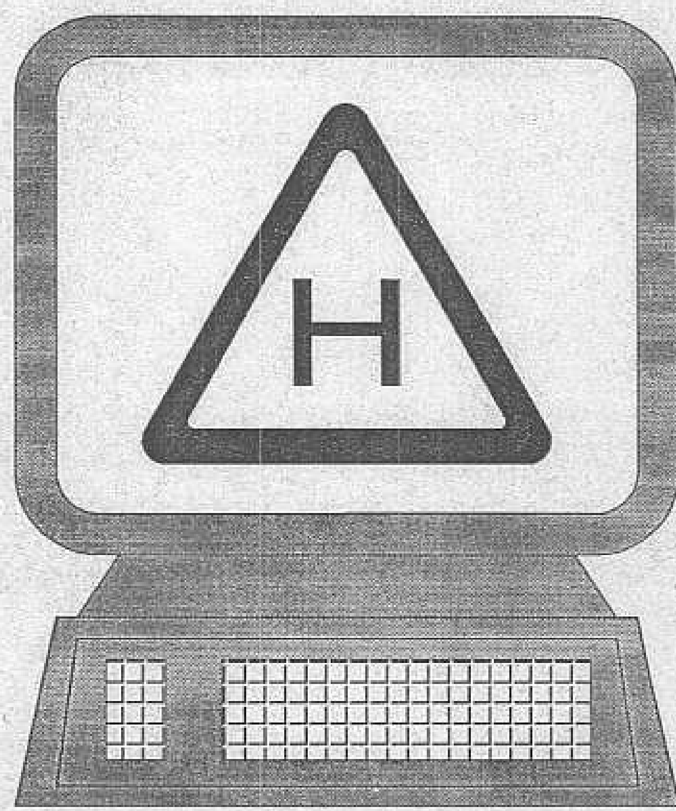
U.S. Department of Transportation

Federal Aviation Administration

HNM
Heliport Noise Model Version 1

User's Guide



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16. Abstract

This document contains the instructions to execute the Heliport Noise Model (HNM), Version 1. HNM Version 1 is a computer tool for determining the total impact of helicopter noise at and around heliports. The model runs on IBM PC/XT/AT personal computers and compatibles. This manual contains a general description of elements of a heliport case study and specific instructions for preparing the case for input.

HNM Version 1 is based upon the FAA's Integrated Noise Model (INM) for noise from fixed-wing aircraft.

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1.0 INTRODUCTION

The Heliport Noise Model (HNM) is a computer program that can serve as an aid in assessing the impact of helicopter noise in the vicinity of heliports. HNM Version 1 is based upon Version 3 of the FAA's Integrated Noise Model (INM), a similar computer program for fixed-wing aircraft noise [1]*, and is designed to run on a suitably-configured IBM PC/XT/AT personal computer or compatible machine.

The HNM differs from Version 3 of INM in its ability to accommodate the greater complexity of helicopter flight activities compared to the activities of fixed-wing aircraft, and in the provision of a graphic-input module for heliport layouts and helicopter flight tracks. The graphic-input module, which requires that the computer have a graphic tablet, is not essential to the use of the HNM, but it is a considerable convenience. If a graphic tablet is not available, the HNM has a menu-driven interactive mode for entry of all data, and accepts an input data file analagous to the input file for INM Version 3.

1.1 Background

In the Aviation Noise Abatement Policy, November 18, 1976, the Secretary of Transportation and the Federal Aviation Administrator reiterated the responsibility of the FAA, established by a 1969 mandate from Congress, to reduce aircraft noise. This responsibility extends to promoting compatible land use in areas adjacent to airports and heliports, and providing technical and financial assistance to airport proprietors undertaking comprehensive noise abatement planning.

Like the Integrated Noise Model, the Heliport Noise Model is part of the FAA's continuing effort to provide the technical means to analyze and abate aircraft noise.

The HNM is one tool which can determine both the cumulative noise measure for continuous contours and the cumulative noise measures for discrete points required by Order 1050.1C, "Policies and Procedures for Considering Environmental Impacts", December 20, 1979. It can also be used to generate noise exposure contours for Airport Operator's Noise Compatibility Programs [2].

* Numbers in brackets refer to references listed in Chapter 6.

Heliport planners, helicopter operators, and local governments are encouraged to address the recurring problems of helicopter noise impact. The significance of these problems is underscored by increased public awareness of aircraft/airport noise in general, and, specifically, helicopter/heliport noise. Technologically feasible and economically reasonable solutions to these problems are being developed by all of those involved with helicopter and heliport noise issues, both private and governmental. The Heliport Noise Model is the most sophisticated tool avaliable to analyze heliport noise impacts, and represents part of FAA's ongoing commitment to help resolve these issues.

1.2 HNM Capabilities

The Heliport Noise Model is a computer program used for determining the levels of noise near heliports. The projected noise levels are expressed in terms of the Day-Night Average Sound Level, "L_{dn}".* The L_{dn} is a measure of the total amount of acoustical energy received at a given point over a 24-hour period, with all noise received between the hours of 10 pm and 7 am "weighted" with a 10-dB penalty imposed because people are more sensitive to noise at night.

The results of the HNM may be presented in terms of equal-level "contours" around the heliport. Contours are presented in the form of a printout of the contour coordinates and as a plot of the contours. The model also allows for the calculation of noise levels at specific points in the heliport vicinity. The output from this type of calculation is a printed Grid Report.

The model also produces a number of supporting reports. For example, the Echo Report presents the user's input data in tabular format, and the Data Base Print Report presents selected portions of the HNM Data Base in tabular format. In addition, without performing grid or contour analyses of the input data, the model can produce Preview plots of the input flight scenarios. All of these reports aid the user in developing an accurate representation of the input data for the model.

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* L_{dn} is sometimes designated "DNL" for day-night level. The designation Ldn is also used.

1.3 Hardware Requirements

The HNM was written for execution on an IBM PC/AT personal computer system with the following minimum configuration:

512 kilobytes of RAM
20 megabyte Hard Disk Drive
1.2 megabyte 5-1/4 Inch Floppy Disk Drive
360 kilobyte 5-1/4 Inch Floppy Disk Drive
80287 Numeric Coprocessor
IBM Enhanced Graphics Adapter
IBM Enhanced Graphics Monitor
Epson MX100 Printer
Hewlett Packard 7475A Plotter

Use of the HNM is made easier with the following additional hardware, but its inclusion in the computer system used to run HNM is not required:

Summagraphics MM1201 Graphics Tablet

1.4 Software Requirements

The HNM program was written under the MS(PC)-DOS Version 3.1 operating system. The program was written in the Microsoft FORTRAN 77, Version 3.3, and Microsoft C, Version 5.0, programming languages, and uses graphics routines from the GSS Graphics Toolkit, Version 2.00.

1.4.1 Disk Operating System

Microsoft MS-DOS (or IBM PC-DOS) Version 2.1 (or later) is required to run the HNM program.

1.4.2 Configuration Files

In order to run HNM, your system's CONFIG.SYS and AUTOEXEC.BAT files must contain the commands that tell the operating system how to configure the system's hardware for proper operation of the program. Following the installation procedure described in Section 1.5 will create copies of those files for use with the HNM.

1.4.3 Device Driver Files *

"Device drivers" are short sections of computer code that are used by the operating system to communicate with the various hardware components of the computer system. In order to run HNM, the device drivers must be "installed" by including the name of the device driver files in the CONFIG.SYS and AUTOEXEC.BAT files. Following the installation procedure described in Section 1.5 will install the device drivers on your system.

GSS drivers available for use with the HNM are shown in Tables 1-1A and 1-1B. This is not meant to be a complete list of device drivers compatible with the HNM. If your device is not listed, contact the FAA.

1.4.4 HNM Execution Files

The Heliport Noise Model actually consists of numerous individual modules, each of which performs a specific function within the overall HNM program. Each module contains the executable computer code to perform specific tasks, and each is provided as a separate file on the distribution disks. To run HNM, all of these execution files need to be accessable to the operating system. Section 1.5 provides instructions on how to install these files on the hard disk.

Tables 1-1A and 1-1B list the HNM execution files that are distributed with the HNM system disks.

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* Device drivers and graphics software are proprietary products of Graphic Software Systems (GSS), Inc., Beaverton, Oregon. See Appendix C.

TABLE 1-1A

HNM 360K DISTRIBUTION DISKS CONTENTS
(Part 1 of 3)

Disk A - Installation

INSTALL .EXE	-	Program to create CONFIG.SYS and AUTOEXEC.BAT files based on your hardware configuration.
INSTALL .TXT	-	Additional installation instructions.
HNMSETUP.TXT	-	Additional installation and execution instruction.
HNMUNDO .TXT	-	Instructions on returning to original CONFIG.SYS and AUTOEXEC.BAT files.
GSSCGI .SYS	-	GSS Graphics Toolkit controller.
IBMCO .SYS	-	IBM Color Graphics adapter (4-color mode) device driver.
IBMEGA .SYS	-	IBM Enhanced Graphics Adaptor (4 modes) device driver.
HERCBW .SYS	-	Hercules Graphics Card (monochrome) device driver.
SUMMATB .SYS	-	Summagraphics Summasketch 1200 series graphics tablet device driver.
HPPLOT .SYS	-	Hewlett-Packard and IBM Plotters device driver for: HP 7440, HP 7470, HP 7475, HP 7550, HP 7580, HP 7585, HP 7586, IBM 6180, IBM 7371, IBM 7372, IBM 7374, IBM 7375 Model 1, IBM 7375 Model 2.
EPSON100.SYS	-	Epson 100 Series Printer device driver for: FX 100, FX 286, RX 100.
EPSON80 .SYS	-	Epson 80 Series Printer device driver for: MX 80 with Graftrax+, FX 80, FX 185, RX 80.
IBMGPR .SYS	-	IBM 5152 Graphics Printer device driver.
ANDX01 .SYS	-	Anadex 9501A Printer device driver.

Disk B - Installation

ATT479 .SYS	-	AT&T Graphics Printer device driver.
IBMPRCOL.SYS	-	IBM 5182 Color Printer device driver.
LASERJET.SYS	-	Hewlett-Packard Laserjet Plus Printer device driver.
PRISM .SYS	-	Dataproducts Printers device driver for: Microprism 480, Prism 80, Prism 132.
PRNTRX .SYS	-	Printronix MVP, P300, P600 Printer device driver.
TEK4695 .SYS	-	Tektronix 4695, 4696 Printer device driver.
THINKJET.SYS	-	Hewlett-Packard Thinkjet Printer device driver.
TI855IBM.SYS	-	Texas Instruments 855 Printer device driver.
TOSHIBA .SYS	-	Toshiba Inkjet Printers - P1351, P351 device driver.
OKID84 .SYS	-	Okidata Microline 93 & 84 w/ Step 2 Printer device driver.
INSTALL .TXT	-	Additional installation instructions.

TABLE 1-1A

HNM 360K DISTRIBUTION DISKS CONTENTS
(Part 2 of 3)

Disk C - Installation/Data Base

DIAB150	.SYS -	Xerox-Diablo C150, Xerox 4620 Printer device driver.
INSTALL	.TXT -	Additional installation instructions.
DBASE	.DAT -	ASCII formatted data base.
DBINDX	.DAT -	Index of helicopters in data base.
HFOR03	.DAT -	Binary formatted data base.

Disk D - Program

DRIVERS	.EXE -	GSS program to load device drivers.
TESTCASE	.ENT -	Sample data entry.
TESTCASE	.INP -	Sample input file created by HNM.
TESTCASE	.MAP -	Sample map.
TESTCASE	.OUT -	Sample output.
MAP	.EXE -	Tablet data entry module for background maps.

Disk E - Program

APPRCH	.EXE -	Keyboard data entry module for approach flight tracks, profiles and operations.
APTRKG	.EXE -	Tablet data entry module for approach tracks.
TAXI	.EXE -	Keyboard data entry module for taxi flight tracks, profiles and operations.

Disk F - Program

COMPUTE	.EXE -	Compute module.
DBASEPR	.EXE -	Data base report module.
ECHPRT	.EXE -	Keyboard data entry module for echo report generation.
ENTHLP	.EXE -	Data entry help module.

Disk G - Program

FILGET	.EXE -	Creates scratch files for data entry module.
FILSAV	.EXE -	Saves user inputs and creates HNM input stream.
GRUNIT	.EXE -	Keyboard data entry module for ground distance units.
PLOT	.EXE -	Plot module.
PROCES	.EXE -	Keyboard data entry module for process reports and plots.

TABLE 1-1A
HNM 360K DISTRIBUTION DISKS CONTENTS
(Part 3 of 3)

Disk H - Program

HELSEL	.EXE -	Keyboard data entry module for helicopter selection.
HNM	.EXE -	Main HNM program module.
PADK	.EXE -	Keyboard data entry module for helipad inputs.
SETUP	.EXE -	Keyboard data entry module for setup inputs.
TXTRKG	.EXE -	Tablet data entry module for taxi tracks.

Disk I - Program

PADG	.EXE -	Tablet data entry module for helipad inputs.
TAKOFF	.EXE -	Keyboard data entry module for takeoff flight tracks, profiles and operations.
TOTRKG	.EXE -	Tablet data entry module for takeoff tracks.

Disk J - Program

FLIGHT	.EXE -	Flight module.
INPUT	.EXE -	Input module.
PREVIEW	.EXE -	Preview module.

TABLE 1-1B

HNM 1.2M DISTRIBUTION DISKS CONTENTS *

(Part 1 of 2)

Disk A - Installation/Data Base

INSTALL .EXE
INSTALL .TXT
HNMSETUP.TXT
HNMUNDO .TXT
GSSCGI .SYS
IBMCO .SYS
IBMEGA .SYS
HERCBW .SYS
SUMMATB .SYS
HPPLOT .SYS
EPSON100.SYS
EPSON80 .SYS
IBMGPR .SYS
DIAB150 .SYS
ANDX01 .SYS
ATT479 .SYS
IBMPRCOL.SYS
LASERJET.SYS
PRISM .SYS
PRNTRX .SYS
TEK4695 .SYS
THINKJET.SYS
TI855IBM.SYS
OKID84 .SYS
TOSHIBA .SYS
DBASE .DAT
DBINDX .DAT
HFOR03 .DAT

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* See Table 1-1A for description of these files.

TABLE 1-1B

HNM 1.2M DISTRIBUTION DISKS CONTENTS *

(Part 2 of 2)

Disk B - Program

DRIVERS .EXE
TESTCASE.ENT
TESTCASE.INP
TESTCASE.MAP
TESTCASE.OUT
APPRCH .EXE
APTRKG .EXE
COMPUTE .EXE
DBASEPR .EXE
ECHPRT .EXE
ENTHLP .EXE
FILGET .EXE
FILSAV .EXE
FLIGHT .EXE
GRUNIT .EXE
HELSEL .EXE
HNM .EXE
INPUT .EXE

Disk C - Program

MAP .EXE
PADG .EXE
PADK .EXE
PLOT .EXE
PREVIEW .EXE
PROCES .EXE
SETUP .EXE
TAKOFF .EXE
TAXI .EXE
TOTRKG .EXE
TXTRKG .EXE

* See Table 1-1A for description of these files.

1.5 Installation

Before HNM can be run, it is necessary to "install" the device drivers in the system and necessary files onto the computer's hard disk. HNM comes complete with a program that assists you with this installation procedure. INSTALL does several things. First, it determines if you have enough space available on your hard disk. Next, it prompts you for information describing your hardware configuration, i.e., monitor type, printer type, and communication ports. It then creates the files necessary to reconfigure you system to run HNM. Finally, it instructs you how to run the model. Follow the steps below and instructions given on the screen to run INSTALL and execute HNM:

Step 1 - Insert INSTALL disk [A] in a floppy disk drive.

Step 2 - Make that drive the current drive by typing

x:

where x is the floppy drive designation.

Step 3 - Type

INSTALL

and follow the instructions given on the screen.

From this point on, to run HNM at any time you would only need to go to your root directory and type

HNMSETUP

and again follow the instructions on the screen. There is no need to run INSTALL again unless you change your hardware or COM port configuration.

1.6 Screen Displays for Use With the Keyboard

The HNM includes an interactive, menu-driven input program for data entry and to direct processing operations. The menus are of two types: selection among choices displayed on the screen, and "fill-in-the-blank" forms for alphanumeric entry.

1.6.1 Selection Menus

Figure 3-1 shows the Main Menu of the HNM. It is an example of a selection menu. A list of choices, in this case a list of program functions, is displayed. The user selects a choice by typing the number in front of the desired choice. This number appears in an inverse box at the bottom of the screen. If the user makes an error, the correct number can be typed and will replace the erroneous one. When the correct number is displayed, the ENTER (or RETURN) key must be pressed to proceed.

1.6.2 Alphanumeric Entry Menus

Figure 3-2 is an example of a "fill-in-the-blank" menu for the entry of alphanumeric data. Typed data appear in an inverse "window" or "box" (represented by [ ] in the figures in this report).

A full-screen editing capability is provided. The user can move between fields ("windows") with the tab keys, or within a field with the left and right arrow keys. Also, the user can press the ENTER (or RETURN) key at the conclusion of a field in order to proceed to the next one.

When all fields are correctly typed, the END key must be pressed to continue to the next step of the process. Some data entry functions require more than one screen display. For example, keyboard entry of helipad locations can use two essentially identical screens, each allowing the entry of six pad locations (see Figure 3-6). The PAGE UP (PgUp) and PAGE DOWN (PgDn) keys are used to change screens in such entry sequences.

For all alphanumeric data entry screens, the END key is used to signify the completion of entries for a parameter. If the END key is pressed before all fields are filled in, the unfilled fields will have null values. Alternatively, the ESC (Escape) key is used to signify that any newly-made entries on the screen should be ignored ("abandoned") and all values should be those shown when the screen was originally displayed.

Many of the alphanumeric data entry screens provided by the HNM are very similar to each other. In situations where this similarity could result in some confusion, the function of the screen is defined by a local legend in the upper right-hand corner of the display. See, for example, Figures 3-15 and 3-20.

1.7 Screen Displays for Use With Graphics Tablet

On computers equipped with a Summagraphics MM1201 Graphics Tablet, the tablet can be used for graphic entry of helipad locations, flight tracks (takeoff, approach, and taxi), and background maps. During graphic entry, a flashing "+" cursor on the screen shows the location of the puck or stylus on the tablet.

Graphic entry involves the use of two screen displays: an "initial" screen, which is basically a selection menu, and a graphic entry or "sketch" screen, which is used to input actual graphic data. Figures 3-7 and 3-8 are examples of these two screen displays.

1.7.1 Initial Graphic Screen

When the initial screen (Figure 3-7) is displayed, program functions appear in boxes on the top of the screen. Existing graphic information is displayed pictorially below these boxes. User instructions appear in an area on the right. The boxes containing those program functions which are possible at any point in the entry sequence are outlined with a bright line on the screen. A particular function is selected by using the graphic stylus to move the cursor on the screen into the box labeled with the desired function. The button on the stylus or any button on the puck is then pressed to select the function. That selection must then be confirmed by moving the cursor to the box labeled "YES" and again pressing the button. Moving to "NO" and pressing the button will cancel the selection. The labeled boxes thus serve as a graphic keyboard for program function selection.

1.7.2 Graphic Entry Screen

When the selected program function involves the entry of graphic information, the graphic entry screen (Figure 3-8) appears. This contains a large sketching area on the left, and a limited keyboard area on the right. User instructions are displayed at the top. Pointing or sketching is done by moving the cursor to the desired location in the sketch area and depressing the button. Function selection is done by moving the cursor into the box with the appropriate label and pressing the button. When a graphic entry function is completed, it must be saved. The user can then return to the initial graphic screen.

1.7.3 Use of the Keyboard

During the graphic entry process, the keyboard must be used for certain functions such as the entry of labels and file names. Whenever the keyboard must be used, this is indicated on the screen display.

2.0 ELEMENTS OF A HELIPORT CASE STUDY

HNM Version 1 requires that the user input data be entered via a menu-driven interactive input or via an input data file. A graphic tablet can be used to enter flight-track, helipad, and background map data.

This section describes the data required to produce a case study. These requirements are illustrated by data for a specific test case called "Example Heliport". Section 3 provides instructions for creating the HNM input data file.

2.1 General Description of Heliport Case Study Elements

In order to run the model, the user is required to provide data describing the heliport and its associated activity. These data are described in the following sub-sections.

- 2.1.1 Heliport Altitude and Temperature
- 2.1.2 Heliport Definition
- 2.1.3 Helicopter Definition
- 2.1.4 Helicopter Profiles
- 2.1.5 Takeoff Profiles
- 2.1.6 Landing Profiles
- 2.1.7 Taxi Profiles
- 2.1.8 Description of Takeoff Tracks and Operations
- 2.1.9 Description of Landing Tracks and Operations
- 2.1.10 Description of Taxi Tracks and Operations

The minimum data required for a specific case includes the heliport altitude, temperature and definition; the specification of at least one helicopter and the description of one type of profile with one track and the associated number of operations. Table 2-1 describes the operating modes for profile and track segments.

2.1.1 Heliport Altitude and Temperature

The altitude and temperature data consist of the heliport altitude above sea level in feet and the average daily heliport temperature for the period under consideration. If the scenario reflects a typical hot day, then the

TABLE 2-1

HNM OPERATING MODE DATA FOR PROFILE AND TRACK SEGMENTS

(UNDERLINE MEANS OPERATOR INPUT)

OPERATING MODE	PROFILE DATA				TRACK DATA		ADDITIONAL DATA (8)			
	DIST. FROM START	ENDING ALTITUDE RE. GRD.	ENDING AIRSPEED IAS-K OR DURATION	THRUST NAME	ENDING	LOCATIONS	HEADING RE. + Y AXIS	HORIZ. ACCEL. (A)	GRAD. (RUN/ RISE)	HORIZ. TRANSI- TION
(Notes)	(FT.) (1)	(FT.) (2)	(SEC.) (2) (3)		(FEET) (2)(4)	(2) (4)	(DEG.) (1) (4)	(g) (1)	(1)(5)	(5)
STATIC OPERATIONS (S)										
GROUND IDLE	0 or CFT	0	DUR	GIDLE	X	Y	HEAD (DEF.P)	0	0	NA
FLIGHT IDLE	CFT	0	DUR	FIDLE	DEF.P	DEF.P	HEAD (DEF.P)	0	0	NA
IGE - HOVER	CFT	ALT	DUR	HIGE	DEF.P	DEF.P	HEAD (DEF.P)	0	0	NA
VERT. ASCENT	CFT	ALT	DUR or CALC	VASC	DEF.P	DEF.P	HEAD (DEF.P)	0	NA	NA
OGE - HOVER	CFT	ALT	DUR	HOGE	DEF.P	DEF.P	HEAD (DEF.P)	0	0	NA
MOVING WITH CONSTANT VELOCITY (MC)										
TAXI	CFT	PRIOR ALT	VEL (10K DEF)	HIGE	X	Y	CFT	0	0	FROM 0 - Vt & to 0
CLIMBOUT @ Vy	CFT	ALT	Vy	TO	CFPT (7)	CFPT (7)	CFT	0	GVY	NA
CRUISE @ Vc	CFT	ALT	Vc	LFLO	ARRIV-CFT	ARRIV-CFT	CFT	0	0	FROM Vy to Vc
DESCENT @ Va	CFT	ALT	Va	APPR	X	Y	CFT	0	GVA	TO Va FROM Vc
MOVING WITH ACCELERATION (MA)										
ACCEL. HORIZ. ACCEL. to Vy	CFT	PRIOR ALT	VEL (Vy DEF.)	ACLH	X or CFT	Y or CFT	CFT	CFT or A (.1g DEF)	0	NA
ACCEL. CLIMB to Vy	CFT	ALT or CFT	VEL (Vy DEF.)	ACLC	X or CFT	Y or CFT	CFT	"	GAC or CFT	NA
DECEL. DESCENT to 0	CFT	ALT	0	DCLD	X	Y	CFT	"	GDD or CFT	NA
IGE HORIZ. DECEL. to 0	CFT	PRIOR ALT	0	DCLH	X	Y	CFT	"	0	NA

Notes:
(1) CFT means calculated from track.
(2) Initial values at beginning of segment are ending values of prior segment.
(3) DEF means Default, and IAS-K means Indicated Air Speed - Knots.
(4) DEF.P means default is prior definition.
(5) CFPT means calculated from profile and track.
(6) NA means not applicable.
(7) HNM will extend last cruise segment 10 N. Mi. beyond its starting point unless otherwise defined for departures, and similarly beyond ending point for arrivals.
(8) Additional data that must be considered in defining an appropriate profile-track model for any specific case.

average summer temperature is entered. However, most scenarios will require the average annual temperature. The temperature units may be either Fahrenheit, Celsius, or Rankine as specified by the user. Heliport temperature and altitude are not presently used in the HNM computations.

2.1.2 Heliport Definition

The definitions of the helipads and the boundaries of the heliport establish the heliport geometry and its relationship to the surrounding area. First, the user must define a cartesian coordinate system with which to describe the heliport. The units for distances can be specified in feet, meters, or international nautical miles (equivalent to 6,076.1155 feet). The positive X and Y axis must run true east and true north, respectively as on a typical map. The placement of the origin point (0,0) is arbitrary; however, for computational precision, the distances from the origin to the helipads should be small. The user determines X and Y coordinates for each helipad giving the HNM the information it needs to reconstruct the user's coordinate system.

It may be desirable to locate the origin so that all helipads are in the first quadrant and thus have positive coordinates. If there is only one helipad, some calculations are simplified if the origin is located at its center. After selection of the origin, the user may employ simple trigonometric techniques or a graph paper overlay to determine the X and Y values of the helipads and the points on the heliport boundary. Figure 2-1 illustrates the coordinate system with the Y axis pointing north. Any X coordinate of a point to the west of the origin and any Y coordinate to the south of the origin must be a negative number.

The user must determine whether the ground is principally hard or soft with respect to propagation of noise from low altitude helicopter operations such as hover and taxi. The heliport should be characterized as hard if most of the ground surface is "acoustically hard" for at least 250 feet from the location of operations in the direction of noise sensitive receivers, such as residences. Examples of acoustically hard surfaces include concrete or asphalt paving, water or baked clay surfaces. Note that if the site does not meet the requirements for characterization as "hard", then it should be classified as "soft".

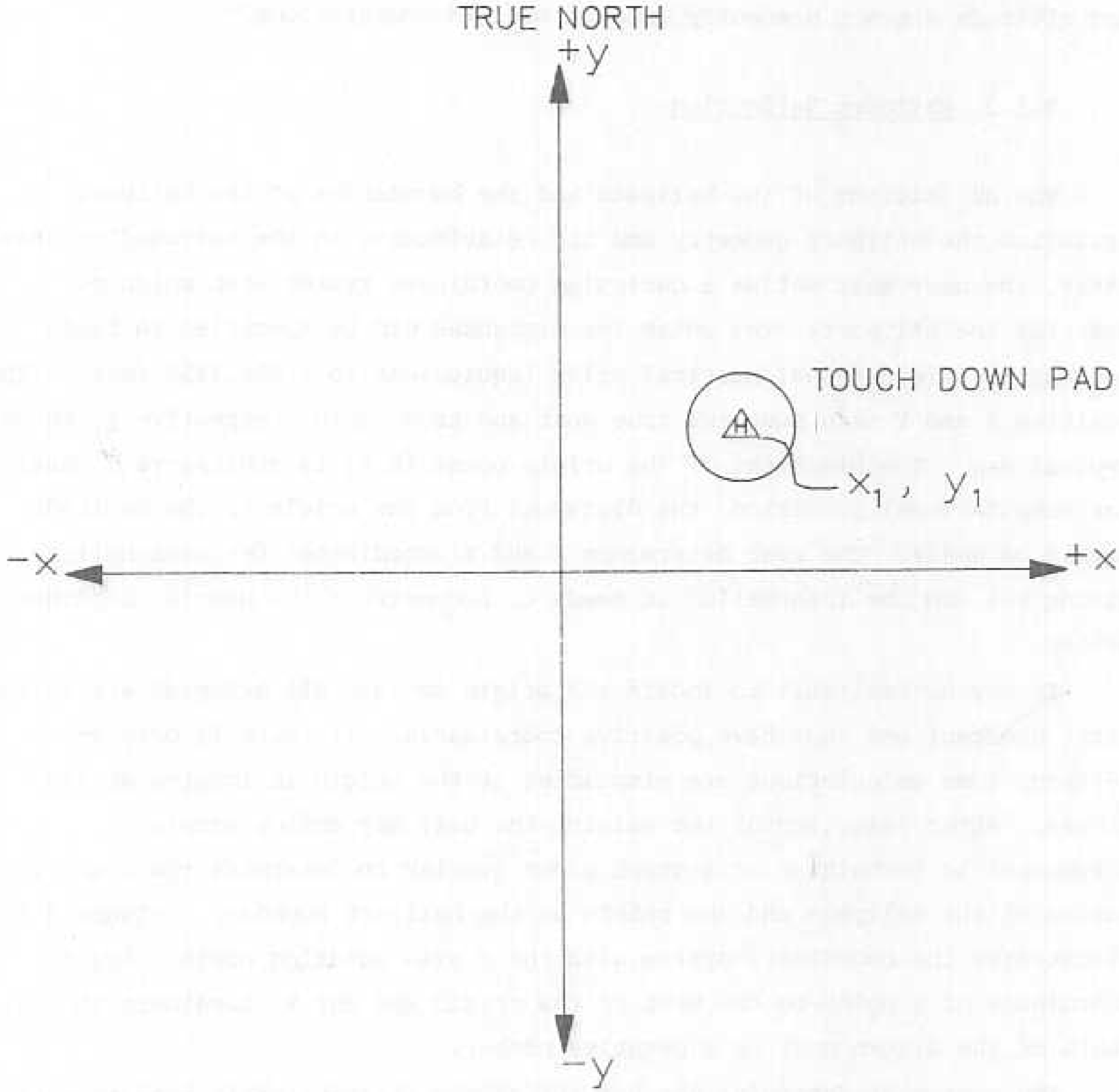


FIGURE 2-1 HELIPORT COORDINATE SYSTEM

The boundaries of the heliport, together with significant features of its environs, such as shorelines and highways, may be defined. This optional feature is called MAP and utilizes the graphics input tablet.

2.1.3 Helicopter Definition and the Noise Data Base

In describing the types of helicopters which will be part of the case study, the user must select helicopters from the data base. At least one helicopter type must be selected or defined for any case study.

The main rotor RPM may be changed by the user if the default RPM in the HNM data base is not applicable to the case study.

Table 2-2 lists the helicopters contained in the HNM Data Base. The table also gives the maximum weight of each helicopter. A helicopter is selected by its name as listed in this table and on the input screen. The HNM Data Base contains noise data sets for seven operating modes: four for essentally stationary operations and three for moving operations.

The noise curves for the four stationary modes are named:

GIDLE - Ground Idle
FIDLE - Flight Idle (also used for ground wheeled taxi)
HIGE - Hover in Ground Effect (also used for airborne taxi)
hOGE - Hover Out of Ground Effect

The noise data for these quasi-stationary modes consist of tables of the values for the A-weighted sound level at eight distances ranging from 200 feet to 10,000 feet. For each of these modes there is a data table for propagation over acoustically hard ground (e.g., pavement) and over acoustically soft ground (e.g., grass). The table to be used is selected based upon the operator's stating that the heliport is hard or soft (see Section 2.1.2).

The noise curves for the three moving operations are named:

TO - Takeoff
APPR - Approach for Landing
LFLO - Level Flyover

TABLE 2-2

HELICOPTERS STORED IN THE HNM DATA BASE*

Storage	Helicopter Name	Description	Max. Weight (lbs.)
1	B212	Bell 212 (UH-1N)	10,500
2	S61	Sikorsky S-61 (CH-3A)	19,000
3	S64	Sikorsky S-64 (CH-54B)	42,000
4	CH47D	Boeing Vertol 234 (CH-47D)	48,500
5	H500D	Hughes 500D	2,550
6	BO105	Boelkow BO-105	5,070
7	B47G	Bell 47G	2,950
8	SA330J	Aerospatiale SA-330J	15,432
9	B206L	Bell 206L	4,000
10	A109	Augusta A-109	5,730
11	SA341G	Aerospatiale SA-341G	3,970
12	H300C	Hughes 300C	1,900
13	S65	Sikorsky S-65 (CH-53)	37,000
14	S70	Sikorsky S-70 (UH-60A)	20,250
15	S76	Sikorsky S-76	10,000
16	SA365N	Aerospatiale SA-365N	8,488
17	SA355F	Aerospatiale SA-355F	5,070
18	SA350D	Aerospatiale SA-350D	4,300
19	B222	Bell 222	7,800
20	R22HP	Robinson R22HP	1,300
21	BK117	Boelkow BK-117	6,283

* See Appendix A for a complete description of data in the database for each helicopter.

The noise data for these moving operational modes consist of tables of the values of the A-weighted Sound Exposure Level (SEL) at eight distances ranging from 200 feet to 10,000 feet. For the level flyovers, the data are given for one typical speed. Values of SEL at other speeds are calculated in the program using constants stored in the first three positions of the LFLO data table.

Additional information on the noise data base may be found in Appendix A which is entitled "Helicopter Noise Data Base". Note that the HNM, unlike the INM, does not allow insertion of alternative noise data.

2.1.4 Helicopter Profiles

There are three types of profiles used in the HNM. They are:

- Takeoff Profile
- Landing Profile
- Taxi Profile

Examples of these profiles are illustrated in Figures 2-2 and 2-3.

Because there are so many ways to operate a helicopter, it is not possible to incorporate a set of a few standard profiles in the HNM in the manner used for fixed wing aircraft in the INM. Rather, it is necessary that the model use profiles appropriate to each specific helicopter type as it operates at a specific heliport. Since entry of profile data is a regular requirement in the use of the HNM, menu-driven screens are provided to assist the user.

For each segment of a profile of a specific helicopter operation, the user will be asked to provide four items of information. These are:

- Ground distance of the point from start (or end) of the operation in user specified units (feet, meters or international nautical miles).

- Altitude in feet above the heliport.

