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LEVEL II

NOISEMAP 3.4 COMPUTER PROGRAM
Operator's Manual

JANE M. BECKMANN
HARRY SEIDMAN
BOLT BERANEK AND NEWMAN INC.
21120 VANOWEN STREET
CANOGA PARK, CALIFORNIA 91303

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AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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FOR THE COMMANDER

HENNING E. VON GIERKE
Director
Biodynamics and Bioengineering Division
Aerospace Medical Research Laboratory

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The NOISEMAP computer program was developed to calculate community noise exposure from aircraft operations. This report documents the steps necessary to prepare data for using the current version, NOISEMAP 3.4. Allowable card sequences are identified and examples are given. Each permissible card type is formally defined and discussed. A companion computer program, DATASCREEN, was previously developed to aid in the checking of the NOISEMAP input deck. The special features of DATASCREEN are identified including a summary of operations that is produced.

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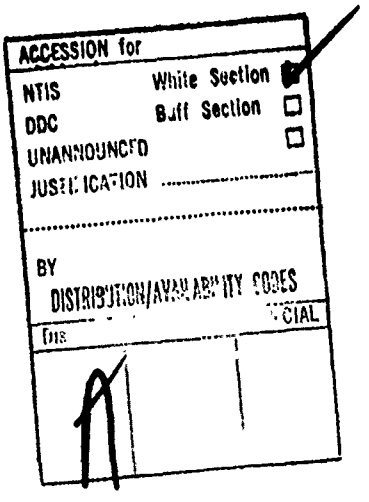
SUMMARY

The NOISEMAP computer program was developed to calculate community noise exposure from aircraft operations. This report documents the steps necessary to prepare data for using the current version, NOISEMAP 3.4. Allowable card sequences are identified and examples are given. Each permissible card type is formally defined and discussed. A companion computer program, DATASCREEN, was previously developed to aid in the checking of the NOISEMAP input deck. The special features of DATASCREEN are identified including a summary of operations that is produced.



PREFACE

This research was performed for the Aerospace Medical Research Laboratory at Wright-Patterson Air Force Base, Ohio under Project/Task 723107, Technology to Define and Assess Environmental Quality of Noise From Air Force Operations. Technical Monitor for this effort was Mr. Jerry D. Speakman of the Biodynamic Environment Branch, Biodynamics and Bioengineering Division.

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1.0 INTRODUCTION

The NOISEMAP computer program was developed to calculate community noise exposure from a variety of aircraft operations. Since the release of the first operator's manual, several improvements have been made to the program. Several addenda have been prepared to document these improvements. The purpose of the document is to provide a single volume that describes all modifications to date.

Since the original development of NOISEMAP, many features were found desirable that pertained to data preparation. A separate program, DATASCREEN, was developed that fulfilled this need. DATASCREEN has a few features that are unique. These will be identified in the following section. All NOISEMAP decks are completely compatible with DATASCREEN although DATASCREEN has no capability to actually calculate noise exposure.

Another major change that has occurred since the original version of NOISEMAP is the noise measure calculated. The day-night average level (DNL) is currently the measure used by the United States Air Force in preparing noise studies, and the default is this mode.

NOISEMAP is capable of calculating cumulative exposure using a variety of measures. These are shown in Table 1. NOISEMAP is designed to operate with the NOISEFILE military aircraft noise data, which is available from the Aerospace Medical Research Laboratory (AMRL). NOISEFILE was developed by systematically measuring and analyzing the noise characteristics of military aircraft under controlled test conditions. Table 1 identifies which NOISEFILE single event measures should be used for each cumulative exposure index.

TABLE 1

NOISEMAP CUMULATIVE EXPOSURE INDICES

NOISEMAP Index	NOISEFILE Measure		Comments
	Flight	Runup	
DNL	SEL	AL	Day-Night Average Sound Level
DNLT	SELT	ALT	DNL with tone corrected noise level
DNLW	SEL	AL	DNL with +10 dB noise runup penalty
DNLTW	SELT	ALT	DNL with both tone and runup penalties
CNEL	SEL	AL	Community Noise Equivalent Level - California
NEF	EPNL	PNLT	Noise Exposure Forecast with runup penalty
WECPNL	EPNL	PNLT	Weighted Equivalent Continuous Perceived Noise Level can be approximated by calculating NEF and adding 48 to the plotted values
SEL	SEL		Single event footprint values can be obtained by calculating DNL with 870.964 flights and adding 20 to plotted values
EPNL	EPNL		Single event footprint values can be obtained by calculating NEF with 630.957 flights and adding 60 to plotted values

The following section will describe how to set up a deck ready for processing by NOISEMAP/DATASCREEN. The third section contains detailed descriptions of individual cards. These cards are listed in alphabetical order. The final section contains a description of one of the unique features of DATASCREEN; the operation's summary.

2.0 NOISEMAP/DATASCREEN DATA PREPARATION

The purpose of this chapter will be to show the user how to prepare an input data deck to obtain the desired measure of community noise exposure. Because of the compatibility of NOISEMAP and DATASCREEN, any discussion of NOISEMAP will also apply to DATASCREEN with the notable exception that DATASCREEN has no computational capabilities. Other exceptions will be explicitly identified when discussed.

Before discussing preparation of the input to the program, it is important to discuss briefly the organization of data files. Also, the output will be described so that one can understand what it is that he is trying to achieve.

The input will then be broken into functional sub-groups. Integration of these groups of cards into a NOISEMAP acceptable deck is then shown. The basic data required for each type of data card will be identified. Specific data on each card type is given in alphabetical order in the following chapter.

2.1 Files used by NOISEMAP

The program reads cards from unit 5. Unit 6 is assumed to be a printer and contains a listing of all cards encountered as well as other messages. This file is called the "Chronicle" and is discussed below.

Files 8 and 11 are used for the plotter interface. These are designed to be compatible with the California Computer Products, Inc. (CALCOMP) General Purpose Contouring Program (GPCP). Unit 8 is assumed to be a card punch. Because of the large number of card images produced in any one NOISEMAP run, these cards are rarely actually punched, but are stored on a tape or temporary disk file. Additional GPCP required data is written onto tape 11.

Files available to the user for additional printouts or binary storage are in the range 12-99. Not more than 10 units can be used during a run. The program will not permit binary and formatted dumps to take place on the same logical unit number. Since it serves no purpose and makes tapes unreadable within the scope of the FORTRAN language, one should not attempt to circumvent this protection feature.

Although as is explained later, binary files should never be equivalenced to each other, all printed dumps may be written on the same printer. Since the program prints a separator identifying each printout by unit number and dump number, one can always find the correct dump back. This printer should be logically different from the printer used for the Chronicle to preserve the integrity of the Chronicle.

The logical units which must be assigned as a minimum during the running of NOISEMAP are 3, 4, 5, 6.* If a PLOT card appears anywhere in the deck, units 8 and 11 should also be assigned. If processing of data occurs, unit 10 should be assigned and all units referred to on NOISEMAP I/O control cards. Table 2 shows the function of all external files.

2.2 Output on Unit 6: "Chronicle"

This unit contains a listing of messages indicating what happened to the data as the data cards were read in. This listing also contains any diagnostics which the program may have occasion to generate; as such the name Chronicle is appropriate.

---

* For certain types of run, unit 4 may not be required.

TABLE 2

EXTERNAL FILES REFERENCED BY NOISEMAP

Unit	Purpose	Device	Mode	When Needed
3	Scratch Space	Disk	Binary	Always
4	Data Base	Disk	Binary	Always except if NODATA card is present during initialization
5	Control Card Input	Card Reader	BCD	Always
6	Diagnostics ("Chronicle")	Printer	BCD	Always
8	GPCP Control Cards	Card Punch	BCD	If PLOT card is present
10	Default Binary Dump	Tape	Binary	If PROCES card is present
11	GPCP Data Cards	Tape or Punch	BCD	If PLOT card is present
12-99	User assignable	Tape	Binary	If used during "proces" mode
		Printer	BCD	

The Chronicle file is formatted to print 84 columns wide which includes a margin of 10 columns. The reason for this is twofold: (1) the messages generated do not require the full width of "standard" 14 inch paper; (2) since the Chronicle will, most likely, be kept in the user's file of the particular airbase, a printout the same size as all other documents will be easier to file in the same place.

The Chronicle contains a running account of the processing taking place. There are several general types of entries which are recorded in this file. A first use of the Chronicle is a listing of all control cards as they are encountered in the input. This listing is generally not in card-image format. Rather, appropriate descriptive text is used to augment the data on the card, making the entry more easily readable and more meaningful in checking the content of the card. An entry in the Chronicle due to reading a card is always preceded by the identifier "+++" in the margin.

A further use of the Chronicle is to provide a place to record certain information generated during the course of the run. There are essentially three levels of information. The first level consists of messages provided "for the record". If the program, for instance, calculates a new altitude versus distance curve during the course of the run, this new curve will be entered in the Chronicle.

The second level of information is provided by the WARNING message. Warnings are signified by a message preceded by a warning banner across the Chronicle page. A summary of warnings is printed at the end of the Chronicle listing for each airfield. A warning is issued at any time when the program detects the existence of a condition where the probability of an error is considerably greater

than usual. It is also used to inform the user of the fact that the program has taken a different action than the user had specified because a user command was invalid. The first kind of warning is given, for example, when the user changes the location of a navigational aid; the second type of warning would occur if the user should attempt a binary dump on the line printer.

The third level is the ERROR message. An error occurs when the program detects a condition which will lead to erroneous results or where further processing becomes impossible. Errors are signified by a message preceded by an error banner across the Chronicle page. A summary of errors is printed at the end of the Chronicle listing of each airfield. An error would be issued when attempting to process data describing runup operations without specifying where the runup pad is located. When an error occurs, the program switches to the NOGO mode, and no further processing takes place for this airfield.

There are several keywords that affect the Chronicle. A brief description follows:

Keyword	Function
ALIGN	Determines the number of alignment pages printed. Default value is two pages.
COMMEN	Allows text to be printed
ECHO/NOECHO	Controls printing of noise data. Default is NOECHO.

Keyword	Function
ERRORS	Controls printing of errors messages associated with incomplete DATASCREEN deck. Default prints errors.
EXPAND/NOEXPA	Controls printing of complete departure procedure. Default is NOEXPA.
LIST/NOLIST	Controls printing of comment cards. Default is LIST.

2.3 DATASCREEN Output

There are several forms of output that are valuable during the coding and verification of input data. Several options were therefore put into the DATASCREEN program. These are identified below.

Keyword	Function
CHKPLT	Allows plotting of flight track and/or runup maps. These can be CALCOMP plots or SC-4020 microfilm plots.
PICTUR	Provides a graphic display of altitude and power level profiles on line printer.
GRAPH	Makes a plot of altitude and single event levels along a flight track.
DEVICE	Determines the graphics device that will be used with the GRAPH card.

DATASCREEN automatically will provide a summary of aircraft operations by type of aircraft and by runway. Runup operations are also provided by aircraft type and runup pad. These are extremely valuable in verifying the input data. See Section 4.0 for detailed explanation of DATASCREEN operation's summary.

2.4 Output of DNL Values

After a cumulative grid has been computed, there are several means of displaying the results. Listed below are the keywords that affect the output.

