,*) DELTA                                                   MYT04640
      GO TO 8                                                           MYT04650
   90 RETURN                                                            MYT04660
      END                                                               MYT04670
C                                                                       MYT04680
C        USER PROVIDED ROUTINE - INITIALIZES GRAPHIC SYSTEM             MYT04690
      SUBROUTINE GRINIT                                                 MYT04700
C     *****************                                                 MYT04710
C                                                                       MYT04720
      COMMON /EXCUT/ LEVL,TERM,LANG                                     MYT04730
      INTEGER LEVL,TERM,LANG                                            MYT04740
      IF (TERM.EQ.1) GO TO 10                                           MYT04750
      IF (TERM.EQ.2) GO TO 20                                           MYT04760
   10 CALL DSINIT                                                       MYT04770
      CALL GSERSE                                                       MYT04780
      GO TO 50                                                          MYT04790
   20 CALL INITT(1200)                                                  MYT04800
      CALL NEWPAG                                                       MYT04810
      GO TO 50                                                          MYT04820
   50 CONTINUE                                                          MYT04830
```

```
      RETURN
      END
C
C        USER PROVIDED RCUTINE - EJECT PAGE
      SUBROUTINE FRAME
C     ****************
C
      COMMON /EXCUT/ LEVL,TERM,LANG
      INTEGER LEVL,TERM,LANG
      IF (TERM.EQ.1) GO TO 1C
      IF (TERM.EQ.2) GO TO 20
      GO TO 50
   10 CALL GSERSE
      GO TO 50
   20 CALL NEWPAG
   50 CONTINUE
      RETURN
      END
C
C        USER PROVIDED ROUTINE - TERMINATES GRAPHIC OUTPUT
      SUBROUTINE GREND
C     ****************
C
      COMMON /EXCUT/ LEVL,TERM,LANG
      INTEGER LEVL,TERM,LANG
      IF (TERM.EQ.1) GO TO 1C
      IF (TERM.EQ.2) GO TO 20
   10 CALL GSFRCE
      CALL CSTERM
      GO TO 50
C  20 CALL TSEND
   20 CALL FINITT(1,1)
   50 CONTINUE
      RETURN
      END
C
C
      SUBROUTINE SHOWIT
C     *****************
C
      COMMON /MYFILE/ MFIL
      COMMON /MYSCLE/ JSZE
      COMMON /EXCUT/ LEVL,TERM,LANG
      INTEGER NN,X1,X2,Y1,Y2,TERM,LEVL,LANG,A,B
      REAL Q
      REWIND MFIL
      IF (TERM.EQ.1) GC TO 150
      IF (TERM.EQ.2) GC TO 250
```

```
150   READ(MFIL) Q,NN,X1,Y1,X2,Y2                              MYTC5320
      IF (Q.LT.-1C0.0) GO TO 195                               MYT05330
      IF (Q.GT.0.0) GO TO 160                                  MYT05340
      IM=X2                                                    MYT05350
      IF (Q.LE.0.0) GO TO 170                                  MYT05360
160   X1=X1/JSZE                                               MYTC5370
      Y1=Y1/JSZE                                               MYT05380
      X2=X2/JSZE                                               MYT05390
      Y2=Y2/JSZE                                               MYTC5400
      CALL GSVECT(0,X1,Y1)                                     MYT05410
      CALL GSVECT(1,X2,Y2)                                     MYT05420
      GO TO 150                                                MYT05430
170   A=X1/JSZE                                                MYT05440
      B=Y1/JSZE                                                MYT05450
C     IM=X2                                                    MYT05460
      CALL GSVECT(0,A-IM,B-IM)                                 MYT05470
      CALL GSVECT(1,A-IM,B+IM)                                 MYTC5480
      CALL GSVECT(1,A+IM,B+IM)                                 MYT05490
      CALL GSVECT(1,A+IM,B-IM)                                 MYT05500
      CALL GSVECT(1,A-IM,B-IM)                                 MYT05510
      GO TO 150                                                MYT05520
195   CALL GSFRCE                                              MYT05530
      RETURN                                                   MYT05540
250   READ(MFIL) Q,NN,X1,Y1,X2,Y2                              MYTC5550
      IF (Q.LT.-100.0) GO TO 295                               MYT05560
      IF (Q.GT.0.0) GO TO 260                                  MYT05570
      IM=2                                                     MYT05580
      IF (Q.LE.0.C) GO TO 27C                                  MYT05590
260   X1=X1/JSZE                                               MYT05600