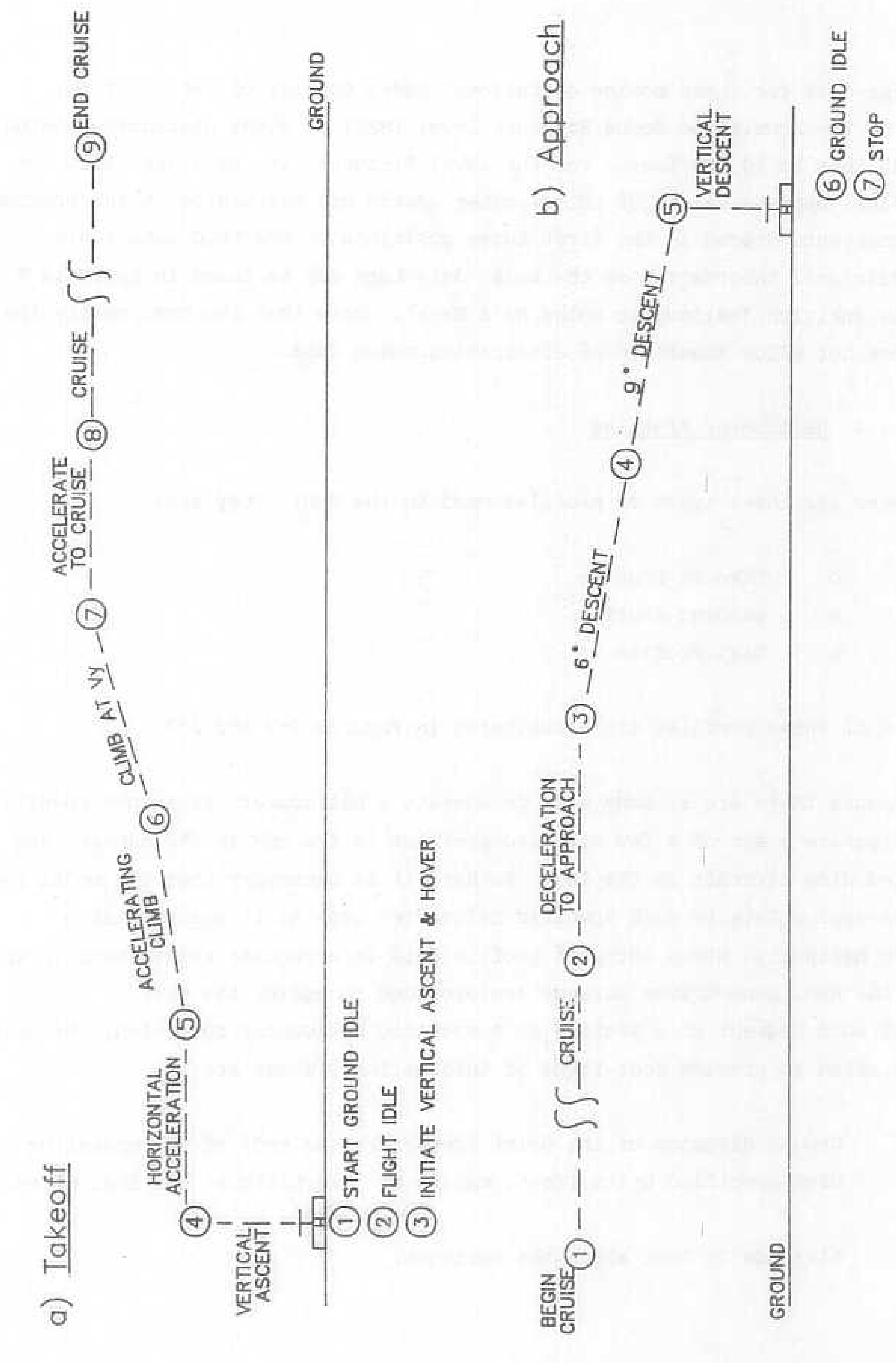


FIGURE 2-2 ILLUSTRATION OF TAKEOFF AND APPROACH PROFILES

FIGURE 2-2 ILLUSTRATION OF TAKEOFF AND APPROACH PROFILES

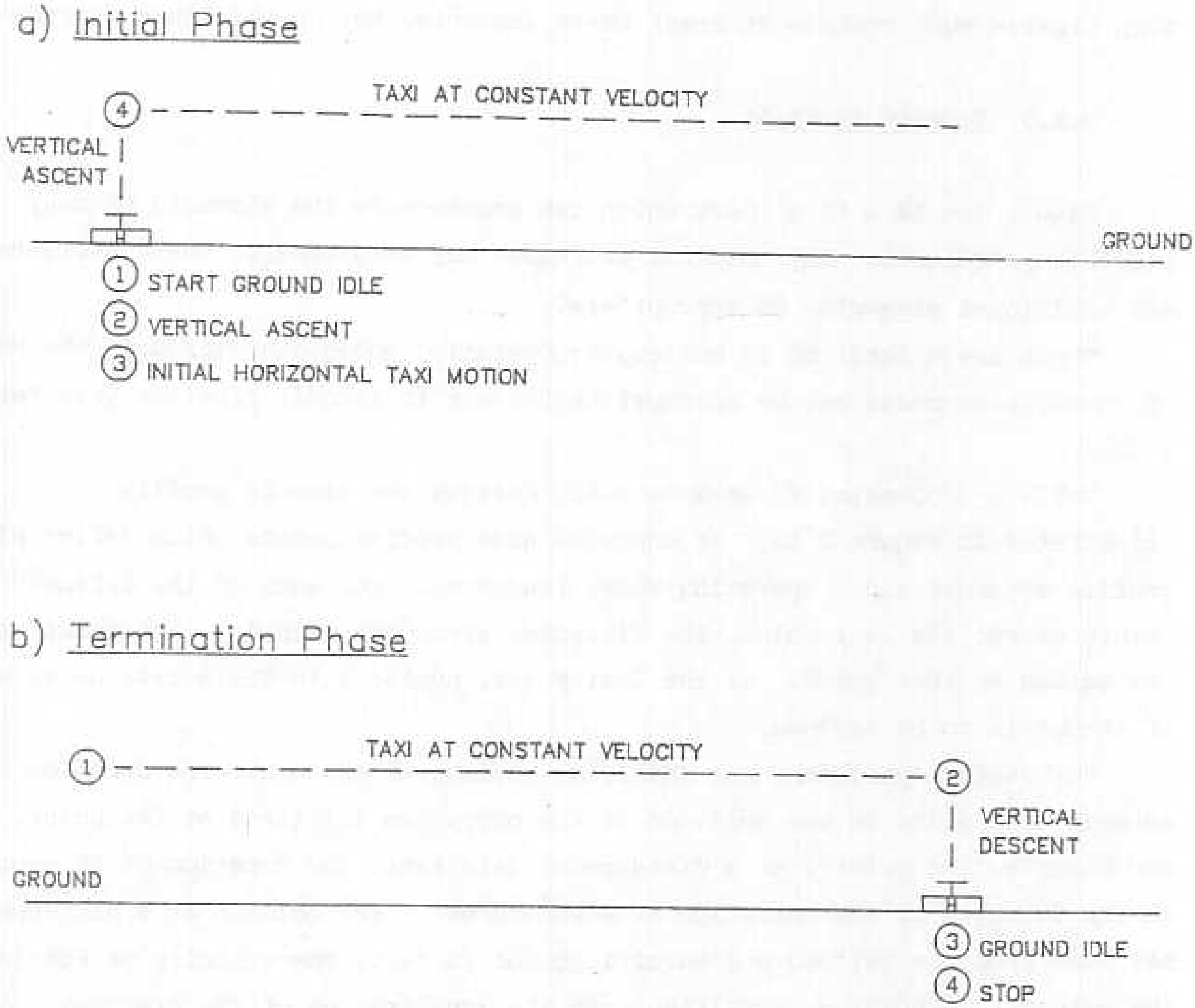


FIGURE 2-3 ILLUSTRATION OF AN AIRBORNE TAXI PROFILE

- Velocity in knots at the point (or, for static operations, the duration in seconds of the operation at the point).

- Operating mode (thrust name).

Each profile must contain at least three segments, but no more than fourteen.

2.1.5 Takeoff Profiles

Figure 2-4 is a flow chart which can accommodate the elements of many possible procedures. Any specific procedure may skip some of these elements or add additional elements, as appropriate.

There are a total of 13 helicopter operating modes identified in the HNM. Of these, nine modes may be appropriate for use in takeoff profiles (see Table 2-3).

Table 2-4 contains an example which defines the takeoff profile illustrated in Figure 2-1a. It contains nine profile points which define eight profile segments and 5 operating modes (thrusts). For each of the defined points except the last point, the distance, altitude, velocity, and thrust are the values at that point. At the last point, number 4 in Table 2-4, no value of thrust is to be defined.

For static operations not involving horizontal movement, the duration entered at a point is the duration of the operation initiated at the point. For example, for point 1 at a distance of zero feet, the duration of 10 seconds is the duration of the operation at GIDLE thrust. For point 6 at a distance of 562 feet from the helipad and an altitude of 30 feet, the velocity of 60K is the velocity at point 6, resulting from the acceleration of the previous segment (5-6).

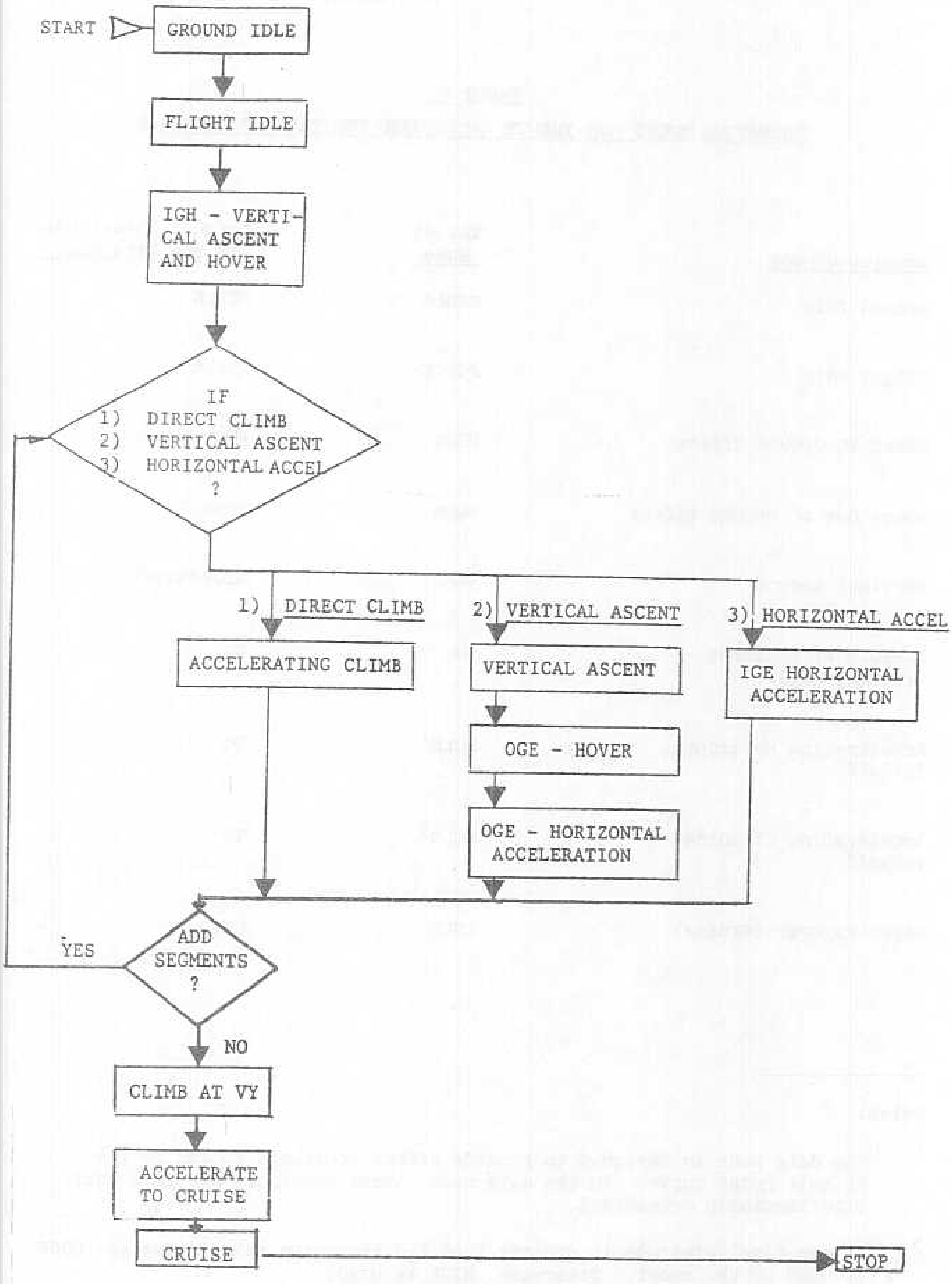


FIGURE 2-4 HNM HELICOPTER DEPARTURE OPERATING MODE INPUT OPTIONS

TABLE 2-3

OPERATING MODES AND THRUST NAMES USED FOR TAKEOFF PROFILES

Operating Mode	Thrust Name	Default Thrust Name in the Data Base
Ground Idle	GIDLE	GIDLE
Flight Idle	FIDLE	FIDLE
Hover In Ground Effect	HIGE	HIGE
Hover Out of Ground Effect	HOGE	HOGE
Vertical Ascent	VASC[1]	HIGE/HOGE[2]
Takeoff at Constant Velocity (Vy)	TO	TO
Accelerating Horizontal Takeoff	ACLH[1]	TO
Accelerating Climbing Takeoff	ACLC[1]	TO
Level Flyover (Cruise)	LFLO	LFLO

Notes:

1 The data base is designed to provide offset constants to add to the default noise curve. In the data base, these constants are zero until experimentally determined.

2 If the final altitude is greater than 1.5 times the rotor diameter, HOGE is used by the model. Otherwise, HIGE is used.

TABLE 2-4

EXAMPLE TAKEOFF PROFILE FOR HELICOPTER

From Runway End Radial not Cartesian

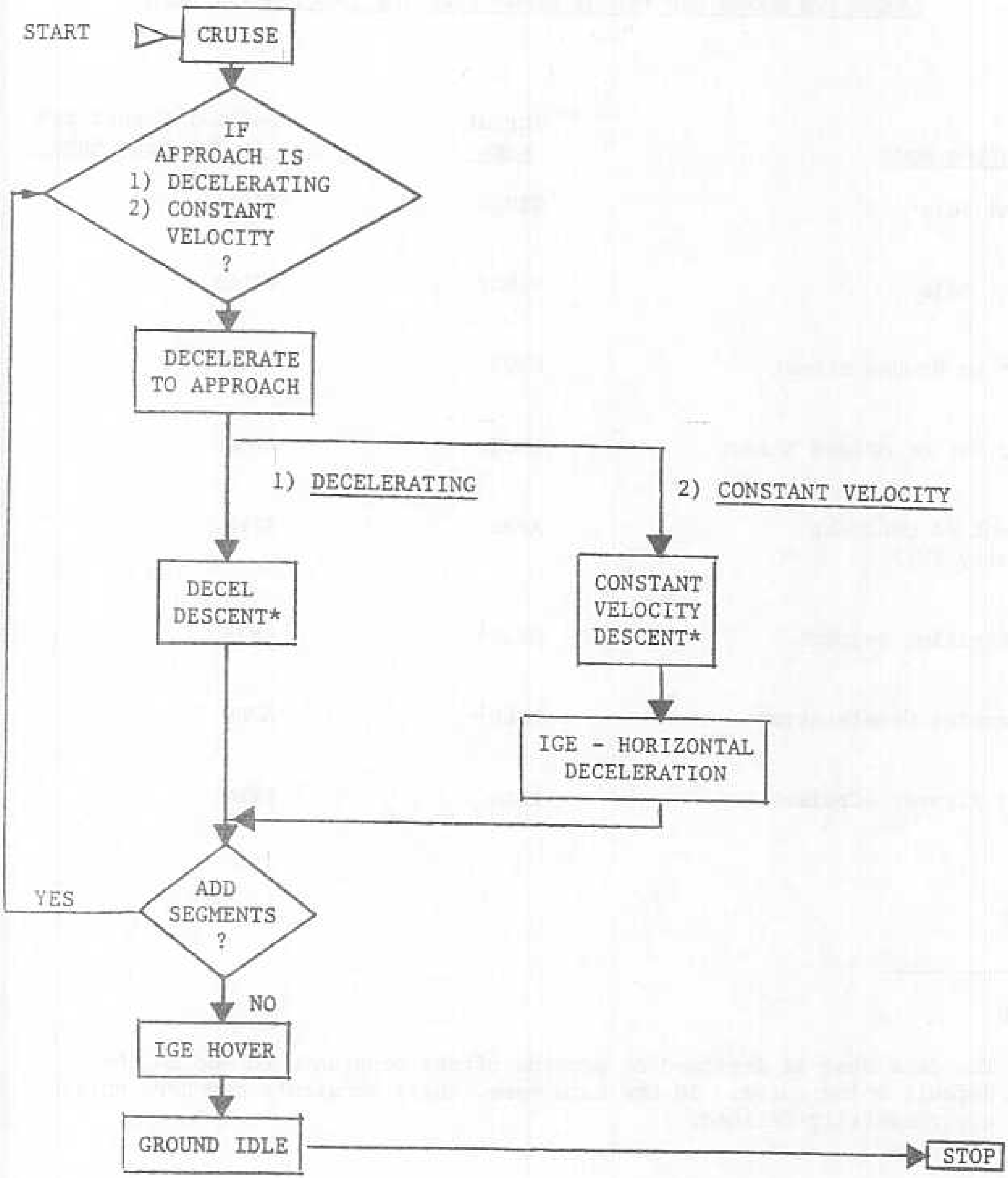
Description	Distance (ft)	Altitude (ft)	Velocity or Duration IAS(K) or SEC	Thrust
1. Startup and Idle	0	0	10 (SEC)	GIDLE
2. Flight Idle Checks	0	0	10 (SEC)	FIDLE
3. Vertical Ascent to 15 ft. and Hover	0	0	3 (SEC)	HOGE
4. Horizontal Accel. to 30K (0.2g)	0	15	16 (K)	TO
5. Climb and Accel. to 60K at 30 ft.	100	15	30 (K)	TO
6. Climb at 1,700 ft./min.	562	30	60 (K)	TO
7. Accel. to Cruise	4,032	1,000	60 (K)	TO
8. Begin Cruise	6,786	1,000	100 (K)	LFLO
9. End of Cruise	99,999	1,000	100 (K)	

2.1.6 Landing Profiles

Figure 2-5 is a flow chart which can accommodate the elements of many possible procedures. Any specific procedure may skip some of these elements or add additional elements, as appropriate.

Of the 13 helicopter operating modes identified in the HNM, eight modes may be appropriate for use in landing profiles (see Table 2-5). Table 2-6 contains an example which defines the landing profile illustrated in Figure 2-1b. It contains seven profile points which define six segments.

For each of the defined points, the distance, altitude, velocity, and thrust are the values at that point, except for the last point. At the last point, number 7 in Table 2-6, no value of thrust is to be defined. For static operations not involving horizontal movement, the duration entered at a point is the duration of the operation initiated at the point. For example, for point 5 at a distance of zero feet and altitude of fifteen feet, the duration of 3 seconds is the duration of the operation at HOGE thrust. For point 3 at a distance of 4,819 feet from the landing helipad and an altitude of 1,000 feet, the velocity of 60K is the velocity at point 3, resulting from the deceleration of the previous segment (2-3).



*May have more than 1 segment.

FIGURE 2-5 HNM HELICOPTER LANDING OPERATING MODE INPUT OPTIONS

TABLE 2-5

OPERATING MODES AND THRUST NAMES USED FOR LANDING PROFILES

Operating Mode	Thrust Name	Default Thrust Name in the Data Base
Ground Idle	GIDLE	GIDLE
Flight Idle	FIDLE	FIDLE
Hover In Ground Effect	HIGE	HIGE
Hover Out of Ground Effect	HOGE	HOGE
Descent at Constant Velocity (Vy)	APPR	APPR
Decelerating Descent	DCLD[1]	APPR
Horizontal Deceleration	DCLH[1]	APPR
Level Flyover (Cruise)	LFLO	LFLO

Notes:

1 The data base is designed to provide offset constants to add to the default noise curve. In the data base, these constants are zero until experimentally defined.

TABLE 2-6

EXAMPLE LANDING PROFILE FOR HELICOPTERS

Description	Distance (ft)	Altitude (ft)	Velocity/ Duration IAS(K) or SEC	Thrust
1. Cruise	99,999	1,000	100 (K)	LFLO
2. Decel. to Approach	10,535	1,000	100 (K)	APPR
3. 6° Descent to 500 ft.	4,819	1,000	60 (K)	APPR
4. 9° Decel. Descent	3,062	500	60 (K)	APPR
5. Hover and Vertical Descent	0	15	3 (SEC)	HOGE
6. Ground Idle	0	0	10 (SEC)	GIDLE
7. Stop	0	0	0	

2.1.7 Taxi Profiles

Figure 2-6 is a flow chart which can accommodate the elements of many possible procedures. Any specific procedure may skip some of these elements or add additional elements, as appropriate.

Of the 13 helicopter operating modes identified in the HNM, seven may be appropriate for use in taxi profiles (see Table 2-7). Table 2-8 contains an example which defines the taxi profile illustrated in Figure 2-3. It contains eight profile points which define six segments. The constant velocity segment for the "takeoff" portion of the taxi operation is combined with the constant velocity segment for the "landing" portion of the taxi operation.

For each of the defined points, the distance, altitude, velocity, and thrust are the values at that point, except for the last point. Note that the last point on both the "takeoff" and "landing" portions of the taxi operation have no thrust value defined. However, for static operations not involving horizontal movement, the duration entered at a point is the duration of the operation initiated at the point. For example, for point 1 at a distance and altitude of zero feet, the duration of 10 seconds is the duration of the operation at GIDLE thrust.

Note that the flight idle noise thrust curve is used for constant velocity taxi segments if a helicopter has wheels. If the vehicle has no wheels, the HIGE noise curve is used. This distinction is made automatically by the program.

The taxi profiles utilize software designed for takeoff and for landing operations to provide for all aspects of a taxi operation. However, the HNM will only allow takeoffs to occur at a designated takeoff/landing pad. Consequently, the "takeoff" portion of a taxi operation must begin at the takeoff/landing pad regardless of the actual initiation point of the taxi operation being modeled. When the helicopter is taxiing from the takeoff/landing pad to the parking pad, the profile is being used in the "direct" sequence. However, when the helicopter taxies from the parking place to the takeoff/landing pad, the profile is given in "reverse" sequence as shown in the example in Table 2-9.

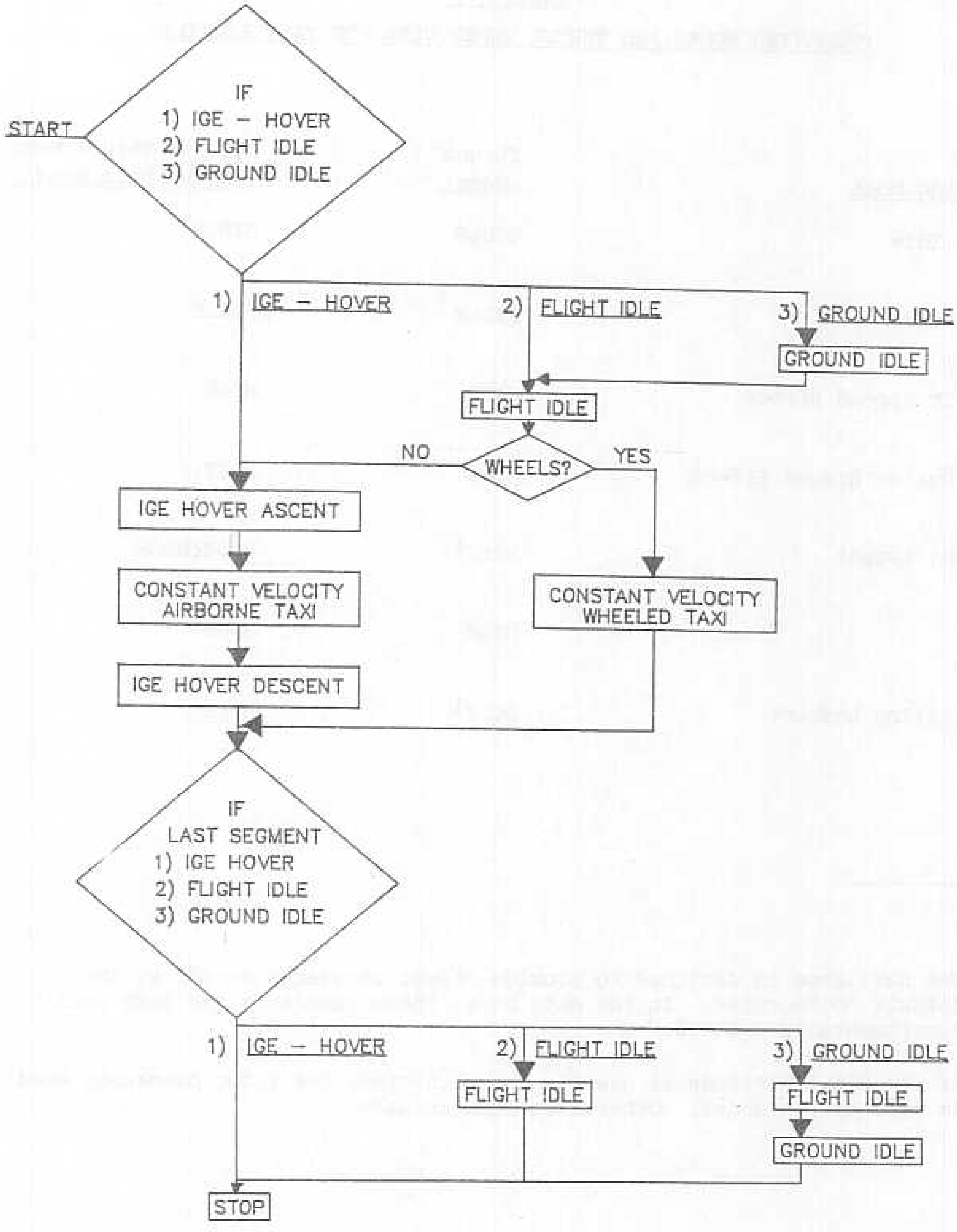


FIGURE 2-6 HNM TAXI MODE OPERATIONS

TABLE 2-7

OPERATING MODES AND THRUST NAMES USED FOR TAXI PROFILES

Operating Mode	Thrust Name	Default Thrust Name in the Data Base
Ground Idle	GIDLE	GIDLE
Flight Idle	FIDLE	FIDLE
Hover In Ground Effect	HIGE	HIGE
Hover Out of Ground Effect	HOGE	HOGE
Vertical Ascent	VASC[1]	HIGE/HOGE[2]
Taxi	HIGE	HIGE
Decelerating Descent	DCLD[1]	APPR

Notes:

1 The data base is designed to provide offset constants to add to the default noise curve. In the data base, these constants are zero until experimentally defined.

2 If the final altitude is greater than 1.5 times the rotor diameter, HOGE is used by the model. Otherwise, HIGE is used.

TABLE 2-8

EXAMPLE OF A "DIRECT" TAXI PROFILE FOR TAXI

FROM THE TAKEOFF/LANDING PAD TO THE PARKING PAD*

Description	Initial Distance (ft)	Initial Altitude (ft)	Initial Velocity/ Duration IAS(K) or SEC	Thrust
Takeoff Portion:				
1. Ground Idle	0	0	10 (SEC)	GIDLE
2. Vertical Ascent to 3 ft. and Accel.	0	0	2 (SEC)	HIGE
3. Initial Horizontal Taxi Motion	0	3	10 (K)	HIGE
4. Constant Velocity**	5,280	3	10 (K)	
Landing Portion:				
1. Constant Velocity**	5,280	3	10 (K)	HIGE
2. Vertical Descent to Ground and Decel.	0	3	2 (SEC)	HIGE
3. Ground Idle	0	0	30 (SEC)	GIDLE
4. Stop	0	0	0	

* This example is for a "direct" operation in which the helicopter starts from the takeoff/landing pad, moves to the parking pad, sits down and stops.

** The HNM combines two constant velocity segments into a single taxi segment with a length specified by the operator in the track definition. The "5280" feet is ignored.

TABLE 2-9

EXAMPLE OF A "REVERSE" TAXI PROFILE FOR TAXI FROM THE PARKING PAD TO THE TAKEOFF/LANDING PAD*

Description	Initial Distance (ft)	Initial Altitude (ft)	Initial Velocity/ Duration IAS(K) or SEC	Thrust
Takeoff Portion:				
1. Ground Idle	0	0	10 (SEC)	GIDLE
2. Vertical Descent and Decel.	0	0	2 (SEC)	HIGE
3. Initial Horizontal Taxi Motion	0	3	10 (K)	HIGE
4. Constant Velocity**	5,280	3	10 (K)	
Landing Portion:				
1. Constant Velocity**	5,280	3	10 (K)	HIGE
2. Vertical Ascent and Accel.	0	3	2 (SEC)	HIGE
3. Flight Idle Check	0	0	120 (SEC)	FIDLE
4. Ground Idle	0	0	60 (SEC)	GIDLE
5. Stop	0	0	0	

* This example is for a "reverse" operation in which the initial GIDLE and FIDLE operations occur at the parking pad, the helicopter then moves to the takeoff pad, sits down, and idles for 10 seconds.

** The HNM combines two constant velocity segments into a single taxi segment with a length specified by the operator in the track definition. The "5280" feet is ignored.

2.1.8 Description of Takeoff Tracks and Operations

A takeoff track definition consists of all information needed to model a flight path's projection on the ground starting at a reference point on a helipad. Each track is associated with a particular helipad and can be used only for one type of operation: takeoff, landing, or taxi. Ordinarily, each helipad will be associated with several tracks for each type of operation. Each track is identified by a name which must be unique for the associated helipad. However, the user is encouraged to use a unique name for each track in the case study.

A track is made up of up to sixteen segments which must alternately be straight and curved. The initial and final segments must always be straight and the initial straight segment must have an associated heading. Subsequent straight segments can be defined simply by their length in user-specified units. A curved segment requires a trio of entries. The first is whether the turn is to be to the left or right. The second can be either a turn angle or a new heading. The third entry is the radius of turn.

Takeoff tracks are described as a departing helicopter would fly, with the first segment beginning at the helipad. The first horizontal segment must be straight. Figure 2-7 presents a sample takeoff track.

The user may provide the heading of the helicopter for any static operations at the helipad. This information can be used to enable calculation of the directional characteristics of some of the static operating modes. However, Data Base 0 provides for uniform radiation in all directions.

Takeoff operations describe the type, magnitude, and arrangement of takeoff activity at a heliport. The input consists of the average number of daytime and nighttime takeoffs per day on each track. Daytime is the period between 7:00 AM and 9:59 PM; nighttime is between 10:00 PM and 6:59 AM. The specification of the time of day is an important factor in the calculation of Day-Night Sound Level (L_{dn}), which is the measure of cumulative noise in the HNM. The contribution of each nighttime operation to total noise exposure is ten times the contribution of each daytime operation. The preparation of operations data is based on knowledge of schedule, demand, track utilization, and air traffic control procedures in addition to the helipad and track layout.

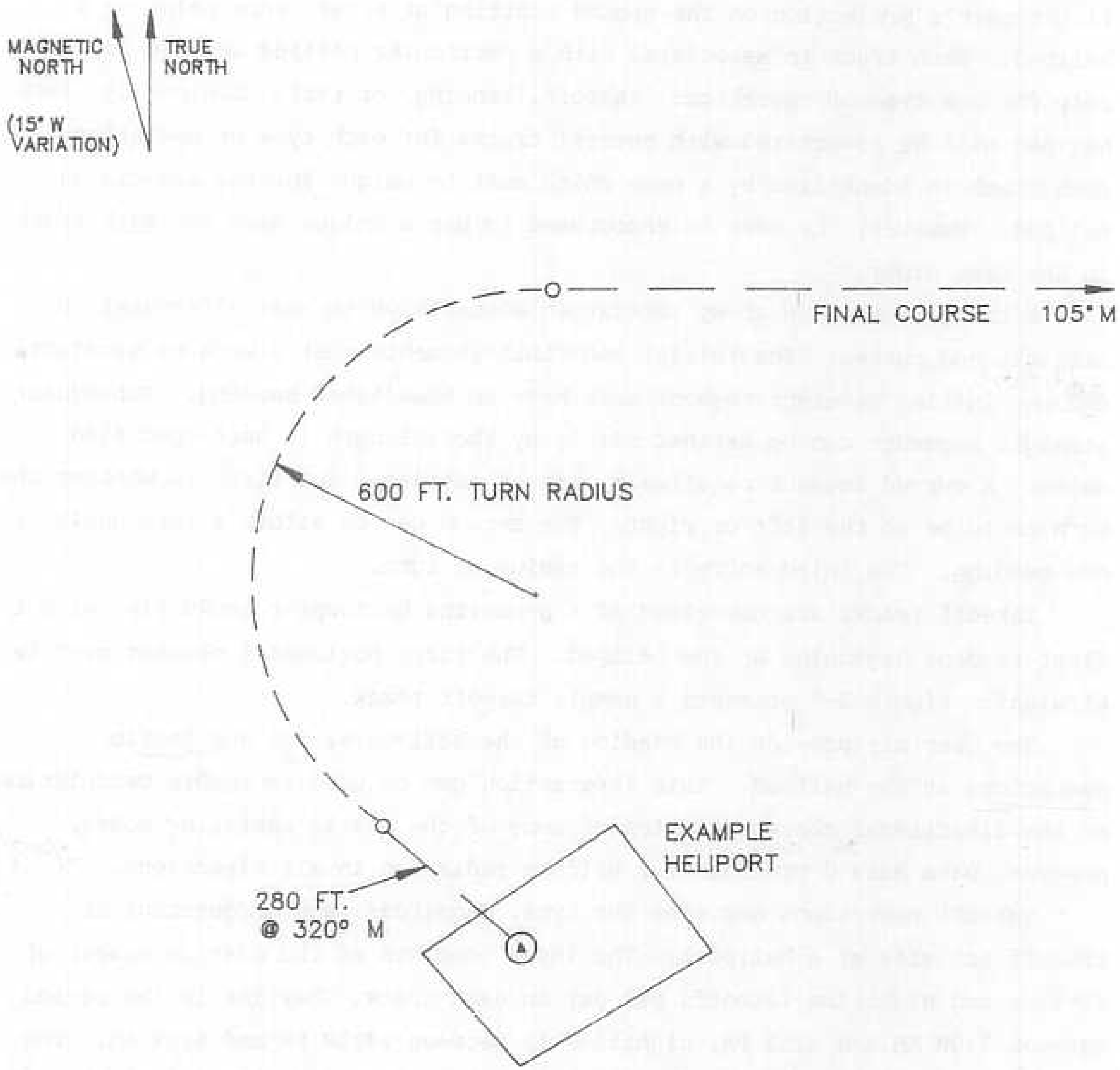


FIGURE 2-7 ILLUSTRATION OF A TAKEOFF TRACK

Takeoff operations are described for the HNM by frequency of operation in daytime and in nighttime. Each takeoff track description must be accompanied by a description of the operations on that track. Each operation description gives the helicopter type name, and the number of daytime and nighttime takeoffs for that helicopter on that particular track. Table 2-10 contains an example of takeoff operations by frequency.

TABLE 2-10

ANNUAL AVERAGE DAILY TAKEOFF OPERATIONS AT EXAMPLE HELIPORT

		Operations	
Track	Helicopter	Daytime	Nighttime
TD1	S76	4.8	0
TD1	A109	.90	.30
TD2	A109	.60	.20
TD3	S76	3.2	0
TD3	A109	.60	.20
TD4	A109	.60	.20

2.1.9 Description of Landing Tracks and Operations

A landing track definition consists of all information needed to model a flight path's projection on the ground up to a reference point on a helipad. Each track is associated with a particular helipad and can be used only for one type of operation: takeoff, landing, or taxi. Each track is identified by a name which must be unique for the associated helipad.

A track is made up of up to sixteen segments which must alternately be straight and curved. The initial and final segments must always be straight, and the initial straight segment must have an associated heading. Subsequent straight segments can be defined simply by their length in user-specified units. A curved segment requires a trio of entries. The first is whether the turn is to be to the left or right. The second can be either a turn angle or a new heading. The third entry is the radius of turns.

Landing tracks, when using keyboard entry, are described as an arriving helicopter would fly, with the last segment ending at the helipad. Tablet entry is reversed. Figure 2-8 presents a sample landing track.

The user must provide the heading of the helicopter for any static operations at the helipad. This information enables calculation of the directional characteristics of some of the static operating modes.

Landing operations describe the type, magnitude, and arrangement of landing activity at a heliport. The input consists of the average number of daytime and nighttime landings per day on each track. The preparation of operations data is based on knowledge of schedule, demand, and air traffic control procedures in addition to the helipad and track layout.