Keyword	Function
DMPGRD	To write a binary dump on magnetic tape.
PRINT	Print the grid of noise values.
PRPLOT/AREA/ARPLOT	Print a plot of noise level contours on the printer and/or calculate the area within each contour.
PLOT	Write a GPCP compatible file for plotting the noise level contours on a CALCOMP plotter.
AICUZ	Write a GPCP compatible file for plotting USAF standard compatible land use maps.
WIDTH	Select width of CALCOMP plotting paper to be used. Default is 30 inches.

It is common practice to dump the contents of the grid to magnetic tape and store that data for future reference. Any file number from 12 through 99 may be used. Several dumps may be written on a

single tape unit. These dumps can be read by a future run of NOISEMAP and reprocessed. A typical occurrence would be if one decides to request an additional noise contour that was not desired at the time of the original run. A further discussion of the use of dumps is given in the section of grid manipulation.

Upon using a PRINT keyword, the cumulative noise value is printed for each non-zero grid points. Unless a LIMITS card has been used, this will encompass a square grid with 100 points on a side. On a single page of computer output, 25 values are printed across the page and 20 values are printed down each column of the page. Therefore, if values are calculated at all points, 20 pages of output will be produced. This form of output is valuable when the noise levels at specific locations is desired or if one wants to hand plot contours.

A printer plot, Figure 1, of the noise contours can be produced with a PRPLOT keyword. Letters of the alphabet are used to plot the various noise levels with an "A" always being the highest contour requested. Figure 1 is an example of a printer plot. Simultaneously with preparing the printer plot, NOISEMAP is capable of calculating the area within each contour. This can be requested using an AREA keyword. Since there is very little difference in computer costs to calculate areas when a PRPLOT has been requested, these two functions have been combined into a single keyword, ARPLOT.

The PLOT keyword causes NOISEMAP to write a GPCP compatible file for later preparation of CALCOMP plots. Figure 2 shows a typical CALCOMP plot.

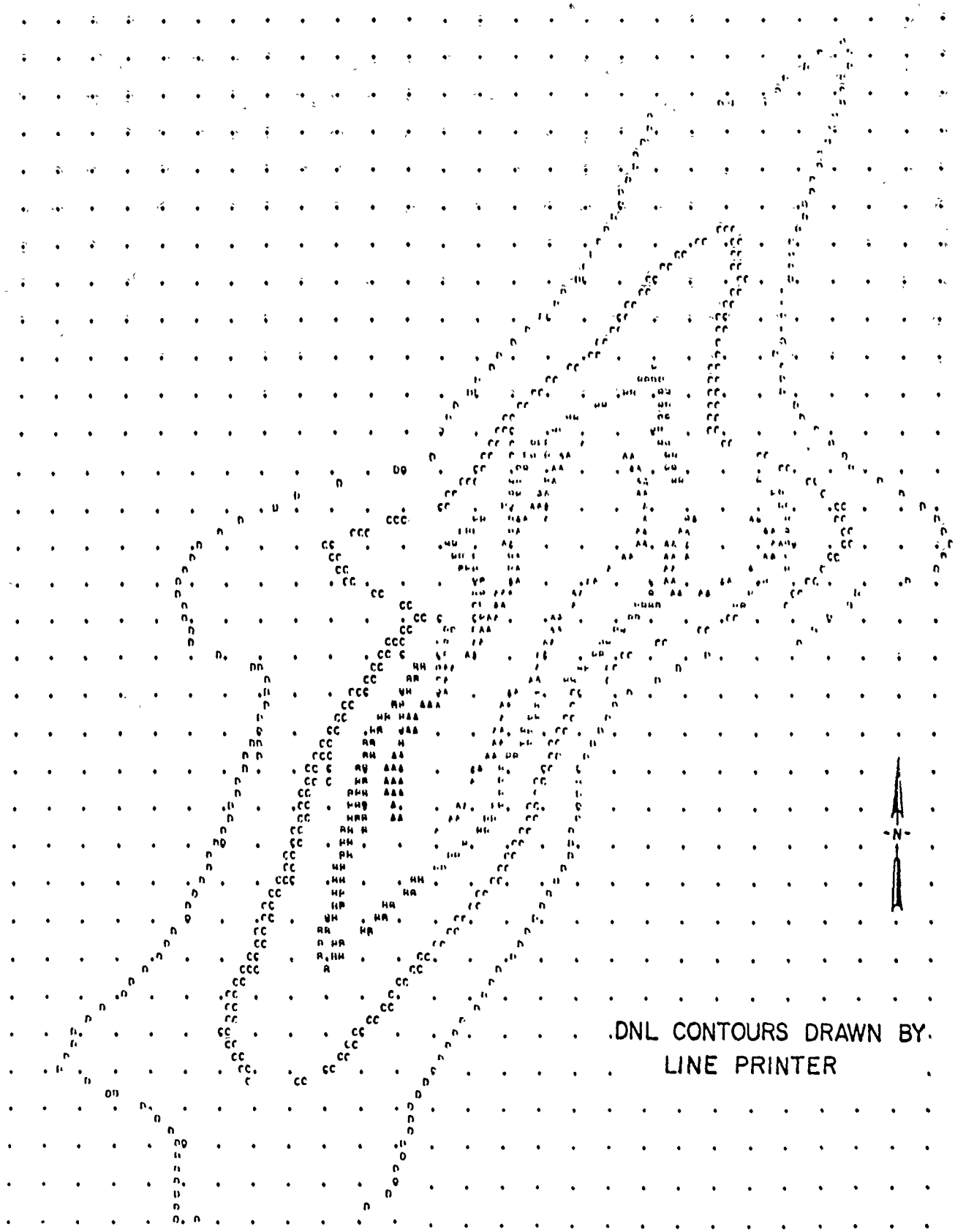
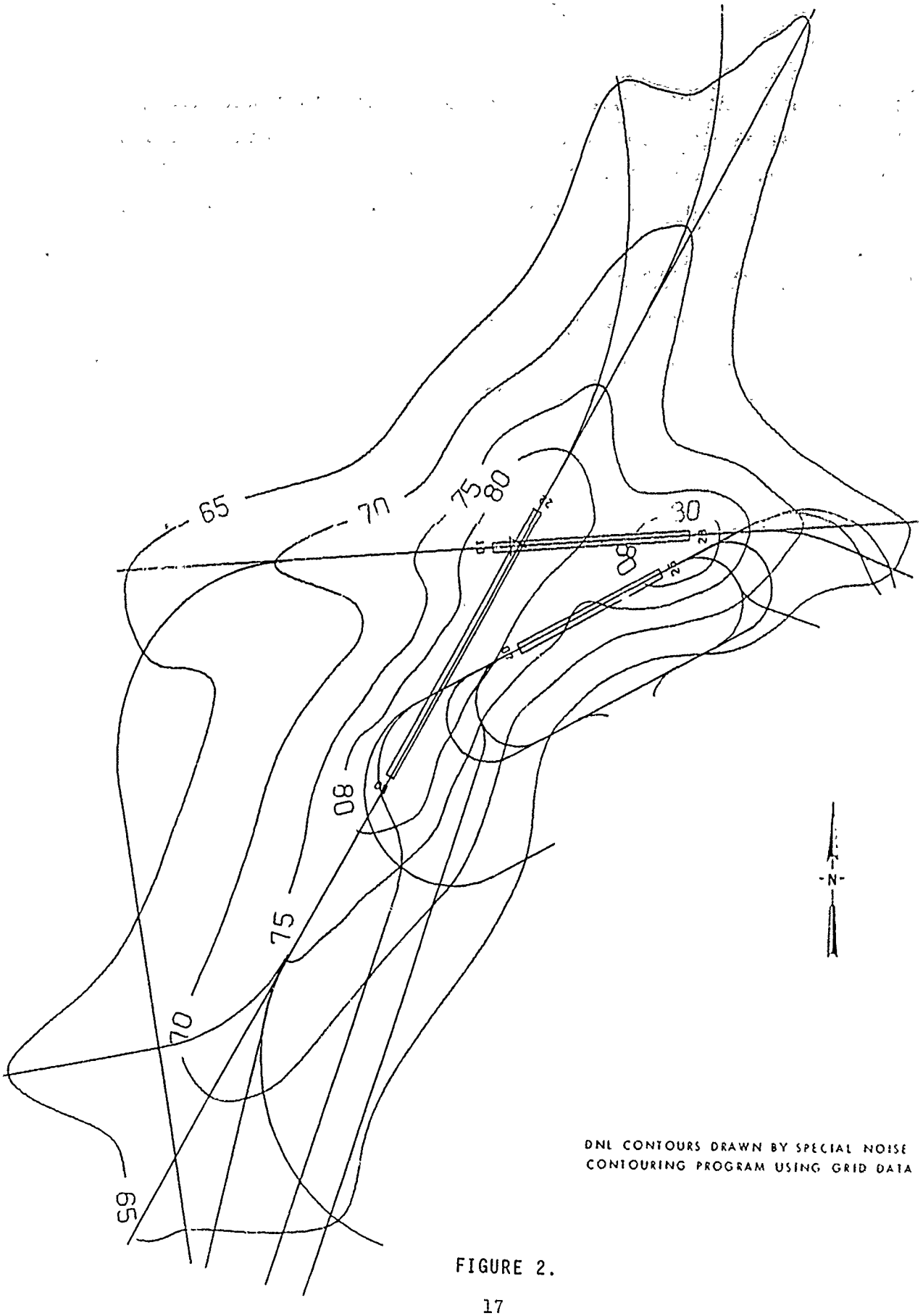


FIGURE 1.



DNL CONTOURS DRAWN BY SPECIAL NOISE CONTOURING PROGRAM USING GRID DATA

FIGURE 2.

If one wants the USAF standard compatibility land use maps, this is requested with an AICUZ keyword. These later plots are always to the scale of 1" = 4000 feet (1:48000) and the 65, 70, 75 and 80 DNL contours are plotted. The 60 DNL can be requested.

2.5 Air Field Layout

NOISEMAP must first know where the aircraft are flying and doing runup operations before it can know where to accumulate the noise exposure data. This data is passed to NOISEMAP with the following keywords:

Keyword	Function
AIRFLD	Identifies the airfield, set up coordinate system including origin and spacing of grid points, field altitude and magnetic declination.
RUNWAY	Gives X, Y coordinates of a runway and identifies threshold offsets and standard glide slopes.
FLTTRK	Identifies the path of a flight track explicitly.
DEPART	Develops a flight track based upon a set of instructions usually with the use of NAVAIDs.
NAVAID	Identifies the location of navigational aids.
RNPPAD	Identifies the location and direction of runup pads.
UNITS	Selects English or Metric units.

NOISEMAP is capable of storing information on only one of each of the above cards. The sequence of these cards is therefore important. When the program encounters a card telling it the number of operations for a particular aircraft operation, it assumes that the aircraft is flying on the last flight track it has been given and that flight track is from the last runway given and that runway is at the last airport given. A common way of coding data is to identify all the aircraft operating on a flight track, then inserting a new flight track and identifying the aircraft on that flight track et cetra until all flight tracks for a runway are complete. A new runway card is then inserted. Similarly, when information on the amount of time spent on runups is given for an aircraft, it is assumed that the aircraft is on the last runup pad identified.

2.6 Aircraft Characteristics

After NOISEMAP is given information on where the aircraft are operating, it must also know how the aircraft are being operated. This data is stored in a series of libraries with the following keywords:

Keyword	Function
TODSCR	Add on entry to the takeoff description library
LNDSCR	Add on entry to the landing description library
RUDSCR	Add on entry to the runway description library
ALTUDE	Add on entry to the altitude profile library
SEL	Add on entry to the SEL profile library

DSEL	Add on entry to the Delta-SEL profile library
AL	Add on entry to the AL profile library.