      Y1=Y1/JSZE                                               MYT05610
      X2=X2/JSZE                                               MYTC5620
      Y2=Y2/JSZE                                               MYT05630
      CALL MCVABS(X1,Y1)                                       MYTC5640
      CALL CRWABS(X2,Y2)                                       MYT05650
      GO TO 250                                                MYT05660
270   A=X1/JSZE                                                MYT05670
      B=Y1/JSZE                                                MYT05680
C     IM=IM/2                                                  MYT05690
      CALL MOVABS(A-IM,B-IM)                                   MYT05700
      CALL DRWABS(A-IM,B+IM)                                   MYT05710
      CALL DRWABS(A+IM,B+IM)                                   MYT05720
      CALL DRWABS(A+IM,B-IM)                                   MYTC5730
      CALL DRWABS(A-IM,B-IM)                                   MYT05740
      GO TO 250                                                MYT05750
C295  CALL TSEND                                                MYT05760
295   RETURN                                                   MYT05770
      END                                                      MYT05780
C                                                              MYT05790
```

```
C     SEQUENCE ADDED TO ALL DRAWING CONTROL SUBROUTINES TO ACCOMODATE
C     COMMON LINE STORAGE FILE,INCLUSION OF SENTINNEL, AND NOEJ OPTION
C     ADDED TO SUBROUTINE GENHD,DRWALL,DRWHDN,EXPLODE, AND XSECTN
C     ****************************************************************
C
      COMMON /MYFILE/ MFIL
      COMMON /FSPCL/ XSEC,SUBS,EXPLO,AXES,LABL,IMPX,NOEJ
      LOGICAL XSEC,SUBS,EXPLO,AXES,LABL,IMPX,NOEJ
      Q=-999.9
      SENT=1
      MFIL=((APPLICABLE FILE NUMBER))
      WRITE(MFIL) Q,SENT
      IF (.NOT. NOEJ) CALL FRAME
      CALL SHOWIT
C
C    ***********************************
C    *  CHANGES MADE TO SPLGEN PROGRAM  *
C    ***********************************
C
      READ(1,*) SIZE,LEVL
      CALL FRTCMS('CLRSCRN ')
C
C
C * BEGIN INTERACTIVE SESSION *
C *****************************
C
      IF(LEVL.NE.1) GO TO 30
    1 DO 2 I=1,10
         IBUG(I)=0
    2 CONTINUE
      WRITE(7,130)
    3 CONTINUE
      READ (1,*) PRMP1
      IF(PRMP1.EQ.1) GO TO 5
      IF(PRMP1.EQ.2) GO TO 7
      WRITE(7,90)
      GO TO 3
    5 DENSTY=25.0
      GO TO 40
    7 DENSTY=40.0
      GO TO 40
   90 FORMAT(5X,'I NEED A 1,OR 2')
  130 FORMAT(3X,'THE DENSITY OF LINES CAN BE SET HIGHER THAN NORMAL',
     *'IF YOU INTEND'/3X,'TO DO EXPLODED VIEWGRAPHS.  NORMAL SETTING',
     *' IS RECOMMENDED FOR NOVICE USERS'//10X,
     *'************************************'/10X,
     *'*    SETTING            FUNCTION KEY    *'/10X,
     *'*    -------            ------------    *'/10X,
```

```
     *'*   NORMAL DENSITY            1          *  '/10X,              MYT06280
     *'*   HIGHER DENSITY            2          *  '/10X,              MYT06290
     *'***************************************  ')                     MYT06300
  30  CALL INTER(DENSTY,IBUG)                                          MYT06310
  40  WRITE(6,9) SIZE,DENSTY,IBUG                                      MYT06320
C                                                                      MYT06330
C    INTERMEDIARY/EXPERIENCED SET SIZE,DENSITY AND BEBUG SWITCHES      MYT06340
C    ************************************************************      MYT06350
C                                                                      MYT06360
      SUBROUTINE INTER(DENS,IBUG)                                      MYT06370
      COMMON /DEBUG/  IPRNT(30)                                        MYT06380
      DIMENSION IBUG(10)                                               MYT06390
      CALL FRTCMS('CLRSCRN ')                                          MYT06400
      WRITE(7,130)                                                     MYT06410
   3  CONTINUE                                                         MYT06420
      READ (1,*) PRMP1                                                 MYT06430
      IF(PRMP1.EQ.1) GC TO 5                                           MYT06440
      IF(PRMP1.EQ.2) GC TO 7                                           MYT06450
      WRITE(7,90)                                                      MYT06460
      GO TO 3                                                          MYT06470
   5  DENS=25.0                                                        MYT06480
      GO TO 9                                                          MYT06490