Landing operations are described for the HNM by frequency of operations in daytime and nighttime. Each landing track description is followed by the operations on that track. Each operation description gives the helicopter type name and the number of daytime and nighttime landings for that helicopter on that particular track. Table 2-11 gives an example of takeoff operations by frequency.

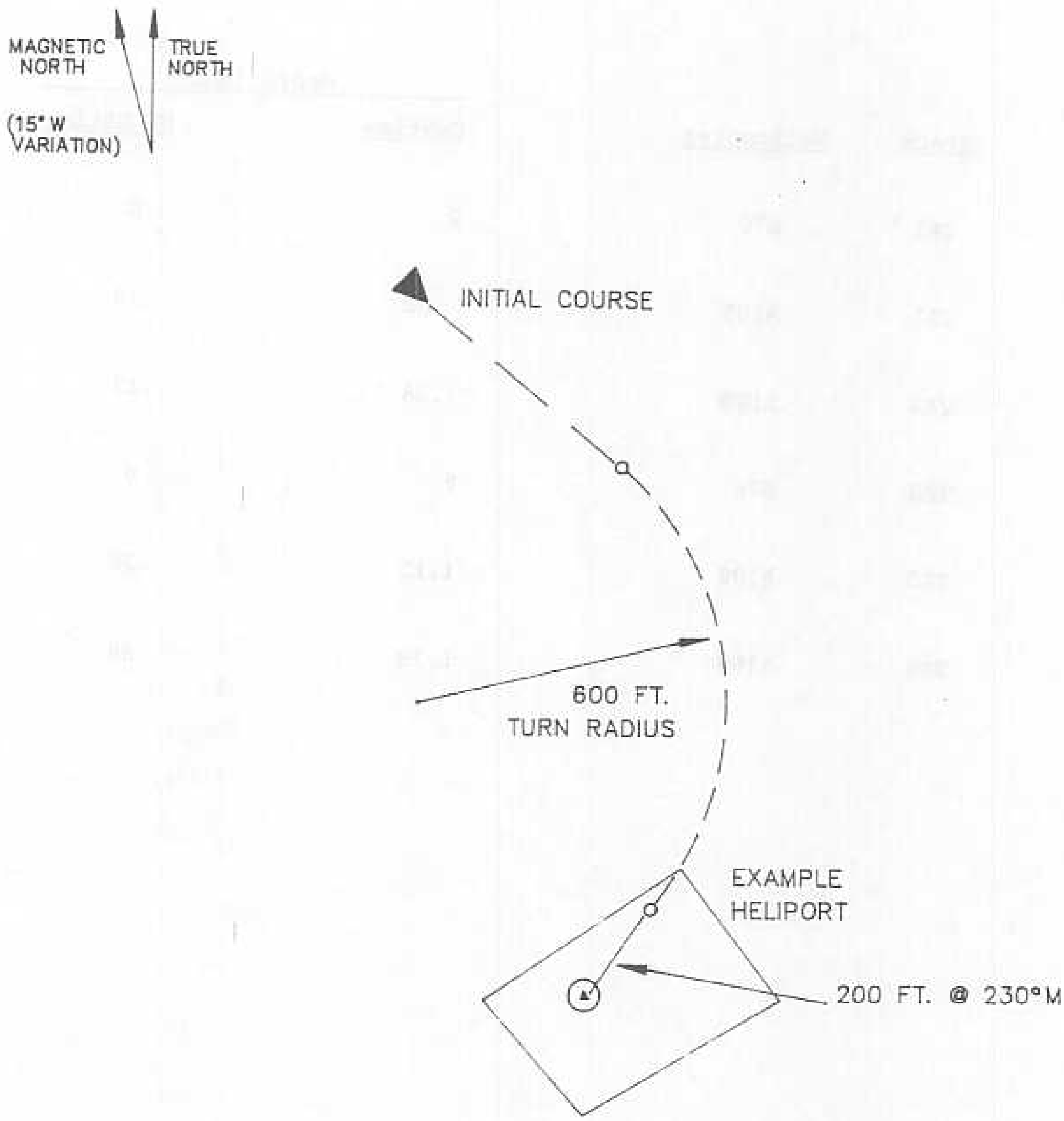


FIGURE 2-8 ILLUSTRATION OF A LANDING TRACK FOR EXAMPLE HELIPORT

TABLE 2-11

ANNUAL AVERAGE DAILY LANDING OPERATIONS AT EXAMPLE HELIPORT

Track	Helicopter	Operations: Daytime	Operations: Nighttime
TA1	S76	2	0
TA1	A109	.38	.13
TA2	A109	.38	.13
TA3	S76	6	0
TA3	A109	1.13	.38
TA4	A109	1.13	.38

2.1.10 Description of Taxi Tracks and Operations

Taxi tracks are described with the first segment beginning at the helipad and the final segment ending at the parking position. For a "direct" taxi operation (see Table 2-8) from the helipad to the parking position, the track is defined as the taxi would be accomplished. However, for the "reverse" taxi operation that taxies from the parking position to the helipad, the track is defined opposite to the direction that the taxi would be accomplished (see Table 2-9). For convenience of checking the input, it is good practice to give these two tracks different names even though their definitions may be identical. The first moving segment must be straight. Figure 2-9 presents a sample direct taxi track.

The user must provide the heading of the helicopter for any static operations at the helipad or parking pad. This information will be used with a later data base to enable calculation of the directional characteristics of some of the static operating modes. The data base provides for uniform radiation in all directions.

Taxiing operations describe the type, magnitude, and arrangement of taxi activity at a heliport. The input consists of the average number of daytime and nighttime taxi operations per day on each track. The preparation of operations data is based on knowledge of schedule, demand, and air traffic control procedures in addition to the helipad and track layout.

Taxi operations are described for the HNM by frequency of operation in the daytime and nighttime. Each taxi track description is followed by the operations on that track. Each operation description gives the helicopter type name, and the number of daytime and nighttime taxi operations for that helicopter on that particular track. Table 2-12 presents an example of taxi operations by frequency.

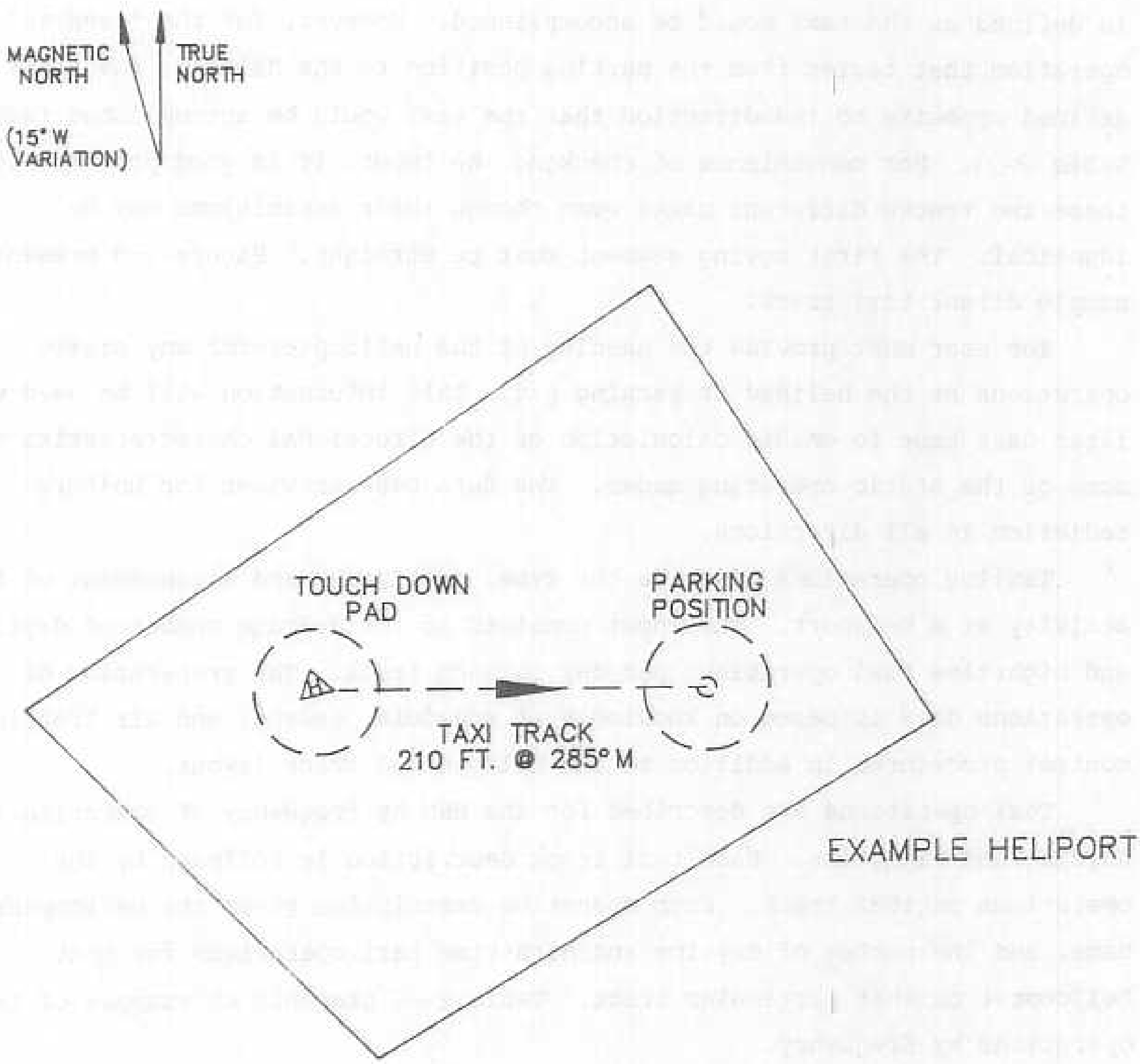


FIGURE 2-9 ILLUSTRATION OF A DIRECT TAXI TRACK AT EXAMPLE HELIPORT

TABLE 2-12

ANNUAL AVERAGE DAILY TAXI OPERATIONS AT EXAMPLE HELIPORT

Track	Helicopter	Operations Daytime	Operations Nighttime
TX1	A109	1	0
TX2	A109	0	1

2.2 Example Heliport Description

A hypothetical heliport, together with its tracks and operations, has been developed to serve as an example for the HNM user. The heliport is named "Example Heliport". It is the basis for the sample input and output data contained in this manual.

Figure 2-10 shows the layout of Example Heliport. It serves as a scheduled stop for a commercial helicopter flying between the business district and the city's international airport. It also supports a single corporate helicopter which is based at Example Heliport.

The heliport contains a touchdown helipad that is used by both helicopters and a parking position for the corporate helicopter. There are two principal arrival and departure corridors for the heliport. Their relative use is dictated primarily by the wind conditions and only secondarily by other factors.

This heliport is only given as an example. Its layout and operating conditions are entirely fictitious and should not be construed as representative of FAA standards.

The following define Example Heliport and its operations for an assessment of its potential noise impact.

- Heliport elevation is at 13 feet above sea level.

- Annual average ambient temperature near the surface is 59°F.

- The touchdown helipad and the parking position shown in Figure 2-10 are utilized at the example heliport.

- There are four takeoff tracks, four landing tracks, and two taxi tracks, as illustrated in Figure 2-11.

- Two helicopter types, a Sikorsky S76 and an Augusta A109, operate at the heliport on a regular basis.

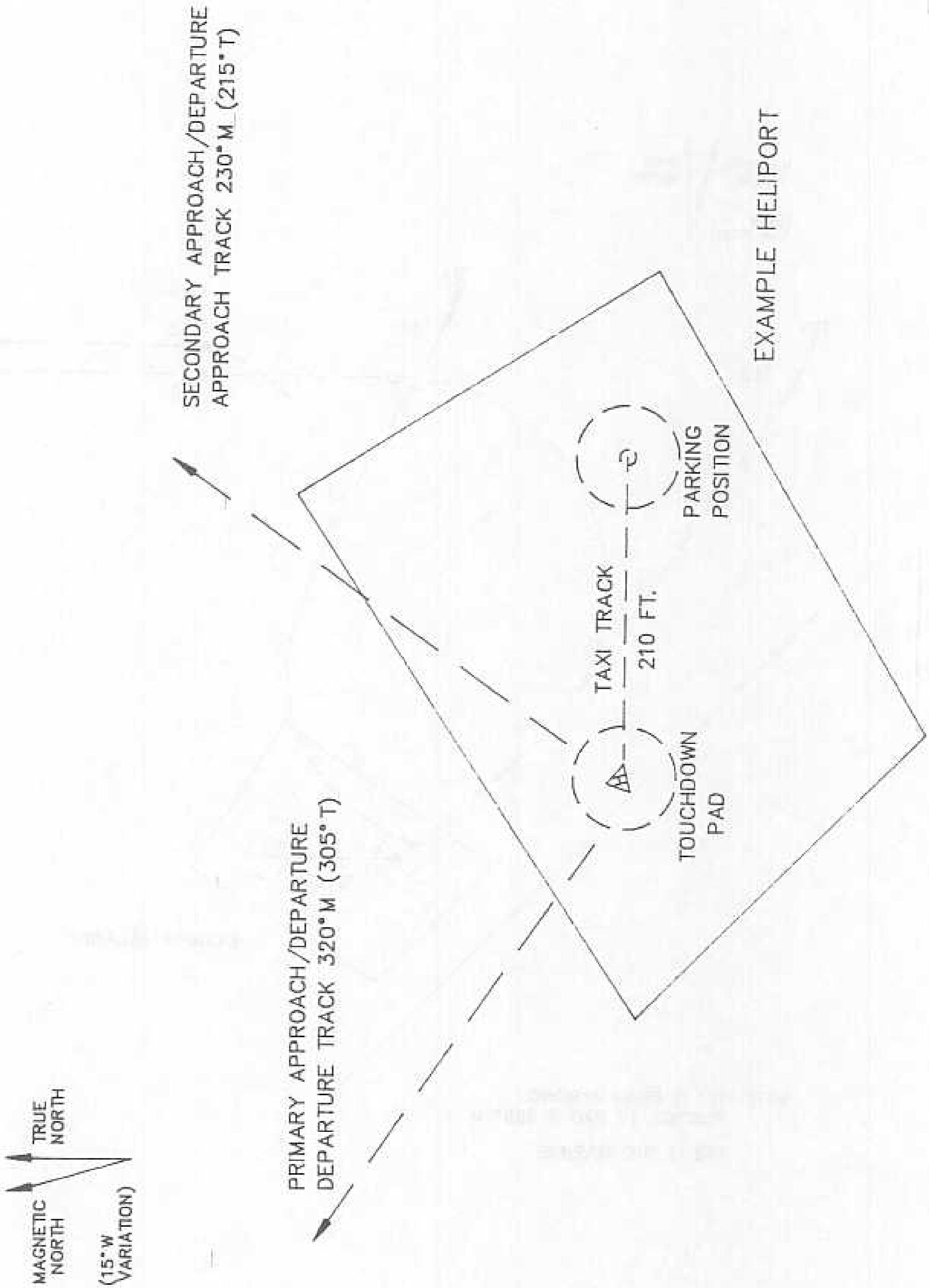
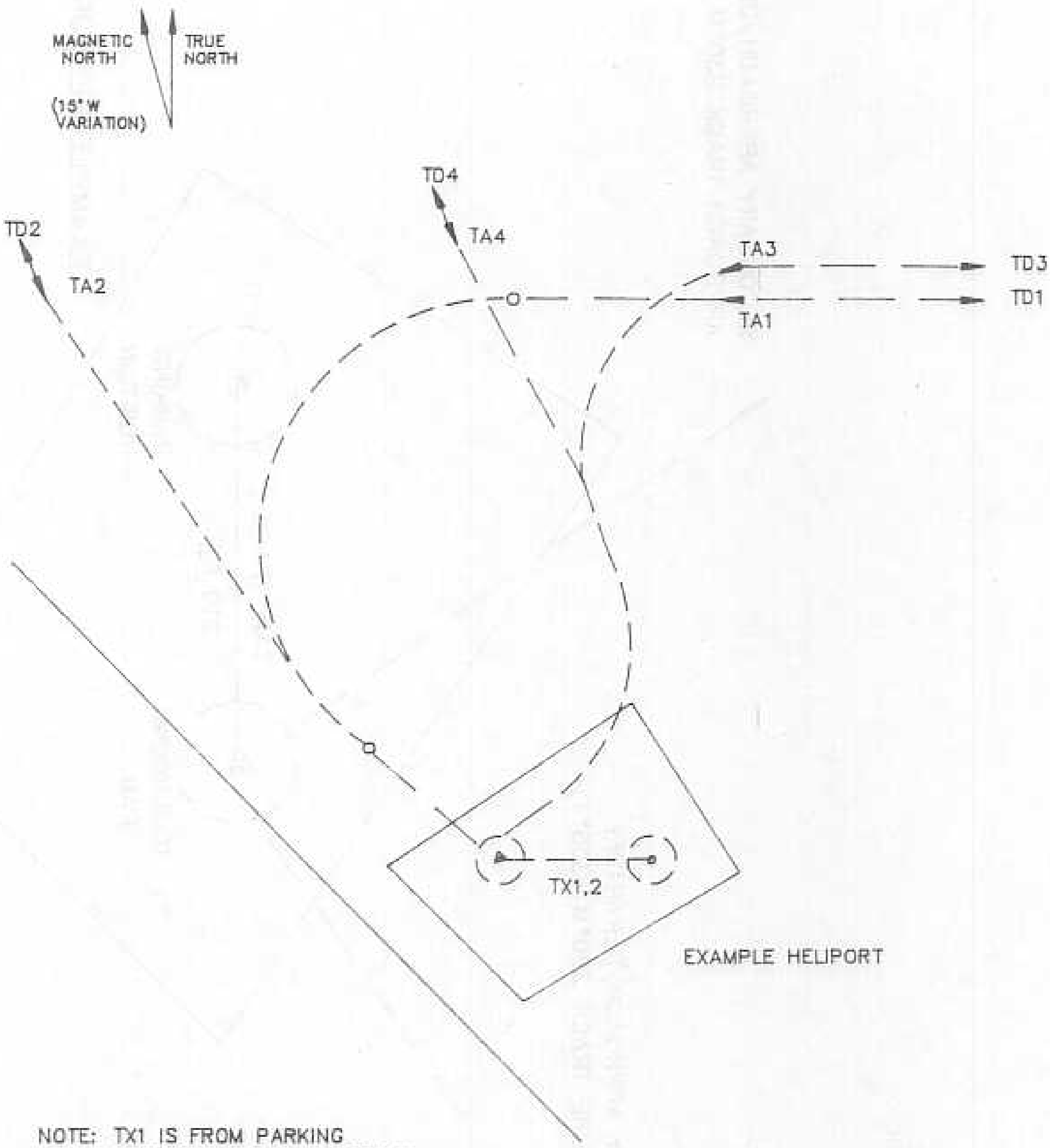


FIGURE 2-10 EXAMPLE HELIPORT LAYOUT



NOTE: TX1 IS FROM PARKING POSITION TO PAD @ 285° M

TX2 IS THE REVERSE

FIGURE 2-11 TAKEOFF AND LANDING TRACKS FOR EXAMPLE HELIPORT

- The numbers of operations of each helicopter on each track are given in Tables 2-10, 2-11 , and 2-12.

- The landing, takeoff, and taxi profiles for both helicopters are described in Tables 2-4 , 2-6 , 2-8 , and 2-9. Note: These profiles are hypothetical and should not be assumed to be applicable to an actual heliport case.

- The ground surface is acoustically hard.

3.0 PROGRAM START-UP AND PREPARING CASE INPUTS

3.1 System Start-Up: The HNN Main Menu

The HNM Main Menu, Figure 3-1, appears when the HNM is first started. The functions provided by the program are accessed from the menu. Many are similar to those available with the INM. In this section, we are concerned only with the first three functions:

1) Input File Designation
2) Case Data Entry
3) Map Entry

The first two of these functions <u>must</u> be done before any of the others. They are discussed in this section. The third function, Map Entry, is optional, but is also discussed in this section along with the other data entry functions. All of the other functions accessible from the HNM Main Menu are discussed in Section 4.0.

3.2 Input File Designation

When "1" is selected from the HNM Main Menu, the File Information screen, Figure 3-2, is displayed. On this screen, the user may first specify the name of an existing data file for a case which is to be edited or changed. (Note: Entry of a non-existent file name will result in a prompt to the user to re-enter a valid file name.) In addition, a name must be given for the file that will contain all of the results of the data entry or editing process. Any valid DOS file name (up to eight characters, optionally followed by a one-to-three character extension) can be used. When the file name(s) is/are correctly typed, the END key must be pressed to continue to the next step of the process.

If the user enters a valid name of an existing case, all of the data in that file are loaded and will be displayed during the entry and editing processes described below. This makes it easy to build a case file in more than one session at the computer, or to change one case file to another without having to re-enter the same data twice.

```
                     MAIN MENU

             1 - INPUT FILE DESIGNATION
             2 - CASE DATA ENTRY
             3 - MAP ENTRY
             4 - RUN INPUT/FLIGHT/COMPUTE
             5 - INPUT FORMATTING
             6 - FLIGHT COMPILATION
             7 - COMPUTE
             8 - DATA BASE REPORTS
             9 - PREVIEW REPORTS
            10 - PLOT



ESC to exit
Type your selection and press ENTER[ ]
```

FIGURE 3-1 HNM MAIN MENU

```
                    FILE INFORMATION

EXISTING CASE ID TO EDIT  - [testcase.ent]

RESULTING CASE ID TO SAVE - [testcase.tst]




Press END when finished, ESC to quit
```

FIGURE 3-2 SCREEN DISPLAY FOR ENTRY OF DATA FILE (CASE) NAMES

The user must remember the name given to the output data file if that file is to be edited at some time in the future.*

If the resulting case file name is the same as the name of the existing case to edit, then the resulting case file will replace the existing case file on the disk. Hence, the existing file will be lost, and only the resulting file will remain available to the user.

3.3 Case Data Entry

The process of entering data into the HNM program is interactive, involving menu selections and "fill-in-the-blank" forms displayed on the computer screen. This differs from the data-entry process for Version 3 of the INM, which requires preparing text files in a specified manner. The HNM may also be run using an input text file created in a similar manner to one used for INM. Nevertheless, to avoid any of the errors associated with this method of creating an input file, it is strongly recommended that the HNM data entry routines be used.

Data input for the HNM can conveniently be described in terms of 6 sections:

- SETUP -- Containing heliport data and specifying units.
- HELICOPTERS -- Containing helicopter types and rotor speeds.
- TAKEOFFS -- Containing takeoff tracks, profiles, and operations.
- APPROACHES -- Containing approach tracks, profiles, and operations.
- TAXI -- Containing taxi tracks, profiles, and operations.
- PROCESS -- Containing the process commands.

All sections are required with the exception that only one of the activities sections (TAKEOFFS, APPROACHES, or TAXI) is required.

---

* Use the DOS "DIR" command prior to starting HNM to list all available files.

3.3.1 Data Entry Menu

When Case Data Entry is selected from the HNM Main Menu, the Data Entry Menu, Figure 3-3, is displayed. All data entry steps begin and end with this menu. These are in two categories: keyboard entries on the left and tablet entries on the right. (The latter are available only on computers equipped with a Summmagraphics Model MM1201 graphic tablet.) A HELP option is also available from the Data Entry Menu, and provides descriptions of each of the menu options.

To make a selection from the Data Entry Menu, type the number of the selection and then press the ENTER key. In general, data entry should proceed in the order in which the steps are numbered in the Menu. For example, Ground Distance Units must be specified (step 1) before any ground distance values are entered.

3.3.2 Setup Functions

3.3.2.1 Ground Distance Units

Specification of the ground distance units in which certain types of data will be entered is normally the first step in data entry. This is done by selecting "1" from the Data Entry Menu. The Units Definition screen, Figure 3-4, is then displayed.

At this point, the user can specify the units in which ground distances will subsequently be entered for keyboard input of the heliport layout, flight profiles, and flight tracks; and the units in which results will be presented in grid reports and contour plots. (RETRIEVE applies to portions of a contour display. See Section 3.4.5.) The possible units are feet, meters, and international nautical miles. They are selected by typing "F", "M", or "I", respectively, before each data type where ground distance is of significance. After all selections have been made, pressing the END key saves the choices and returns to the Main Data Entry Menu screen. Alternatively, pressing the ESC

DATA ENTRY MENU

KEYBOARD ENTRIES	TABLET ENTRIES
1 - GROUND DISTANCE	10 - MAP
2 - SETUP	11 - HELIPADS
3 - HELIPADS	12 - TAKEOFF TRACKS
4 - HELICOPTERS	13 - APPROACH TRACKS
5 - TAKEOFFS	14 - TAXI TRACKS
6 - APPROACHES	
7 - GROUND TAXI	
8 - PROCESSES	
9 - ECHO REPORTS	15 - HELP

ESC to exit
Type your selection and press ENTER [1]

FIGURE 3-3 DATA ENTRY MENU

```
                    UNITS DEFINITION                    UNITS

Enter letter of unit to use for ground distances -
   F(feet), M(metric), I(international nautical miles)

                        F  PADS
                        F  TAKEOFF PROFILES
                        F  APPROACH PROFILES
                        F  TAXI PROFILES
                        F  TAKEOFF TRACKS
                        F  APPROACH TRACKS
                        F  TAXI TRACKS
                        F  GRID
                        F  CONTOUR
                        F  RETRIEVE

Note:  Any units selected other than feet will be converted to feet when a
       graphics tablet input is selected.

Press END to save, ESC to abandon
```

FIGURE 3-4 UNITS DEFINITION SCREEN PRESENTED WHEN "GROUND DISTANCE" IS SELECTED FROM DATA ENTRY MENU key returns all selections to their original units and returns to the Main Data Entry Menu screen. Except when an existing case file is being edited, the default ground distance is feet (F). Note that for graphic displays of map-type information (heliport arrangements, flight tracks), all distances entered are converted internally to feet and displayed in the units of feet.

reword: state the norm and then the exception

3.3.2.2 Setup

The Heliport Definition screen, Figure 3-5, is displayed by selecting "2" from the Data Entry Menu. This screen is used to enter information identifying the case and the heliport under study.

Enter a case title -- any descriptive name you wish, up to 67 characters and the heliport name, up to 35 characters. Enter the heliport elevation (above mean sea level) and the temperature. The default heliport elevation is sea level (0 feet). The temperature can be in Centigrade (C), Fahrenheit (F), or Rankine (R) degrees. The annual average termperature or standard-day temperature would generally be used. The default temperature is 59°F. (Heliport altitude and temperature not currently used in the HNM.)

Finally, the acoustic property of the ground surface within 250 feet of the heliport (or of the most-used helipad at the heliport) in the direction of the nearest neighbor should be characterized as either Hard (H) or Soft (S). From an acoustic point of view, "hard" ground is either pavement or water. All other surfaces (dirt, grass, areas covered by trees, etc.) should be considered "soft".

3.3.2.3 Helipads

Helipad layout can be done with the keyboard by selecting "3" from the Data Entry Menu, or with the graphics tablet, by selecting "11". These are equivalent and redundant methods. Indeed, a helipad located by keyboard entry of its X-Y coordinates will show up later on the graphic layout display, and one entered with the graphic tablet will later appear with its coordinates listed in the keyboard entry menu. At least one helipad must be entered for the HNM to operate properly.

```
                              HELIPORT DEFINITION                    SETUP

CASE TITLE -
[Example test case input                                             ]

HELIPORT NAME - [Example Heliport                  ]

ALTITUDE (FT) - [13      ]

TEMPERATURE (DEG) - [59.00 ]   SCALE (C,F or R) - [F]

TYPE OF SURFACE WITHIN 500 FT - HARD(H),SOFT(S)-[H]




Press END to save, ESC to abandon
```

FIGURE 3-5 SETUP DISPLAY FOR ENTERING HELIPORT IDENTIFYING INFORMATION

Keyboard

Keyboard entry of helipad locations is enabled from the Main Data Entry Menu by selecting "3". The Pad Definition screen, Figure 3-6, is then displayed. Enter an identifier -- up to 3 letters and/or numerals -- for each helipad of the heliport and then enter its X and Y coordinates. Normally the helipad (or main helipad, if there is more than one at the heliport) is assigned the coordinates (0,0); the other helipads are assigned coordinates relative to that point. The distance units should be those selected with the GROUND DISTANCE UNITS option (Figure 3-4). The type of units you selected are shown in the heading on the screen, Figure 3-6.

Up to 6 helipads can be located on the first screen, Figure 3-6. Up to 6 more can then be located by pressing the PGDN key. The first six can be retrieved by pressing the PGUP key. At least one but no more than 12 helipads must be located.

Graphic Tablet

To enter helipad locations with the graphics tablet, select "11" at the Data Entry Menu. The screen in Figure 3-7 is displayed. Note that as you move the puck or stylus around the surface of the tablet, a blinking cross moves correspondingly around the screen. This is the graphic cursor.

The screen in Figure 3-7 has three areas: a "graphic keyboard" area on the top, an instruction area on the right, and a graphic display area to the left and center. The principal purpose of this screen is to allow you to select the function you wish to perform from the graphic keyboard area. Only functions within a "highlighted" area can be selected. These functions are:

- SCALE -- This allows you to change the scale of the graphic display (the scale is always in feet).

- RETRIEVE MAP -- This function allows you to retrieve and display a map of the heliport and its environs previously created with the MAP routines (described in Section 3.3.2.4).

PAD DEFINITION HELIPADS

HELIPAD ID.	COORDINATES (FEET) X	Y
[P01]	[.0]	[.0]
[ ]	[.0]	[.0]
[ ]	[.0]	[.0]
[ ]	[.0]	[.0]
[ ]	[.0]	[.0]
[ ]	[.0]	[.0]

Press PGDN to save, & get pads 7-12
Press END to save & return, ESC to abandon

FIGURE 3-6 DISPLAY FOR THE ENTRY OF HELIPAD LOCATIONS FROM THE KEYBOARD

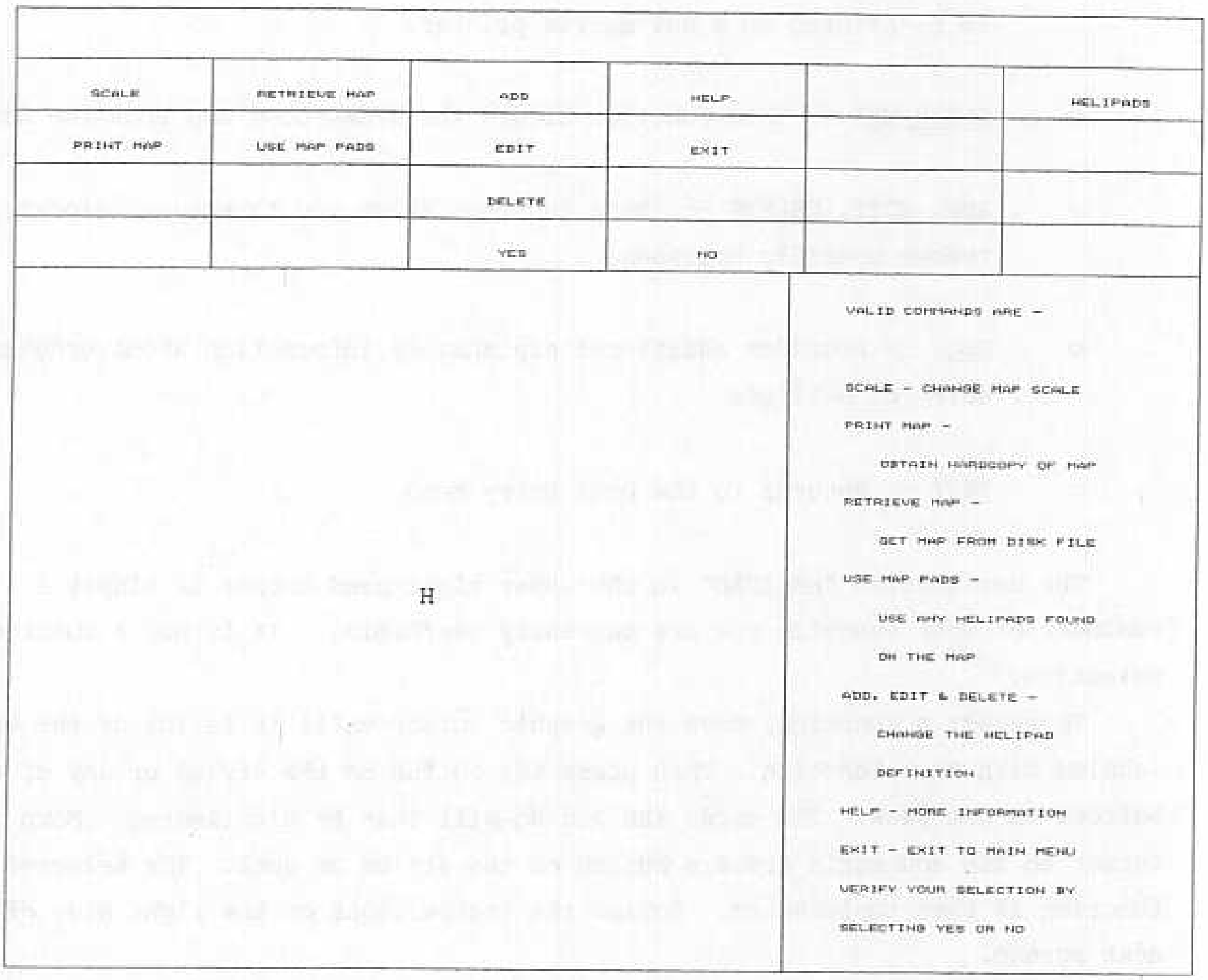


FIGURE 3-7 INITIAL SCREEN DISPLAY FOR GRAPHIC ENTRY OF HELIPAD LOCATIONS

- <u>USE MAP PADS</u> -- This function takes all the helipads (up to 12 max.) previously entered onto a map using the MAP routines, and designates them as helipad locations as defined above.

- <u>PRINT MAP</u> -- This function allows a map of the heliport and its environs, retrieved with the RETRIEVE MAP function (described below) to be printed on a dot matrix printer.

- <u>CLEAR MAP</u> -- This function clears the background map from the screen.

- <u>ADD, EDIT, DELETE</u> -- These functons allow you to enter, relocate, or remove specific helipads.

- <u>HELP</u> -- Provides additional explanatory information about graphic entry of helipads.

- <u>EXIT</u> -- Returns to the Data Entry Menu.

The designation "HELIPAD" in the upper right-hand corner is simply a reminder of what function you are currently performing. It is not a function selection.

To select a function, move the graphic cursor until it is inside the box labeled with that function. Then press the button on the stylus or any of the buttons on the puck. The words YES and NO will then be highlighted. Move the cursor to YES and again press a button on the stylus or puck. The selected function is then implemented. Follow the instructions on the right side of the next screen.

The functions ADD, EDIT, and DELETE require drawing within the graphic area of the display. For this purpose, the Sketch Screen, Figure 3-8, appears automatically. On this screen, you can again select functions with the cursor from the graphic keyboard area on the right. You can designate pads for deletion, locate new pads, or relocate existing helipads within the graphic sketch area by moving the cursor and depressing a button on the stylus or puck.