The TODSCR/LNDSCR cards are used to identify which ALTUDE, SEL and DSEL cards should be used for a particular mission. Similarly, the RUDSCR card identifies which AL data should be used for a particular runup operation. The ALTUDE card(s) transmit data about the altitude profile of a particular aircraft. The SEL cards contain the air-to-ground and ground-to-ground noise versus distance data. The DSEL card contains the appropriate offsets that must be applied to the noise profiles to account for power and speed changes. The AL cards provide the noise data for ground runup for a variety of angles around the aircraft.

2.7 Library Maintenance

NOISEMAP has a limited amount of storage available for the profile libraries. The limits are identified in Table 3. Several keywords are available to aid in the maintenance of the libraries. These fall into three general sets of cards. The first set allows one to list all active entries within a library. The second type allows one to expunge individual entries from a library. The third type allows one to expunge total libraries. The key words are as follows:

TABLE 3

LIBRARY SIZE LIMITATIONS

Type of Profile	Maximum Number of Profiles That Can be Stored at One Time
SEL	20
Sum of TODSCR's and LNDSCR's	20
ALTUDE	20
DSEL	20
RUDSCR	14
AL	10
NAVAIDS	25

LIBRARY	LIST	EXPUNGE	CLEAR
TODSCR	LTODSC	XTODSC	CTODSC
LNDSCR	LLNDSC	XLNDSC	CLNDSC
RUDSCR	LRUDSC	XRUDSC	CRUDSC
ALTUDE	LALTUD	XALTUD	CALTUD
DSEL	LDSEL	XDSEL	CDSEL
SEL	LSEL	XSEL	CSEL
AL	LAL	XAL	CAL
NAVAID	LNAVAI	XNAVAI	CNAVAI
ALL LIBRARIES			CLEAR

Any library data that is read before the first AIRFLD card is automatically written to file 4. This data is stored throughout the entire NOISEMAP run and are not permanetly expunged. They can be recalled by using a RESET and will be recalled each time a new AIRFLD card is encountered. If it is desirable to not have the data base reset, a NODATA card should be included before a second AIRFLD card.

2.8 Action Cards

NOISEMAP needs to be told when to start making actual calculations of noise exposure. Also, the type of calculations to be made must be identified, along with any limitation on the area to be analyzed. Finally, the program needs to know when to stop. These functions are accomplished with the following keywords:

Keyword	Function
PROCES/NOPROC	Tells the NOISEMAP to start/stop calculating noise exposure
DNL	Tells the computer the day-night equivalent levels are to be calculated. This is the default noise measure other options are NEF and CNEL. Tone corrected data may also be used.
LIMITS	Allows user to limit the area studied to less than the normal 100 x 100 grid points
FLIGHT	Identifies the number of day and night operations of aircraft flights. One card required for each aircraft type and mission combination.
RUNUP	Identifies the time spent doing runups
TOROLL	ENABLES/DISABLES special routine to account for noise exposure at start of takeoff roll.
END	Ends the NOISEMAP computer run.

Everytime NOISEMAP encounters a FLIGHT or RUNUP card, noise exposure is calculated for all appropriate grid points.

2.9 Grid Manipulation

NOISEMAP calculates the noise data and updates the grid points that are stored in core memory of the computer. It is often desirable to store this grid information on tape so that additional manipulation can be performed on the data. This can be accomplished with the following keywords:

Keyword	Function
DMPGRD	Write a copy of the existing grid to tape
CLRGRD	Clear the grid that is in the core of the machine
ADDGRD	Add values to the in core grid from a grid stored on tape
LODGRD	Clears the in core grid and adds grid values from tape.

As a minimum, it is a common practice to save the final set of grid values on tape for future reference. In many applications, additional dumps of the grid may be desirable. For example, one may want to dump the grid after the normal takeoffs and landings. The in core grid could be done after the pattern operations. This would give the user the option of looking at contours with or without the pattern operations.

The user has total flexability of dumping the grid and adding them back. It is the user's responsibility to keep track of what data is in core at any time.

The LODGRD card is equivalent to a CLRGRD card followed by an ADDGRD card.

The user can write more than one dump on any legal unit and retrieve it by giving the unit number and dump number. The following few paragraphs outline how one may use this feature, which errors may occur and a few cautionary statements regarding the input/output operations as they relate to the FORTRAN IV language.

If at the time that the request to read is made, the program has written fewer dumps than the number requested, an error will be printed:

ONLY *** DUMPS ON UNIT **

and the request will be ignored. When a dump number higher than physically present on tape is requested, the program will encounter the NOISEMAP end-of-information record on that unit. The error message will read:

ONLY *** DUMPS ON UNIT ** , THE FOLLOWING
DUMP WAS WRITTEN AS END *** ON UNIT ** BY PROGRAM NOISEMAP ON **/**/**
FROM AIRFIELD **** (contents of dump label) ****

The program must recognize a valid header on each dump. If the header is not legal, the invalid header is written in the Chronicle:

ILLEGAL TAPE HEADER **** (contents of header) ****

and further access to the file is inhibited until the next AIRFLD card.

It is possible to write on a tape even if its first reference was a read operation. This is true under any circumstance: a read operation followed by a dump will cause the program to skip over

all previously dumped information and write an additional dump. If the initial status of a file was "input only" and a dump is attempted on this file, the program will locate the end-of-information record and proceed writing. The file status changes from "input only" to "input and output" as evidenced by the message:

UNIT ** NOW WRITE ACCESSIBLE.

It should be emphasized that tapes which were written during a run, which terminated due to the operating system action, may not have this end-of-information record and therefore such tapes cannot be read beyond the last dump since ANSI FORTRAN IV cannot recognize a tapemark.

When it is desired to extend an already existing file (obtained from a previous run), the logical unit to which it will be associated could be referenced first in an ADDGRD or LODGRD card. If this is not done, the first DMPGRD card will cause the previous information to be overwritten. If the file has been referenced in the read mode first, the program will first locate the end record of the last dump written before writing the next dump. When in the contemplated run, the first reference is a write, rather than a read, a dummy read reference must be established. This is done by inserting as many ADDGRD cards as are necessary to establish a reference to all tapes which will be augmented. These should preferably be put immediately following the airfield title card, and they must be followed by a CLRGRD to delete the dummy grid which was generated. (If the run which follows starts with a LODGRD to restore a grid which will be updated during this run, the CLRGRD card should of course, be omitted.)

2.10 Deck Setup

Following is a typical deck set up showing the use of a few of the cards:

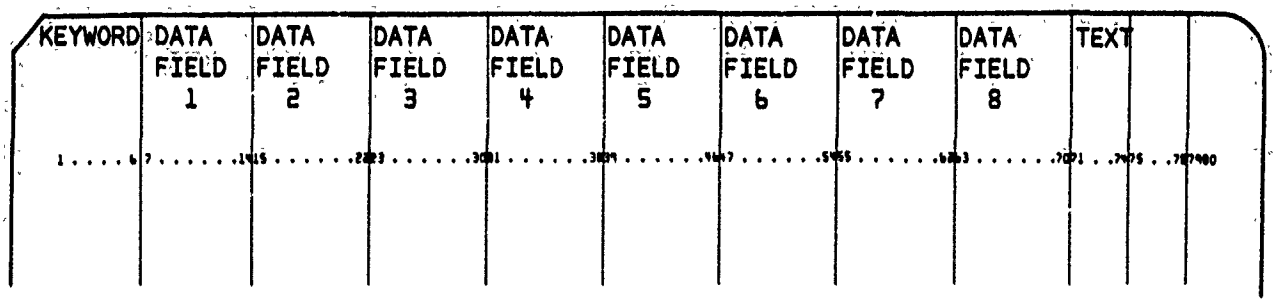
TODSCR ALTUDE DSEL LNDSCR DSEL SEL	Cards identifying aircraft characteristics. These cards are written to unit 4 and can be retrieved with a RESET card when written before the AIRFLD card.
SEL ALIGN AIRFLD LIMITS PROCES RUNWAY	
FLTTRK TOROLL FLIGHT FLIGHT FLTTRK FLIGHT	Flights on a variety of flighttracks on the first runway.
XTODSC XALTUD XDSEL XSEL	Delete aircraft characteristics that are no longer needed.
TODSCR ALTUDE DSEL SEL	Add new aircraft characteristic cards.

RUNWAY	
DEPART	
FLIGHT	
FLIGHT	
FLIGHT	
FLTTRK	Process flights on second runway.
FLIGHT	
DMPGRD	Store the data from two runways
CLRGRD	on tape and clear grid.
RUDSCR	
AL	
RUDSCR	
AL	Calculate noise from runup
RNPPAD	operations.
RUNNUP	
RNPPAD	
RUNUP	
XRUDSC	Delete aircraft characteristics that
XAL	are no longer needed.
DMPGRD	Dump runup noise grid to tape.
ADDGRD	Add back in flight noise data. Grid now contains sum of runups and flights since grid not cleared.
CHKPLOT	Prepare flight track map (for DATASCREEN only)
PRINT	
ARPLOT	Print the grid, do printer and
PLOT	calcomp plots.
END	END the computer run.

The average NOISEMAP run will involve many aircraft types and many different missions. The purpose of the preceding simple example is to give the user a feel for the order that the cards should be placed. By reading and understanding the use of individual keywords as detailed in the following chapter, one can begin to appreciate the power and flexibility of NOISEMAP.

3.0 KEYWORD DESCRIPTIONS

This chapter gives detailed information on the individual keywords. A standard format for input data cards is shown below:



1 - 6	Keyword	A6	Format
7 - 14	Data Field	1	F8.0 Format
15 - 22	" "	2	" "
23 - 30	" "	3	" "
31 - 38	" "	4	" "
39 - 46	" "	5	" "
47 - 54	" "	6	" "
55 - 62	" "	7	" "
63 - 70	" "	8	" "
71 - 74	Text	A4	Format
75 - 78	Text	A4	Format
79 - 80	Continuation code	A2	Format

The first six columns form the keyword field which contains the appropriate keyword (or operation code) for the library function to be performed. The keywords which are less than six characters in length must be <u>left justified</u> in the keyword field, otherwise they will not be recognized by the program.

Columns 7 through 70 are divided into eight, 8-column data fields. These fields are used to enter numeric data. When integers (numbers without decimal points) are entered, they must be right justified in the appropriate field. If numbers contain decimal points, they may be placed anywhere within the field. However, integers may be converted to real numbers by adding a decimal point, and consequently left justified.