   7  DENS=40.0                                                        MYT06500
   9  DO 10 I=1,3C                                                     MYT06510
         IPRNT(I)=0                                                    MYT06520
  1C  CONTINUE                                                         MYT06530
      WRITE(7,140)                                                     MYT06540
  12  WRITE(7,145)                                                     MYT06550
      READ(1,*) PRMP2                                                  MYT06560
      IF(PRMP2.EQ.0) GO TO 35                                          MYT06570
      IF(PRMP2.NE.1) GO TO 12                                          MYT06580
      CALL FRTCMS('CLRSCRN ')                                          MYT06590
      WRITE(7,150)                                                     MYT06600
      WRITE(7,155)                                                     MYT06610
      WRITE(7,160)                                                     MYT06620
      WRITE(7,165)                                                     MYT06630
      WRITE(7,170)                                                     MYT06640
      WRITE(7,175)                                                     MYT06650
      WRITE(7,180)                                                     MYT06660
  9C  FORMAT(5X,'I NEED A 1,OR 2')                                     MYT06670
 100  FORMAT('1',10X,'SCAN LINE GENERATION - PART 1'/9X,               MYT06680
     *'______________________________'//)                              MYT06690
 110  FORMAT(5X,'PLEASE REFER TO TABLE 2 OF YOUR USERS GUIDE'/5X,      MYT06700
     *'ENTER ANY ALPHANUMERIC KEY TO BEGIN DATA INPUT :'/5X,           MYT06710
     *'****************************************')                      MYT06720
 130  FORMAT(3X,'THE DENSITY OF LINES CAN BE SET HIGHER THAN NORMAL',  MYT06730
     *'IF YOU INTEND'/3X,'TO DO EXPLODED VIEWGRAPHS.  NORMAL SETTING', MYT06740
     *' IS RECOMMENDED FOR NOVICE USERS'//10X,                         MYT06750
```

```
     *'****************************************'/10X,
     *'*    SETTING           FUNCTION KEY    *  '/10X,
     *'*    -------           ------------    *  '/10X,
     *'*   NORMAL DENSITY          1          *  '/10X,
     *'*   HIGHER DENSITY          2          *  '/10X,
     *'****************************************  ')
 140 FORMAT(10X,'DEBUGGING SWITCHES ARE AVAILABLE TO ASSIST'/10X,
     *'THE USER BY PROVIDING INTERMEDIATE RESULTS'/10X,
     *'FOR THE DATAMEDIA TERMINAL WHEN A NEW TARGET'/10X,
     *'IS BEING INTRODUCED TO SCAN.  NOT RECOMMENDED'/10X,
     *'EXCEPT FOR THE MOST EXPERIENCED USERS')
 145 FORMAT(3X,'ENTER "1" TO SET DEBUG SWITCHES OR "0" TO CONTINUE',
     *' WITH PROGRAM'/3X,'********************************************',
     *'**********************')
 150 FORMAT(2X,'2-ALL LINE GENERATION PRINTS'/2X,
     *'3-LINE GENERATION OF BOUNDING PLANES')
 155 FORMAT(2X,'4-LINE GENERATION OF ELLIPTIC CYLINDERS'/2X,
     *'5-LINE GENERATION OF ELLIPSOIDS'/2X,
     *'6-LINE GENERATION OF PARABOLOIDS')
 160 FORMAT(2X,'7-LINE GENERATION OF ELLIPTIC CONES'/2X,
     *'8-LINE GENERATION OF PARABOLIC CYLINDERS'/2X,
     *'9-LINE GENERATION OF HYPERBOLOID 1'/2X
     *'10-LINE GENERATION OF HYPERBOLOID 2')
 165 FORMAT(2X,'11-LINE GENERATION OF PARABOLIC HYPERBOLOID')
 170 FORMAT(2X,'12-PRINTS OF HYPERBOLIC BOUNDING PLANES'/2X,
     *'13-PRINTS OF PARABOLIC BOUNDING PLANES'/2X,
     *'14-PRINTS OF ELLIPTIC BOUNDING PLANES'/2X)
 175 FORMAT(2X,'16-LISTING OF TARGET LINES'/2X,
     *'19-TARGET COMPONENT RETRIEVAL'/2X,
     *'20-EXTENT,CENTER, AND NUMBER OF COMPONENTS')
 180 FORMAT('TO OBTAIN A SPECIFIC COMPONENT PRINT REFER TO THE ',
     *'USER MANUAL'//5X,'ENTER UP TO TEN DEBUG SWITCHES WHEN PROMPTED',
     *' BY A QUESTION MARK(?)'/5X,' DEBUG SWITHES ARE THE INTEGERS ',
     *'LISTED ABOVE: ZERO(0)=NIL SETTING'/5X,'*********************',
     *'******************************************')
     READ (1,*) IBUG
     GO TO 45
  35 DO 40 I=1,10
        IBUG(I)=0
  40 CONTINUE
  45 DO 60 I=1,10
        IF (IBUG(I).EQ.0)  GO TO 60
        IF (IBUG(I).LT.0)  GO TO 55
           IB=IBUG(I)
           IPRNT(IB)=1
           GO TO 60
  55    IPRNT(22)=-IBUG(I)
  60    CONTINUE
```

```
      IF (DENS.LE.0.0)  DENS=25.0
C     WRITE(7,66) SIZ,DENS,IBUG
C     WRITE(7,67) IPRNT
C  66 FORMAT(2X,'SIZE=',2F10.2,2X,'IBUG SWITCH',5I6/2X,5I6)
C  67 FORMAT(2X,'IPRINT=',10I6/2X,10I6/2X,10I6)
      RETURN
      END
```

APPENDIX D

DEFAULT WARHEAD AND CASE FILES

The following outline describes the default Case and Warhead Data files that are provided for use with the NPS version of SCAN:

1. CASE DATA - Encounter Geometry Summary.

Trajectory Type 1:	Fixed detonation point measured from target CG.	
Detonation Point:	X = 35.0 feet aft of CG	
	Y = 0.0 feet centered on CG.	
	Z = 25.0 feet above CG.	
Number of runs in Sample 5:		
Target Parameters:	Velocity	1000.0 feet/sec
	Roll Angle	0.0 degrees
	Pitch Angle	0.0 degrees
	Your Angle	0.0 degrees
	Sideslip	0.0 degrees
	Angle of Attack	0.0 degrees
Missile Parameters	Velocity	2000.0 feet/sec
	Pitch Angle	0.0 degrees
	Azimuth	0.0 degrees
	Aimpoint	Target CG
	Angle of Attack	5.0 degrees
	Sideslip	0.0 degrees
Encounter Altitude	10,000 feet	

2. WARHEAD DATA - Fragment, Fuzing and Blast Envelope Summary

a. <u>Fragment Parameters</u>

Number of Polar Zones 3

Number of Mass Classes 1

Polar Zone Number 1

Limiting Angles 50-60 degrees	
Upper/Lower Velocity of Fragments	5000 ft/sec
Fragment Mass	100 grains
Fragment Number	2000
Fragment Initial Position from Center	5.0 feet
Fragment Material	Mild steel
Fragment Shape	Rectangular

Polar Zone Number 2

Limiting Angles	60-70 degrees
Upper/Lower Velocity of Fragments	4750 ft/sec
Fragment Mass	100 grains
Fragment Number	2000
Fragment Initial Position from Center	2.5 feet
Fragment Material	Mild Steel
Fragment Shape	Rectangular

Polar Zone Number 3

Limiting Angles	70-80 degrees
Upper/Lower Velocity of Fragments	4500 ft/sec
Fragment Mass	100 grains
Fragment Number	2000

Fragment Initial Position from Center	0.0
Fragment Material	Mild Steel
Fragment Shape	Rectangular

b. Fuzing Parameters

Fuze Type 0

Fuze Position 3.5 feet

Fuze Delay 0.0 seconds

Fuze Look Angle 75.0 degrees

Fuze Cut-off Range 25.0 feet

Radius of Missile Body 1.0 feet

Nose of Missile 5 feet in front of warhead

c. Blast Envelope

Fuselage blast radius 20.0 feet

Wing blast radius 25.0 feet

Cylinder length forward of CG 20.0 feet

Cylinder length aft of CG 20.0 feet

Starting point of wing cylinder 2.5 0.0 1.5

Endpoint of wing cylinder 20.0 5.0 1.5

LIST OF REFERENCES

1. Weapons Evaluation Department, Pacific Missile Test Center Publication, SCAN, A Computer Program for Survivability Analysis, Volume I. User Manual, July 1976.

2. Directorate of Mission Analysis, Deputy for Development Planning Publication, SCAN, A Computer Program for Survivability Analysis, Volume II. Analyst Manual, May 1981.

3. Fair, C. K., A Comparison of Computer Warhead - Target Endgame Simulations and Recommendations Pertaining to Future Endgame Programs, M.S. Thesis, Naval Postgraduate School, Monterey, California, June 1981.

4. Hayes, T. M., The Installation of Computer Graphics for Survivability Studies and Discussion of PK/D Functions, M.S. Thesis, Naval Postgraduate School, Monterey, California, June 1981.

5. Ball, R. E., Notes on Warhead Lethality, presented on course AE-3702 at Naval Postgraduate School, Monterey, California, March 1981.

6. Parr, J. E., Attack vs. SCAN: A Comparison of Endgame Aircraft Survivability Computer Programs, M.S. Thesis, Naval Postgraduate School, Monterey, California, 1980.

7. Mozeico, H., A Human/Computer Interface to Accommodate User Learning Stages, February 1982.

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Expansion of the SCAN endgame program for aircraft survivability studies and development of a supporting user's guide.