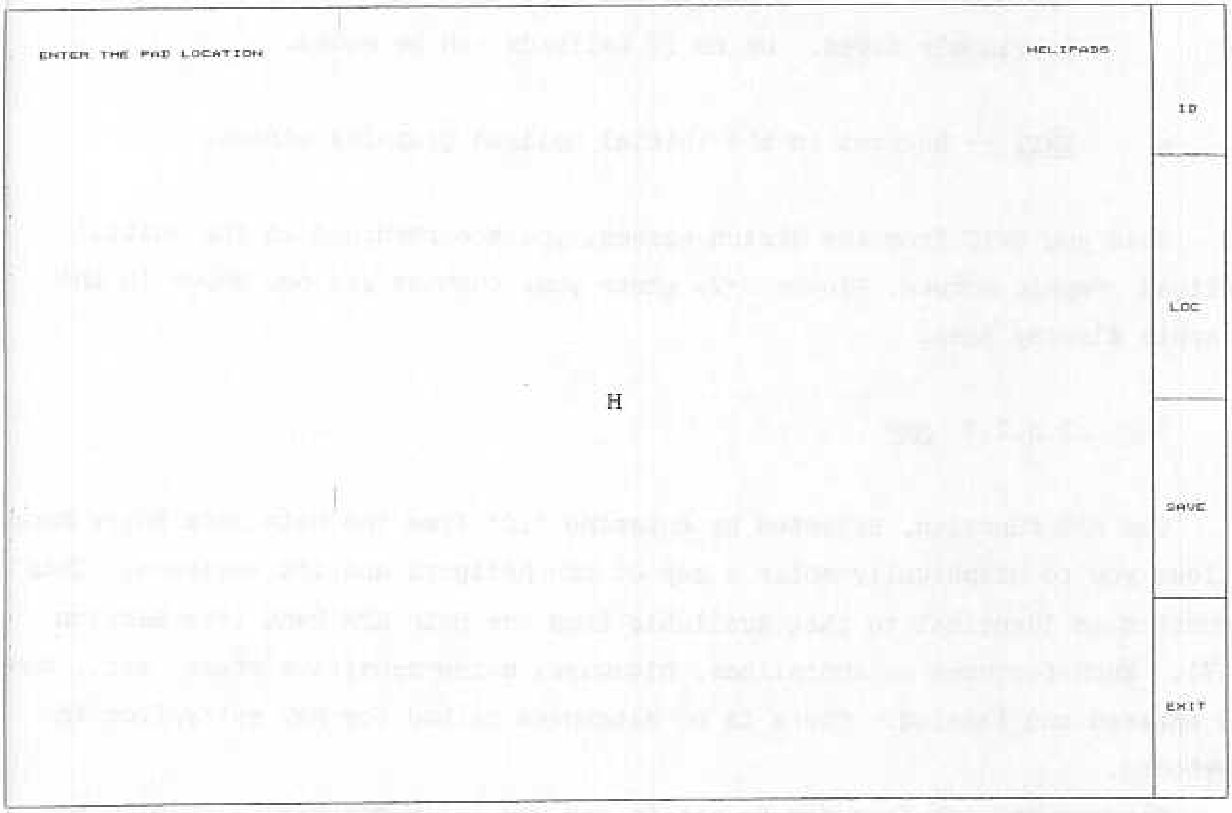


FIGURE 3-8 SCREEN DISPLAY FOR GRAPHIC ENTRY OF HELIPAD LOCATIONS

The functions are:

- o ID -- To enter an alphanumeric identifier for a helipad.

- o LOC -- To locate a helipad in the sketch area. Press a button on the stylus or puck when you reach your desired location.

- o SAVE -- To save a helipad location for future use by the HNM. (Each helipad location must be SAVEd once you are sure of its location.) The numeral in this box is one more than the number of helipads previously saved. Up to 12 helipads can be saved.

- o EXIT -- Returns to the initial helipad graphics screen.

When you EXIT from the sketch screen, you are returned to the initial helipad graphic screen, Figure 3-7, where your changes are now shown in the graphic display area.

3.3.2.4 MAP

The MAP function, selected by entering "10" from the Main Data Entry Menu, allows you to graphically enter a map of the heliport and its environs. This function is identical to that available from the Main HNM Menu (see Section 3.7). Such features as shorelines, highways, noise-sensitive areas, etc., can be entered and labeled. There is no alternate method for MAP entry from the keyboard.

The map and its features do not in any way influence HNM calculations. The sole purpose of the map is to designate local features that will aid in your interpretation of HNM results.*

---

* One exception to this generalization is the fact that, when entering helipad locations graphically (see subsection above), you can RETRIEVE a previously entered map, and then use the pads on that map as helipad locations for HNM calculations.

The initial MAP screen, Figure 3-9, is similar to the initial helipad graphics screen, Figure 3-7. It simply allows more drawing options. Once again, these options are selected by moving the stylus or puck on the graphic tablet so that the cursor is within the box labeled with the desired function or choice, and then pressing the button on the stylus or any button on the puck. A YES or NO confirmation is then required.

The functions available for MAP entry and editing are as follows:

- CLEAR MAP -- Erases a map entirely except for a scale and a north arrow in the upper right-hand corner.
- MOVE NORTH -- Allows the location of the north arrow to be changed. (The arrow always points up.)
- LINE TYPE -- Allows the selection of one of seven possible line types.
- RETRIEVE MAP -- Retrieves and displays a previously entered map from disk storage.
- SCALE -- Changes the scale of the map.
- MOVE SCALE -- Relocates the scale bar on the map.
- MARKER TYPE -- Allows the selection of one of six types of markers.
- SAVE MAP -- Allows a map to be given a name, and saved to disk under that name.
- MAP -- Switches to the sketch screen (Figure 3-10) so that map entries can be drawn.
- TEXT -- Allows text to be entered and positioned to label items on the map.

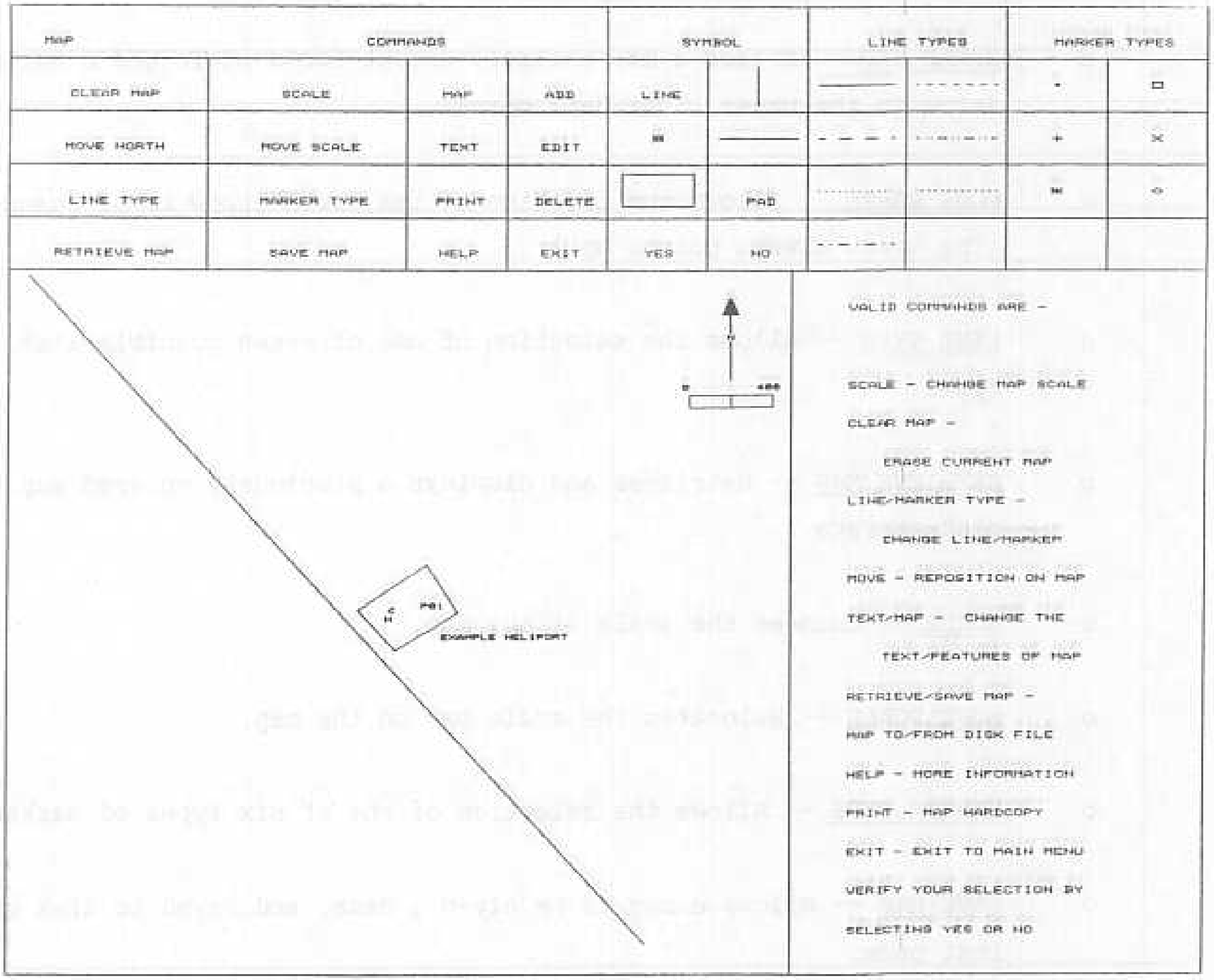


FIGURE 3-9 INITIAL SCREEN DISPLAY FOR MAP ENTRY

- PRINT -- Prints the map on a dot-matrix printer.

- HELP -- Displays additional information about map-entry options.

You must select your LINE TYPE and MARKER TYPE before switching to the sketch screen (Figure 3-10) with MAP to enter map features. Otherwise, they will retain their default values: a solid line and a star.

When either MAP or TEXT is selected, the options ADD, EDIT, and DELETE are highlighted. One of these options must then be selected. Next, if your initial selection was MAP, one of six symbol types must be selected from the highlighted area. The symbol options are an arbitrary line, a marker (indicated by a star on the screen menu), a rectangle, a vertical line, a horizontal line, and a helipad.

When your entry requires pointing or sketching on the map, the sketch screen, Figure 3-10, is displayed. Instructions in the upper left-hand corner tell you what to do. A graphic keyboard area on the right-hand side of the screen shows your options. To select one of these options, simply move the graphic cursor to within the appropriate box and press any button on the stylus or puck. Note that all sketch screen entries must be SAVEd if you wish these to become a permanent part of your map.

3.3.3 Helicopters

The next data entry step is to select from the database the helicopter types that use the heliport. This is done by selecting "4" from the Data Entry Menu. The Heliport Selection screen, Figure 3-11, is then displayed. This screen presents a list of the helicopters for which noise data are available in the HNM data base. At least one helicopter must be selected for HNM computations to be performed, and that helicopter must be in the data base. If your particular helicopter is not in the data base, then select one from the data base that is most similar to yours in terms of its noise properties.

Helicopter types are selected by typing an "X" in front of each selection. When selections are complete, press the END key to save them and to continue.

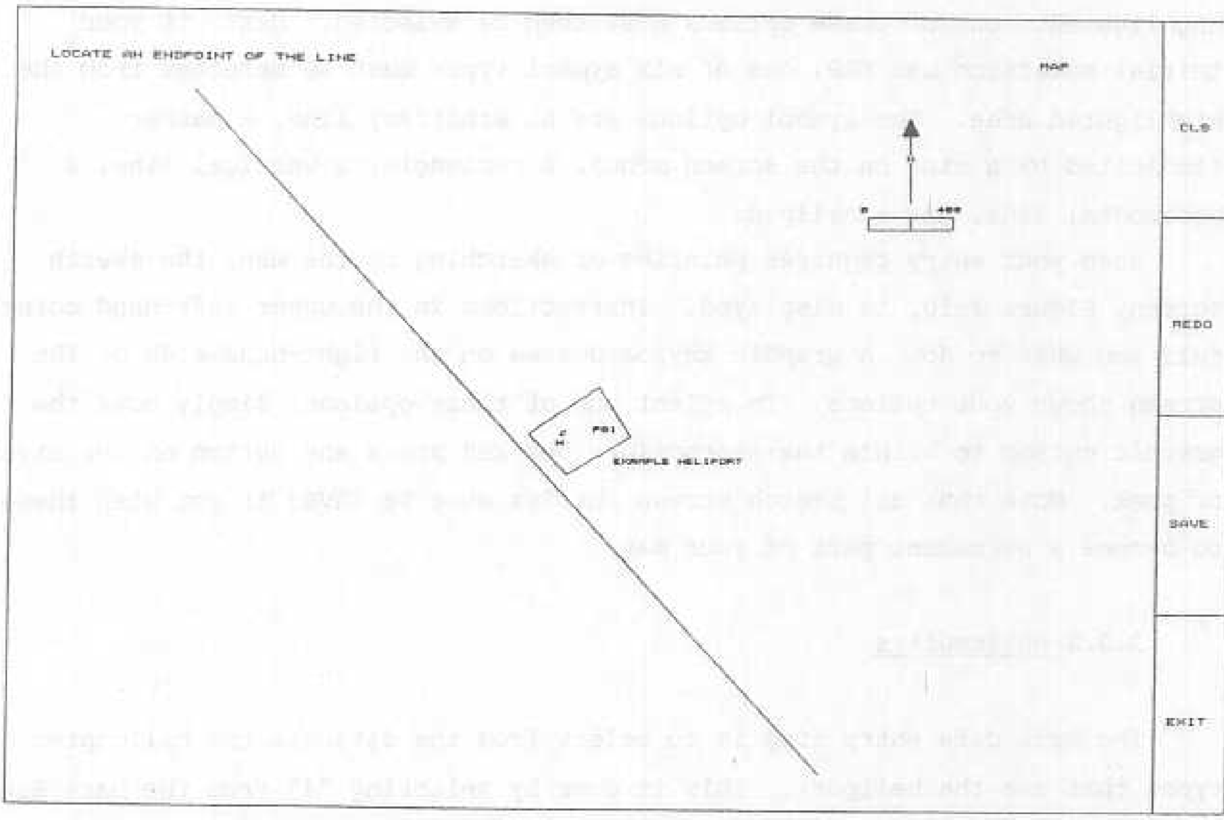


FIGURE 3-10 SKETCH SCREEN DISPLAY FOR MAP ENTRY

HELICOPTER SELECTION HELICOPTERS

Place an X by any helicopter you will be using:

[ ] 1	B212	BELL 212 (UH-1N)		[ ] 9	B206L	BELL 206L
[ ] 2	S61	SIKORSKY S-61(CH-3A)		[X] 10	A109	AGUSTA A-109
[ ] 3	S64	SIKORSKY S-64(CH54B)		[ ] 11	SA341G	AEROSPATIALE SA-341G
[ ] 4	CH47C	BOEING VERTOL(CH47C)		[ ] 12	H300C	HUGHES 300C
[ ] 5	H500C	HUGHES 500C		[ ] 13	S65	SIKORSKY S-65(CH-53)
[ ] 6	BO105	BOELKOW BO-105		[ ] 14	S70	SIKORSKY S-70(UH60A)
[ ] 7	B47G	BELL 47G		[X] 15	S76	SIKORSKY S-76
[ ] 8	SA330J	AEROSPATIALE SA-330J				

Press END to save, ESC to abandon

FIGURE 3-11 DISPLAY FOR SELECTION OF THE HELICOPTER TYPES THAT USE THE HELIPORT

Next, the Helicopter Rotor Speeds screen, Figure 3-12, is displayed. This screen presents an entry form for the helicopter rotor RPM for each of the selected helicopters. Nominal rotor RPM values are displayed from the data base for each of your selected helicopters. You can change these, or press the END key to save them and return to the Main Menu.

3.3.4 Takeoffs

The HNM requires information about helicopter takeoff, approach, and/or taxi activities at the heliport. In each case, it is necessary to define ground tracks and flight profiles, and to enter information on the number of operations associated with each track and profile for all of the helicopters selected. This is a relatively involved process for a busy heliport, but the HNM allows the information to be entered in a straightforward and systematic way. The entry of data on takeoff activities is described in this section. The entry of data on approach and taxi activities is almost identical, and differences are noted in Sections 3.3.5, Approaches, and 3.3.6, Ground Taxi Activities, below. Note that the current type of data entry is indicated in the upper right corner of the screen: "TAKEOFF" in this case.

When TAKEOFFS is selected by entering "5" from the Data Entry Menu, the Flight Menu, Figure 3-13, is displayed. From this menu, you can choose to define TRACKS, PROFILES, or OPERATIONS. You may also choose to graphically define takeoff tracks by selecting "12" from the Data Entry Menu. Each of these selections is described below.

3.3.4.1 Tracks

Ground tracks can be entered either from the keyboard by selecting "1" from the Flight Menu, or graphically by selecting "12" from the Data Entry Menu. A takeoff ground track starts at a designated helipad with a straight segment on an initial heading. Alternate curved and straight segments can then follow, out to 9,999 feet from the helipad. The program automatically extends the final segment of any takeoff track out to 9,999 feet from the helipad.

```
                    HELICOPTER ROTOR SPEEDS                  HELICOPTERS

Enter any rotor speeds you wish to change

                              ROTOR SPEED                            ROTOR SPEED
          HELICOPTER             (RPM)          HELICOPTER              (RPM)
          10    A109          [0      ]         15    S76            [0      ]




Press END to save, ESC to abandon
```

FIGURE 3-12 ENTRY SCREEN FOR HELICOPTER ROTOR RPM

FLIGHT MENU TAKEOFF

1. DEFINE TRACKS

2. DEFINE PROFILES

3. DEFINE OPERATIONS

ESC to quit
Enter your selection[ ]

FIGURE 3-13 FLIGHT MENU FOR TAKEOFFS

Keyboard Entry

Keyboard entry of a takeoff flight track involves the use of three data entry screens (Figure 3-14a, b, and c). On the first screen, Track Identification, Figure 3-14a, the user enters an identifier for the takeoff track and designates the helipad from whence that track originates and the initial heading of the track. The helipad must match one of the helipads designated and located as described in Section 3.3.2.3, Helipads. The initial heading is the true (not magnetic) heading of the first straight track segment. (This need not be the initial heading of the helicopter on its pad. Information on how helicopters might change their heading just after lift-off is entered as described in Section 3.3.4.2, Profiles.) When the END key is pressed, the Track Segment Definition screen, Figure 3-14b, is displayed. Note that the track identifier you have just entered is shown in the upper right corner. The length of the initial straight track segment is then entered.

If the complete track is a straight line out to 9,999 feet, then pressing the END key at this point signals the end of the track entry process. Regardless of the segment length entered here, if this is the only segment, the track length will automatically be adjusted to 9,999 feet. However, if the track curves, the PGDN key should be pressed. The Track Segment Definition screen, Figure 3-14c, is then displayed. Now the curved segment can be defined. After this is done, use of the PGDN key causes the straight segment entry screen of Figure 3-14b to be displayed and a subsequent straight segment can be entered. You are thus forced to alternate straight and curved track segments until the track is completely defined. However, you can "back up" during the entry proces with the PGUP key, or abandon the Track Segment Definition process completely with the ESC key.

When you are satisfied with a track definition, press the END key. The Track Selection screen, Figure 3-15, is displayed. This screen presents a listing of available tracks, and it will include at least the track you have just defined (track Td1 in this case). You can now choose to edit or delete an existing track, define another track, or terminate the track definition process by pressing the ESC key. (At this point, your tracks are saved. ESC just abandons the track selection screen, not the tracks.)

```
                    TRACK IDENTIFICATION                    TAKEOFF
                                                            TRACKS
TRACK ID - td1

  PAD ID    - P01

  INITIAL HEADING (DEG) - [305]






  Press END to save, ESC to abandon
```

FIGURE 3-14a DISPLAY FOR TRACK IDENTIFICATION AND INITIAL HEADING

```
                                                            TAKEOFF
                                                            TRACK td1
                    TRACK SEGMENT DEFINITION
                        SEGMENT NO.  1


STRAIGHT SEGMENT

   DISTANCE (FEET)     -[280.0  ]





Press PGDN to save, & get next segment
Press PGUP to save, & get previous segment
Press END when finished with track
Press ESC to abandon
```

FIGURE 3-14b DISPLAY FOR THE ENTRY OF A STRAIGHT TRACK SEGMENT

```
                                                            TAKEOFF
                                                            TRACK td1
                    TRACK SEGMENT DEFINITION
                        SEGMENT NO.  2


CURVED SEGMENT

   LEFT(L) OR RIGHT(R) - [R]
   DEGREES OF TURN(D) OR NEW HEADING(H) - [H]
   TURN ANGLE/HEADING (DEG) - [90  ]
   RADIUS OF TURN (FEET)    - [600.0 ]




Press PGDN to save, & get next segment
Press PGUP to save, & get previous segment
Press END when finished with track
Press ESC to abandon
```

FIGURE 3-14c DISPLAY FOR THE ENTRY OF A CURVED TRACK SEGMENT

```
                    TRACK SELECTION                          TAKEOFF
                                                             TRACKS

Available tracks -
   1 td1          2 td2          3 td3          4 td4




CHOICE -[ ]

Enter number of track to edit/delete
Press ENTER for new track
Press ESC to quit
```

FIGURE 3-15 TRACK SELECTION MENU

Tablet Entry

Tablet definition of tracks is much simpler and less error-prone than keyboard entry. When the graphic definition of tracks is first selected by selecting "12" from the Data Entry Menu, the screen in Figure 3-16 is displayed. The options available to you are similar to those encountered when helipads and maps are entered graphically. They are as follows:

- SCALE -- This allows you to change the scale of the graphic display (the scale is always in feet).
- RETRIEVE MAP -- This function allows you to retrieve and display a map of the heliport and its environs previously created with the MAP routines described in Section 3.3.2.4.
- PRINT MAP -- This function allows a map of the heliport and its environs, retrieved with the RETRIEVE MAP function to be printed on a dot matrix printer.
- CLEAR MAP -- This function clears the background map from the screen.
- PRINT TRACKS -- This function is to reproduce tracks with the background map, if any, on a dot-matrix printer.
- ADD, EDIT, DELETE -- These functions allow you to enter, relocate, or remove specific tracks.
- HELP -- Provides additional explanatory information about graphic entry of tracks.
- EXIT -- Returns to the Data Entry Menu.

The designation "TRACKS" in the upper right-hand corner is simply a reminder of what function you are currently performing. It is not a function selection.

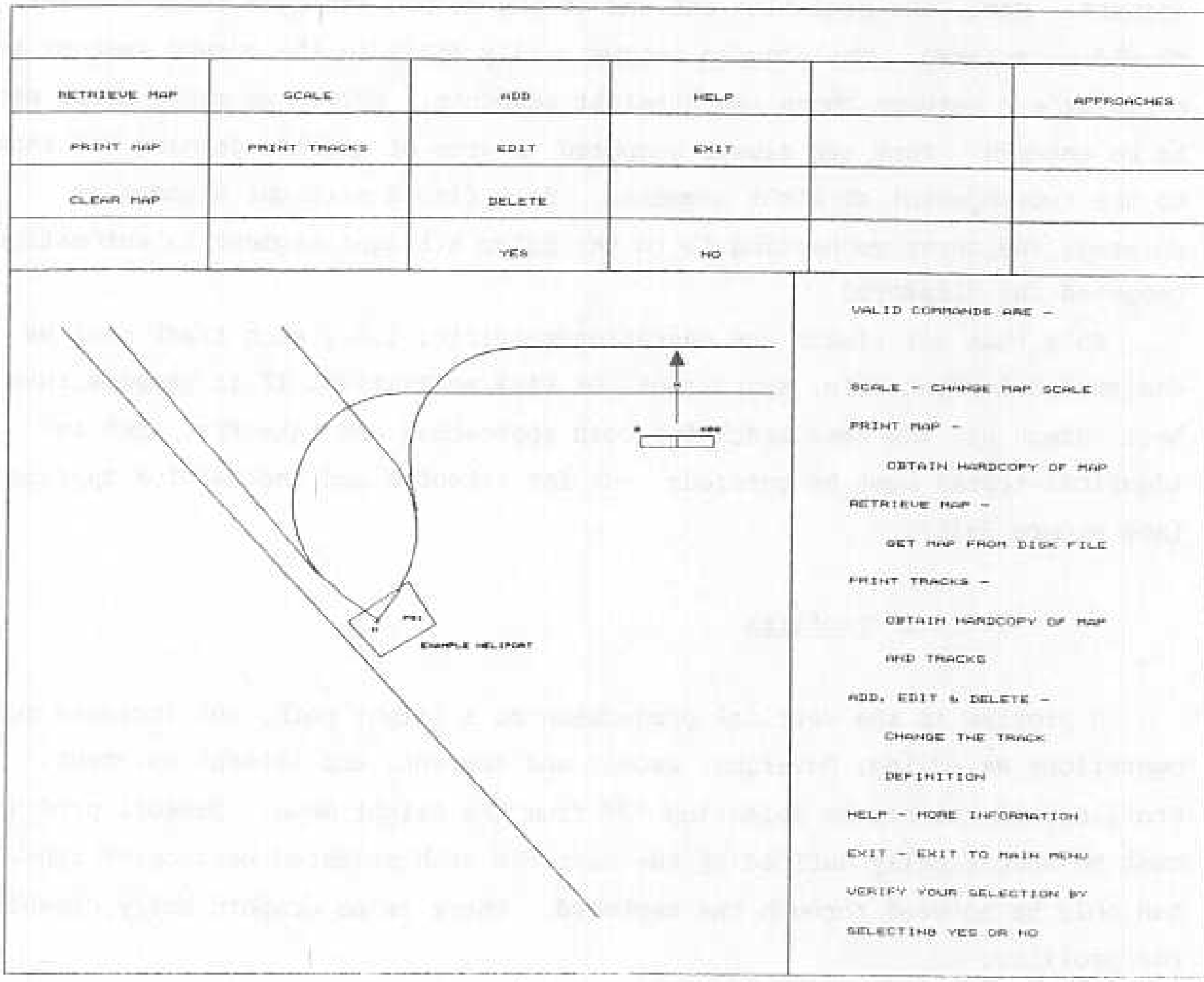


FIGURE 3-16 INITIAL GRAPHIC DISPLAY FOR THE ENTRY OF TRACKS

To select a function, move the graphic cursor until it is inside the box labeled with that function. Then press any of the buttons on the stylus or puck. The words YES and NO will then be highlighted. Move the cursor to YES and again press a button on the puck. The selected function is then implemented. Then, follow the instructions on the right side of the next screen.

When tracks are to be added, the screen in Figure 3-17 is displayed. On this screen, you indicate the beginning and end of the first straight track segment. Next, the beginning and end of the second straight track segment should be entered. The program automatically fills in the curved segment as a circular arc between these two straight segments. Curved segments never need to be entered. They are always computed as arcs of circles joining and tangent to the two adjacent straight segments. Each time a straight segment is entered, the curve connecting it to the prior straight segment is automatically computed and displayed.

Note that all tracks are operation-specific; i.e., each track must be designated for takeoffs, approaches, or taxi activities. If it happens that helicopters use the same track for both approaches and takeoffs, then two identical tracks must be entered: one for takeoffs and another for appraoches (see Figure 2-11).

3.3.4.2 Profiles

A profile is the vertical projection of a flight path, and includes such operations as idling, hovering, ascent and descent, and lateral movement. Profiles are entered by selecting "2" from the Flight Menu. Takeoff profiles must be specifically defined by the user for each selected helicopter type, and can only be entered through the keyboard. There is no graphic entry capability for profiles.

The first step in profile definition is to specify a helicopter. A list of the helicopters designated during the helicopter selection phase (Section 3.3.3) is displayed on the screen, and one of these must be selected. Once a helicopter has been specified, a takeoff profile can be defined using the Profile Definition screen, Figure 3-18.

The next step in profile definition is to name the profile. This can be any name you wish, but mneomics like "TA109" are useful.

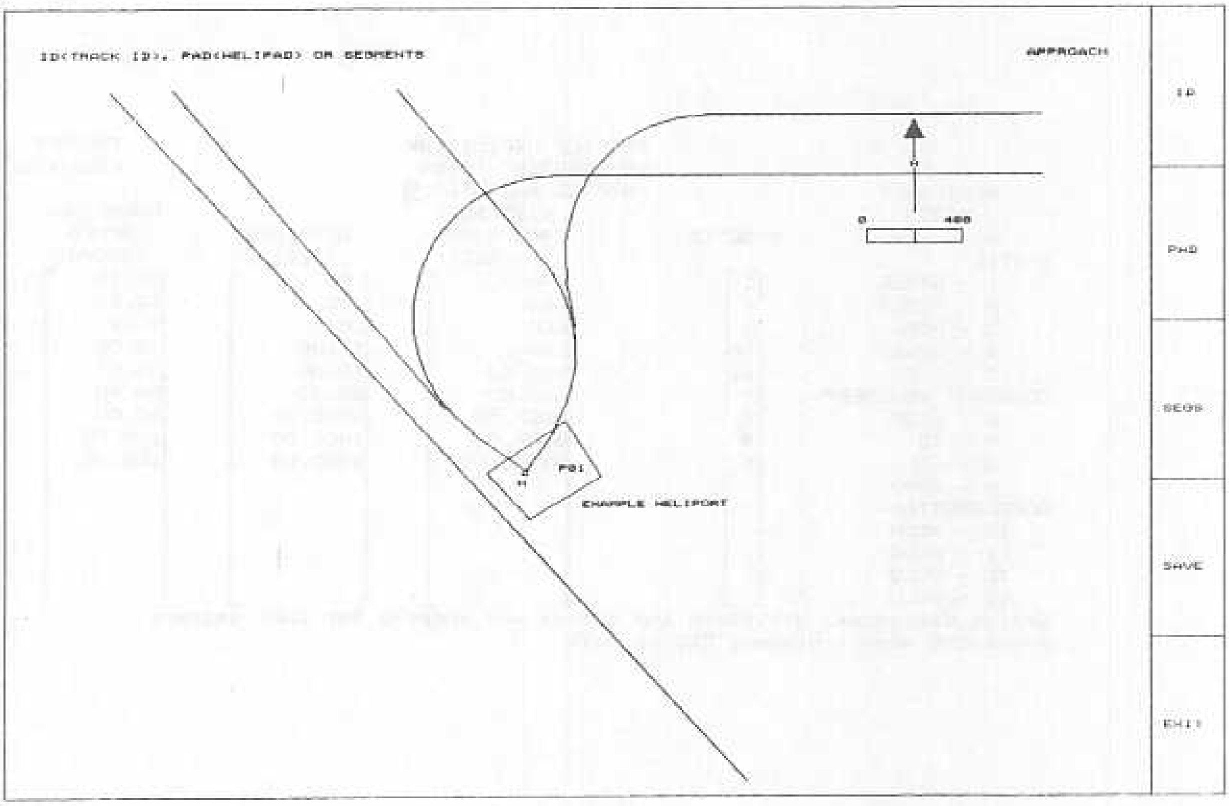


FIGURE 3-17 SKETCH GRAPHIC DISPLAY FOR THE ENTRY OF TRACKS

```
                                   PROFILE DEFINITION                           TAKEOFF
                                   HELICOPTER - A109                            PROFILES
     AVAILABLE                     PROFILE NAME [TA109]
       MODES                                  DISTANCE                          DURATION/
     ---------        | MODE ID              FROM START        ALTITUDE           SPEED
STATIC-               |                        (FEET)           (FEET)           (SEC/KT)
    1 - GIDLE         |  [1  ]              [.00        ]    [.00        ]    [10.00     ]
    2 - FIDLE         |  [2  ]              [.00        ]    [.00        ]    [10.00     ]
    3 - HIGE          |  [5  ]              [.00        ]    [.00        ]    [3.00      ]
    4 - HOGE          |  [10 ]              [.00        ]    [15.00      ]    [16.00     ]
    5 - VASC          |  [11 ]              [100.00     ]    [15.00      ]    [30.00     ]
CONSTANT MOVEMENT-    |  [7  ]              [562.00     ]    [30.00      ]    [60.00     ]
    6 - HIGE          |  [7  ]              [4032.00    ]    [1000.00    ]    [60.00     ]
    7 - TO            |  [8  ]              [6786.00    ]    [1000.00    ]    [100.00    ]
    8 - LFLO          |  [0  ]              [99999.00   ]    [1000.00    ]    [100.00    ]
    9 - APPR          |
ACCELERATION-         |
   10 - ACLH          |
   11 - ACLC          |
   12 - DCLD          |
   13 - DCLH          |
Ending distances, altitudes and speeds are entered for each segment
Press END when finished, ESC to quit
```

FIGURE 3-18 TAKEOFF PROFILE DEFINITION SCREEN

A takeoff profile must have at least three segments, but up to 14 can be accommodated. Each segment is identified by its specific flight operating mode because each mode has different noise characteristics. A list of all the possible flight operating modes is shown down the left side of the screen, Figure 3-18, under "AVAILABLE MODES". There are 13 possible modes, divided into three classes: static, constant movement (i.e., lateral movement at constant airspeed), and acceleration. The modes are:

STATIC

1. GIDLE: Ground idle.
2. FIDLE: Flight idle.
3. HIGE: Hover in ground effect (static, with no lateral movement).
4. HOGE: Hover out of ground effect (static).
5. VASC: Vertical ascent. A constant is added to the HOGE noise curve to determine noise level for VASC.

CONSTANT MOVEMENT

6. HIGE: Hover in ground effect with lateral movement, for Taxi. A constant is added to the HIGE noise curve to determine HIGE for Taxi.
7. TO: Takeoff, with lateral movement at constant airspeed.
8. LFLO: Level flyover (cruise, out of ground effect).
9. APPR: Approach at constant airspeed.

ACCELERATION

10. ACLH: Accelerating, horizontal takeoff. A constant is added to the TO noise curve to determine noise levels for ACLH.
11. ACLC: Accelerating, climbing takeoff. A constant is added to the TO noise curve to determine noise levels for ACLC.
12. DCLD: Decelerating, descending approach. A constant is added to the APPR noise curve to determine noise levels for DCLD.
13. DCLH: Decelerating, horizontal approach. A constant is added to the APPR noise curve to determine noise levels for DCLH.

In the Data Base, the constants for VASC, HIGE (Taxi), ACLH, ACLC, DCLD, and DCLH are all set equal to zero until experimentally defined.

Each segment of a takeoff profile consists of one row on the fill-in table. For each row, you must enter a mode identification for the operating mode in the MODE ID column. The distance from the pad, in the units previously defined, and the final altitude above the ground must then be entered (see Section 3.3.2.1).

For static flight modes, you must enter the duration in seconds. For modes with horizontal movement, a final speed must also be supplied. Many of the operating modes are not applicable to takeoffs. However, this same screen and procedure are used to define approach and taxi profiles, and the other modes may be used then.

As in other data entry screens, this screen has full-screen editing capability. Press the END key when the profile definition is complete. The Profile Selection screen, Figure 3-19, is displayed. Note that profiles are helicopter-specific. If more than one type of helicopter flies the same profile from a given helipad, then that profile has to be entered separately for each of the helicopters.

3.3.4.3 Operations

Operations are entered by selecting "3" from the Flight Menu, Figure 3-13. They are entered on a track-by-track basis, using the tracks defined as described in Section 3.3.4.1. For each track, helicopter types are selected, followed by the selection of a profile for each helicopter type.

Finally, the number of daytime and nighttime operations are entered for that helicopter profile along that track. This process is repeated until all average daily helicopter takeoff operations at the heliport are accounted for.

The first step in the entry of operations is to specify a track from the Track Selection screen, Figure 3-20. Note that this screen is very similar to the Track Selection screen used for track entry (Figure 3-15).

Once a track has been selected, you must specify a helicopter for which operations are to be entered using a Helicopter Selection screen. This screen is shown on Figure 3-21.