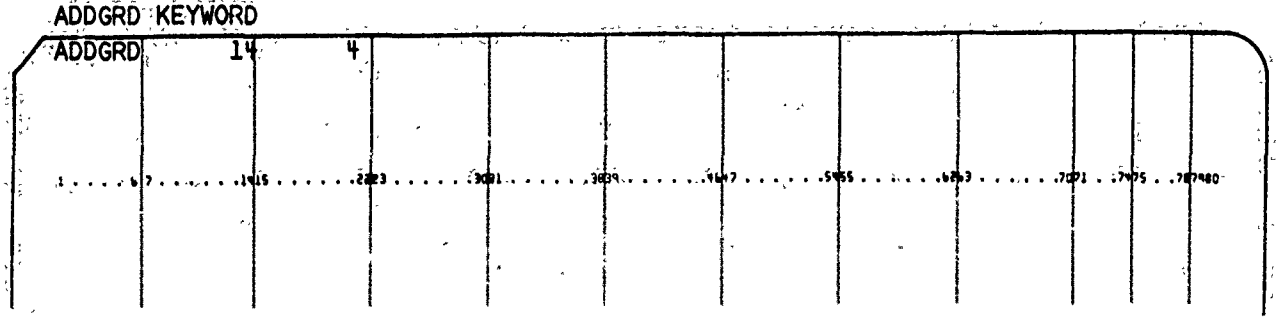
Columns 71 - 78 form a text field. This field is used for specifying alphanumeric data such as names of aircraft. Any Hollerith character is legal here.

Columns 79 and 80 form a continuation field. Any nonblank characters in these columns will direct the program to look for additional data cards if there is insufficient room on the first data card to complete the entry. In the remainder of this discussion, we will use an asterisk (*) in Column 80 as a continuation character, but this choice is arbitrary.

There are a few exceptions to this rule that are handled by NOISEMAP. One exception is that the second card associated with the AIRFLD card can contain text in the data fields. Also, COMMEN, FLTTRK and DEPART cards can have text in the data fields.

The rest of this chapter is divided by keywords and are listed in alphabetical order to make it easier for the user to locate information on a particular keyword.

ADDGRD KEYWORD



This card adds a specified grid (previously dumped) from a device onto the working grid.

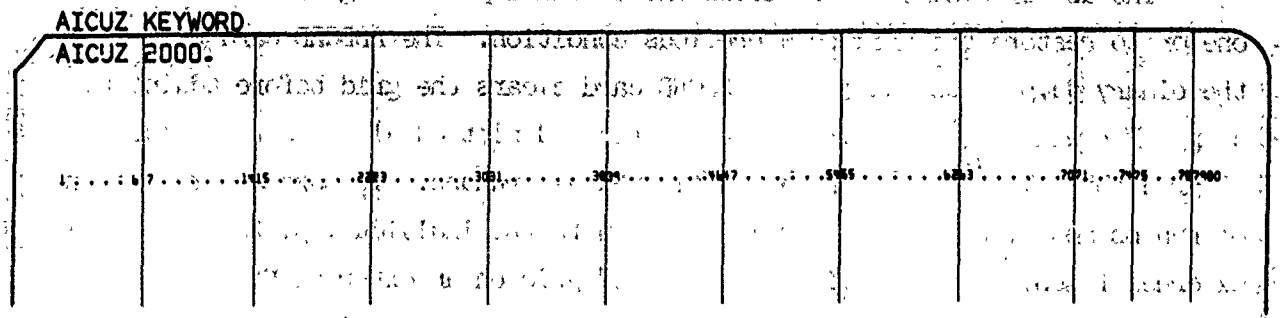
Columns	
1 - 6	ADDGRD Keyword
7 - 14	Unit number where grid is stored and should be retained. This number normally is 12, 13 or 14. NOTE: Do not use Unit 15. This is for printed output only!
15 - 22	Dump number of dump to be retained. This is used to specify a particular dump on the unit designated for adding a stored grid to the working grid.

A dump on a user assignable file can be read during the same run in which it was written. The cards shown above direct the reading of the fourth dump on unit 14. When the first read reference is made to a unit on which the program has not written during this run, the warning message:

NO KNOWN DUMPS ON THIS UNIT

will appear just before the file recognition message. Once the read reference has been established, the program will recognize the tape as an "INPUT ONLY" file.

The use of binary files allows one to add a previous grid to the current one or to restore the grid to a previous condition. The ADDGRD card will cause the binary dump to be added, the LODGRD card clears the grid before adding the dump. For example, one may have calculated and plotted all flight operations, cleared the grid and calculated and plotted all runups. To make a composite map of runups and flight operations in addition to the individual plots, one can use external files. One can write the "flight" grid on an external file before clearing the grid. After the plotting of the runups, one simply adds the external "flight" grid to the "runup" grid to get the composite.




```
+++  COMPATIBLE USE DISTRICT MAP  -  WIDTH OF CLEAR ZONE IS  2000.0 FT
                CONTOURS SHOWN ARE  65.0  70.0  75.0  80.0
                PLOTTER BLOCK   1 IS CONTOURS
                PLOTTER BLOCK   2 IS BORDER
                PLOTTER BLOCK   3 IS CRASH AREA
                PLOTTER BLOCK   4 IS LAYOUT
                PLOTTER BLOCK   5 IS ADVANCE
```

Columns	
1 - 5	AICUZ
7 - 14	Width of clear zone either 2000. or 3000.

NOISEMAP has the ability to make USAF standard compatible land use maps. The program will produce a special sequence of GPCP directives for this purpose. For this option to work properly, it is necessary that the Calcomp software which drives the plotter is capable of producing searchable address blocks. The program will print the contents of each plotter block and provide the block address, so that the plotter operator can superpose the plot blocks in the order desired.

The AICUZ card has two options. One may specify the width of the clear zone to be either 2,000 or 3,000 feet in the data field 1, and one may specify in data field 2 that the 60 L_{dn} contour must also be plotted. The program default is 2,000 foot clear zone no 60 L_{dn} contour. A non-standard clear zone size will result in a diagnostic; the default value is used for the plot. Any non-zero value will cause a 60 L_{dn} contour to be computed; the program does not check the value, only if it is non-zero. Figure 3 shows a sample output of the AICUZ card.

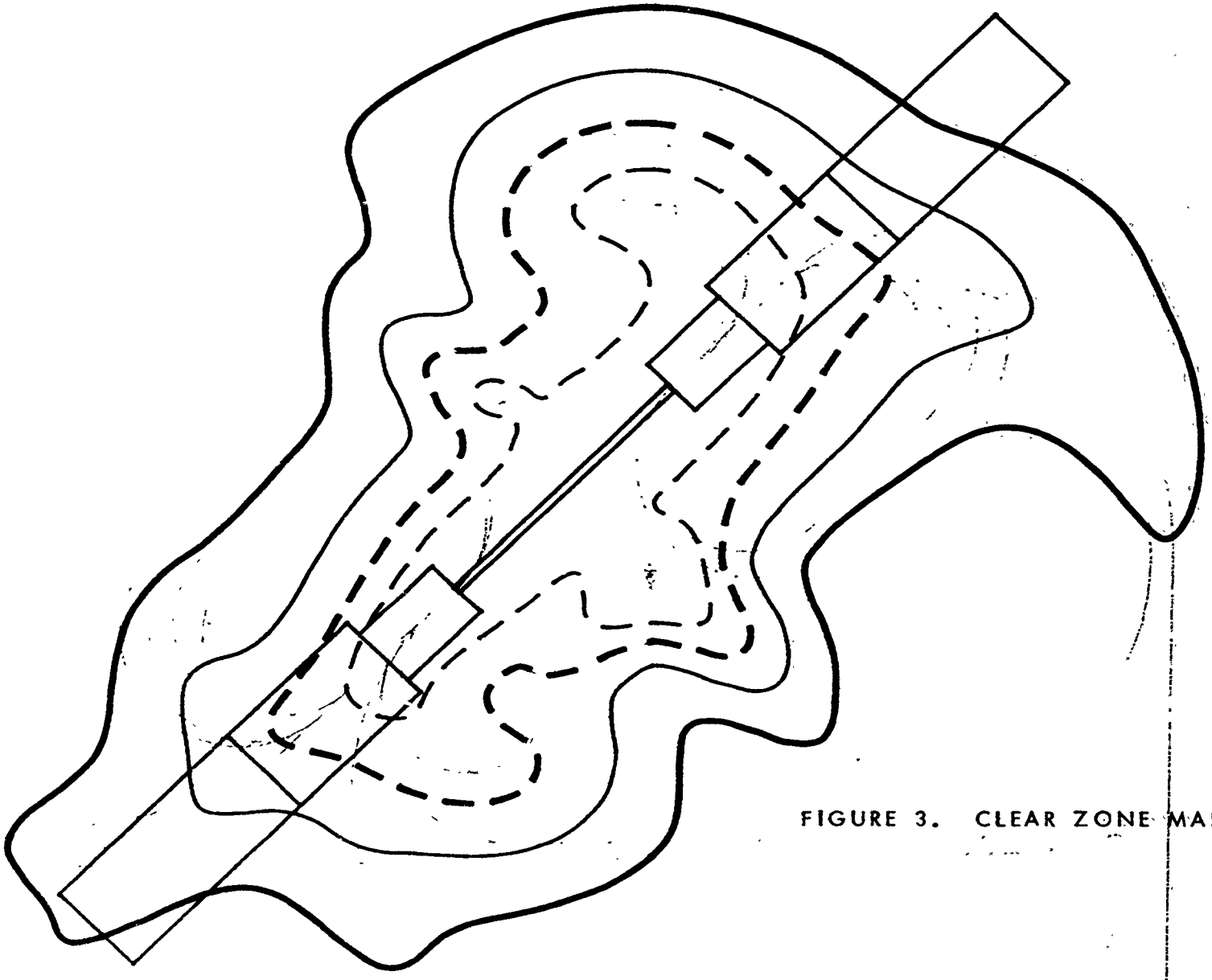


FIGURE 3. CLEAR ZONE MAP

The program will assume that all data cards for GPCP go to TAPE11 (with the exception of the initial JOBX, BAS, and EDIT cards). It is, however, possible to split the GPCP files by specifying a negative width for the width of the clear zone (i.e., a -2000 clear zone will cause the cards to be placed on TAPE8 rather than TAPE11). This is exactly similar to the use of negative plot options on PLOT cards. AICUZ maps are always plotted to a scale of 1:48000. This cannot be changed by the user.

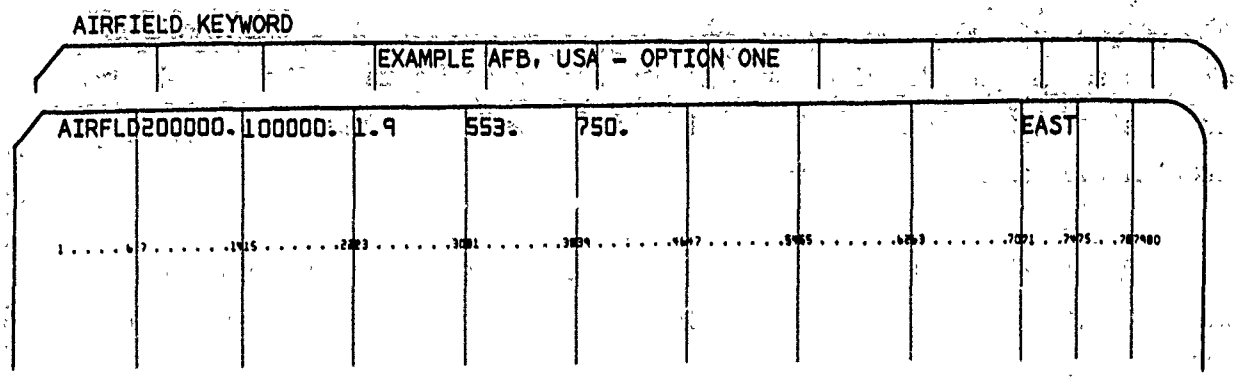
The AICUZ card can generate a number of diagnostics, which are self-explanatory:

NON-STANDARD CLEAR ZONE - 2000.0 ASSUMED
NO DATA - PLOT SUPPRESSED
NO RUNWAYS - NO ACCIDENT POTENTIAL MAP
NO GRID VALUES - NO CONTOURS

In all cases, the cause is followed by the action taken by the program.