TAKEOFF
PROFILES

PROFILE SELECTION

Available profiles for helicopter A109

1 - TA109

CHOICE -[ ]

Enter number of profile to edit/delete
Press ENTER for new profile
Press ESC to quit

FIGURE 3-19 PROFILE SELECTION MENU

```
                    TRACK SELECTION                            TAKEOFF
                                                               OPERATIONS

Available tracks -
   1 td1          2 td2          3 td3          4 td4




Enter number of track - [1 ]


Press ESC to quit
```

FIGURE 3-20 TRACK SELECTION MENU FOR TAKEOFF OPERATIONS

HELICOPTER SELECTION

PROCESSES
PREVIEW
TAKEOFF

Place an X by any helicopter you will be using:

X 10 A109

X 15 S76

Press END to save, ESC to abandon

FIGURE 3-21 HELICOPTER SELECTION SCREEN

After selecting a track and specifying a helicopter, you must now select the profile for which operations are to be entered using the Profile Selection Menu, similar to Figure 3-19.

When the track, the helicopter, and the profile have all been identified, the Track Operations Definition screen, Figure 3-22, is displayed. Note that the track you are working with is defined in the upper right-hand corner of the Track Operations definition screen. Similarly, the helicopter and its selected profile are listed. The total number of operations you have previously defined for this track -- for all helicopter and profile types -- is shown at the top.

You now enter the total number of average daytime (7:00 AM - 9:59 PM) and nighttime (10:00 PM - 6:59 AM) operations for the designated track, helicopter, and profile. Then enter the heading (true) of the helicopter as it sat on the ground prior to takeoff, and its typical or average heading during any hover operations that occur during takeoff. The default values for these static headings are the initial track headings.

Once the number of operations and the headings are entered, the Operations Selection list, Figure 3-23, is displayed. You can now choose to edit or delete an existing set of operations, enter a new set of operations, or terminate the operations entry process by pressing the ESC key. (At this point, your operations are saved -- ESC abandons the Operations Selection screen, not the operations.)

3.3.5 Approaches

Entry of information about approaches is identical to that for takeoffs. Tracks, profiles, and operations are entered as described in Section 3.3.4. Keyboard entry of approach tracks, and also of approach profiles, is done in the order they are flown. However, graphic entry of approach tracks must be done in the reverse order from the way the track is flown, starting at the helipad and moving outwards from the heliport.

TAKEOFF
OPERATIONS
TRACK td1

TRACK OPERATIONS DEFINITION

Number of operations already defined for this track - 3

HELICOPTER - A109
PROFILE - TA109

NUMBER OF OPERATIONS

DAY - [.90]
NIGHT - [.30]

HELICOPTER HEADINGS IN DEG. TRUE NORTH

GROUND HEADING - [300]
HOVER HEADING - [300]

Press END when finished, ESC to quit

FIGURE 3-22 TRACK OPERATIONS DEFINITION SCREEN

OPERATIONS SELECTION

TAKEOFF OPERATIONS

Existing operations for track td1

#	HELICOPTER	PROFILE	DAY	NIGHT	#	HELICOPTER	PROFILE	DAY	NIGHT
1	A109	TA109	.90	.30	2	S76	TS76	4.80	.00

CHOICE -[ ]

Enter operations set number to edit/delete
Press ENTER for new set of operations
Press ESC to quit

FIGURE 3-23 OPERATIONS SELECTION (SUMMARY) LIST

3.3.6 Ground Taxi Activities

Taxi activities consist of an abbreviated takeoff and approach within the confines of the heliport. The complete track is entered, starting at the helipad of origin and ending at an arbitrary parking space. For keyboard entry of taxi tracks, the user must enter the X and Y coordinates of the helicopter parking space. For graphic track entry, the end of the final segment is considered the parking space. A complete profile is entered for each taxiing helicopter consisting of all the necessary taxi modes (typically GIDLE, FIDLE, Constant Movement HIGE, FIDLE GIDLE). When the numbers of daytime and nighttime operations are entered (Figure 3-22), ground and hover headings must be given at both the originating helipad and destination parking space.

is this listing correct and not redundant

does the program check this?

3.4 Selecting the Processes to be Performed

The entry of processing options is straightforward and entirely menu-driven. When PROCESSES is selected from the Data Entry Menu by typing "11", the Process Menu screen, Figure 3-24, is displayed. Five possible processing options can be selected from this menu.

The HNM does not have the "NO VERIFY", "NO EXECUTE", and "NO WARN" options of the INM. All input data are automatically verified by the HNM, and all warning messages are displayed and execution will proceed as requested from the Process Menu.

3.4.1 Data Base

To print all or portions of the helicopter data base, select "1" from the Process Menu. You are then prompted whether or not to plot this data; respond by entering "Y" or "N". The default is that the data will not be plotted. The Data Base Report Selection screen, Figure 3-25, is displayed. Any or all of the data types in the HNM's built-in helicopter data base can be selected from this menu.

```
PROCESS MENU                                   PROCESSES

1 - DATA BASE     PRINT DATA BASE REPORTS
2 - PREVIEW       PLOT USER INPUTS
3 - GRID          PRODUCE GRID REPORTS
4 - CONTOUR       PRODUCE CONTOURS
5 - RETRIEVE      RETRIEVE A CONTOUR

CHOICE - [ ]

Press ESC to quit
```

FIGURE 3-24 PROCESS SELECTION MENU

```
DATA BASE REPORT SELECTION                     PROCESSES
                                               DATA BASE
1 - ALL DATA
2 - PERFORMANCE DATA
3 - NOISE CURVE DATA
4 - TEST TAKEOFF PROFILE
5 - TEST APPROACH PROFILE
6 - TEST TAXI PROFILE

CHOICE - [ ]

Press ESC to quit
```

FIGURE 3-25 DATA BASE REPORT SELECTION MENU

For each data type selected, a helicopter selection menu (Figure 3-11) is displayed so that you can designate the particular helicopters for which the data are to be reported.*

3.4.2 Preview

Before performing grid or coutour analysis of input data, the user may wish to preview some or all of the flight profiles and tracks in the scenario. Preview provides the capability to plot any number of profiles and all the tracks included in the input file.

Selecting "2" from the Process Menu results in the Preview Menu, Figure 3-26 being displayed. When any of the three profile types (takeoff, approach, or taxi) is selected for preview, a Helicopter Selection screen (Figure 3-21) is displayed so that you can specify the helicopters for which profiles are to be previewed. In this case, as opposed to data base reports described in Section 3.4.1, only those helicopters you have previously selected from the data base for computation can be specified.

When "4" is selected from the Preview Menu, the Plot Tracks screen, Figure 3-27, is displayed. On this screen you must specify the paper X-axis and Y-axis lengths, the plot scale, and the plot origin point. The proper X-axis length is the size of the paper along the X-axis. Similarly, the Y-axis length is the size of the paper along the Y-axis. The default size is 8.5 by 11 inches. Th plot scale is in feet per inch. The default is 3000 feet per inch. The plot origin position (X,Y) in inches relative to the lower left hand corner of the paper can be entered. If no origin is specified, the center of the paper is selected as the origin. Tracks will be plotted only in the area allowed by the paper.

3.4.3 Grid

A grid analysis determines the noise levels for the L_{dn} noise metric at specified points on a grid around the heliport area. The actual grid is defined by three entries:

---

* Note that any helicopter in the data base can be selected. The selections are not restricted to those you made in Section 3.3.3.

```
                    PREVIEW MENU                          PROCESSES
                                                          PREVIEW
                 1 - TAKEOFF PROFILE
                 2 - APPROACH PROFILE
                 3 - TAXI PROFILE
                 4 - PLOT TRACKS
CHOICE -[ ]





Press ESC to quit
```

FIGURE 3-26 PREVIEW SELECTION MENU

```
                    PLOT TRACKS                           PROCESSES
                                                          PREVIEW
PAPER LENGTHS (IN) -                                      TRACKS
         X-AXIS -    [8.5   ]
         Y-AXIS -    [11.0  ]
PLOT SCALE (FT/IN) - [1000.0]
PLOT ORIGIN RELATIVE TO LOWER LEFT CORNER (IN) -
         X -         [.0    ]
         Y -         [.0    ]




Press END when finished, ESC to quit
```

FIGURE 3-27 PLOT TRACKS ENTRY SCREEN

(1) The coordinates of the point in the lower left-hand corner of the grid in relation to the helipad. The same coordinate system as was used to define helipad locations (Section 3.3.2.3) must be used here. The coordinates must be expressed in the user specified units.

(2) The increment (distance) between points in each direction (X and Y) expressed in the same units.

(3) The number of increments along the grid in the X- and Y-directions.

The actual number of points in the grid is the product of the number of X-values times the number of Y-values.

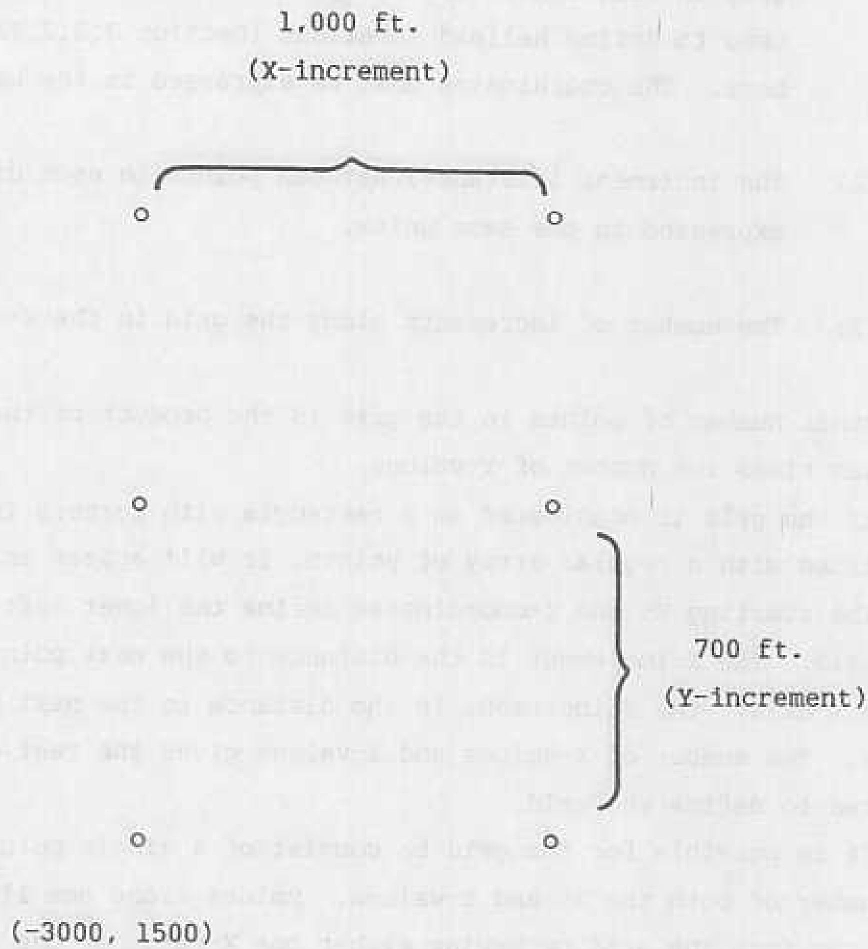
If the grid is considered as a rectangle with corners indicated by points and filled with a regular array of points, it will appear as in Figure 3-28.

The starting X- and Y-coordinates define the lower left corner of the rectangle. The X-increment is the distance to the next point moving parallel to the X-axis. The Y-increment is the distance to the next point along the Y-axis. The number of X-values and Y-values gives the rest of the information required to define the grid.

It is possible for the grid to consist of a single point by using "1" as the number of both the X- and Y-values. Points along one line (parallel to one axis) can form the grid by having either one X-value or one Y-value.

The normal output from the grid analysis is a Standard Grid Analysis Report (see Section 5). In addition to this report, the user may elect to receive a Detailed Grid Analysis Report provided the grid contains no more than 20 points. Any number of grid analyses may be requested in one execution.

Grid reports can be prepared by selecting "3" from the Process Menu. The Grid Definition screen, Figure 3-29, is displayed. Up to 20 grid reports can be requested.



Starting X-coordinate:	-3000
Starting Y-coordinate:	1500
X-increment:	1000
Y-increment:	700
Number of X increments:	2
Number of Y increments:	3

FIGURE 3-28 SCHEMATIC OF THE GRID

```
                       GRID DEFINITION                     PROCESSES
                       GRID NUMBER 1                       GRID

METRIC IS LDN

STARTING GRID COORDINATES (FEET)
   X - [-1200 ]
   Y - [-1200 ]

INCREMENT STEPS (FEET)
   X - [200   ]
   Y - [200   ]

NUMBER OF VALUES
   X - [11 ]
   Y - [11 ]

DETAIL REPORT (Y/N) - [N]

Press PGDN for next grid
Press PGUP for previous grid
Press END when finished with grids
Press ESC to quit
```

FIGURE 3-29 DATA ENTRY SCREEN FOR GRID DEFINITION

3.4.4 Contour

A contour analysis determines an irregular grid of points from which may be extracted contours of the selected values of L_{dn} in the area around the heliport. For example, if the contour value is 75 dB, the area enclosed by the contour will have an LDN at or above 75 dB. If the user does not specify at least one level, then the calculations are performed for L_{dn} at levels of 65 and 75 dB.

If the user desires to save a set of contour data to a file for retrieval during subsequent use of the model, he must specify a name by which the contour data set can be identified. One set of contour data (up to 10 contours) may be saved during one execution. If no name is specified for the contour set, the default name CONT00 is assigned to the set.

The user may also specify a contour value tolerance, i.e., the measure of smoothness of the contour line. Tolerance in decibels indicates the section of the heliport noise surface which will require more detailed calculations. The default tolerance is ± 1dB, and the user may change this to any desired value. If the minimum requested contour value is 65.0 and the points being checked have values of 63.1 and 66.2, then the area around this point will be subdivided further to produce more points at which to calculate noise levels. A very small tolerance could generate several thousand additional calculations and will greatly increase the time for computing the contour.

Refinement determines the spacing of locations on the ground for which noise exposure is calculated. A higher refinement means closer spacing and yields smoother, more precise contours. But, this increases computation time. Refinement can be set from 3 to 6. The default is 6.

Finally, the user can specify the rectangular area (or window) within which he wants the contour calculations to be restricted. The window is defined by the X- and Y-coordinates of its lower left and upper right-hand corners. All four window coordinates must be specified if this user option is selected. Otherwise, the model uses the default window which is a square of 20,000 foot sides around the origin.

The user may select one or two types of reports from the contour calculations. The "Print Report" option yields a tabulation of the points which define the contours. The "Plot Contour" option provides a graphic plot of the contours. The user is not required to select any type of report from a CONTOUR analysis and it may be very reasonable to do this if he is saving the contour for later retrieval.

The "Plot Contour" option allows additional user input. The user may specify the paper X-axis and Y-axis lengths, the plot scale, and the plot origin point. The proper X-axis length is the size of the paper along the X-axis. Similarly, the Y-axis length is the size of the paper along the Y-axis. The default size is 8.5 by 11 inches. The plot scale is in feet per inch, and defaults to 3000 feet per inch. The plot origin position (X,Y) in inches relative to the lower left-hand corner of the paper is entered. If no origin is specified, the center of the paper is selected as the origin.

When contours are to be produced, select "4" from the Process Menu. The Contour Definition screen, Figure 3-30, is displayed. As with the INM, up to 10 contour levels can be specified, but there are two default levels, 65 and 75 dB, and only one metric, L_{dn}. The set of contours can then be given a name if it will be retrieved later. The tolerance level and the refinement level default values can be changed. You can also change the window size within which contours will be determined by changing the window size default values. Finally, y u select whether the contour points are to be tabulated (printed) and/or plotted. If a plot is requested, you can change the paper size, plot scale, and plot origin default values.

3.4.5 Retrieve

The user may elect to retrieve data for a contour from three sources:

(1) An old contour file produced by a previous execution of the model;

(2) A newly saved contour file produced by the current model execution; or

(3) The current scratch contour file.

```
                                CONTOUR DEFINITION                    PROCESSES
                                                                      CONTOUR

CONTOUR LEVELS (DB) - UP TO 10
[55.00 ][60.00 ][65.00 ][.00  ][.00  ][.00  ][.00  ][.00  ][.00  ][.00  ]

CONTOUR NAME - [CON001]

TOLERANCE LEVEL (DB)   - [.50]
NUMBER OF REFINEMENTS  - [5]

COORDINATES OF GRID (FEET)
    LOWER LEFT CORNER   - X -[-2000.0]    Y -[-2000.0]
    UPPER RIGHT CORNER  - X -[2000.0 ]    Y -[2000.0 ]

PRINT REPORT (Y/N) -[Y]
PLOT CONTOUR (Y/N) -[Y]
IF PLOTTING THE CONTOUR -
    PAPER SIZE (IN) -      X -[8.5    ]    Y -[11.0   ]
    PLOT SCALE (FT/IN)  -     [400    ]
    PLOT ORIGIN (IN) -     X -[.0     ]    Y -[.0     ]

Press END when finished, ESC to quit
```

FIGURE 3-30 DATA ENTRY SCREEN FOR CONTOUR DEFINITION

To retrieve from the first two sources, the user must identify the name under which the contour was saved. To retrieve from the scratch file, no name is required. Any number of retrievals may be requested in one execution.

The window described under this option should be within the window specified for the retrived contour. If no window is specified, the current contour window is used. Again, four coordinates must be specified to define a window.

When you wish to retrieve a contour computed earlier, select "5" from the Process Menu. The Contour Retrieve screen, Figure 3-31, is displayed. The information required is similar to that required to specify a contour, but you may choose to retrieve only a portion of the original contour.

3.5 Echo Reports

Echo Reports simply reproduce your input information so that you can verify its correctness. Echo Reports can be obtained by selecting "9" from the Data Entry Menu. The Echo Report screen, Figure 3-32, is displayed. Type an "X" in front of each type of report you wish to have printed. The default is that only the process report will be printed.

3.6 Help

There is a HELP option in the Data Entry Menu which is accessed by selecting "15". A Help Menu, Figure 3-33, is then displayed which looks very much like the Data Entry Menu. Selecting an option from this menu produces one or more screens of instructions for the particular menu function selected.

3.7 Map Entry

The third data entry option available from the HNM Main Menu, Figure 3-1, is Map Entry. This separately accesses the map entry functions available from within the data entry process. These are described in Section 3.3.2.4.

```
                         CONTOUR RETRIEVE                            PROCESSES
                                                                     RETRIEVE

CONTOUR LEVELS (DB) - UP TO 10
[65.00] [75.00 ] [.00    ] [.00    ] [.00    ] [.00    ] [.00    ] [.00    ] [.00    ] [.00    ]

CONTOUR NAME - [CON001]


COORDINATES OF GRID (FEET)
    LOWER LEFT CORNER  - X - [-1000.   ]   Y - [-1000.   ]
    UPPER RIGHT CORNER - X - [1000.    ]   Y - [1000.    ]

PRINT REPORT (Y/N) - [Y]
PLOT CONTOUR (Y/N) - [N]
IF PLOTTING THE CONTOUR -
    PAPER SIZE (IN) -    X - [8.5      ]   Y - [11.0     ]
    PLOT SCALE (FT/IN)   -   [400      ]
    PLOT ORIGIN (IN) -   X - [.0       ]   Y - [.0       ]

Press END when finished, ESC to quit
```

FIGURE 3-31 CONTOUR RETRIEVE DATA ENTRY DISPLAY

ECHO REPORTS   ECHO

Place an X by any echo report you wish to see

[X] SETUP

[X] HELIPADS

[X] HELICOPTERS

[X] APPROACH PROFILES

[X] TAKEOFF PROFILES

[X] TAKEOFF TRACKS AND OPERATIONS

[X] LANDING TRACKS AND OPERATIONS

[X] TAXI OPERATIONS

Press END when finished, ESC to abandon

FIGURE 3-32 ECHO REPORT SELECTION MENU

```
                              HELP MENU                    HELP

     KEYBOARD ENTRIES                           TABLET ENTRIES
     ----------------                           --------------

    1 - GROUND DISTANCE                      10 - MAP
    2 - SETUP                                11 - HELIPADS
    3 - HELIPADS                             12 - TAKEOFF TRACKS
    4 - HELICOPTERS                          13 - APPROACH TRACKS
    5 - TAKEOFFS                             14 - TAXI TRACKS
    6 - APPROACHES
    7 - GROUND TAXI
    8 - PROCESSES                            15 - EDIT KEYS
    9 - ECHO REPORTS                         16 - FILE INFORMATION


ESC to exit
Enter your selection
```

FIGURE 3-33 HELP MENU AVAILABLE FROM DATA ENTRY MENU

4.0 RUNNING THE CASE

The steps included in actually running a case, and the various run options available to the user, are indicated by the HNM Main Menu, Figure 3-1. These are all identical to steps in the operation of the INM.

Case Data Entry (selection No. 2 from the HNM Main Menu, see Section 3.3) produces an input text file quite similar to that required by the INM (FOR02.DAT). This file is reproduced in Figure 4-1 for the Example Heliport case. The HNM processes this file in three steps.

- o Input Formatting
- o Flight Compilation
- o Computation

All of these steps must be performed in the indicated order to produce heliport noise contours for a case. This is most conveniently done by selecting "4 - Run Input/Flight/Compute" from the HNM Main Menu. There may be circumstances, however, when the user will want to perform these steps separately. Hence, the separate options: "5 - Input Formatting", "6 - Flight Compilation", and "7 - Compute" are also available from the HMM Main Menu. HNM will prompt you where you would like your output from input formatting and computation to go, i.e, printer or file and file names.

4.1 The Input File

Many of the errors which could occur in creating an input file for the INM are not possible with the HNM's menu-driven entry process. However, some errors of omission can still occur.

Every input case should contain the following data sections:

1) SETUP (which contains heliport descriptions and helipad data)
2) AIRCRAFT (which selects or defines the helicopter types)
3) TAKEOFFS (which describes takeoff tracks, and defines takeoff operations by frequency or by percentage)
4) LANDINGS (which describes landing tracks, and defines landing operations by frequency or by percentage)

```
BEGIN.
ECHO.
SETUP:
  TITLE (Example test case input)
  AIRPORT (Example Heliport                         )
  ALTITUDE    13. TEMPERATURE  59.00 F SURFACE H
ECHO.
FT.
  RUNWAYS
    RW P01        0.        0. TO        0.        1.      HEADING=360
ECHO.
AIRCRAFT:
  TYPES
  AC A109   ROTOR      0 CURVE A109    CATEGORY HCOM
            STAGE 1=TA109
            STAGE 2=GA109
            STAGE 3=GA109P
  AC S76    ROTOR      0 CURVE S76     CATEGORY HCOM
            STAGE 1=TS76
            STAGE 2=GS76
ECHO.
FT.
  PROFILES APPROACH
    PF AA109   SEGMENTS= 7
            DISTANCES 99999. 10535.   4819.   3062.      0.      0.      0.
            ALTITUDES  1000.  1000.   1000.    500.     15.      0.      0.
               SPEEDS 100.00 100.00   60.00   60.00    3.00   10.00    .00
              THRUSTS  LFLO   APPR    DCLH    DCLD    HOGE    GIDLE
    PF GA109   SEGMENTS= 4
            DISTANCES  5280.     0.      0.      0.
            ALTITUDES     3.     3.      0.      0.
               SPEEDS  10.00   2.00   10.00    .00
              THRUSTS  HIGE   HIGE    GIDLE
    PF GA109P SEGMENTS= 4
            DISTANCES  5280.     0.      0.      0.
            ALTITUDES     3.     3.      0.      0.
               SPEEDS  10.00   2.00   10.00    .00
              THRUSTS  HIGE   HIGE    GIDLE
    PF AS76    SEGMENTS= 7
            DISTANCES 99999. 10535.   4819.   3062.      0.      0.      0.
            ALTITUDES  1000.  1000.   1000.    500.     15.      0.      0.
               SPEEDS 100.00 100.00   60.00   60.00    3.00   10.00    .00
              THRUSTS  LFLO   APPR    DCLH    DCLD    HOGE    GIDLE
    PF GS76    SEGMENTS= 4
            DISTANCES  5280.     0.      0.      0.
            ALTITUDES     3.     3.      0.      0.
               SPEEDS  10.00   2.00  120.00    .00
              THRUSTS  HIGE   HIGE    GIDLE
ECHO.
FT.
  PROFILES TAKEOFF
    PF TA109   SEGMENTS= 9 WEIGHT= 5730 ENGINES= 1
            DISTANCES     0.     0.      0.      0.    100.    562.   4032.
                       6786.  99999.
            ALTITUDES     0.     0.      0.     15.     15.     30.   1000.
```


FIGURE 4-1 INPUT TEXT FILE FOR THE EXAMPLE HELIPORT CASE

(Part 1 of 4)

```
                        1000.   1000.
              SPEEDS   10.00   10.00    3.00   16.00   30.00   60.00   60.00
                       100.00  100.00
             THRUSTS   GIDLE   FIDLE   VASC    ACLH    ACLC    TO      TO
                        LFLO
   PF GA109  SEGMENTS= 5 WEIGHT= 5730 ENGINES= 1
            DISTANCES     0.      0.      0.      0.   5280.
            ALTITUDES     0.      0.      0.      3.      3.
              SPEEDS   60.00 120.00    2.00   10.00   10.00
             THRUSTS   GIDLE   FIDLE   HIGE    HIGE
   PF GA109P SEGMENTS= 4 WEIGHT= 5730 ENGINES= 1
            DISTANCES     0.      0.      0.   5280.
            ALTITUDES     0.      0.      3.      3.
              SPEEDS   30.00    2.00   10.00   10.00
             THRUSTS   GIDLE   HIGE    HIGE
   PF TS76   SEGMENTS= 9 WEIGHT=10000 ENGINES= 1
            DISTANCES     0.      0.      0.      0.    100.    562.   4032.
                        6786.  99999.
            ALTITUDES     0.      0.      0.     15.     15.     30.   1000.
                        1000.   1000.
              SPEEDS   10.00   10.00    3.00   16.00   30.00   60.00   60.00
                       100.00  100.00
             THRUSTS   GIDLE   FIDLE   VASC    ACLH    ACLC    TO      TO
                        LFLO
   PF GS76   SEGMENTS= 5 WEIGHT=10000 ENGINES= 1
            DISTANCES     0.      0.      0.      0.   5280.
            ALTITUDES     0.      0.      0.      3.      3.
              SPEEDS   60.00 120.00    2.00   10.00   10.00
             THRUSTS   GIDLE   FIDLE   HIGE    HIGE
ECHO.
FT.
TAKEOFFS BY FREQUENCY:
  TRACK td1  RWY P01 HEADING 305
          STRAIGHT   280.00
          RIGHT   90 H   600.00
          STRAIGHT 9999.00
    OPER A109    STAGE 1 D      .90 N      .30 GHDT 300 HHDT 300
    OPER S76     STAGE 1 D    4.80 GHDT 300 HHDT 300
  TRACK td2  RWY P01 HEADING 305
          STRAIGHT   280.00
          RIGHT  320 H   600.00
          STRAIGHT 9999.00
    OPER A109    STAGE 1 D      .60 N      .20 GHDT 299 HHDT 299
  TRACK td3  RWY P01 HEADING  35
          STRAIGHT   200.00
          LEFT   350 H   600.00
          STRAIGHT   200.00
          RIGHT   90 H   600.00
          STRAIGHT 9999.00
    OPER A109    STAGE 1 D      .60 N      .20 GHDT  33 HHDT  33
    OPER S76     STAGE 1 D    3.20 GHDT  33 HHDT  33
  TRACK td4  RWY P01 HEADING  35
          STRAIGHT   200.00
          LEFT   320 H   600.00
          STRAIGHT 9999.00
```

2

FIGURE 4-1 INPUT TEXT FILE FOR THE EXAMPLE HELIPORT CASE

(Part 2 of 4)

```
   OPER A109    STAGE 1 D     .60 N      .20 GHDT  32 HHDT  32
ECHO.
FT.
LANDINGS BY FREQUENCY:
  TRACK ta1   RWY P01 HEADING 270
          STRAIGHT 9999.00
          LEFT  125 H   600.00
          STRAIGHT  280.00
   OPER A109    PROF=AA109  D      .38 N      .13 GHDA 126 HHDA 126
   OPER S76     PROF=AS76   D     2.00 GHDA 126 HHDA 126
  TRACK ta2   RWY P01 HEADING 140
          STRAIGHT 9999.00
          LEFT  125 H   600.00
          STRAIGHT  280.00
   OPER A109    PROF=AA109  D      .38 N      .13 GHDA 127 HHDA 127
  TRACK ta3   RWY P01 HEADING 270
          STRAIGHT 9999.00
          LEFT  170 H   600.00
          STRAIGHT  200.00
          RIGHT 215 H   600.00
          STRAIGHT  200.00
   OPER A109    PROF=AA109  D     1.13 N      .38 GHDA 215 HHDA 215
   OPER S76     PROF=AS76   D     6.00 GHDA 215 HHDA 215
  TRACK ta4   RWY P01 HEADING 140
          STRAIGHT 9999.00
          RIGHT 215 H   600.00
          STRAIGHT  200.00
   OPER A109    PROF=AA109  D     1.13 N      .38 GHDA 215 HHDA 215
ECHO.
FT.
TAXIS BY FREQUENCY:
  TRACK tx1   RWY P01     210.0       .0 HEADING  90
          STRAIGHT  210.00
   OPER A109    STAGE 2 PROF=GA109  D      1.00
                        GHDT  90 HHDT  90 GHDA  90 HHDA  90
  TRACK tx2   RWY P01     210.0       .0 HEADING  90
          STRAIGHT  210.00
   OPER A109    STAGE 2 PROF=GA109  D      1.00
                        GHDT  90 HHDT  90 GHDA  90 HHDA  90
PROCESS:
    DATA BASE
     *AIR
          B212    S61     S64     CH47D   B47G    SA330J
          B206L   SA341G  H300C   S65     SA365N  SA350D
     *PFM
          H500D   S70
     *NOI
          SA355F  B222
```

3

FIGURE 4-1 INPUT TEXT FILE FOR THE EXAMPLE HELIPORT CASE

(Part 3 of 4)

```
  *PRO
      B0105
  *APP
      B0105
  *TAX
      B0105
  *END
PREVIEW
  *PRO
      A109    S76
  *APP
      A109    S76
  *TAX
      A109    S76
  *TRACK SIZE=      8.5      11.0 SCALE=    1000. ORIGIN=        .0        .0
  *END
FT.
GRID LDN  START=  -1200.   -1200. STEP=    200.     200.
      SIZE=   11 BY     11
GRID LDN  START=     200.     200. STEP=      0.       0.
      SIZE=    1 BY     1 DETAIL
FT.
CONTOUR LDN  AT  65.0  75.0
      WITH NAME=CON001 TOLERANCE= .50
      XSTART=  -1000. YSTART=  -1000. XSTOP=   1000. YSTOP=   1000.
      REFINE= 4
      REPORT
      PLOT SIZE=      8.5      11.0 SCALE=     400.
          ORIGIN=      .0      .0
END.
```

4

FIGURE 4-1 INPUT TEXT FILE FOR THE EXAMPLE HELIPORT CASE

(Part 4 of 4)

5) TAXI (which describes taxi tracks, and defines taxi operations by frequency or by percentage)

6) PROCESS (which describes the analysis processes to be performed on the input case)

The only exception to this rule is the situation where one or two types of operations are not to be included in the scenario. In this case, the user may omit any two of the TAKEOFFS, LANDINGS, or TAXIS sections if there are not operations of that type. However, the input data must include at least one of these sections and for each of these sections that is included, at leat one operation must be entered.

4.2 Runtime Files

The HNM creates several files during execution. Most of the files can be erased from the hard disk after running a case. However, two of the files can be renamed for future processing. Those files are described below:

HFOR02.DAT	Input file - file created by data entry module for input into HNM.
FOR33.DAT	Contour points file - created by compute module for input into plot module.

4.3 Error Messages

The HNM Input Formatting module can produce a number of warning and fatal error messages. The printout should be checked for these messages and the input case should be corrected to be error free. To aid the user, as the Input Formatting module begins to process a major section of input, it prints out a processing location message. For example, the message "***PROCESSING SETUP SECTION" is printed prior to the processing of the section of input text file which follows the keyword "SETUP:". Subsection 4.3 and Appendix B contain a description of the error messages. If a fatal error is detected by the Input Formatting module, execution of the model terminates immediately. If any warning errors are detected by the Input Formatting module, no analyses will be performed on the data and execution of the model terminates after execution of the module.

The Input Formatting module can also print out the input data in the form of ECHO reports, if that option has been selected from the Data Entry Menu (Section 3.5). The user should verify that the information processed by the program is as intended.

If the input case is acceptable to the Input Formatting module, execution of the process commands will begin. However, all modules can produce warning and fatal error messages. The execution printout should be checked for these messages. Section 4.3 and Appendix B describe these messages and instruct the user as to the action to be taken when the messages are encountered. A fatal error within any one of these modules, except the Flight Compilation module, causes termination of the execution of that module only and not termination of the execution of the model. Any fatal error during Flight Compilation causes termination of the model execution. All fatal errors must be eliminated for proper execution. In addition, measures should be taken to eliminate all warning messages, if possible.

The HNM does not contain the "NOWARN" option which exists in the HNM.

Finally, the user should study the output reports and plots produced by the various modules. Verify that the desired analyses were performed and that the input data produced reasonable results.

4.4 Error Analysis and Correction

Each module of the INM produces its own error messages. All are listed in Appendix B. Each message is of the form:

```
Axx     *FATAL: ....
or
Axx     *WARNING: ....
```

where A is a one or two letter prefix to indicate which module produced the message and xx is a unique number identifier for the error. The prefixes are as follows:

C	COMPUTATION
CN	CONTOUR
DB	DATA BASE PRINT
E	EXECUTIVE

F FLIGHT OVERLAY
I INPUT
M IMPACT
P PLOT
PR PREVIEW
RG REPORT GENERATOR
V VERIFY

A fatal message within the Input Formatting or Flight Compilation modules causes termination of model execution. A fatal message within any other module causes control to be returned to the Executive module which will attempt to continue the processing of modules as directed by the processing template.

4.5 Data Base Reports

Option No. 8 of the HNM Main Menu (Figure 3-1) allows the user to produce printed reports of information from the HNM's built-in data base. Data Base Reports can be selected for any helicopter in the data base. Selections are not restricted to those helicopters specifically selected for the case to be run. However, Input Formatting, Option 5 of the HNM Main Menu, must be run before Data Base Reports are selected.

4.6 Preview Plots

Option 9, Preview Plots, on the HNM Main Menu, may be selected to produce plots of user input data. Input Formatting must be done before Preview Plots is selected. When plotting tracks, the Track Plot Module Menu, Figure 4-2, appears.