The block assignment is also printed for the PLOT card, so that the user can find the particular information more easily.

Both PLOT and AICUZ cards will, for plotters thus equipped, change pens during the plotting. For PLOT cards, the contours are plotted with pen #1, the remainder with pen #2. For AICUZ cards, everything is plotted with pen #1, except for the airfield name and scale, which are drawn with pen #2.




```
08/02/78 EXAMPLE AFB , USA - OPTION ONE                          PAGE 1
 DNL
-------------------------------------------------------------------------

    +++  NEW AIRFIELD  EXAMPLE AFB , USA - OPTION ONE

                       EXTERNAL LOCATION OF GRID ORIGIN X = 200000.Y =  100000.
                       MAGNETIC DECLINATION   1.9 DEG TO EAST
                       FIELD ALTITUDE      553.0 FT CORRECTION  .1 DB
                       GRID SPACING IS     750.0 FT CONTOUR PGM SPACING 750.0 FT
                       OPTIONS     PROGRAM WILL ANALYZE INPUT DATA (ENGLISH UNITS)
                                   BUT NO PROCESSING WILL BE DONE
                                   FOR DAY-NIGHT AVERAGE LEVEL CALCULATIONS
                                   USING NO  TONE CORRECTION NO  RUNUP WEIGHTING
                                   DATA BASE CARRIED FORWARD UNCHANGED

                       FILES KNOWN TO PROGRAM
                       UNIT 10 BINARY WITH     0 DUMPS
```

(A) First Card

Columns	
1 - 6	AIRFLD
7 -14	X - origin of grid
15 -22	Y - origin of grid
23 -30	Magnetic Declination of Airfield Enter to nearest tenth of a degree; positive number
31-38	Field Elevation, enter to nearest foot
39-46	Grid Spacing
47-54	Contour Spacing
71-74	Direction of Declination (East/West) (For 0° declination , also enter either East or West)

(B) Second Card

Columns	
7-66	Text- Airfield name, location, and/or other identification

The AIRFLD card is unique in that it actually consists of two cards. The second card contains any suitable alphanumeric descriptor which will be printed as the page heading for all output of the program.* The AIRFLD card is physically two cards and no continuation character is needed in the continuation field of the first card.

The AIRFLD card will cause the grid to be cleared irrespective of the mode of the program and will reset the data base to its initialization values unless this is inhibited by a NODATA card. The options list gives the options in effect when the AIRFLD card was read. These may, of course, be changed at any time.

(1) Grid Origin

The computer grid must be associated with the reference used to input the data which are to follow. One should therefore decide where to put the grid for which DNL values will be computed. A first step in the absence of any contrary judgment is to position the grid so that the airfield is in the middle. The grid origin is located at the lower left hand corner of the grid.

(2) Magnetic Declination

The program is capable of constructing flight tracks from departure procedures. These procedures are worded in terms of magnetic heading. All geometric calculations in the program are done with respect to the DNL grid. It is therefore necessary to specify the magnetic declination with respect to Y-axis of the grid.

---

* This descriptor should be placed in columns 7-66.

The magnetic declination specified must be in the range $0 \leq DECL \leq 180$ and the word EAST or WEST must be placed in column 71-74. If these conditions are not met the program will issue the error:

ILLEGAL MAGNETIC DECLINATION *.* DEG TO ****

It is allowable not to specify a declination. In that case all headings are in degrees true, but care must then be taken that no magnetic headings are used for input.

(3) Airfield Altitude

Airfield altitude may be specified on the AIRFLD card in the 4th data field. The program will automatically calculate an altitude correction. The altitude and the correction will be printed in the preamble to the airfield. The altitude may be negative to indicate base level below sea level. Dumps written will include a special coding to indicate that this base is not at sea level. It is impossible to combine dumps calculated for different base altitudes. Any attempt to do so will result in the error message:

CURRENT PARAMETERS DO NOT MATCH THOSE OF DUMP

ITEM	CURRENTLY	IN THE DUMP
FLDALT	*****	*****

It is still the user's responsibility to adjust performance profiles to the aircraft performance at the altitude of the base. The program only adjusts for the change in acoustic output with respect to the same operation at sea level. When using departure procedures, care should be taken since altitudes in Standard Instrument Departures are Mean Sea Level whereas the program altitude profiles are Above Ground Level.

(4) Grid Spacing

The grid spacing is set to 1000 ft as part of the initialization of a new airfield. One may override this value by specifying a different grid spacing in the 5th data field on the AIRFLD card. Since the total number of grid points remains fixed, the area encompassed by the grid will change. This feature is only appropriate in very unusual situations; e.g., small general aviation airports without jets where a 500 ft spacing may be desired. It is important to remember that the resulting calculation time varies inversely with the square of the grid spacing. Any attempt to combine dumps calculated for different grid spacings will result in the error:

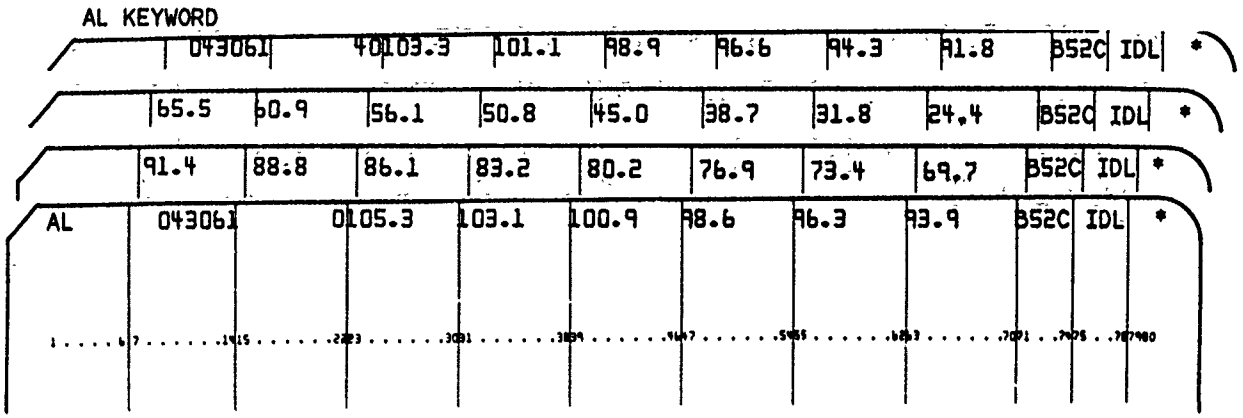
```
CURRENT PARAMETERS DO NOT MATCH THOSE OF DUMP
ITEM      CURRENTLY      IN THE DUMP
GRDSPC      *****          *****
```

(5) Contour Program Grid Spacing

The contour program grid spacing is set equal to the internal grid spacing specified above. This is not always desirable. The 6th data field can be used to change this parameter. A good understanding of the consequences of such changes to the sensitivity of the contouring algorithms is required so that the resulting contours will be reliable. This parameter is best left unspecified.

(6) Airfield Title

The AIRFLD statement consists of two cards. The second of these, which must always be present, is used to communicate an airfield title. This title will be printed on the chronicle pages and separators. It is also written on the GPCP plots and is part of the header information written on binary tapes.

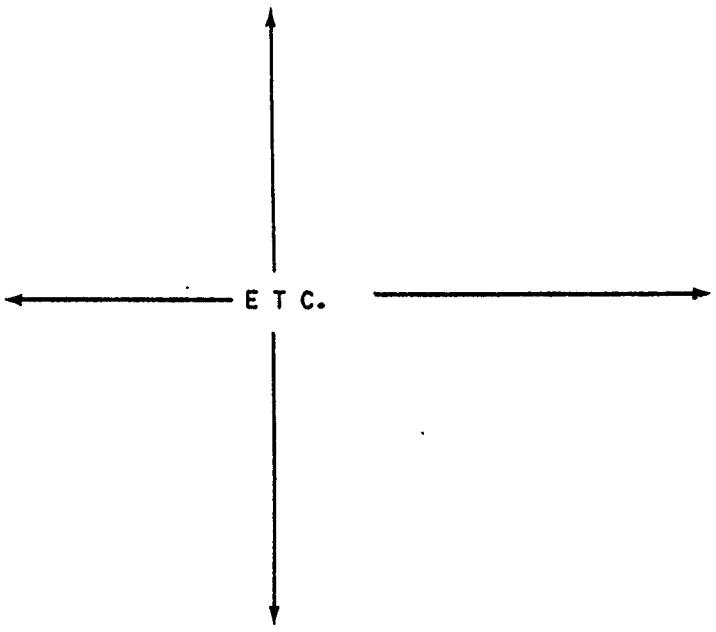


ETC.

+++ RUNUP NOISE LEVEL PROFILE (AL) NAME = 43061 B52C IDL

ANGLE IN DEGREES

DIST	0.0	40.0	70.0	90.0	110.0	120.0	130.0	140.0	160.0	180.0
200.0 FT	105.3	103.3								
250.0 FT	103.1	101.1								
315.0 FT	100.9	98.9								
400.0 FT	98.6	96.6								
500.0 FT	96.3	94.3								
630.0 FT	93.9	91.8								
800.0 FT	91.4	89.3								
1000.0 FT	88.8	86.7								
1250.0 FT	86.1	84.0								
1600.0 FT	83.2	81.2								
2000.0 FT	80.2	78.2								
2500.0 FT	76.9	74.9								
3150.0 FT	73.4	71.5								
4000.0 FT	69.7	67.7								
5000.0 FT	65.5	63.6								
6300.0 FT	60.9	59.1								
8000.0 FT	56.1	54.2								
10000.0 FT	50.8	48.9								
12500.0 FT	45.0	43.0								
16000.0 FT	38.7	36.5								
20000.0 FT	31.8	29.5								
25000.0 FT	24.4	22.1								



	Columns	
Card 1		
	1 - 6	AL
	7 - 14	Runup noise level profile name
	15 - 22	Angle in degrees (for first set of noise data angle must be 0)
	23 - 70	Runup noise levels for 200, 250, 315, 400, 500 and 630 feet respectively.
	71 - 78	Text identifying aircraft type and power setting
	80	Continuation code
Card 2		
	1 - 6	BLANK
	7 - 70	Runup noise levels for 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000 feet respectively
	71 - 80	Same as card 1
Card 3		
	1 - 80	Same as card 2 except runup noise levels for 5000, 6300, 8000, 10000, 12500, 16000, 20000 and 25000 feet respectively.
Card 4		
	1 - 6	BLANK
	7 - 80	Same as card 1 except for 2nd angle and runup noise for 2nd angle
Card 5 & 6		Same as cards 2 and 3 except runup noise levels for 2nd angle.
Card 7 - 9		Same as cards 4-6 except runup noise levels for 3rd angle

ETC.

The purpose of the AL profile is to define the noise level of an aircraft during a ground runup operation. The noise level is defined both as a function of the distance from the aircraft and the ang-le of orientation of the aircraft with respect to the observer. This is done by specifying a number of noise level versus distance profiles at ten angles about the aircraft. The noise levels are only specified for one side of the aircraft. The program assumes that the noise levels are symmetric about the longitudinal axis of the airplane. Therefore, only angles from 0 to 180 degrees are specified. Note that 0 and 180 degrees must be two of the ten angles.