4.7 Plot

The Plot option, selection 10 from the HNM Main Menu, allows the plotting of previously computed noise exposure contours. When this option is selected, the Contour Plot Module Menu, Figure 4-3, appears. By selecting from this menu, the user can plot contours on the screen or a plotter. The user can change the plot window, plot scale, or the centering of the origin of the plot.

```
*********************************
* HNM Flight Track Plot Module *
*********************************

     The HNM Preview Plot Module allows you to control the display of
the Flight Tracks and helipads from the HNM Input Module.

If you wish to:

     (0)  Return to the Main Menu.

     (1)  Display the Flight Tracks.

     (2)  Edit the Plot Windows:                          1 Windows

     (3)  Edit the Plot Scale:                            1000.0 Feet/inch

     (4)  Edit the Centering Option
          User Centering Option in Effect

     (5)  Display Tracks on the Screen Only

Please enter your selection:[1]
```

FIGURE 4-2 HNM TRACK PLOT MODULE MENU

```
**************************
* HNM Contour Plot Module *
**************************

     The HNM Contour Plot Module allows you to control the display of
the Noise Contours generated by the HNM Computation Module.

If you wish to:

        (0)  Return to Main Menu.


        (1)  Plot the Noise Contours.

        (2)  Edit the Plot Windows:                          1 Windows

        (3)  Edit the Plot Scale:                          400.0 Feet/inch

        (4)  Edit the Centering Option
             User Centering Option in Effect

        (5)  Display Contours on the Screen Only

Please enter your selection:[1]
```

FIGURE 4-3 HNM CONTOUR PLOT MODULE MENU

5.0 INTERPRETING THE OUTPUT

The output of the HNM consists of printed reports, flight and contour plots. The Input Formatting module produces ECHO Reports of the input data file. The Data Base Print module prints selected portions of the data base. The Preview module produces a plot of selected flights from the input case. A Grid analysis produces a printed report of noise exposure at specific locations on the ground. A Contour analysis creates a report of ground locations with equal noise exposure. In addition, a contour analysis may produce a plot of these contours. The following subsections describe each of these reports.

5.1 Echo Reports

The Input Formatting module can produce up to nine ECHO Reports to provide the user with a quick means of detecting errors in the input data. Figures 5-1 through 5-9 illustrate these 9 reports. The reports, which are formatted with headers, are easy to read and essentially self-explanatory. To facilitate processing within the model, approach profiles and tracks entered with the keyboard in the order in which they are flown, have been reversed. The ECHO Reports show these items in the reversed order starting at the helipad. Subsection 3.5 describes how to obtain these reports.

PAGE 1

HELIPORT NOISE MODEL - ECHO REPORT

REPORT 1

S E T U P

TITLE	Example test case input		
AIRPORT	Example Heliport		
ALTITUDE	13. FT.		
TEMPERATURE	518.7 R	59.0 F	15.0 C
HARD SURFACE			

NOISE METRICS

DAY-NIGHT AVERAGE SOUND LEVEL (LDN) - BASED ON LEQ, WITH NIGHTTIME OPERATIONS WEIGHTED BY A 10 DECIBEL PENALTY.

FIGURE 5-1 SAMPLE ECHO REPORT: SETUP

R U N W A Y S REPORT 2

NAME	HEADING	UNITS	STARTING COORDINATES X	Y	RUNWAY LENGTH
P01	360	FT	0.	0.	1.
		M	0.	0.	0.
		NMI	.000	.000	.000

FIGURE 5-2 SAMPLE ECHO REPORT: HELIPADS

A I R C R A F T

NAME	CATEGORY	NOISE CURVE NAME	ROTOR SPEED	TAKEOFF PROFILE NAMES STAGE1	STAGE2	STAGE3	STAGE4	STAGE5	STAGE6	STAGE7
A109	HCOM	A109	0	TA109	GA109	GA109P				
S76	HCOM	S76	0	TS76	GS76					

FIGURE 5-3 SAMPLE ECHO REPORT: HELICOPTERS

A P P R O A C H   P R O F I L E S

REPORT 6

NAME	SEGMENT	DISTANCE FROM RUNWAY END FT	M	NMI	ALTITUDE (FT)	SPEED (KNTS)	THRUST
AA109	1	0.	0.	.00	.00	10.00	GIDLE
	2	0.	0.	.00	.00	3.00	HOGE
	3	0.	0.	.00	15.00	10.00	DCLD
	4	3062.	933.	.50	500.00	60.00	DCLH
	5	4819.	1469.	.79	1000.00	60.00	APPR
	6	10535.	3211.	1.73	1000.00	100.00	LFLO
	7	99999.	30480.	16.46	1000.00	100.00	
GA109	1	0.	0.	.00	.00	10.00	GIDLE
	2	0.	0.	.00	.00	2.00	HIGE
	3	0.	0.	.00	3.00	10.00	HIGE
	4	5280.	1609.	.87	3.00	10.00	
GA109P	1	0.	0.	.00	.00	10.00	GIDLE
	2	0.	0.	.00	.00	2.00	HIGE
	3	0.	0.	.00	3.00	10.00	HIGE
	4	5280.	1609.	.87	3.00	10.00	
AS76	1	0.	0.	.00	.00	10.00	GIDLE
	2	0.	0.	.00	.00	3.00	HOGE
	3	0.	0.	.00	15.00	10.00	DCLD
	4	3062.	933.	.50	500.00	60.00	DCLH
	5	4819.	1469.	.79	1000.00	60.00	APPR
	6	10535.	3211.	1.73	1000.00	100.00	LFLO
	7	99999.	30480.	16.46	1000.00	100.00	
GS76	1	0.	0.	.00	.00	120.00	GIDLE
	2	0.	0.	.00	.00	2.00	HIGE
	3	0.	0.	.00	3.00	10.00	HIGE
	4	5280.	1609.	.87	3.00	10.00	

FIGURE 5-4 SAMPLE ECHO REPORT: APPROACH PROFILES

TAKEOFF PROFILES REPORT 7

NAME	ENGINES	WEIGHT	SEGMENT	DISTANCE FROM RUNWAY END FT	M	NMI	ALTITUDE(FT)	SPEED(KTS)	THRUST
TA109	1	5730.	1	0.	0.	.00	.00	10.00	GIDLE
			2	0.	0.	.00	.00	10.00	FIDLE
			3	0.	0.	.00	.00	3.00	VASC
			4	0.	0.	.00	15.00	16.00	ACLH
			5	100.	30.	.02	15.00	30.00	ACLC
			6	562.	171.	.09	30.00	60.00	TO
			7	4032.	1229.	.66	1000.00	60.00	TO
			8	6786.	2068.	1.12	1000.00	100.00	LFLO
			9	99999.	30480.	16.46	1000.00	100.00	

FIGURE 5-5 SAMPLE ECHO REPORT: TAKEOFF PROFILES

HELIPORT NOISE MODEL - ECHO REPORT PAGE 6

T A K E O F F - T R A C K S REPORT 9 - PART A

TRACK	RUNWAY	INITIAL HEADING	SEGMENT	DIRECTION	LENGTH (NMI)	TURN ANGLE (DEG)	RESULTANT HEADING (DEG)	TURN RADIUS (NMI)
td1	P01	305	1	STRAIGHT	.05		305	
			2	RIGHT		145	90	.10
			3	STRAIGHT	1.65		90	
td2	P01	305	1	STRAIGHT	.05		305	
			2	RIGHT		15	320	.10
			3	STRAIGHT	1.65		320	
td3	P01	35	1	STRAIGHT	.03		35	
			2	LEFT		45	350	.10
			3	STRAIGHT	.03		350	
			4	RIGHT		100	90	.10
			5	STRAIGHT	1.65		90	
td4	P01	35	1	STRAIGHT	.03		35	
			2	LEFT		75	320	.10
			3	STRAIGHT	1.65		320	

HELIPORT NOISE MODEL - ECHO REPORT PAGE 7

T A K E O F F - O P E R A T I O N S REPORT 9 - PART B

TRACK	RUNWAY	AIRCRAFT	CLASS	STAGE	PROFILE	OPERATIONS DAY	EVENING	NIGHT
td1	P01	A109	COM	1	TA109	.90	.00	.30
		S76	COM	1	TS76	4.80	.00	.00
td2	P01	A109	COM	1	TA109	.60	.00	.20
td3	P01	A109	COM	1	TA109	.60	.00	.20
		S76	COM	1	TS76	3.20	.00	.00
td4	P01	A109	COM	1	TA109	.60	.00	.20

HELIPORT NOISE MODEL - ECHO REPORT PAGE 8

T A K E O F F - D I S T R I B U T I O N REPORT 9 - PART C

		O P E R A T I O N S DAY	EVENING	NIGHT
COMMERCIAL	-	10.7	.0	.9
GENERAL AVIATION	-	.0	.0	.0
MILITARY	-	.0	.0	.0

P R O P O R T I O N S

TRACK	RUNWAY	COMMERCIAL DAY	COMMERCIAL EVENING	COMMERCIAL NIGHT	GENERAL AVIATION DAY	GENERAL AVIATION EVENING	GENERAL AVIATION NIGHT	MILITARY DAY	MILITARY EVENING	MILITARY NIGHT
td1	P01	.53	.00	.33	.00	.00	.00	.00	.00	.00
td2	P01	.06	.00	.22	.00	.00	.00	.00	.00	.00
td3	P01	.36	.00	.22	.00	.00	.00	.00	.00	.00
td4	P01	.06	.00	.22	.00	.00	.00	.00	.00	.00
	TOTAL	1.00	.00	1.00	.00	.00	.00	.00	.00	.00

FIGURE 5-6 SAMPLE ECHO REPORT: TAKEOFF TRACKS AND OPERATIONS

HELIPORT NOISE MODEL - ECHO REPORT PAGE 9

L A N D I N G - T R A C K S REPORT 10 - PART A

TRACK	RUNWAY	INITIAL HEADING	SEGMENT	DIRECTION	LENGTH (NMI)	TURN ANGLE (DEG)	RESULTANT HEADING (DEG)	TURN RADIUS (NMI)
ta1	P01	305	1	STRAIGHT	.05		305	
			2	RIGHT		145	90	.10
			3	STRAIGHT	1.65		90	
ta2	P01	305	1	STRAIGHT	.05		305	
			2	RIGHT		15	320	.10
			3	STRAIGHT	1.65		320	
ta3	P01	35	1	STRAIGHT	.03		35	
			2	LEFT		45	350	.10
			3	STRAIGHT	.03		350	
			4	RIGHT		100	90	.10
			5	STRAIGHT	1.65		90	
ta4	P01	35	1	STRAIGHT	.03		35	
			2	LEFT		75	320	.10
			3	STRAIGHT	1.65		320	

HELIPORT NOISE MODEL - ECHO REPORT PAGE 10

L A N D I N G - O P E R A T I O N S REPORT 10 - PART B

TRACK	RUNWAY	AIRCRAFT	CLASS	PROFILE	OPERATIONS DAY	EVENING	NIGHT
ta1	P01	A109	COM	AA109	.38	.00	.13
		S76	COM	AS76	2.00	.00	.00
ta2	P01	A109	COM	AA109	.38	.00	.13
ta3	P01	A109	COM	AA109	1.13	.00	.38
		S76	COM	AS76	6.00	.00	.00
ta4	P01	A109	COM	AA109	1.13	.00	.38

HELIPORT NOISE MODEL - ECHO REPORT PAGE 11

L A N D I N G - D I S T R I B U T I O N REPORT 10 - PART C

		O P E R A T I O N S DAY	EVENING	NIGHT
COMMERCIAL	-	11.0	.0	1.0
GENERAL AVIATION	-	.0	.0	.0
MILITARY	-	.0	.0	.0

		P R O P O R T I O N S								
		COMMERCIAL			GENERAL AVIATION			MILITARY		
TRACK	RUNWAY	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT
ta1	P01	.22	.00	.13	.00	.00	.00	.00	.00	.00
ta2	P01	.03	.00	.13	.00	.00	.00	.00	.00	.00
ta3	P01	.65	.00	.37	.00	.00	.00	.00	.00	.00
ta4	P01	.10	.00	.37	.00	.00	.00	.00	.00	.00
	TOTAL	1.00	.00	1.00	.00	.00	.00	.00	.00	.00

FIGURE 5-7 SAMPLE ECHO REPORT: LANDING TRACKS AND OPERATIONS

HELIPORT NOISE MODEL - ECHO REPORT PAGE 12

TAXI - TRACKS

REPORT 11 - PART A

TRACK	RUNWAY	INITIAL HEADING	SEGMENT	DIRECTION	LENGTH (NMI)	TURN ANGLE (DEG)	RESULTANT HEADING (DEG)	TURN RADIUS (NMI)
tx1	P01	90	1	STRAIGHT	.04		90	
tx2	P01	90	1	STRAIGHT	.04		90	

HELIPORT NOISE MODEL - ECHO REPORT PAGE 13

TAXI - OPERATIONS

REPORT 11 - PART B

TRACK	RUNWAY	AIRCRAFT	CLASS	STAGE	TAXI PROFILE	PROFILE	OPERATIONS DAY	EVENING	NIGHT
tx1	P01	A109	COM	2	GA109	GA109	1.00	.00	.00
tx2	P01	A109	COM	2	GA109	GA109	1.00	.00	.00

HELIPORT NOISE MODEL - ECHO REPORT PAGE 14

TAXI - DISTRIBUTION

REPORT 11 - PART C

		OPERATIONS DAY	EVENING	NIGHT
COMMERCIAL	-	2.0	.0	.0
GENERAL AVIATION	-	.0	.0	.0
MILITARY	-	.0	.0	.0

PROPORTIONS

TRACK	RUNWAY	COMMERCIAL DAY	EVENING	NIGHT	GENERAL AVIATION DAY	EVENING	NIGHT	MILITARY DAY	EVENING	NIGHT
tx1	P01	.50	.00	.00	.00	.00	.00	.00	.00	.00
tx2	P01	.50	.00	.00	.00	.00	.00	.00	.00	.00
	TOTAL	1.00	.00	.00	.00	.00	.00	.00	.00	.00

FIGURE 5-8 SAMPLE ECHO REPORT: TAXI TRACKS AND OPERATIONS

```
HELIPORT NOISE MODEL - ECHO REPORT
                                                            PAGE  15

P R O C E S S E S
-----------------                                          REPORT 12

DATA BASE
   *AIRB212
   *AIRS61
   *AIRS64
   *AIRCH47C
   *AIRH500C
   *AIRBO105
   *AIRB47G
   *AIRSA330J
   *AIRB206L
   *AIRA109
   *AIRSA341G
   *AIRH300C
   *AIRS65
   *AIRS70
   *AIRS76
   *PFMH500C
   *PFMS76
   *NOIA109
   *NOIS76
   *PROS76
   *END
VERIFY

EXECUTE

PREVIEW
   *PROA109
   *PROS76
   *APPA109
   *APPS76
   *TAXA109
   *TAXS76
   *TRA
      PLOT
      X AXIS       8.5
      Y AXIS      11.0
      SCALE     1000.0
      USER DEFINED CENTERING     ORIGIN (        .0,        .0)
   *END
HELIPORT NOISE MODEL - ECHO REPORT
                                                            PAGE  16

P R O C E S S E S (CONT.)
----------------- -------

GRID
   METRIC = LDN
   STARTING POINT =    -1200.   -1200.
   STEP =        200.     200.
   SIZE =      11   11
   REPORT

CONTOUR
   LEVELS =  55.00  60.00  65.00
   METRIC LDN
   TOLERANCE =  .50
   REFINEMENT =  5
   WINDOW =    -2000.  -2000.   2000.   2000.
   SAVED AS CON001
   REPORT
   PLOT
      X AXIS       8.5
      Y AXIS      11.0
      SCALE      400.0
      USER DEFINED CENTERING     ORIGIN (        .0,        .0)

RETRIEVE
   LEVELS =  65.00  75.00
   NAME CON001
   WINDOW =  -10000. -10000.  10000.  10000.
   REPORT
Stop - Program terminated.
```

FIGURE 5-9 SAMPLE ECHO REPORT: PROCESS

5.2 Data Base Reports

The Data Base Print module produces reports which present the internally stored aircraft performance and noise data in an easily read tabular format and, if desired, plots of the performance data. Subsection 3.4.1 describes how to obtain these reports.

Figure 5-10 is a sample Data Base Report for the S76 helicopter from the Data Base. The Data Base Print module can generate the following five sub-reports for this selection option:

1) Performance Data
2) Noise Curve Data
3) Test Takeoff Profile
4) Test Approach Profile
5) Test Taxi Profile

The first section of the Data Base Report presents aircraft definition data. The aircraft identification number, name, description, and category are shown, followed by the gross weight, number of engines, number of rotors, and rotor rpm. Many of these items are for identification only, and are not used for computation. As discussed in Subsection 3.4.1, items are retrieved from the data base by names, not identification numbers. Default durations of static modes are then given along with flight performance data.

The second section of the Data Base Report presents aircraft noise curve data. The noise curve name follows the report header information. The static noise level and SEL noise tables are then given. Each table shows the noise values for eight slant distances and up to nine thrust levels. Slant distances are given in feet, whereas thrusts are identified by flight mode. For static noise curves, a default duration is given in seconds. For SEL curves, a default velocity is given. There can be separate static noise curves for hard (H) and soft (S) ground, and separate SEL curves for left (L), center line (C), and right (R) of the flight path.

The equation constants used to compute these offsets from the noise curves for various operations are then printed.

HELICOPTER DEFINITION DATA

NUMBER	NAME	DESCRIPTION	CATEGORY
15	S76	SIKORSKY S-76	HCOM

WEIGHT(LB)	NUMBER OF ENGINES	NUMBER OF WHEELS
10000	1	0

NUMBER OF ROTORS	ROTOR DIAMETER(FT)	ROTOR SPEED(RPM)
0	.0	0.

DURATION OF STATIC MODES(SEC):	GROUND IDLE	FLIGHT IDLE	HIGE	HOGE
	60.0	120.0	3.0	3.0

TAKEOFF Vy(KT)	APPROACH Vy(KT)
74.0	74.0

BEST RATE OF CLIMB(FPM)	CLIMB ANGLE(DEG)	DESCENT ANGLE(DEG)
1350	10.3	6.0

FIGURE 5-10 SAMPLE DATA BASE REPORT FOR THE S76 HELICOPTER

(Part 1 of 4)

NOISE CURVE DATA

NOISE CURVE NAME: S76

STATIC NOISE LEVELS(STNDB)

	MODE							
	GIDL-H	GIDL-S	FIDL-H	FIDL-S	HIGE-H	HIGE-S	HOGE-H	HOGE-S
VELOCITY(KT)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
DISTANCE(FT)								
200.	75.0	73.0	81.0	79.0	87.0	85.0	90.0	88.0
400.	68.8	66.3	74.8	72.3	80.8	78.3	83.8	81.3
630.	65.1	61.6	71.1	67.6	77.1	73.6	80.1	76.6
1000.	60.4	54.4	66.4	60.4	72.4	66.4	75.4	69.4
2000.	53.7	45.2	59.7	51.2	65.7	57.2	68.7	60.2
4000.	46.6	36.8	52.6	42.8	58.6	48.8	61.6	51.8
6300.	42.2	32.2	48.2	38.2	54.2	44.2	57.2	47.2
10000.	36.1	26.1	42.1	32.1	48.1	38.1	51.1	41.1

SEL NOISE LEVELS(DBA)

	MODE								
	TOFF-L	TOFF-C	TOFF-R	APPR-L	APPR-C	APPR-R	LFLY-L	LFLY-C	LFLY-R
VELOCITY(KT)	.0	74.0	.0	.0	74.0	.0	.0	124.0	.0
DISTANCE(FT)									
200.	94.9	94.9	94.9	95.6	95.6	95.6	90.3	90.3	90.3
400.	90.1	90.1	90.1	91.5	91.5	91.5	87.6	87.6	87.6
630.	87.3	87.3	87.3	89.0	89.0	89.0	86.0	86.0	86.0
1000.	83.8	83.8	83.8	85.8	85.8	85.8	83.1	83.1	83.1
2000.	78.9	78.9	78.9	81.0	81.0	81.0	77.1	77.1	77.1
4000.	74.1	74.1	74.1	75.6	75.6	75.6	71.0	71.0	71.0
6300.	71.3	71.3	71.3	72.1	72.1	72.1	67.5	67.5	67.5
10000.	67.8	67.8	67.8	68.3	68.3	68.3	63.1	63.1	63.1

FIGURE 5-10 SAMPLE DATA BASE REPORT FOR THE S76 HELICOPTER

(Part 2 of 4)

NOISE CURVE DATA - PAGE 2

NOISE CURVE NAME: S76

EQUATION CONSTANTS

GIDL-H	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
GIDL-S	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
FIDL-H	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
FIDL-S	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
HIGE-H	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
HIGE-S	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
HOGE-H	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
HOGE-S	.00000	.00000	.00000	.00000	.00000	.00000
	.00000	.00000	.00000	.00000	.00000	.00000
TOFF-L	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
TOFF-C	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
TOFF-R	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
APPR-L	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
APPR-C	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
APPR-R	.00	.00	.00	.00	.00	.00
	.00	.00	.00	.00	.00	.00
LFLY-L	.38	31.76	434.70	.00	.00	.00
	.00	.00	.00	.00	.00	.00
LFLY-C	.38	31.76	434.70	.00	.00	.00
	.00	.00	.00	.00	.00	.00
LFLY-R	.38	31.76	434.70	.00	.00	.00
	.00	.00	.00	.00	.00	.00

FIGURE 5-10 SAMPLE DATA BASE REPORT FOR THE S76 HELICOPTER

(Part 3 of 4)

TEST TAKEOFF PROFILE

PROFILE NAME: TS76

DISTANCE FROM HELIPAD(FT)	ALTITUDE(FT)	DURATION(SEC)/ VELOCITY(KTS)*	MODE
.0	.0	60.0	GIDLE
.0	.0	180.0	FIDLE
.0	.0	3.0	VASC
.0	15.0	16.0	ACLH
100.0	15.0	30.0	ACLC
562.0	30.0	60.0	TO
4032.0	1000.0	60.0	TO
6786.0	1000.0	100.0	LFLO

TEST APPROACH PROFILE

PROFILE NAME: AS76

DISTANCE FROM HELIPAD(FT)	ALTITUDE(FT)	DURATION(SEC)/ VELOCITY(KTS)*	MODE
99999.0	1000.0	100.0	LFLO
10535.0	1000.0	100.0	APPR
4819.0	1000.0	60.0	DCLH
3062.0	500.0	60.0	DCLD
.0	15.0	3.0	HOGE
.0	.0	120.0	GIDLE
.0	.0	.0	
.0	.0	.0	

TEST TAXI PROFILE

PROFILE NAME: GS76

DISTANCE FROM HELIPAD(FT)	ALTITUDE(FT)	DURATION(SEC)/ VELOCITY(KTS)*	MODE
.0	.0	60.0	GIDLE
.0	.0	120.0	FIDLE
.0	.0	2.0	HIGE
.0	3.0	10.0	HIGE
5280.0	3.0	10.0	HIGE
.0	3.0	2.0	HIGE
.0	.0	120.0	GIDLE
.0	.0	.0	

* Durations are associated with static modes, velocities with moving modes.

FIGURE 5-10 SAMPLE DATA BASE REPORT FOR THE S76 HELICOPTER

(Part 4 of 4)

The last sections of the Data Base Report present the test takeoff, approach, and taxi profiles for the aircraft. The profile identification name follows the report header information. For each segment of a profile, the distance from brake release, altitude, speed, and thrust are given. A maximum of 14 segments can be stored in the HNM Data Base.

Figure 5-11 is a sample Data Base Plot of the Sound Exposure Level (SEL) vs. distance data retrieved by noise curve name. The noise curve name is shown in the heading. The X-axis is logarithmic and shows the slant range distance in feet. The Y-axis is the noise units in decibels. Each curve represents a different operating mode.

Figure 5-12 is a sample Data Base Plot of a test takeoff profile. The plot displays aircraft altitude in feet as a function of distance in feet from the helipad.

5.3 Preview Plot

The Preview module produces plots of takeoff profiles and tracks appended to helipads. Subsection 3.4.2 describes how to obtain these plots.

A Preview plot of a takeoff profile is identical in format to the Data Base Plot as shown in Figure 5-12. Unlike Data Base, Preview plots the user-defined takeoff profiles contained within the input file.

Figure 5-13 is a sample Preview plot of helipads and tracks. The outer border of the plot is drawn to user specified height and width. The default width is 8.5 inches and the default height is 11 inches. An inner border serves as a window against which the heliport helipads, tracks, and coordinate system axes are drawn. Any helipads, tracks, or portions of these that lie outside this window will not be shown.

The heliport origin used in the helipad definitions is automatically centered within the plotting area. This default may be overridden if the user inputs non-zero plot origin values. Tic marks are drawn along the X- and Y-axes of the heliport coordinate system every 1,000 feet, regardless of scale.

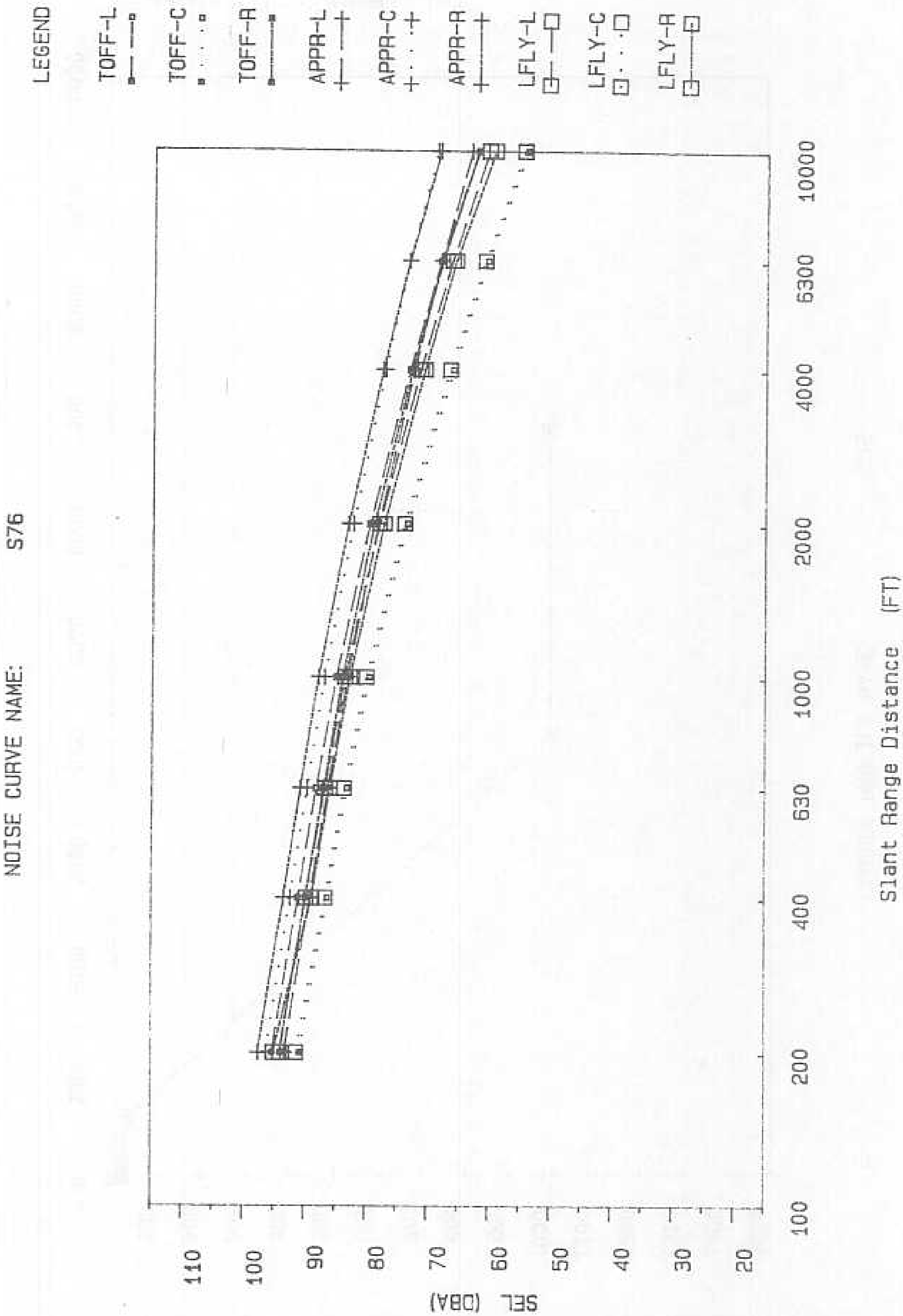


FIGURE 5-11 SAMPLE NOISE CURVE PLOT PRODUCED AS A DATA BASE REPORT

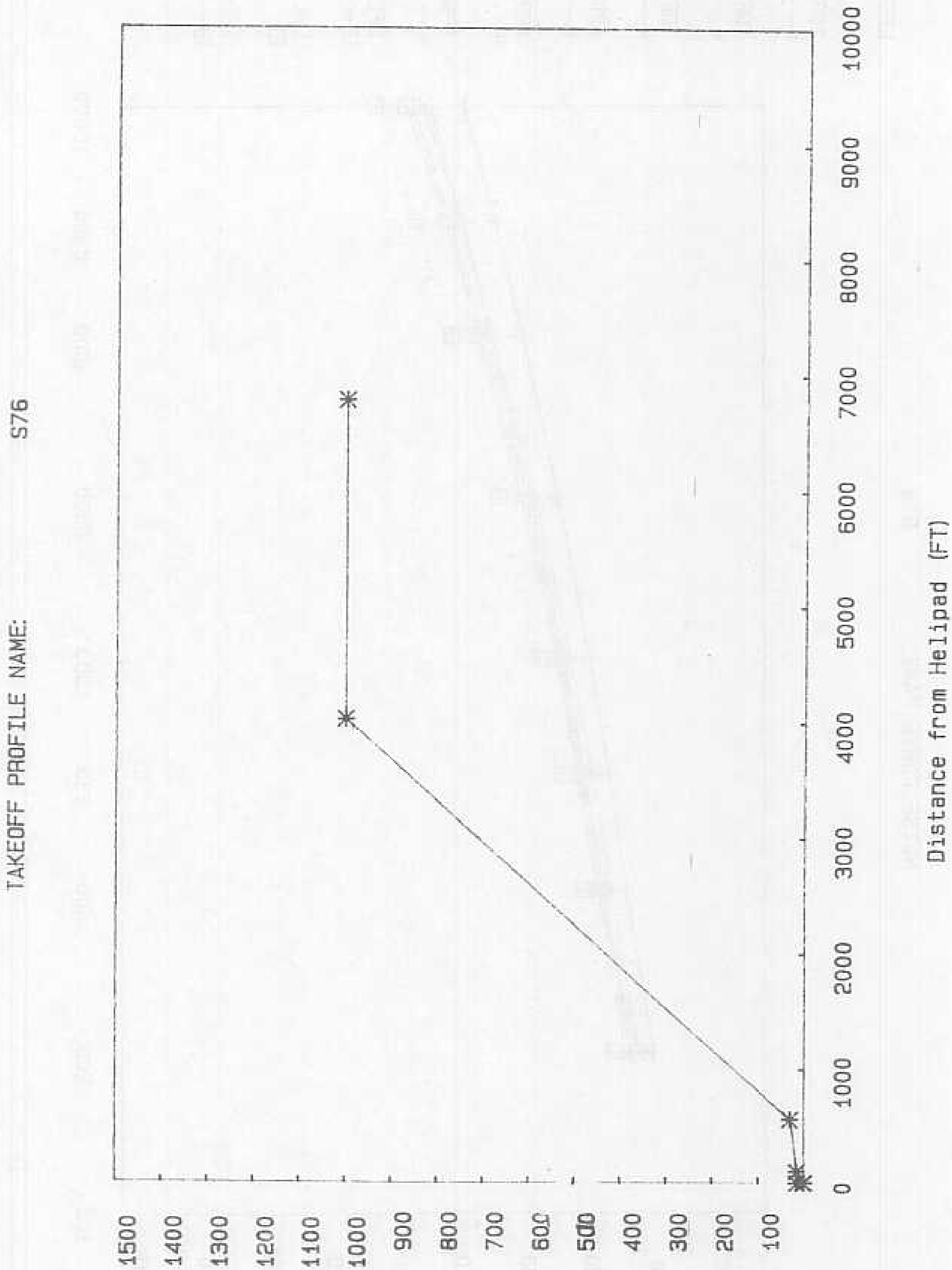


FIGURE 5-12 SAMPLE DATA BASE PLOT OF A TEST TAKEOFF PROFILE

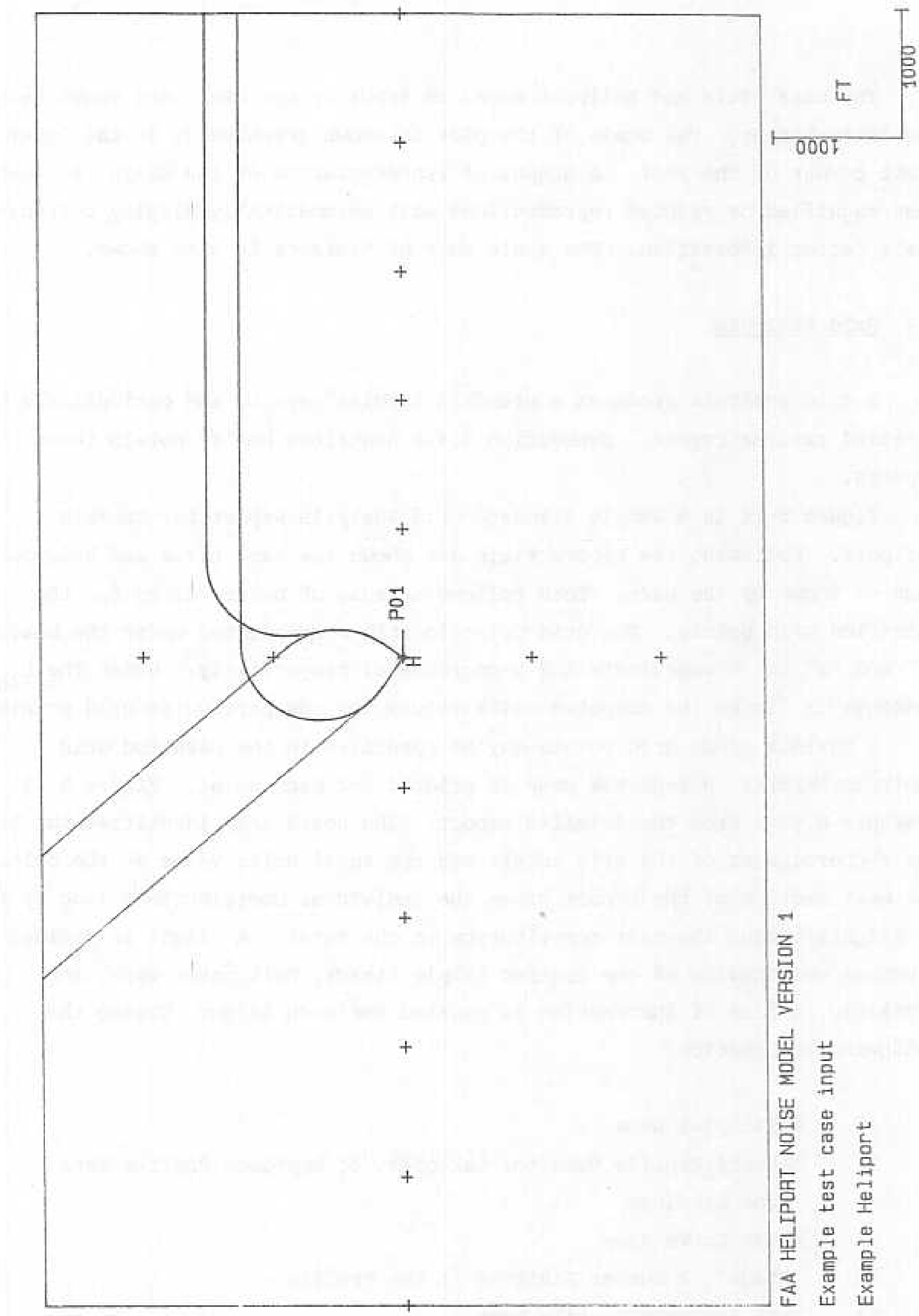


FIGURE 5-13 PREVIEW PLOT OF HELIPADS AND FLIGHT TRACKS FOR THE EXAMPLE HELIPORT

The case title and heliport name, as input by the user, are shown below the inner border. The scale of the plot is shown graphically in the lower right corner of the plot. A graphical representation of the scale is shown so that magnified or reduced reproductions will automatically display correct scale factor information. The scale unit of distance is also shown.