One entry in the AL profile data set is actually a collection of several profiles taken at various angles. Each profile is constructed by specifying the A-weighted noise level (AL) at a number of fixed distances. These distances encompass a range of 200 feet to 25,000 feet. The 22 fixed distances increase in a fashion such that each distance is 1.259 (the tenth root of ten) times as great as the previous one.

(1) Entering an AL Profile

The keyword to be used for entering a profile is AL, which is left judtified in the six column keyword field of the first data card. Upon recognizing this keyword, the program will print the following:

+++ RUNUP NOISE LEVEL PROFILE (AL)

A set of 3 data cards is required to enter the AL profile values for each angle. On the first card, the numeric name of the profile is placed in data field one. This number may be any nonzero, positive number. If a negative number is used, the program will automatically convert it to positive. If zero is used on the first data card, the following warning message will be printed:

ILLEGAL NAME

The number may be up to 8 digits long but must be unique among all entries in this data set. If it is not unique, the old profile of the same name will be lost.

Data field two contains the angle in degrees. It is mandatory that the first angle entered be zero degrees; thus, a zero is placed in column 22 of data field two.

Data fields three through eight contain the first six AL values. The additional continuation cards, containing eight AL values each, are necessary to complete the first profile. Each continuation card must have the keyword field left blank and column 80 of all three cards must have a continuation indicator.

After the profile for the first angle has been entered, the profiles for succeeding angles must be entered in order of increasing angle. A set of three data cards is required for each additional angle and the keyword field on these three cards must be left blank. The format of the three card set is identical with the first angle. The numeric name which is entered in data field one of the first data card in each subsequent set must be identical to the name used in the first set (for zero degrees). If the names do not agree, the following warning message will be printed:

NAME DOES NOT MATCH FOR ANGLE = *****

In order to aid the user in locating where the problem occurred, the message prints the angle which was read from the second data field of this card. If the problem is caused by cards being out of order, the angle value printed may in fact be an AL value.

The angle may be any positive number between 0 and 180. If the number is negative, the program will automatically convert it to positive. Data fields three through eight contain the first six AL values. The two additional continuation cards contain the remaining sixteen AL values. The AL values themselves have only two restrictions. First, the value is limited in magnitude to plus or minus 200 dB. If the value is outside of this range, the following warning message will also be printed:

NOISE LEVEL(S) OUT OF RANGE

Second, it is logical that the noise levels should decrease as the distance between the aircraft and the observer increases. Therefore, consecutive entries in each of the profiles must be decreasing in value. If this is not the case, the following warning message will be printed and the offending profile will be identified by its associated angle:

NOISE LEVELS DO NOT DECREASE FOR ANGLE = ***.* DEG

The program performs a few simple checks for the completeness of the data. A first check is to verify that (1) there are three data cards for each angle, (2) that all cards have the continuation code in column 80 with the exception of the last card, and (3) that the keyword field for each continuation is left blank. If a card with continuation code is followed by a card with a mnemonic, the program assumes that one or more data cards were inadvertently omitted, and the following warning message, which indicates the last angle read, will be printed:

MISSING DATA. LAST ANGLE = ***.*

This error can be caused by inadvertently placing a continuation code in column 80 of the third card of the last angle, thus causing the program to expect another profile for that entry.

Once the program encounters a card with column 80 left blank, it assumes that this card terminates the data entry. Clearly, this is a critical problem if column 80 is left blank on either of the first two cards of the three card sequence for a particular angle. If such is the case, the program assumes that either the continuation code was omitted from this card or that some data cards are missing. It then prints the following warning message

MISSING CONTINUATION CODE OR MISSING DATA. LAST ANGLE = *.***

If either of these two error conditions should occur, the program will cease to interpret any further cards as belonging to the AL profile.

Additional checks involve the angles which have been specified. If the profiles are not in ascending order of angle, or if two profiles are specified with the same angle, the following warning message will be printed:

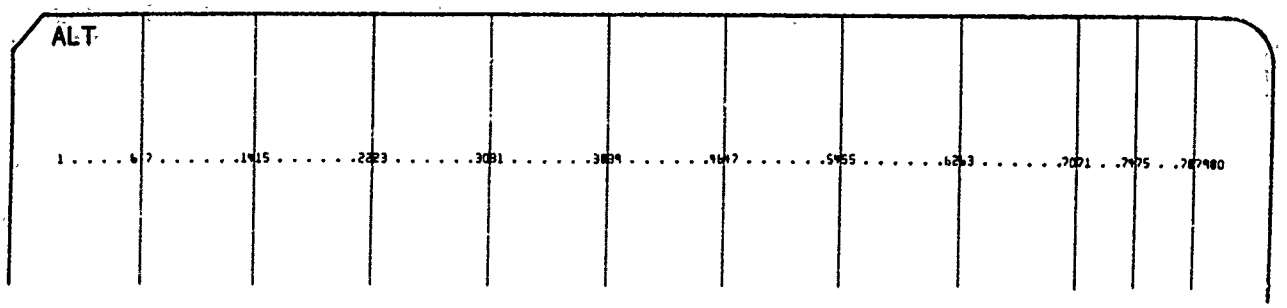
ANGLES NOT IN ASCENDING ORDER OR DUPLICATE ANGLE

It is possible (but very unlikely) that this message could be manifested by cards being out of order.

Profiles for up to 10 angles may comprise one entry. If more than ten are specified, the listing of the input data will show only the first nine angles and the last angle (rather than the tenth angle) entered, and the following warning message will be printed:

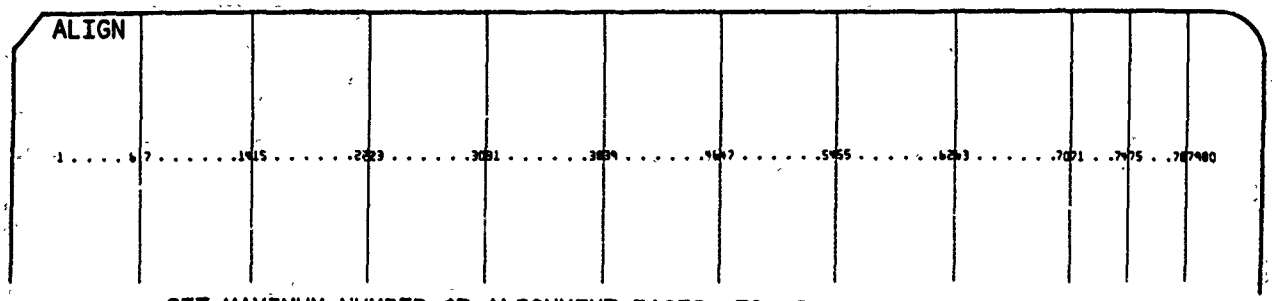
TOO MANY ANGLES, 10 MAX

ALT KEYWORD



The ALT cards are identical in format to AL cards but data is assumed to be tone corrected.

ALIGN KEYWORD



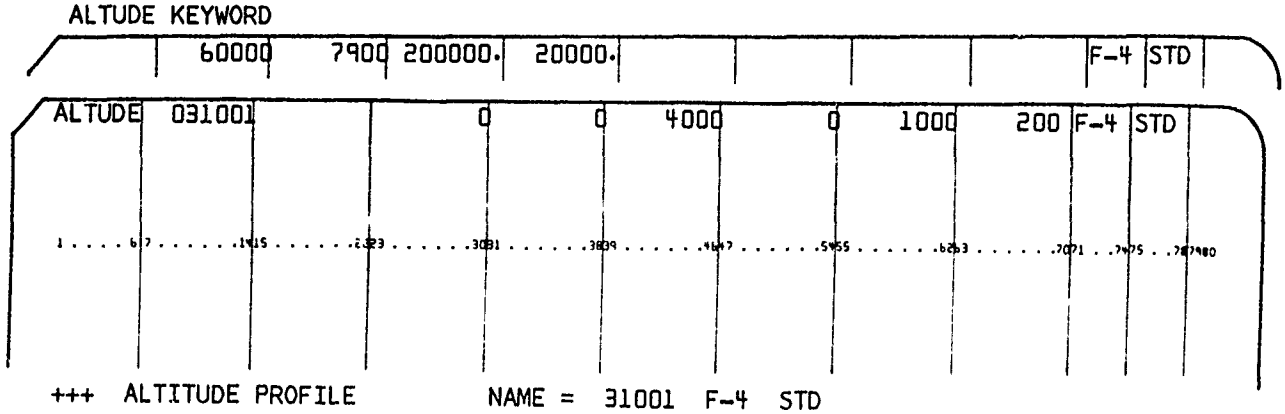
+++ SET MAXIMUM NUMBER OF ALIGNMENT PAGES TO 0

Columns	
1 - 6	ALIGN (Chronicle Alignment Page Suppression)
7 -14	Page count

Both NOISEMAP and DATASCREEN print two alignment pages before each airfield and one following each airfield. This can be changed by using a card with the keyword ALIGN. No alignment pages are printed when the page count field is left blank or is zero. When a positive number is specified this specifies the maximum number of identical pages allowed. So that when a one (1) is specified, the program will omit one of the two leading pages; when a two (2) is specified, the usual sequence is followed. It is also possible to force an increase in the number of pages (up to a maximum of five) by specifying a negative page count.

The typical use of this card will be to suppress the alignment pages. As such, its logical place is in the initialization procedure. The very first two alignment pages of the chronicle cannot be suppressed.

ALTUDE KEYWORD



+++ ALTITUDE PROFILE NAME = 31001 F-4 STD

TRACK DIST	ALTITUDE
0. FT	0. FT
4000. FT	0. FT
10000. FT	200. FT
60000. FT	7900. FT
200000. FT	20000. FT

Columns	
1 - 6	ALTUDE Keyword
7 - 14	Altitude profile identification number. This number must correspond to that specified on TODSCR or LNDSCR card preceding the ALTUDE card.
23 - 70	Cumulative track distance and altitude pairs. Continuation cards are used as necessary.
71 - 78	Some identification as for TODSCR or LNDSCR cards.
80	If additional card needed, enter asterisk (*) in Col. 80.
Continuation cards:	Enter cumulative track distance and altitude pairs in Cols 7-70 as required. Enter identification in Col. 71-78. Enter asterisk (*) in Col. 80 if another card is required to describe altitude profile.