5.4 Grid Analysis

A grid analysis produces a standard tabular report, and optionally a detailed tabular report. Subsection 3.4.3 describes how to obtain these reports.

Figure 5-14 is a sample Standard Grid Analysis Report for Example Heliport. Following the report title are shown the case title and heliport name as input by the user. Then follows a table of noise values for the specified grid points. The grid point locations are listed under the headings "X" and "Y" for X-coordinate and Y-coordinate, respectively. Under the L_{dn} headings is listed the computed noise values for the particular grid points.

A maximum of 20 grid points may be specified in the Detailed Grid Analysis Report. A separate page is printed for each point. Figure 5-15 presents a page from the detailed report. The boxed area identifies the X- and Y-coordinates of the grid point, and the total noise value at the point. The next section of the report gives the individual contributions made by the 20 flights making the most contribution to the total. A flight is defined as a unique combination of the ordered triple (track, helicopter type, and profile). A line of information is printed for each flight, giving the following information:

1) Helicopter Name
2) Takeoff Profile Name for Takeoffs, or Approach Profile Name for Landings
3) Noise Curve Name
4) "Stage", a Number Assigned to the Profile
5) Taxi Approach Profile Name
6) Flight Type, "T" for Takeoff, "A" for Approach, and "G" for Taxi
7) Track Name

HELIPORT NOISE MODEL - STANDARD GRID ANALYSIS   REPORT

Example test case input

HELIPORT - Example Heliport

X	Y	LDN	X	Y	LDN
-1200.	-1200.	47.0	-1000.	-1200.	47.6
-800.	-1200.	48.1	-600.	-1200.	48.6
-400.	-1200.	49.1	-200.	-1200.	49.4
0.	-1200.	49.6	200.	-1200.	49.5
400.	-1200.	49.3	600.	-1200.	48.9
800.	-1200.	48.5	-1200.	-1000.	47.9
-1000.	-1000.	48.6	-800.	-1000.	49.2
-600.	-1000.	49.9	-400.	-1000.	50.5
-200.	-1000.	50.9	0.	-1000.	51.2
200.	-1000.	51.1	400.	-1000.	50.7
600.	-1000.	50.2	800.	-1000.	49.6
-1200.	-800.	48.7	-1000.	-800.	49.6
-800.	-800.	50.5	-600.	-800.	51.3
-400.	-800.	52.0	-200.	-800.	52.7
0.	-800.	53.0	200.	-800.	52.9
400.	-800.	52.3	600.	-800.	51.6
800.	-800.	50.7	-1200.	-600.	49.6
-1000.	-600.	50.6	-800.	-600.	51.7
-600.	-600.	52.8	-400.	-600.	53.8
-200.	-600.	54.8	0.	-600.	55.4
200.	-600.	55.2	400.	-600.	54.3
600.	-600.	53.1	800.	-600.	51.9
-1200.	-400.	50.4	-1000.	-400.	51.6
-800.	-400.	53.0	-600.	-400.	54.5
-400.	-400.	56.1	-200.	-400.	57.6
0.	-400.	58.7	200.	-400.	58.2
400.	-400.	56.5	600.	-400.	54.6
800.	-400.	53.1	-1200.	-200.	51.1
-1000.	-200.	52.5	-800.	-200.	54.1
-600.	-200.	56.1	-400.	-200.	58.5
-200.	-200.	61.5	0.	-200.	64.4
200.	-200.	62.5	400.	-200.	58.8
600.	-200.	56.1	800.	-200.	54.1
-1200.	0.	51.7	-1000.	0.	53.3
-800.	0.	55.2	-600.	0.	57.5
-400.	0.	60.7	-200.	0.	65.6
0.	0.	108.6	200.	0.	79.4
400.	0.	60.2	600.	0.	57.0
800.	0.	54.8	-1200.	200.	52.4
-1000.	200.	54.1	-800.	200.	56.3
-600.	200.	59.1	-400.	200.	63.5
-200.	200.	66.0	0.	200.	67.6
200.	200.	67.0	400.	200.	61.6
600.	200.	58.0	800.	200.	55.7
-1200.	400.	52.9	-1000.	400.	54.8
-800.	400.	57.4	-600.	400.	60.6
-400.	400.	63.9	-200.	400.	63.0
0.	400.	64.2	200.	400.	67.2
400.	400.	62.0	600.	400.	58.4
800.	400.	56.2	-1200.	600.	53.6
-1000.	600.	55.5	-800.	600.	58.0
-600.	600.	61.1	-400.	600.	61.8
-200.	600.	61.5	0.	600.	63.0
200.	600.	65.5	400.	600.	61.8
600.	600.	58.5	800.	600.	56.6
-1200.	800.	54.0	-1000.	800.	55.7
-800.	800.	58.1	-600.	800.	60.4
-400.	800.	60.8	-200.	800.	61.0
0.	800.	62.8	200.	800.	63.9
400.	800.	61.1	600.	800.	58.6
800.	800.	56.9			

*** CALCULATING GRID LOCATIONS

FIGURE 5-14 STANDARD GRID ANALYSIS REPORT

HELIPORT NOISE MODEL - DETAILED GRID ANALYSIS REPORT


```
----------------------------------
I                                I
I X =     200.     Y =        0. I
I                                I
I METRIC LDN       TOTAL = 79.4  I
I                                I
----------------------------------
```

AIRCRAFT	PROFILE	NOISE CURVE	STAGE	TAXI APPROACH	FLIGHT TYPE	TRACK	HELIPAD	SEL	OPERATIONS DAY	OPERATIONS EVENING	OPERATIONS NIGHT	CONTRIBUTION
A109	GA109	A109	2	GA109	G	tx1	P01	125.7	1.0	.0	.0	.76265E+02
A109	GA109	A109	2	GA109	G	tx2	P01	125.7	1.0	.0	.0	.76265E+02
A109	AA109	A109	0		A	ta3	P01	100.4	1.1	.0	.4	.57972E+02
A109	AA109	A109	0		A	ta4	P01	100.4	1.1	.0	.4	.57971E+02
S76	AS76	S76	0		A	ta3	P01	98.0	6.0	.0	.0	.56370E+02
S76	TS76	S76	1		T	td3	P01	96.1	3.2	.0	.0	.51786E+02
A109	TA109	A109	1		T	td1	P01	94.7	.9	.0	.3	.51193E+02
A109	TA109	A109	1		T	td3	P01	96.2	.6	.0	.2	.50973E+02
A109	TA109	A109	1		T	td4	P01	96.2	.6	.0	.2	.50900E+02
S76	TS76	S76	1		T	td1	P01	93.3	4.8	.0	.0	.50746E+02
A109	AA109	A109	0		A	ta1	P01	97.2	.4	.0	.1	.50077E+02
S76	AS76	S76	0		A	ta1	P01	96.1	2.0	.0	.0	.49745E+02
A109	AA109	A109	0		A	ta2	P01	96.7	.4	.0	.1	.49577E+02
A109	TA109	A109	1		T	td2	P01	94.5	.6	.0	.2	.49237E+02

PEAK LEVEL = 125.7

DECIBELS BELOW 126

		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
NUMBER OF FLIGHTS	-	2	0	0	0	0	0	0	0	0	0
NUMBER OF OPERATIONS	DAY -	2	0	0	0	0	0	0	0	0	0
	EVENING-	0	0	0	0	0	0	0	0	0	0
	NIGHT -	0	0	0	0	0	0	0	0	0	0

FIGURE 5-15 SAMPLE PAGE OF A DETAILED GRID ANALYSIS REPORT

8) Helipad Designation

9) Individual SEL at the Grid Point

10) Number of Daytime and Nighttime Operations (Evening operations are not accessible in the HNM.)

11) Individual Contribution to the Total Noise Exposure

Printed below this table is the highest noise level for all flights over the point. A table showing the number of flights having noise levels within approximately 10 decibels of the peak level then follows. The table shows the distribution of these flights by 1 decibel increments from the first whole number level which equals or exceeds the peak level. The number of daytime and nighttime operations for these flights is also given.

5.5 Contour Analysis

Two types of output can be produced from a contour analysis: a tabular Contour Report and a Contour Plot. Subsection 3.4.4 describes how to obtain these outputs. Their contents are discussed in the following subsections.

5.5.1 Contour Report

The Contour Analysis Report provides a list of the points which define the contours of equal noise values within the user-specified or default contour window. Separate reports are given for each level requested. Figure 5-16 represents a sample page from this report.

Following the report title are shown the contour name, case title, and heliport name as input by the user. Next is the level for which the contour was created, the total area in square miles encompassed by the contour, and the noise metric, L_{dn}. This information is followed by a table of points defining the contour. A contour may be comprised of several distinct and separate areas, called "islands". Within the table, these islands are identified by sequential indexes under the header "ISLAND". Then, for each island, the table prints out a point identifier and the X- and Y-coordinates of the point for each point on the contour island. To conserve space, the points are printed three to a line. The island indicator is printed only once, just before the first point of the island.

HELIPORT NOISE MODEL - CONTOUR ANALYSIS REPORT PAGE 1

C O N T O U R - CON001

Example test case input
HELIPORT - Example Heliport
LEVEL = 55.0 DB AREA = .19 METRIC = LDN

ISLAND	PNT	X	Y	PNT	X	Y	PNT	X	Y
1	1	-832.	2000.	2	-943.	1943.	3	-976.	1750.
	4	-1000.	1616.	5	-1021.	1521.	6	-1022.	1500.
	7	-1019.	1481.	8	-1084.	1250.	9	-1105.	1105.
	10	-1094.	1000.	11	-1083.	917.	12	-1084.	833.
	13	-1084.	750.	14	-1073.	661.	15	-1034.	534.
	16	-1024.	500.	17	-1019.	481.	18	-1000.	433.
	19	-983.	375.	20	-960.	290.	21	-941.	250.
	22	-893.	143.	23	-886.	125.	24	-882.	118.
	25	-875.	104.	26	-823.	0.	27	-801.	-51.
	28	-757.	-125.	29	-750.	-137.	30	-710.	-210.
	31	-679.	-250.	32	-625.	-316.	33	-599.	-349.
	34	-566.	-375.	35	-500.	-427.	36	-460.	-460.
	37	-384.	-500.	38	-372.	-507.	39	-250.	-573.
	40	-179.	-608.	41	-120.	-620.	42	-3.	-627.
	43	0.	-627.	44	50.	-625.	45	123.	-623.
	46	124.	-623.	47	125.	-623.	48	126.	-623.
	49	128.	-622.	50	250.	-599.	51	325.	-575.
	52	375.	-547.	53	444.	-500.	54	478.	-478.
	55	500.	-454.	56	578.	-375.	57	601.	-351.
	58	625.	-312.	59	671.	-250.	60	701.	-201.
	61	735.	-125.	62	750.	-82.	63	774.	-24.
	64	783.	0.	65	815.	65.	66	846.	125.
	67	854.	146.	68	875.	202.	69	897.	250.
	70	924.	326.	71	943.	375.	72	980.	480.
	73	987.	500.	74	990.	510.	75	1000.	536.
	76	1035.	607.	77	1045.	614.	78	1099.	700.
	79	1146.	764.	80	1192.	808.	81	1298.	905.
	82	1324.	926.	83	1442.	1000.	84	1477.	1023.
	85	1500.	1039.	86	1601.	1101.	87	1750.	1191.
	88	1788.	1212.	89	1846.	1250.	90	1992.	1492.
	91	1997.	1500.	92	1750.	1730.	93	1740.	1740.
	94	1723.	1750.	95	1500.	1824.	96	1367.	1867.
	97	1250.	1887.	98	1092.	1908.	99	1000.	1930.
	100	939.	1939.	101	750.	1945.	102	565.	1935.
	103	500.	1933.	104	418.	1918.	105	250.	1901.
	106	106.	1894.	107	0.	1876.	108	-118.	1882.
	109	-250.	1899.	110	-458.	1958.	111	-500.	1966.
	112	-548.	1952.	113	-656.	2000.			

FIGURE 5-16 SAMPLE CONTOUR ANALYSIS REPORT

If, for a given level, there is no contour within the contour window, the table of points will not be printed. In addition, the area value will be 0.00.

5.5.2 Contour Plot

The Contour Plot option of the Contour Analysis produces a plot of selected L_{dn} contours around a heliport. Subsection 4.6 describes how to obtain a Contour Plot.

Figure 5-17 is a sample Contour plot. The outer border of the plot is drawn to user-specified height and width. As the default, the plot width is 8.5 inches and the plot height is 11 inches. An inner border is drawn to define the actual plotting area. This border serves as a window against which the heliport noise contours and coordinte system axes are drawn. Any contours or portions of contours that lie outside of this window will not be shown.

The heliport origin, used in the helipad definitions, is automatically centered within the plotting area. This default may be overridden if the user inputs non-zero plot origin values. Tic marks are drawn along the X- and Y-axes of the airport coordinate system every 1,000 feet regardless of scale. Each contour is drawn and annotated with its noise level.

The case title and heliport name as input by the user are shown below the inner border. The scale of the contour plot is shown graphically in the lower right corner of the plot. A graphical representation of the scale is shown so that magnified or reduced reproductions will automatically display correct scale factor information. The scale unit of distance is also shown.

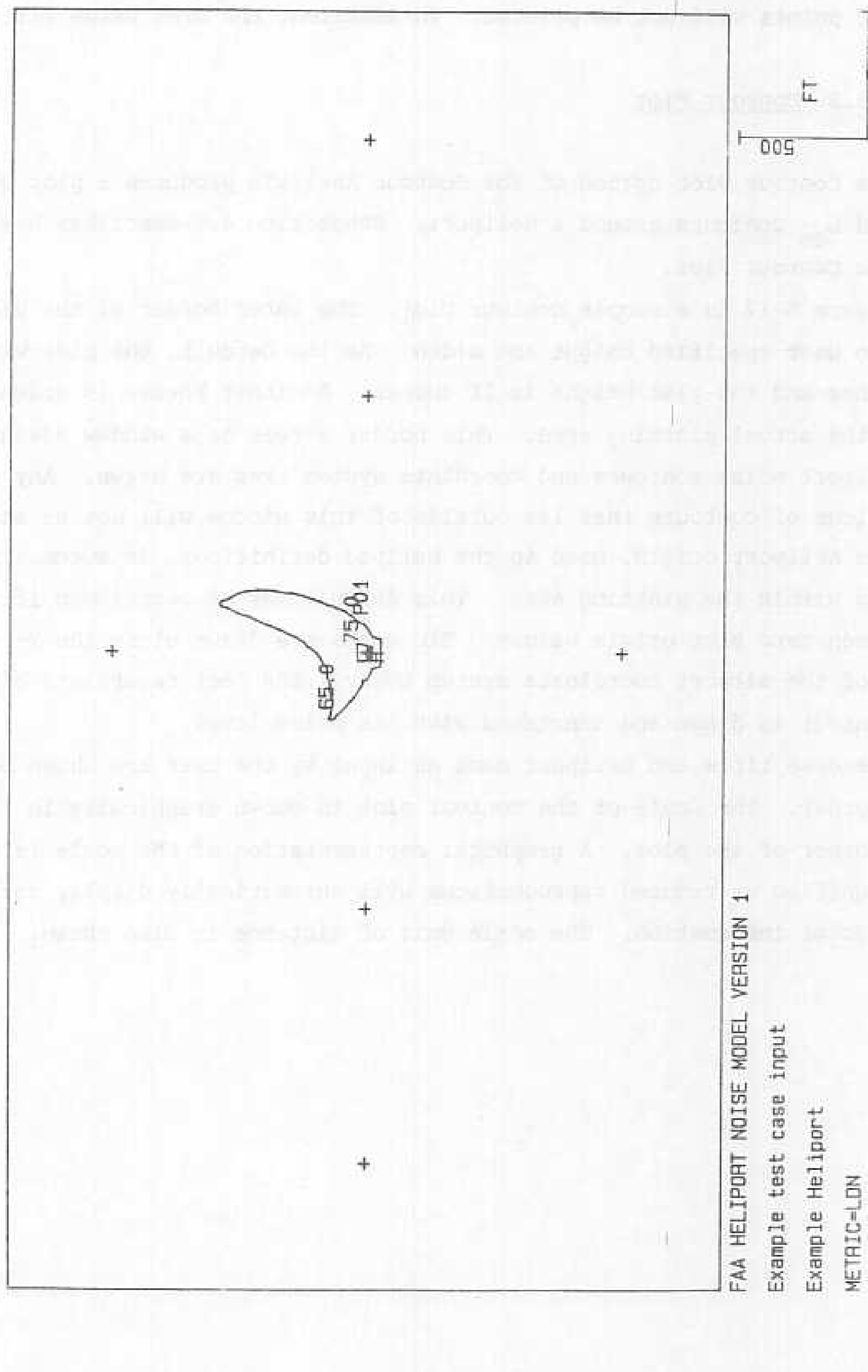


FIGURE 5-17 CONTOUR PLOT

6.0 REFERENCES

1. "INM Integrated Noise Model Version 3 User's Guide", Report No. FAA-EE-81-17, October, 1982.

2. Federal Register Vol. 51, No. 213, "Expansion of Applicablity of Part 150 to Heliports", U.S. Department of Transportation, Federal Aviation Administration, November 4, 1986.

APPENDIX A

HELICOPTER NOISE DATA BASE

APPENDIX A

HELICOPTER NOISE DATA BASE

Database 1 contains partial data on 18 helicopters. All of the data have been developed in a consistent manner and are intended to provide information regarding directional characteristics.

In-flight directionality in terms of elevation angle is accounted for by three sets of sound exposure level (SEL) data, left, center, and right. The left and right data are corrected to elevation angles of 45°. The center data are for an elevation angle of 90°. All of these data were processed from the measured sound time history recordings to sound exposure level adjusting to propagations through the SAE reference atmosphere. The calculations were made with either the "integrated" procedure (Ref. A1) or the "simplified" procedure described in FAR Part 36 (Ref. A2) with a value of 10.0 used as a multiplier to account for distance duration effects in the delta-2 adjustment factor.

The approach noise versus distance data are for 6° descent angles using ICAO procedures where data were reported for more than one velocity. The takeoff data also used the ICAO procedure where data were reported for more than one velocity. The overflight data were based on level flights at a nominal altitude of 500 feet. The tabulated data represent the median speed measured. Data at other velocities are calculated by adding a delta dB correction to the tabulated noise data. The delta dB is calculated using the constants from a polynomial regression of the existing data using the formula:

$$\Delta dB = B_0 + B_1 (M_t - M_{t\ ref}) + B_2 (M_t - M_{t\ ref})^2$$

where B_0, B_1 and B_2 are the constants calculated from the data and stored in the database

M_t is the tip speed for the advancing main rotor blade

and

$M_{t\ ref}$ is the tip speed for the main rotor when the helicopter velocity is zero at the flight RPM.

All of these data are provided by TSC (Ref. A3).

Static directivity in terms of azimuth measured clockwise from the helicopter's nose is accounted for by the coefficients of an 8° of freedom sine/cosine series which was derived from measurements a 45° intervals over both hard and soft surfaces. All of these coefficients have been derived by Southwest Research Institute (Ref. A4).

Table A-1 summarizes the helicopter noise data available in Database 1. Table A-2 reproduces the directivity data from Ref. A4. Tables A-3a through A-3r give specific data currently in Database 1 for each helicopter. Note that helicopters 3, 7, 12, 20, and 21 do not currently have takeoff, approach, or level flyover noise curves. These helicopters cannot be used in an analysis. The remaining helicopters may be used, however, avoid using static modes in profiles where no data is available; i.e., FIDLE and GIDLE.

Table A-1.

Status Summary of Helicopter Noise Data for Database 1

Order of Storage	Helicopter	Takeoff	Approach	Level Cruise	HOGE[3]	HIGE[3,4]	FIDLE	GIDLE
		Data Base Quantities[1]						
1	B212	X	X	(1 vel)[2]				
2	S-61	X	X	(1 vel)				
3	S-64							
4	CH-47D (BV 234)	X	X	X		DS		
5	H500D	X	X	X		DS		
6	BO105	X	X	(1 vel)				
7	B47G							
8	SA330J	X	X	(1 vel)				
9	B206L			(1 vel)		S		
10	A109	X	X	X		D		
11	SA341G	X	X	(1 vel)				
12	H300C							
13	S-65 (CH-53)	X	X	(1 vel)				
14	S-70(UH-60H)	X	X	X				
15	S-76	X	X	X		DS		
16	SA365N	X	X	X	S	DS		
17	SA355F	X	X	X	S	DS		
18	SA350D	X	X	X		DS		
19	B222	X	X	X	S	DS		
20	R22HP					D		
21	BK117					D		

[1] X indicates data from TSC for Database #1.

[2] (1 vel) indicates data available at only one velocity for left, center and right.

[3] S means L_A vs. Slant Distance available from TSC over soft ground.
H means L_A vs. Slant Distance available from TSC over hard ground.

[4] D means directivity constants available from SWRI for both hard and soft ground.

Table A-2. **Helicopter Directivity Pattern Coefficients**

Helicopter	Path	Coefficients - Cosine terms					Coefficients - Sine terms		
		a_0	a_1	a_2	a_3	a_4	b_1	b_2	b_3
Bell 222	Hard	-0.59237	-1.14299	-0.17480	0.94277	-0.20000	-1.60432	0.77495	-1.75457
	Soft	-0.28927	-0.32619	0.02495	-0.57387	-0.49992	-0.24125	-1.22508	-1.49111
SA-365N	Hard	-0.51802	-2.08223	0.17497	-0.66764	-0.41251	-0.10988	0.60010	2.09008
	Soft	-0.70137	-2.10033	0.64005	-1.44973	0.97506	-0.33335	1.00994	0.03671
H500D	Hard	-2.12589	-5.61492	-0.14977	1.31477	0.72498	-2.35532	0.60002	-0.75586
	Soft	-2.56115	-5.73704	0.77528	-0.36318	-1.03748	-0.42319	2.09986	-1.27355
AS355F	Hard	-1.90408	-4.89956	0.70010	-0.55044	-0.28749	-2.77874	0.97506	1.47104
	Soft	-0.74464	-3.28579	-0.19996	-1.16419	-0.42496	-0.51265	0.90008	0.93731
AS350D	Hard	-1.41909	-4.11177	-0.13475	-0.78845	0.41755	-0.30721	2.19995	-1.17742
	Soft	-0.53827	-2.61368	0.99996	-0.38626	-0.06249	-0.07613	-0.62508	0.32383
S-76A	Hard	-1.52630	-4.66072	-1.02507	-2.53935	-0.16230	-0.84154	-1.29996	-1.49132
	Soft	-1.55469	-4.23485	0.07482	-1.26503	-0.91239	1.05798	-2.45005	-0.49191
BV234/CH47D	Hard	-1.20323	0.73770	1.02505	-0.28766	-1.87506	2.18797	1.72490	0.88796
	Soft	-2.16113	0.49999	3.32500	-0.94996	-2.97504	3.52078	1.22459	0.12090
R22HP	Hard	-0.42677	-1.47011	-1.47506	-0.47983	-0.96245	-1.09134	-0.54978	0.80869
	Soft	-1.22094	-3.72551	2.10003	0.37548	0.42499	-0.25517	-0.85026	-0.80538
MBB BK117	Hard	-6.03468	-8.29072	-1.49959	-0.75959	-1.83743	-4.39023	3.27523	-0.24072
	Soft	-2.11642	-2.58532	-1.99998	2.43556	-1.92514	1.31973	0.10033	2.56920
Augusta 109	Hard	-0.54193	-0.97634	-1.32480	2.27624	0.53742	0.03165	0.80009	-0.81431
	Soft	-0.85536	0.41072	-1.10018	-0.26048	-1.71252	-0.56129	-0.72472	2.78881

REFERENCES FOR APPENDIX A

A1. Proposed SAE AIR-1845, "Procedures for the Calculation of Airplane Noise in the Vicinity of Airports."

A2. Federal Aviation Regulations Part 36.

A3. Series of Letter Reports from Transportation Systems Center (TSC) giving SEL or L_{eq} vs. distance data for helicopters, June-December 1986.

A4. Unruh, J. F., "Evaluation of Helicopter Directivity Hover in Ground Effect Data," for TSC under Contract No. DTRS-57-80-C-00086 by Southwest Research Institute, September 1986.

TABLE A-3a.

#1 NAME: BELL 212 SOURCE: TSC 48-FA-753-LR4 - 3 DEC. 86

SLANT DIST. (ft)	TAKEOFF @ 53.37 KTS			6° APPROACH @ 54.7 KTS			LEVEL FLYOVER @ 93.96 KTS		
	Left	Center	Right	Left	Center	Right	Left	Center	Right
200	93.4	92.1	95.5	93.9	97.5	97.8	95.1	95.7	97.3
400	90.1	88.8	92.3	90.6	94.3	94.5	91.7	92.3	93.8
630	87.8	86.4	89.8	88.4	92.1	92.2	89.3	90.0	91.3
1,000	85.2	83.9	87.3	85.9	89.7	89.7	86.6	87.5	88.5
2,000	80.9	79.7	82.9	82.0	85.9	85.4	82.1	83.4	83.8
4,000	75.6	74.7	77.5	77.3	81.4	80.1	76.7	78.7	78.1
6,300	71.4	70.9	73.2	73.8	77.8	75.8	72.5	74.9	73.8
10,000	66.2	66.5	67.9	69.5	73.4	70.3	67.7	70.4	68.9
Coefficients: No Wheels,				DIA = 48.19 FT,			RPM = 324		
B0							0	0	0
B1							0	0	0
B2							0	0	0
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle		Flight Idle		HIGE		HOGE	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								

TABLE A-3b.

#2 NAME: SIKORSKY S-61 (CH3A) SOURCE: TSC 48-FA-753-LR5 - 3 DEC. 86

SLANT DIST. (ft)	TAKEOFF @ 73.21 KTS			6° APPROACH @ 73.59 KTS			LEVEL FLYOVER @ 129.6 KTS		
	Left	Center	Right	Left	Center	Right	Left	Center	Right
200	96.8	95.3	96.3	95.1	95.0	94.8	96.1	93.3	95.0
400	93.3	91.8	92.9	91.6	91.7	91.3	92.5	89.7	91.5
630	90.7	89.2	90.5	89.2	89.3	88.9	90.0	87.2	89.0
1,000	87.9	86.2	87.8	86.5	86.8	86.3	87.2	84.3	86.3
2,000	83.2	81.2	83.2	81.9	82.7	81.8	82.5	79.5	81.6
4,000	77.5	75.1	77.7	76.9	77.8	76.3	76.6	73.8	76.0
6,300	73.1	70.3	73.3	72.0	74.0	72.1	72.0	69.3	71.5
10,000	67.9	64.6	68.1	66.9	69.6	67.1	66.5	63.9	66.3
Coefficients: Wheels,				DIA = 62 FT,			RPM = 203		
B0							0	0	0
B1							0	0	0
B2							0	0	0
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle		Flight Idle		HIGE		HOGE	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								

TABLE A-3c.

UNRUH — HNM DATABASE 1

TSC-48-FA-753-LR1 - 14 NOV. 86

#4 NAME: BOEING VERTOL CH-47D SOURCE: TSC-48-FA-653-LR24 - 16 SEPT. 86

SLANT DIST. (ft)	TAKEOFF @ 85 KTS (ICAO)			6° APPROACH AT 85 KTS (ICAO) (simplified 10 dB)			LEVEL FLYOVER @ 120 KTS (500 ft.)		
	Left	Center	Right	Left	Center	Right	Left	Center	Right
200	93.8	92.7	92.8	100.4	101.3	97.7	92.7	91.2	92.3
400	89.9	89.0	89.2	97.1	98.0	94.3	88.8	87.5	88.5
630	87.2	86.4	86.5	94.9	95.8	92.0	86.2	84.9	85.8
1,000	84.2	83.5	83.6	92.5	93.5	89.6	83.3	82.0	82.9
2,000	79.1	78.6	78.7	88.6	89.6	85.6	78.5	77.0	78.1
4,000	73.1	72.9	72.7	84.0	85.1	81.0	73.0	71.3	72.6
6,300	68.6	68.5	68.1	80.4	81.7	77.4	68.9	67.1	68.6
10,000	63.5	63.5	62.7	76.1	77.6	73.0	64.4	62.5	64.1
Coefficients: Wheels, 2 Rotors, DIA = 60.0 FT, RPM = 225									
B0							0	0	0
B1							36.97	42.21	33.86
B2							1418.53	2213.44	527.01
R^2 (not input)							1.00	1.00	1.00

STATIC CONDITIONS

SLANT DIST.	Ground Idle		Flight Idle		HIGE		HOGE	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
200						86.3		92.3
400						79.5		85.7
630						75.0		81.3
1,000						70.2		76.6
2,000						62.9		69.3
4,000						55.2		61.2
6,300						50.0		55.5
10,000						44.7		49.2
DIR					Yes	Yes		

TABLE A-3d.

UNRUH
TSC-48-FA-753-LR1 - 14 NOV. 86

HNM DATABASE 1

#5 NAME: HUGHES 500D SOURCE: TSC-48-FA-653-LR22 - 29 AUG. 86

SLANT DIST. (ft)	TAKEOFF @ 62 KTS (ICAO) Left	Center	Right	6° APPROACH @ 62 KTS Left	Center	Right	LEVEL FLYOVER @ 111 KTS Left (500 ft. alt. clock)	Center	Right
200	89.3	86.4	88.5	88.6	90.4	90.9	87.4	84.9	86.9
400	86.0	83.1	85.2	85.2	87.1	87.5	83.9	81.6	83.5
630	83.7	80.8	82.8	82.9	84.7	85.1	81.6	79.3	81.2
1,000	81.2	78.3	80.2	80.3	82.2	82.4	78.9	76.8	78.7
2,000	76.9	74.2	75.8	76.0	77.9	77.8	74.5	72.7	74.4
4,000	71.7	69.2	70.5	70.7	72.7	72.1	69.1	67.9	69.2
6,300	67.6	65.1	66.1	66.5	68.5	67.4	65.0	64.2	65.3
10,000	62.4	60.3	60.7	61.5	63.3	61.6	60.0	59.8	60.5
Coefficients: No Wheels,				DIA = 26.41 FT,			RPM = 492		
B0							-.27	-.17	.20
B1							24.06	-17.5	20.04
B2							810.41	183.63	470.06
R^2 (not input)							.78	.94	.81

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Soft	Flight Idle Hard	Soft	HIGE Hard	Soft	HOGE Hard	Soft
200						79.8		
400						73.1		
630						68.4		
1,000						63.4		
2,000						55.2		
4,000						46.3		
6,300						40.5		
10,000						34.7		
DIR					Yes	Yes		

TABLE A-3e.

#6 NAME: BOELKOW BO-105 SOURCE: TSC-48-FA-753-LR7 - 3 DEC. 86

SLANT DIST. (ft)	TAKEOFF @ 67.22 KTS Left	Center	Right	6° APPROACH @ 69.62 KTS Left	Center	Right	LEVEL FLYOVER @ 117 KTS Left	Center	Right
200	90.1	88.9	89.9	93.4	95.4	93.1	92.5	90.7	91.8
400	86.8	85.5	86.5	90.0	92.1	89.7	89.1	87.3	88.4
630	84.4	83.3	84.2	87.6	89.7	87.2	86.7	84.9	85.9
1,000	81.8	80.8	81.6	84.9	87.1	84.6	84.1	82.4	83.2
2,000	77.5	76.7	77.4	80.3	82.7	80.0	79.6	78.2	78.5
4,000	72.3	71.9	72.4	74.8	77.3	74.4	74.1	73.2	72.8
6,300	68.1	68.1	68.4	70.5	72.9	69.9	69.9	69.3	68.3
10,000	63.0	63.6	63.6	65.4	67.5	64.4.	64.9	64.6	63.0
Coefficients: No Wheels,				DIA = 32.23 FT,			RPM = 424		
B0							0	0	0
B1							0	0	0
B2							0	0	0
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Soft	Flight Idle Hard	Soft	HIGE Hard	Soft	HOGE Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								

TABLE A-3f.

#8 NAME: AEROSPATIALE PUMA SA330J SOURCE: TSC-48-FA-753-LR2 - 3 DEC. 86

SLANT DIST. (ft)	TAKEOFF @ 69.39 KTS Left	Center	Right	6° APPROACH @ 69.62 KTS Left	Center	Right	LEVEL FLYOVER @ 126 KTS Left	Center	Right
200	96.8	93.9	97.1	96.0	95.5	96.1	95.7	94.2	95.4
400	93.2	90.3	93.7	92.5	92.2	92.7	92.2	90.5	91.8
630	90.8	87.7	91.3	90.1	89.9	90.3	89.7	87.8	89.4
1,000	88.1	84.9	88.7	87.5	87.5	87.6	87.1	84.8	86.6
2,000	83.5	79.9	84.3	83.1	83.6	83.2	82.6	79.4	82.0
4,000	77.9	73.9	78.9	77.9	79.1	77.8	77.1	72.5	76.4
6,300	73.5	69.1	74.5	73.7	75.6	73.6	72.7	66.8	72.0
10,000	68.2	63.5	69.2	68.8	71.4	68.7	67.2	60.1	66.8
Coefficients: Wheels,				DIA = 49 FT,			RPM = 265		
B0							0	0	0
B1							0	0	0
B2							0	0	0
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Soft	Flight Idle Hard	Soft	HIGE Hard	Soft	HOGE Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								

TABLE A-3g.

HNM DATABASE 1

#9 NAME: BELL 206L (LONG RANGER) TSC-48-FA-753-LR1 - 14 NOV. 86
SOURCE: TSC-48-FA-653-LR20 - 25 JULY 86

SLANT DIST. (ft)	TAKEOFF @ . KTS Left	Center	Right	° APPROACH @ KTS Left	Center	Right	LEVEL FLYOVER @ 115 KTS Left (300 ft. flyover)	Center	Right
200							90.7	87.8	89.0
400							86.9	84.2	85.4
630							84.2	81.7	82.8
1,000							81.3	78.9	79.9
2,000							76.3	74.2	75.2
4,000							70.4	68.5	69.6
6,300							65.9	64.3	65.4
10,000							60.7	59.3	60.6
Coefficients: No Wheels,				DIA = 37.0 FT,			RPM = 394		
B0							0	0	0
B1							0	0	0
B2							0	0	0
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Soft	Flight Idle Hard	Soft	HIGE Hard	Soft	HOGE Hard	Soft
200						76.1		
400						69.5		
630						65.0		
1,000						60.3		
2,000						52.8		
4,000						44.9		
6,300						39.7		
10,000						34.2		

HNM DATABASE 1

\#10 NAME: AUGUSTA A109 SOURCE: UNRUH TSC-48-FA-653-LR19 - 24 JULY 86

SLANT DIST. (ft)	TAKEOFF @ 60 KTS Left	Center	Right	6° APPROACH @ 60 KTS Left	Center	Right	LEVEL FLYOVER @ KTS Left	Center	Right
	Integrated						(500 ft. data)		
200	96.3	93.7	95.1	97.3	99.5	98.5	94.1	92.9	92.3
400	92.8	90.1	91.6	93.8	96.2	96.1	90.4	89.3	88.4
630	90.3	87.6	89.0	91.4	93.8	92.7	87.7	86.7	85.7
1,000	87.6	84.8	86.3	88.6	91.3	90.1	84.8	83.9	82.8
2,000	83.0	79.9	81.7	84.0	87.0	85.8	79.6	79.0	77.8
4,000	77.5	74.2	76.2	78.6	81.8	81.0	73.5	73.2	71.9
6,300	73.3	69.7	72.0	74.5	77.8	77.0	69.0	68.8	67.5
10,000	68.2	64.6	67.1	69.6	72.9	72.2	63.7	63.7	62.3
Coefficients: Wheels,				DIA = 36.09 FT,			RPM = 385		
B0							-.10	.10	.65
B1							46.30	53.26	53.98
B2							249.37	318.98	746.9
R^2 (not input)							1.00	1.00	.93

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Soft	Flight Idle Hard	Soft	HIGE Hard	Soft	HOGE Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								
DIR					Yes	Yes		

TABLE A-31.