Figure 4 shows a typical takeoff and landing profile. Data field one contains the numeric name of the profile. This number may be any nonzero, positive integer. If a negative number is used, the program will automatically convert it to positive. If zero is used, the following warning message will be printed:

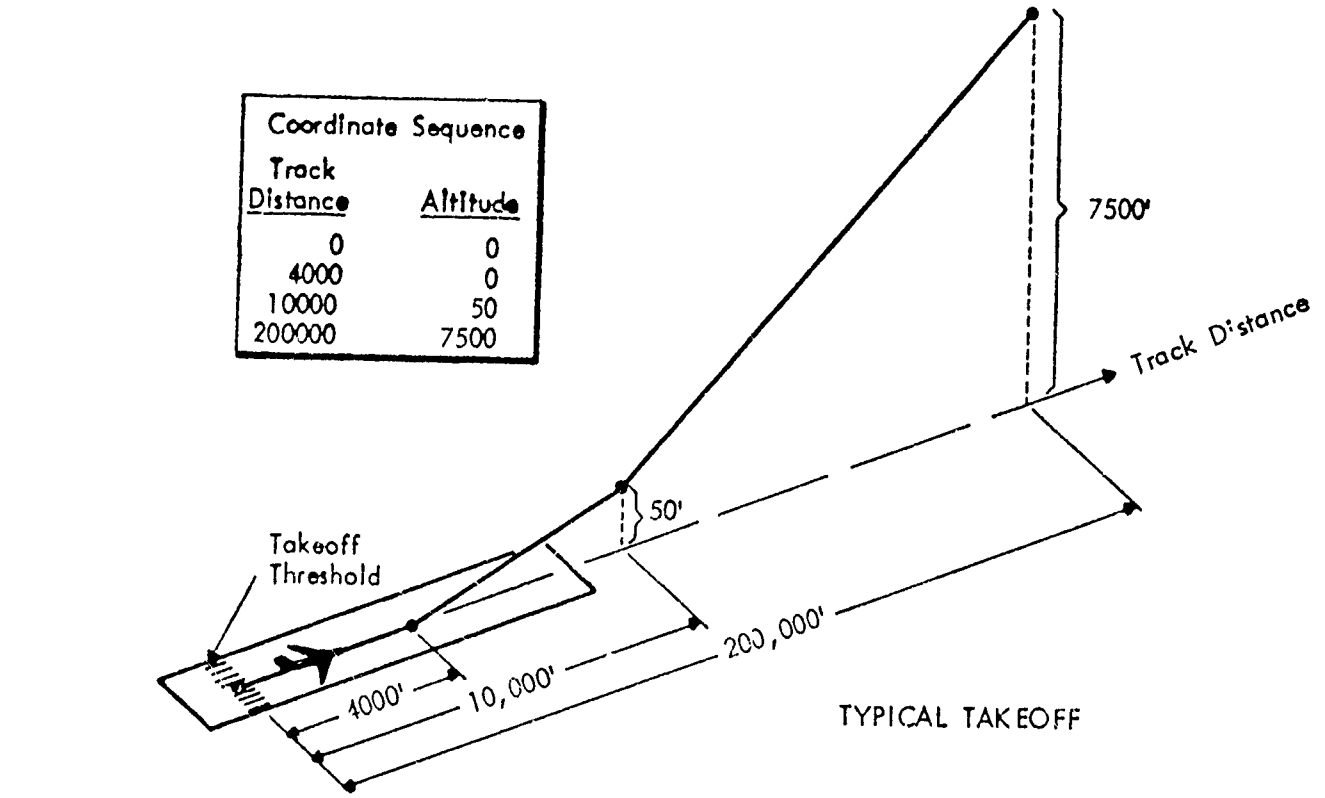
ILLEGAL NAME

The number may be up to 8 digits long. The name must be unique among all entries in this data set. If it is not unique, the old profile of the same name will be lost.

Data field two is not used. Therefore, leave this field blank. Starting with data field three, the coordinates are entered. Data fields three and four contain the first coordinate pair (track distance and altitude, respectively). Succeeding coordinate pairs are entered in data fields five and six, and seven and eight. If more than three coordinates are to be entered, continuation cards may be used. Each continuation card must have the keyword field left blank and an asterisk (*) must appear in Column 80 of the preceding card. The last continuation card should not have an asterisk (*) in Column 80. Four coordinate pairs may be entered on each continuation card, starting with data field one. The coordinates may be in either feet or in meters. However, be certain that the correct UNITS specification is in effect.

There are only three restrictions on the coordinates. First, the track distance of the first coordinate must be zero. If it is not, the following warning message will be printed:

INITIAL TRACK DIST NOT ZERO



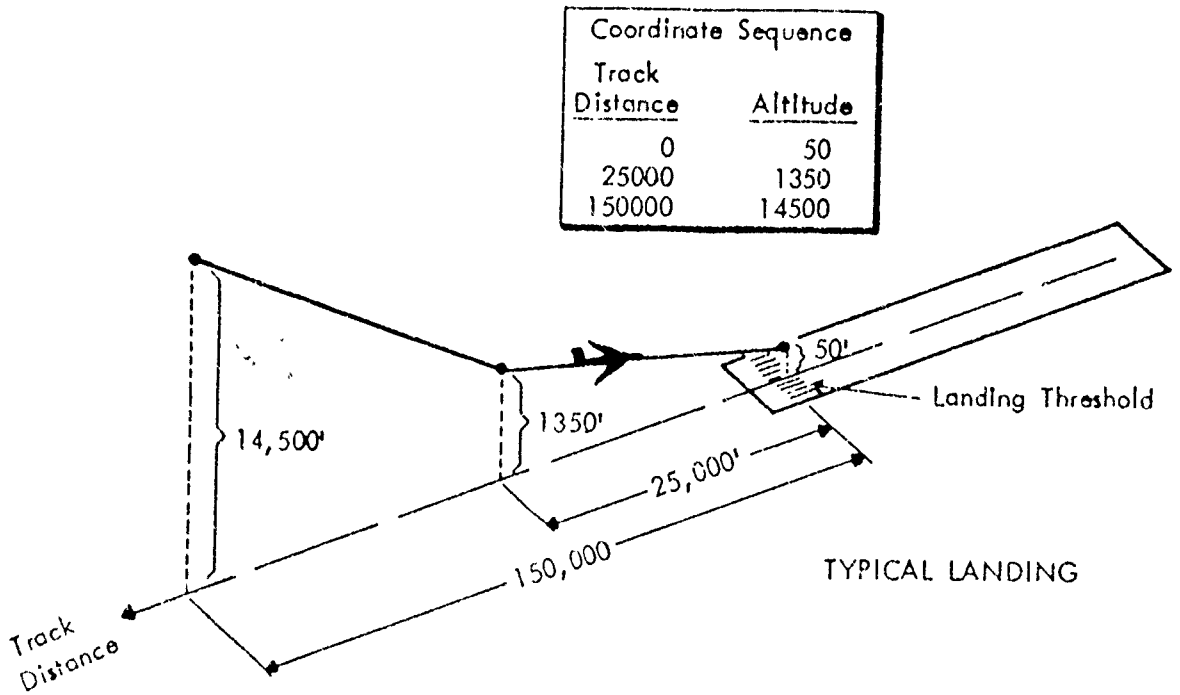


FIGURE 4. ILLUSTRATION OF ALTITUDE PROFILE

Second, all track distances must be positive numbers (with or without decimal points) and must be ascending in value. If they are not, the following warning message will be printed:

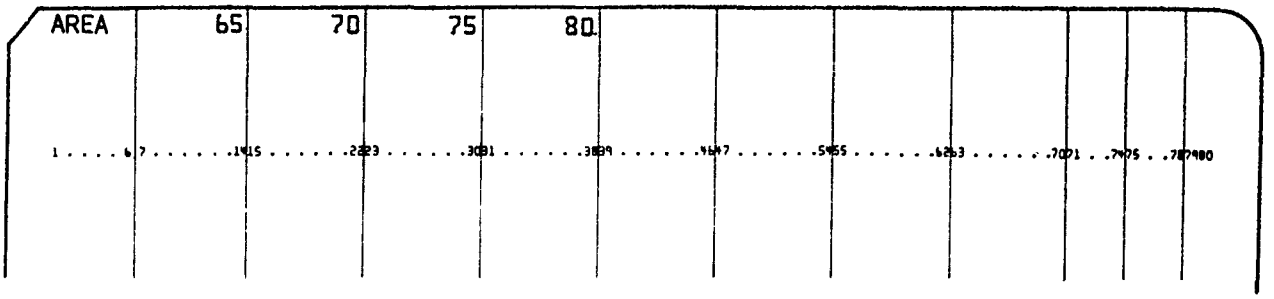
TRACK DISTANCE(S) NOT POSITIVE OR NOT ASCENDING

Third, the number of coordinate pairs must be at least two, but not more than ten. If the number of pairs does not fall in this range, the following warning message will be printed:

NUMBER OF COORDINATES RESTRICTED 2 TO 10

There are no restrictions on the altitude values. They may be positive, negative or zero.

AREA KEYWORD



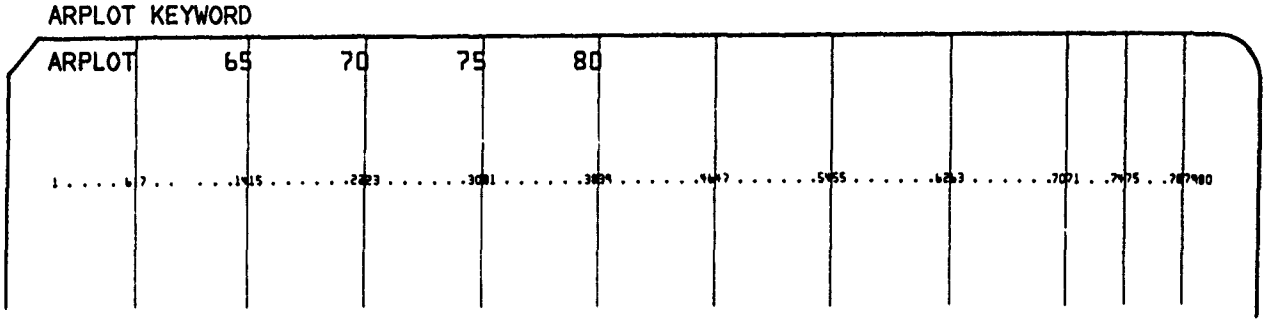

```
+++  AREA CALCULATION
     65.0  VALUES REQUESTED
           65.0  70.0  75.0  80.0
     THERE ARE  3643 DNL     DATA POINTS
     DNL   VALUE      SYMBOL    MILL SQ FT        ACRES    SQ  MILES
        65.0             D         131.733     3024.181        4.725
        70.0             C          68.667     1576.370        2.463
        75.0             B          45.600     1046.832        1.636
        80.0             A          22.000      505.050         .789
```

Columns	
1 - 4	AREA
7 - 70	Specify contours for area computations in these data fields.

Actual areas contained within a contour must be calculated by planimeter from the contour maps. A reliable estimate can, however, be produced by NOISEMAP 3.4 by use of the AREA card. This card computes the area within the contours specified. This is done by subdividing the grid points and determining the number of points above a given threshold. At a grid spacing of 1000 feet each point represents about 1.5 acres.

Areas will be estimated in millions of square feet, acres, and square miles when English units are used. The metric mode computes areas in square kilometers and hectares. The results are printed with three digits following the decimal point, but since each point represents a large area the accuracy is much less than the implied .001 acres.