#11 NAME: AEROSPATIALE GAZELLE SA341G SOURCE: TSC-48-FA-753-LR3 - 3 DEC. 86

SLANT DIST. (ft)	TAKEOFF @ 63.56 KTS			6° APPROACH @ 64.64 KTS			LEVEL FLYOVER @ 127.8 KTS		
	Left	Center	Right	Left	Center	Right	Left	Center	Right
200	94.5	91.7	93.5	93.5	91.3	90.3	90.1	87.4	89.8
400	90.3	87.6	89.4	90.1	87.9	86.7	86.3	83.6	86.0
630	87.2	84.6	86.3	87.7	85.6	89.2	83.6	80.9	83.2
1,000	83.6	81.1	82.6	85.1	83.1	81.3	80.5	77.7	80.0
2,000	77.1	74.8	75.9	80.8	78.8	76.3	75.0	72.2	74.3
4,000	69.6	67.1	67.8	75.8	73.8	70.2	68.0	65.2	67.1
6,300	64.2	61.2	62.0	71.9	69.8	65.5	62.5	59.7	61.5
10,000	58.0	54.4	55.7	67.4	65.1	60.4	56.2	53.3	55.1
Coefficients: No Wheels,				DIA = 34.44 FT,			RPM = 378		
B0							0	0	0
B1							0	0	0
B2							0	0	0
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle		Flight Idle		HIGE		HOGE	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								

TABLE A-3j.

HNM DATABASE 1

#13 NAME: SIKORSKY S-65 (CH53) SOURCE: TSC-48-FA-753-LR6 - 4 DEC. 86

SLANT DIST. (ft)	TAKEOFF @ 73.9 KTS Left	Center	Right	6° APPROACH @ 75.58 KTS Left	Center	Right	LEVEL FLYOVER @ 146 KTS Left	Center	Right
200	99.8	96.7	97.3	97.5	99.3	99.8	97.3	97.2	99.5
400	96.4	93.4	94.1	94.2	96.1	96.6	93.8	93.8	96.0
630	94.1	91.0	91.7	91.9	93.9	94.4	91.4	91.3	93.5
1,000	91.6	88.4	89.3	89.4	91.4	92.1	88.7	88.6	90.7
2,000	87.4	84.1	85.2	85.3	87.5	88.2	84.2	84.0	86.0
4,000	82.3	78.9	80.3	80.7	82.9	83.8	78.7	78.4	80.3
6,300	78.4	74.8	76.5	77.1	79.4	80.5	74.5	74.0	75.9
10,000	73.5	69.9	71.9	73.0	75.4	76.5	69.5	68.9	70.6
Coefficients: Wheels,				DIA = 72.25 FT,			RPM = ?		
B0							0	0	0
B1							0	0	0
B2							0	0	0
	R^2 (not input)								

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Soft	Flight Idle Hard	Soft	HIGE Hard	Soft	HOGE Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								

TABLE A-3k.

HNM DATABASE 1

#14 NAME: SIKORSKY BLACKHAWK UH-60A (S-70) SOURCE: TSC-48-FA-653-LR17 - 21 JULY 86

SLANT DIST. (ft)	TAKEOFF @ 74 KTS Left	Center	Right	6° APPROACH @ 69 KTS Left	Center	Right	LEVEL FLYOVER @ 150 KTS Left	Center	Right
	Integrated						(500 ft. alt.)		
200	91.3	89.5	92.1	94.9	97.6	100.0	100.7	98.0	101.0
400	87.5	85.7	88.4	91.4	94.3	96.7	97.1	94.4	97.2
630	84.7	83.1	85.8	89.0	92.0	94.4	94.6	91.9	94.5
1,000	81.7	80.2	82.9	86.3	89.7	92.0	91.8	89.0	91.6
2,000	76.6	75.4	78.2	81.9	85.8	88.1	87.1	84.2	86.6
4,000	70.8	69.9	72.8	76.9	81.4	83.5	81.4	78.4	80.8
6,300	66.6	65.6	68.8	73.1	78.0	79.9	77.0	73.9	76.4
10,000	61.9	60.8	64.1	68.6	74.1	75.6	72.0	68.7	71.2
Coefficients: Wheels,				DIA = 53.67 FT,			RPM = 285		
B0							.03	-.73	-.87
B1							17.47	9.86	25.33
B2							1207.72	988.71	734.35
R^2 (not input)							1.00	.86	.84

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Soft	Flight Idle Hard	Soft	HIGE Hard	Soft	HOGE Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								

TABLE A-31.

UNRUH HNM DATABASE 1

TSC-48-FA-753-LR1 - 14 NOV. 86

#15 NAME: SIKORSKY S-76 SPIRIT SOURCE: TSC-48-FA-653-LR23 - 4 SEPT. 86

SLANT DIST. (ft)	TAKEOFF @ 74 KTS (ICAO)			6° APPROACH @ 74 KTS			LEVEL FLYOVER @ 130 KTS		
	Left	Center	Right	Left	Center	Right	Left	Center	Right
	Simplified K = 10								
200	94.0	90.0	92.6	92.0	95.6	96.3	94.1	91.3	92.9
400	90.6	86.3	89.3	88.6	92.4	93.0	90.6	87.6	89.4
630	88.1	83.6	86.9	86.2	90.2	90.7	88.1	84.8	86.9
1,000	85.4	80.5	84.4	83.7	87.9	88.3	85.4	81.8	84.2
2,000	80.8	75.2	80.1	79.4	84.1	84.3	80.6	76.4	79.5
4,000	75.1	68.6	74.7	74.4	79.8	79.6	74.7	69.8	73.8
6,300	70.6	63.5	70.4	70.6	76.4	75.9	70.1	64.7	69.3
10,000	65.1	57.6	65.1	66.2	72.4	71.3	64.8	58.9	64.2
Coefficients: Wheels,				DIA = 44.00 FT,			RPM = 293		
B0							-.03	-.01	.16
B1							84.33	73.8	80.73
B2							945.34	1346.11	803.32
R^2 (not input)							1.00	1.00	.99

STATIC CONDITIONS

SLANT DIST.	Ground Idle		Flight Idle		HIGE		HOGE	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
200						82.3		
400						75.9		
630						71.5		
1,000						67.0		
2,000						59.8		
4,000						52.3		
6,300						47.1		
10,000						41.6		
DIR					Yes	Yes		

TABLE A-3m.

UNRUH — HNM DATABASE 1
TSC-48-FA-753-LR1 - 14 NOV. 86

#16 NAME: AEROSPATIALE DAUPHIN SA365N SOURCE: TSC-48-FA-653-LR14 - 27 JUNE 86

SLANT DIST. (ft)	TAKEOFF @ 74 KTS Left	Center	Right	6° APPROACH @ 75 KTS (ICAO) Left	Center	Right	LEVEL FLYOVER @ 120 KTS Left	Center	Right
200	95.6	95.2	91.8	99.0	95.4	No Data	91.5	88.8	90.8
400	91.6	91.2	87.8	94.6	92.0	No Data	87.8	84.8	86.6
630	88.7	88.1	84.9	91.8	89.6	No Data	84.6	81.8	83.5
1,000	85.3	84.6	81.7	88.8	87.1	No Data	81.3	78.5	80.1
2,000	79.5	78.4	76.5	83.9	82.8	No Data	75.4	72.8	74.4
4,000	72.8	70.7	70.6	78.2	77.9	No Data	69.0	66.1	68.0
6,300	67.8	64.7	66.2	73.9	74.2	No Data	64.4	61.4	63.4
10,000	62.5	57.7	61.3	68.9	69.8	No Data	59.4	56.1	58.5
Coefficients: Wheels,				DIA = 39.10 FT,			RPM = 365		
B0							-.04	.58	.09
B1							28.23	20.77	25.5
B2							350.61	591.75	321.28
R^2 (not input)							.97	.83	.98

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Ground Idle Soft	Flight Idle Hard	Flight Idle Soft	HIGE Hard	HIGE Soft	HOGE Hard	HOGE Soft
200						87.3		89.0
400						80.5		82.3
630						75.7		77.7
1,000						70.6		72.7
2,000						61.9		64.6
4,000						51.7		55.3
6,300						44.1		48.4
10,000						36.1		40.6
DIR					Yes	Yes		

TABLE A-3n.

UNRUH — HNM DATABASE 1

TSC-48-FA-753-LR1 - 14 NOV. 86

#17 NAME: AEROSPATIALE TWIN STAR SA355F SOURCE: TSC-48-FA-653-LR18 - 22 JULY 86

SLANT DIST. (ft)	TAKEOFF @ 63 KTS (ICAO) Left	Center	Right	6° APPROACH @ 63 KTS (ICAO) Left	Center	Right	LEVEL FLYOVER @ 116 KTS Left	Center	Right
	Using Integrated Procedure						(500 ft. data)		
200	92.7	89.2	93.8	94.9	94.6	92.0	88.7	87.8	89.5
400	89.2	85.6	90.2	91.6	91.3	88.5	85.2	84.3	86.0
630	86.6	83.1	87.7	89.2	89.0	86.0	82.7	81.8	83.6
1,000	83.8	80.3	84.9	86.7	86.5	83.3	79.9	79.1	80.8
2,000	79.0	75.6	80.1	82.5	82.4	78.6	75.3	74.6	76.2
4,000	73.4	70.1	74.2	77.5	77.5	73.1	69.9	69.2	70.6
6,300	68.9	65.8	69.6	73.5	73.6	69.0	65.6	65.2	66.4
10,000	65.6	60.9	64.2	68.7	69.1	64.1	60.7	65.1	61.6
Coefficients: No Wheels,				DIA = 35.07 FT,			RPM = 394		
B0							.10	.13	-.05
B1							33.68	25.56	42.77
B2							473.99	587.59	562.23
R^2 (not input)							.95	.91	.98

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Ground Idle Soft	Flight Idle Hard	Flight Idle Soft	HIGE Hard	HIGE Soft	HOGE Hard	HOGE Soft
200						80.9		86.5
400						74.6		80.1
630						70.4		75.7
1,000						66.0		71.1
2,000						59.7		63.7
4,000						51.7		55.6
6,300						46.3		49.7
10,000						40.2		43.3
DIR					Yes	Yes		

TABLE A-3o.

UNRUH | HNM DATABASE 1
TSC-48-FA-753-LR1 - 14 NOV. 86

#18 NAME: AEROSPATIALE ASTAR SA350D SOURCE: TSC-48-FA-653-LR21 - 13 AUG. 86

SLANT DIST. (ft)	TAKEOFF @ 63 KTS (ICAO) Left	Center	Right	6° APPROACH @ 63 KTS (ICAO) Left	Center	Right	LEVEL FLYOVER @ 116 KTS Left	Center	Right
200	92.5	89.2	92.5	92.1	94.2	90.9	88.5	87.1	89.7
400	88.8	85.5	88.8	88.7	90.9	87.3	84.7	83.5	86.1
630	86.2	82.9	86.4	86.4	88.6	84.9	82.1	80.8	83.5
1,000	83.3	80.0	83.6	83.8	86.1	82.2	79.3	78.0	80.6
2,000	78.5	75.1	78.8	79.4	82.0	77.6	74.4	73.2	75.7
4,000	72.5	69.3	73.0	74.2	77.1	72.2	68.6	67.5	69.8
6,300	67.8	65.1	68.4	70.0	73.3	68.1	64.2	63.3	65.2
10,000	62.5	60.2	63.0	65.0	68.7	63.3	58.9	58.4	59.9
Coefficients: No Wheels,				DIA = 35.11 FT,			RPM = 386		
B0							.04	.58	.09
B1							28.23	20.77	25.5
B2							350.61	591.75	321.28
R^2 (not input)							.97	.83	.98

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Ground Idle Soft	Flight Idle Hard	Flight Idle Soft	HIGE Hard	HIGE Soft	HOGE Hard	HOGE Soft
200						77.5		
400						71.2		
630						67.0		
1,000						62.6		
2,000						55.6		
4,000						48.0		
6,300						42.5		
10,000						36.2		
DIR					Yes	Yes		

UNRUH — HNM DATABASE 1
TSC-48-FA-753-LR1 - 14 NOV. 86

#19 NAME: BELL 222 — SOURCE: TSC-48-FA-653-LRRH - 27 JUNE 86

SLANT DIST. (ft)	TAKEOFF @ 65 KTS (ICAO) Left	Center	Right	6° APPROACH @ 65 KTS (ICAO) Left	Center	Right	LEVEL FLYOVER @ 123 KTS Left	Center	Right
	Integrated								
200	90.4	90.6	90.6	93.2	96.6	94.3	92.1	90.9	92.7
400	86.7	86.8	86.9	89.6	93.3	90.9	88.3	87.2	89.1
630	84.2	84.2	84.1	87.2	91.1	88.5	85.7	84.6	86.5
1,000	81.4	81.3	81.4	84.6	88.8	86.0	82.8	81.7	83.8
2,000	76.6	76.5	77.0	80.1	85.0	81.9	78.1	77.0	79.2
4,000	71.2	71.0	71.9	75.0	80.6	77.1	72.7	71.5	74.2
6,300	67.2	66.9	68.0	71.0	77.2	73.5	68.7	67.5	70.3
10,000	62.6	62.2	63.7	66.4	73.3	69.3	64.1	62.9	65.9
Coefficients: Wheels,				DIA = 39.80 FT,			RPM = 348		
B0							-.06	.09	-.27
B1							39.29	26.44	75.00
B2							119.05	59.52	178.57
R^2 (not input)							1.00	.99	.99

STATIC CONDITIONS

SLANT DIST.	Ground Idle Hard	Ground Idle Soft	Flight Idle Hard	Flight Idle Soft	HIGE Hard	HIGE Soft	HOGE Hard	HOGE Soft
200						74.2		84.3
400						68.0		77.9
630						63.9		73.6
1,000						59.7		69.0
2,000						53.2		61.6
4,000						46.5		53.3
6,300						41.9		47.1
10,000						36.9		40.1
DIR					Yes	Yes		

NOTE: This helicopter has 12° approaches at several speeds and other data.

TABLE A-3q.

#20 NAME: ROBINSON R22HP SOURCE: UNRUH

SLANT DIST. (ft)	TAKEOFF @ KTS			° APPROACH @ KTS			LEVEL FLYOVER @ KTS		
	Left	Center	Right	Left	Center	Right	Left	Center	Right
200									
400									
630									
1,000									
2,000									
4,000									
6,300									
10,000									
Coefficients: No Wheels,				DIA = 25.17 FT,			RPM = 530		
B0									
B1									
B2									
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle		Flight Idle		HIGE		HOGE	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								
DIR					Yes	Yes		

TABLE A-3r.

HNM DATABASE 1

#21 NAME: BOELKOW BK 117 SOURCE: UNRUH

SLANT DIST. (ft)	TAKEOFF @ KTS			° APPROACH @ KTS			LEVEL FLYOVER @ KTS		
	Left	Center	Right	Left	Center	Right	Left	Center	Right
200									
400									
630									
1,000									
2,000									
4,000									
6,300									
10,000									
Coefficients: No Wheels,				DIA = 36.09 FT,			RPM = 391		
B0									
B1									
B2									
R^2 (not input)									

STATIC CONDITIONS

SLANT DIST.	Ground Idle		Flight Idle		HIGE		HOGE	
	Hard	Soft	Hard	Soft	Hard	Soft	Hard	Soft
200								
400								
630								
1,000								
2,000								
4,000								
6,300								
10,000								
DIR					Yes	Yes		

APPENDIX B

ERROR MESSAGES AND PROBLEMS

HNM ERROR MESSAGES AND PROBLEMS

Error messages produced by the HNM model are listed below. Errors for all modules except the data entry modules are the same as those for the INM. Some error messages have been altered to reflect changes between the HNM and INM. Also, error messages concerning INM approach parameter sets and INM takeoff modification sets do not exist in the HNM because the HNM contains no such sets. Error messages have the same numbers as in the INM to maintain compatibility with the INM.

In addition, Table B-1 lists problems that may be encountered during use of Version 1 of this model. Also included in the list are probable causes and corrective action, if any. These are problems that do not affect the results of the contours but affect your interaction with the program.

**** DATA ENTRY MODULE ERROR MESSAGES ****

The following errors can occur while using the HNM data entry modules. The errors will appear in reverse video on the last line of the display screen, starting at the first column.

Altitude must be from -1296 to 29028 ft.

Cause: An altitude outside this range has been entered in the SETUP screen.

Correction: Re-enter a valid altitude.

Angle or heading must be 0-360 deg.

Cause: An angle or heading has been entered outside of this range while defining a track.

Correction: Enter a valid angle.

Enter D or H for degrees or heading

Cause: No character was entered for degrees of turn or new heading in defining a curved track segment.

Correction: Re-enter 'D' for degrees of turn, 'H' for new heading.

Enter DISTANCE

Cause: No value was entered for the distance in defining a track segment.

Correction: Re-enter a number greater than 0.

Enter H or S for hard or soft surface

Cause: No character was entered for the type of surface entered in the SETUP screen.

Correction: Re-enter 'H' for a hard surface, or 'S' for a soft surface.

Enter L or R for left or right turn

Cause: No character was entered for the direction of turn in defining a curved track segment.

Correction: Re-enter 'L' for a left turn, 'R' for a right turn.

Enter RADIUS OF TURN

Cause: No value was entered for the radius of turn in defining a curved track segment.

Correction: Re-enter a number greater than 0.

Entry must be greater than 0

Cause: No value was entered for the number of X or Y grid points for the GRID PROCESS option, or X or Y paper lengths or plot scale for plotting tracks for the PREVIEW PROCESS option.

Correction: Re-enter a number greater than 0.

Invalid Selection

Cause: An invalid selection was chosen from a menu, or the maximum number of records has been defined for that parameter.

Correction: Make a valid selection, or, to create another record, a current record must first be deleted.

Levels must be from 55-85 dB

Cause: A contour level outside this range was entered for the CONTOUR or RETRIEVE PROCESS screens.

Correction: Re-enter a valid contour level.

NO HELICOPTERS HAVE BEEN SELECTED

Cause: From the FLIGHT menu, PROFILES or OPERATIONS have been selected. However, no helicopters have been chosen for the case from the data base.

Correction: Return to the Main Data Entry Menu and select the HELICOPTER option. Proceed to choose helicopters from the data base for the case.

NO TRACKS HAVE BEEN DEFINED

Cause: From the FLIGHT menu, OPERATIONS was selected. However, no tracks have been defined for the case.

Correction: Select TRACKS from the FLIGHT menu and define new tracks for the case.

PAD ID must be entered

Cause: A track number has been defined without giving a takeoff or landing helipad.

Correction: Enter the identification of the helipad used for takeoff or landing.

Profile must have at least 3 segments

Cause: A profile has been entered that does not contain at least 3 segments. All profiles must have between 3 and 14 valid segments. A valid segment must have a speed/duration value greater than zero.

Correction: Enter more profile segments.

Saved case id must be entered

Cause: The program requires a file name to be assigned to each case. The inputs are written to this file upon conclusion of the entry process.

Correction: Enter a file name.

Temperature must be from -126 to 135 deg. F

Cause: A temperature outside this range has been entered in the SETUP screen.

Correction: Enter a valid temperature.

This helicopter has no available profiles

Cause: A helicopter was chosen for an operations set without having any previously defined profiles.

Correction: Choose another helicopter that does have a profile, or exit the operations sequence and create a profile for the helicopter.

Tolerance Level must be | or = 0.1 dB

Cause: A tolerance level outside this range was entered from the CONTOUR PROCESS screen.

Correction Re-enter a valid tolerance level.

TRACK ID must be entered

Cause: A track number has been selected without giving a track identification.

Correction: Enter a unique track identifier.

Track number must not be greater than xx

Cause: A track number has been chosen that is greater than the number of tracks that exist.

Correction: Select a valid track number.

**** INPUT MODULE ERROR MESSAGES ****

INM Errors I1-I11, I14, I17-I19, I21, I23, I24, I26-I28, I30-I38, I40, I41-I46, I48-I59, I61-I65, I67-I69, I71, I72, I74-I84, I86, I88-I102 will not occur when using the HNM data entry module.

INM Errors I30, I32, I33, I34, I35, I37, I42, I43, I51, I55, I69, I94, I98, and I99 do not exist in the HNM.

I12 *FATAL: ABOVE KEYWORD ENDS SETUP SECTION AND NO PADS HAVE BEEN DEFINED.

Cause: No valid helipad definitions were processed.

Correction: Check that keyword "RUNWAYS" was present and recognized. Check that there is at least one helipad defined and that all definitions area valid.

I13 *WARNING: ABOVE KEYWORD HAS OCCURRED MORE THAN ONCE AND MAY ALTER INPUT.

Cause: Since data is entered by keyword, if a keyword is repeated, the new data replaces the previous data.

Correction: If the keyword is a duplicate, delete the duplicate keyword and associated data.

I15 *WARNING: THESE CHARACTERS NOT PROCESSED. THEY ARE NOT OF TYPE EXPECTED.

Cause: If characters are numeric, alpha characters were expected. If characters are alpha, numeric characters were expected.

Correction: Remove any extraneous characters. If characters are not extraneous, check that preceding data has been processed properly. This error may occur when data is expected to follow a keyword or another keyword is expected to follow some data.

I16 *WARNING: INVALID HELIPAD NAME.

Cause: Helipad name not found.

Correction: Correct helipad name.

I20 *FATAL: TOTAL ERRORS EXCEED 50 OR NUMBER OF ERRORS ON ABOVE CARD EXCEEDS 20.

Cause: Too many errors have been detected in the input data.

Correction: Correct all the preceeding errors and re-submit the job.

I22 *FATAL: INPUT MODULE PRODUCED WARNING MESSAGES. PROGRAM TERMINATED.

Cause: At least one input error was detected by the INPUT module. Since this error invalidates the user input, no further processing is allowed.

Correction: Correct all of the preceeding errors.

I25 *FATAL: ABOVE KEYWORD ENDS AIRCRAFT SECTION AND NO AIRCRAFT WERE DEFINED.

Cause: No valid helicopter definitions were processed.

Correction: Check for a TYPE subsection within the AIRCRAFT section. Make certain that this subsection contains at least one helicopter definition and that all definitions are valid.

I29 Warning: ABOVE NAME IS TOO LONG. IT HAS BEEN TRUNCATED TO 4 CHARACTERS.

Cause: A maximum of 4 characters are allowed for the names of aircraft categories and tracks, and a maximum of 3 for helipads. The input name or a reference to a helipad exceeds 4 characters.

Correction: Use a unique 3- or 4-character name as required.

I39 *WARNING: DISTANCE IN FEET CANNOT BE STORED ON DEFINITION FILE. SET TO 0.

Cause: After conversion to feet, this distance was too large for the format in which it must be stored on the definition file. Therefore, a value of 0.0 was used for the distance.

Correction: Enter a distance within the proper range.

I47 *WARNING: PROFILE DESCRIP. NOT READ. VALUE OF SEGMENTS NOT BETWEEN 3 AND 14.

Cause: Within the taxi profile definition, the number of segments must be from 3 through 14 for both the approach and takeoff portions of the profile. The takeoff segments are determined from the beginning of the taxi to moving HIGE mode. Approach segments are the moving HIGE mode to the end of the taxi. Since an invalid value was entered for the number of segments, the data for the distances, altitudes, speeds, and thrusts could not be processed. If this error occurs for an approach profile, any mode name will be read as a keyword and the program will go back to a level 1 search on keywords.

Correction: Make certain that the profile has between 3 and 14 segments and that the value following the keyword "SEGMENTS" is that number of segments.

I60 *WARNING: ABOVE KEYWORDS ENDS TRACK DEFINITION BUT NO SEGMENTS WERE DEFINED.

Cause: Within a track definition, there must be at least one segment. None were found for this track.

Correction: Enter at least one segment description for the track.

I66 *WARNING: ABOVE HELIPAD NAME NOT FOUND IN XREF. ID SET TO 0.

Cause: Within a track definition, a helipad was referenced but was not found in the cross reference table.

Correction: Verify that the name is spelled correctly and was defined in the SETUP section. This message will also appear if the cross reference table was filled before this helipad was defined.

I70 *WARNING: NO VALID OPERATIONS DEFINED IN LAST OPERATIONS SECTION.

Cause: Within a TAKEOFFS, LANDINGS, or TAXIS section, at least one valid operation must be defined. None was defined for the section preceding this keyword.

Correction: Correct any invalid operations within the section and add operations if none were present.

I73 *WARNING: ABOVE KEYWORD ENDS OPERATION DEFINITION BUT NO D, E, N VALUES GIVEN.

Cause: Within TAKEOFFS, LANDINGS, and TAXIS, operations must include the number of flights by day ("D") and night ("N") with at least one of these being explicitly defined. In this operation, no flights were specified.

Correction: Check for missing or misspelled keywords (at least one of the keywords "D" or "N") and for a valid number of flights for that period of time. At least one time period must have a non-zero number of flights.

I85 *WARNING: ABOVE NAME IS DUPLICATE CONTOUR NAME OR 20 CONTOURS ALREADY SAVED.

Cause: Within the PROCESS section, contours are saved and referenced by their names. A duplicate name has been encountered or more than 20 contours were specified to be saved.

Correction: Make the saved contour names unique and limit the total to 20 contours.

I87 *WARNING: RETRIEVE COMMAND BEFORE ABOVE KEYWORD REQUESTED NO REPORTS.

Cause: A RETRIEVE command must call for some type of report. For this RETRIEVE, the user has suppressed the default REPORT option with a NOREPORT command but did not select a PLOT report.

Correction: Add requests for the types of reports desired.

**** FLIGHT MODULE ERROR MESSAGES ****

INM Errors F2, F3, F5, F6, F8, and F9 will not occur when using the HNM data entry modules.

INM Errors F3, F8, and F9 do not exist in the HNM.

F1 *FATAL: PAD XXXX TRACK: YYYY PROFILE: ZZZZZZ
TOO MANY SEGMENTS. ARRAY BOUNDS EXCEEDED.

Cause: The number of flight path segments generated for this flight exceeds 200.

Correction: Verify the helipad, track, and profile definitions for this flight. If all are correct, then simplify the flight path definition.

F4 *FATAL: PAD XXX TRACK: YYYY PROFILE: ZZZZZZ
TRACK SEGMENT OUT OF RANGE.

Cause: The actual number of track segments does not equal the track segment counter.

Correction: Correct the track in error.

F7 *FATAL: PAD XXXX TRACK: YYYY PROFILE: ZZZZZZ
CHANGE IN HEIGHT GREATER THAN SEGMENT LENGTH.

Cause: A flight path segment has been generated where the aircraft's change in altitude is greater than the actual length of the flight segment.

Correction: Verify the track and profile definitions for this flight.

**** COMPUTATION MODULE ERROR MESSAGES ****

INM Errors C1 and C2 will not occur when using the HNM data entry modules.

C3 *FATAL: NO CONTOUR LEVEL SELECTED

Cause: No contour level values were found on the processing template.

Correction: Supply the missing noise contour level(s).

C4 *FATAL: TOLERANCE CANNOT BE ZERO

Cause: The user has incorrectly defined the irregular grid window.

Correction: Correct the window coordinates.

****** DATA BASE PRINT MODULE ERROR MESSAGES ******

No INM Data Base Print Errors will occur when using the HNM data entry modules.

****** PREVIEW MODULE ERROR MESSAGES ******

No INM Preview Errors will occur when using the HNM data entry modules. INM Error PR3 does not exist in the HNM.

**** REPORT GENERATOR ERROR MESSAGES ****

RG1 *FATAL: NO DETAILED GRID REPORT PRODUCED. ERROR IN COMPUTATION MODULE.

Cause: The COMPUTATION module did not run successfully and consequently did not produce the CONTRIBUTIONS file from which the Detailed Grid Analysis Report is produced.

Correction: Correct the error previously reported by the COMPUTATION module.

RG2 *FATAL: NO STANDARD GRID REPORT PRODUCED. ERROR IN COMPUTATION MODULE.

Cause: The COMPUTATION module did not run successfully and consequently did not produce the regular GRID file from which the Standard Grid Analysis Report is produced.

Correction: Correct the error previously reported by the COMPUTATION module.

RG3 *FATAL: NO CONTOUR REPORT PRODUCED. ERROR IN COMPUTATION MODULE.

Cause: The COMPUTATION module did not run successfully and consequently did not produce the irregular GRID file from which supplies data for the Contour Analysis Report.

Correction: Correct the error previously reported by the COMPUTATION module.

**** CONTOUR MODULE ERROR MESSAGES ****

CN1 *FATAL: CONTOUR NAME XXXXXX DOES NOT EXIST*

Cause: The Grid File does not contain the contour definition name.

Correction: Case 1 -- If this message occurs when a RETRIEVE command is being processed, then an invalid CONTOUR name was used to retrieve from the given old Grid File. Correct the name or select the appropriate old Grid File.

Case 2 -- If this message occurs when a CONTOUR command is being processed, there was a previous error in the COMPUTATION module and no Grid File was created for this contour name. Correct the error reported by the COMPUTATION module.

CN2 *WARNING: XXXX YY.YY CONTOUR AND AREA MAY BE INCOMPLETE

Cause: The contour with metric name = XXXX and level = YY.YY was determined to not be within the range of levels input to the COMPUTATION module. Therefore, the contour may not be accurate.

Correction: If an accurate contour for this level is desired, then resubmit the job to invoke the COMPUTATION module.

CN3 *WARNING: XXXX YYY.YY CONTOUR DOES NOT EXIST

Cause: All noise values calculated by the COMPUTATION module for metrix XXXX are less than contour level = YY.YY.

Correction: No action is required as long as the user has input a reasonable contour level.

****** PLOT MODULE ERROR MESSAGES ******

P1 *FATAL: NO PLOT TAPE CREATED DUE TO CONTOUR MODULE ERROR

Cause: It is not possible to plot the requested contours due to a previously encountered error in the CONTOUR module.

Correction: Correct the CONTOUR module processing error.

P2 *WARNING: NO PLOT FOR CONTOUR LEVEL NUMBER = XX

Cause: No contour for this noise level exists.

Correction: As long as the contour value input to the COMPUTATION module was correct, no action is required.

TABLE B-1

HNM VERSION 1 PROBLEMS

PROBLEM	PROBABLE CAUSE	SOLUTION
No "+" cursor on graphics screen.	1) Driver not installed. 2) Incorrect COM port set. 3) GSS driver is incompatible with tablet.	1) Run INSTALL procedure. 2) Run INSTALL procedure. 3) See GSS Techtip #117, Figure B-1.
Large characters on graphics screen.	CGA monitor.	None. Use monochrome monitor with Hercules graphics card or EGA monitor with EGA graphics card.
Plotter does not plot.	1) Driver not installed. 2) Incorrect COM port set. 3) Baud rate is not set to 1200.	1) Run INSTALL procedure. 2) Run INSTALL procedure. 3) Change dip switches of plotter to 1200 baud.
Flashing error light on plotter.	Unknown.	None. Disregard. Light does not affect plotting.
Write error during PREVIEW plotting.	Unknown.	Wait until plotter pauses before pressing "any key to CONTINUE."
Write error during CONTOUR plotting.	Unknown.	Type "r" to retry. Plot should continue. If not, ~~do not turn~~ keep plotter ~~off,~~ on change paper, plot again.

TechTip #117

Subject: Using the SummaSketch tablet
Date: May 7, 1987

After many complaints regarding the SummaSketch tablet, and the CGI device driver 'summatb.sys', we were able to get a SummaSketch in house, and there are differences from the original Summa tablet 1201.

To work with the CGI device driver, you will need to open the Summa Sketch tablet and remove jumper AC (the other jumpers AA and AB should both be connected).

The 4-button puck does not work the same as the original 3-button puck. The terminator characters returned from Request Locator for the 4-button puck are:

Button (SS labeling)	Value	Keystate (sample)
1	#	4
2	!	2
3	%	6
4	space	1
1,2	%	6
1,3	%	6
1,4	$	5
2,3	%	6
2,4	"	3
3,4	&	7

We recognize that it is awkward on this device to adjust jumpers, however, GSS engineers could find no way to easily modify the current driver to work with the SummaSketch tablet as shipped. There are no plans to modify the device driver at this time, with this techtip providing a work-around.

FIGURE B-1. GSS TECHNICAL TIP ON SUMMASKETCH TABLET

APPENDIX C

HNM USER LICENSE AGREEMENT

HNM USER LICENSE AGREEMENT

> *NOTICE TO USER: READ THIS AGREEMENT CAREFULLY!*
>
> *This product is licensed (not sold). Opening the package implies acceptance of the terms and conditions of this license. If you do NOT accept the terms of this license, you may return the package UNOPENED to the Distributor from which it was obtained, along with all associated materials, and your money will be refunded.*

1. DEFINITIONS

A. "DISTRIBUTOR" means Noise Technology Branch, AEE-120, Noise Abatement Division, Office of Environment and Energy, Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, the developer of the Heliport Noise Model (HNM).

B. "GSS" means Graphic Software Systems, Inc., 9590 S.W. Gemini Drive, Beaverton, Oregon 97005, the author and owner of the copyright of the below-mentioned GSS SOFTWARE.

C. "PROGRAM" means the Heliport Noise Model, related files, and GSS SOFTWARE.

D. "GSS SOFTWARE" means the following set of computer programs included with this PROGRAM, regardless of the form in which you subsequently use it:

GSSCGI.SYS	*PRISM.SYS*
DRIVERS.EXE	*TEK4695.SYS*
IBMCO.SYS	*DIAB150.SYS*
IBMEGA.SYS	*OKID84.SYS*
HERCBW.SYS	*PRNTRX.SYS*
SUMMATB.SYS	*TOSHIBA.SYS*
HPPLOT.SYS	*ANDX01.SYS*
IBMGPR.SYS	*LASERJET.SYS*
IBMPRCOL.SYS	*THINKJET.SYS*
EPSON80.SYS	*ATT479.SYS*
EPSON100.SYS	*TI855IBM.SYS*

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F. "LICENSE" means this Agreement and the rights and obligations which it creates under the United States Copyright Act and the laws of Oregon.

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APPENDIX D

HNM REQUEST FORM

Federal Aviation Administration

REQUEST FORM

Heliport Noise Model (HNM)
Version 1.1

1. Please print all information and fill out the entire form:

Name

Company

Division

Mail Stop

Street Address / P. O. Box

City

State / Country

Zip Code

Telephone Number

Personal Computer System

2. Media Specification (Select one):

- ☐ Ten (10) 360Kb floppy diskettes
- ☐ Three (3) 1.2Mb floppy diskettes
- ☐ One 60Mb Emerald™ data cartridge
- ☐ One 9-track, 1600 bpi magnetic tape

3. Mail form and $63 check payable to "U. S. Treasury" to:

Donna G. Warren
Federal Aviation Administration
AEE-120
800 Independence Ave., SW
Washington, DC 20591

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of Transportation

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Administration**

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