ARPLOT KEYWORD




```
+++  PRINTER PLOT
     DNL     VALUES REQUESTED
             65.0  70.0  75.0  80.0
     THERE ARE  3643 DNL     DATA POINTS
     DNL   VALUE     SYMBOL    MILL SQ FT        ACRES     SQ  MILES
        65.0           D         131.733       3024.181        4.725
        70.0           C          68.667       1576.370        2.463
        75.0           B          45.600       1046.832        1.636
        80.0           A          22.000        505.050         .789
   PRINTED PLOT ON UNIT 15
```

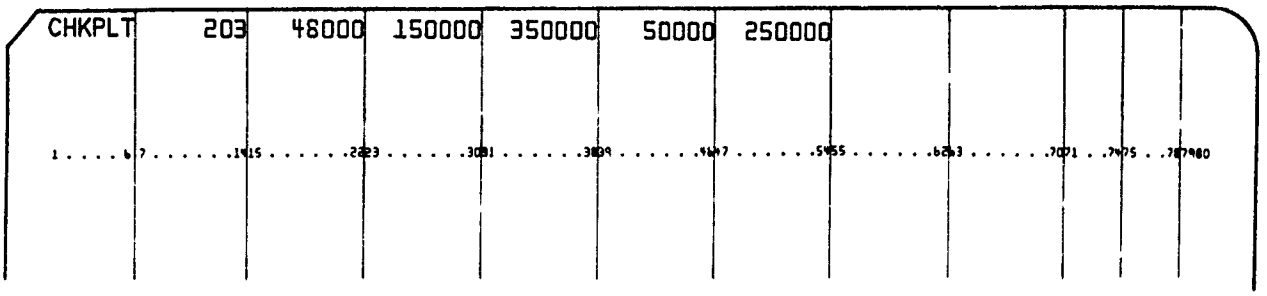
Columns	
1 - 6	ARPLOT
7 - 70	Specify contours for plotting and area computations in these data fields.

The PRPLOT and AREA cards may be combined into the ARPLOT card. This combines both functions in the same amount of computer time as either PRPLOT or AREA since the identical algorithm is used for both functions. The printed plots will appear on logical unit 15.

Due to the finite size of the alphabet, only 26 contours can be calculated at the same time. If more contours are requested, the program will process all data cards which can be completely processed, then after this plot is completed the remaining contours will be printed on the next "plot".

In the non-processing mode, no areas are, of course, computed. The chronicle listing will show **.* if areas will be printed during a processing run.

CHKPLT KEYWORD




```
+++  CHECK PLOT OF ENTIRE LAYOUT
     AREA COVERED:  X =  150000. TO 350000.  Y =  50000. TO 250000.
     OUTPUT ON SC4020
     SC4020  PLOT FRAME NO. 1
```

Columns	
1 - 6	CHKPLT Keyword
12 - 14	Specify the plot type and the device on which the output should be placed
15 - 22	Speci.y the scale
23 - 30	X-coordinate for the lower bound
31 - 38	X-coordinate for the higher bound
39 - 46	Y-coordinate for the lower bound
47 - 54	Y-coordinate for the higher bound

Since for military installations the runup operations and flight operations are approved by different authorities there is a need to produce these layouts separately. The NOISEMAP checkout plot which combines both onto one plot is also available using CHKPLT. A separate CHKPLT card is required for each plot type.

The CHKPLT card contains 6 data fields. The type field contains the plot type and the device on which the output should be placed. The proper value is

calculated from the formula TYPE = 100 * DEVICE + OPTION where device and option are specified as follows:

Value	Device	Option
1	CALCOMP	Flight Tracks
2	SC-4020	Runup Pads
3	both devices	both types together

For example, the "usual" NOISEMAP output of a complete layout including runup pads on the CALCOMP becomes 103. A microfilm plot of flight tracks is a type code 201.

When no value is specified, the program will use the device type which was specified on the last DEVICE card. If no such card has been read by the program, then the device will be the microfilm plotter. In any event, a complete layout (option = 3) will be made.

The next field is the SCALE field. It is only meaningful for CALCOMP plots and will be ignored for microfilm. The scale factor is identical to the one used for the PLOT keyword. To plot on a scale of 1" = 2000', i.e. a scale 1:24000 for flight track maps and 1:4800 (1" = 400') for runup maps.

The next four fields contain the lower and higher bounds on the x-coordinate and the bounds on the y-coordinate. The coordinates should be referred to the same origin that the NOISEMAP data is referred. The area specified may be larger or smaller than the NOISEMAP grid. If the area is larger than the area specified on the AIRFLD and LIMITS cards, the area seen by NOISEMAP will be shown in a broken line.

When the area to be plotted is not specified, DATASCREEN will assume that flight track and combined maps cover the usual NOISEMAP area. If a runup map is desired, the program will plot a square with a side of 20000 ft. centered upon

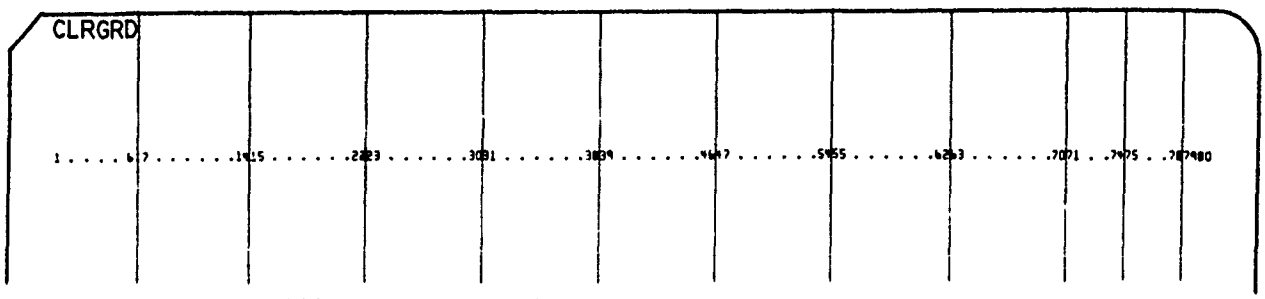
the airport center. The airport center is taken to be the center of the rectangle parallel to the x and y axes, which just circumscribes the runways. This may or may not include all desired runup locations. It is therefore best to specify the runup maps explicitly.

There are no limits on the scale factor used. The screening program will look at the total size of any panel and make sure it is less than 9 ft. for a flight track map and 8 ft. for a runup map. If larger maps are desired, a maximum value may be placed in the seventh data field*. When for example, a 15 is punched, this signals to the computer that a 15 ft. map is allowed and that this large size was intentional and not due to a keypunch error. Because plotter paper comes in rolls of 120 ft., it is not possible to ask for a plot longer than 120 ft. It is doubtful that this would be a serious problem. The microfilm plots are always scaled to fit on one single frame irrespective of the area covered, and the seventh field has therefore no meaning here.

---

* Limiting the plot size to 9 ft. is only a protective device in DATASCREEN. It is, however, a very real limitation when using NOISEMAP since the GPCP program cannot produce maps in excess of 100 inches.

CLRGRD KEYWORD



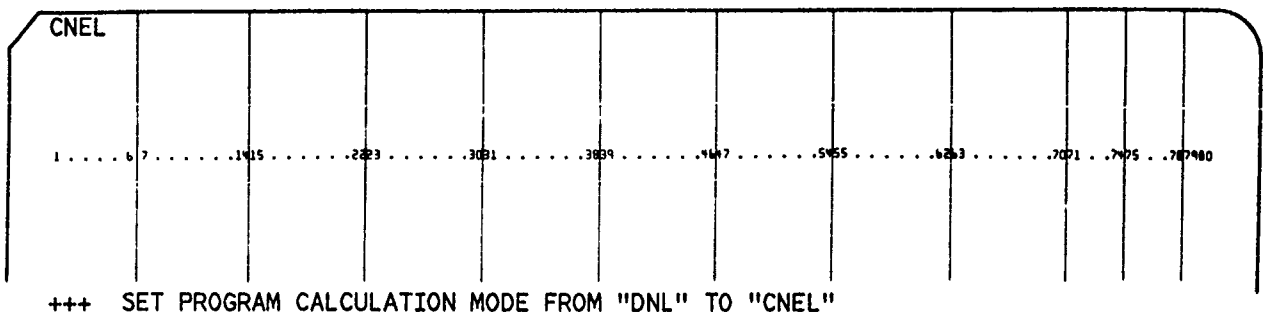
+++ CLEAR GRID *** GRID CLEARED ***

Columns

1 - 6 CLRGRD - set the grid to zero (-88 DNL)

When the grid is cleared, it is set to a zero value. The DNL sum is logarithmic and since minus infinity cannot be used in a computer, the logical zero of the program is set to - 88 DNL. The program in the 'noproc' mode ignores all references to the grid. The CLRGRD card is therefore ignored when the program is in this mode. The value will not be reset until a CLRGRD, or LODGRD card appears after a PROCES card, or until an AIRFLD card is encountered.

CNEL KEYWORD

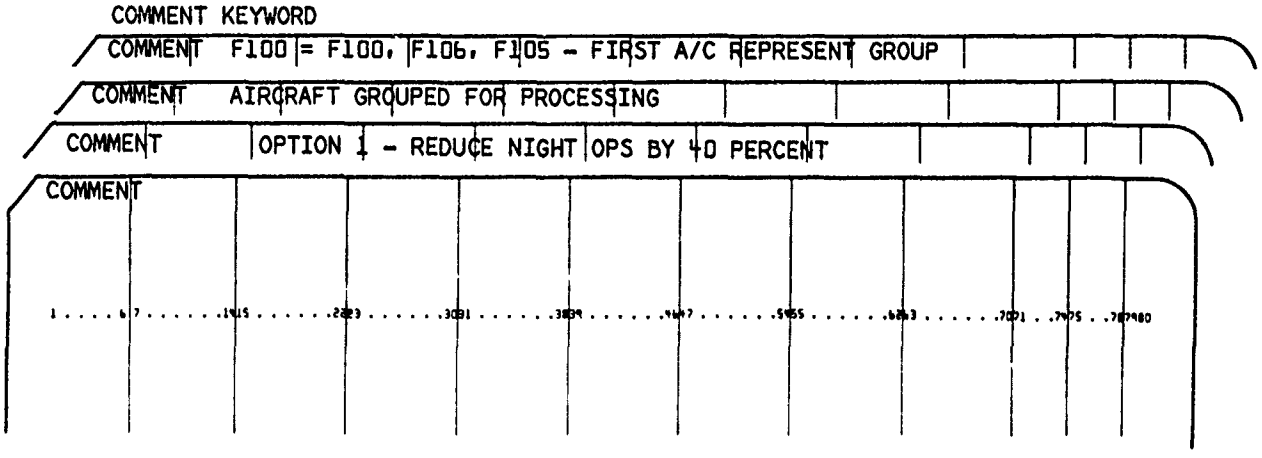



```
+++  SET PROGRAM CALCULATION MODE FROM "DNL" TO "CNEL"
          DSEL KEPT
          SEL  KEPT
          AL   KEPT
     APPROPRIATE DATA KEYWORDS ARE
          SENEL    XSENEL    LSENEL    CSENEL
          DSENEL   XDSENE    LDSENE    CDSENE
          AL       XAL       LAL       CAL
     THE FOLLOWING FORMULA IS USED
     FLIGHTS - CNEL = SENEL + 10 LOG(NDAY + 3 NEVE+ 10 NNITE) -49.4
     RUNUPS  -      = AL    + 10 LOG(NDAY + 3 NEVE+ 10 NNITE) -49.4
     GRIDWALK CUTOFF IS  35.0 CNEL   (  32 MARGINAL ADDITIONS SUM TO 50.0)
```

With the CNEL card, the NOISEMAP computer program will calculate Community Noise Equivalent Level (CNEL).

Appropriate data keywords for CNEL are SENEL, DSENEL and AL. The NOISEMAP program will accept keywords for DNL (SEL, DSEL and AL) but three warning messages will be printed before the program will assume that SEL cards encountered are SENEL cards.

```
**********************************| W A R N I N G **************************
SEL      CARD ENCOUNTERED SENEL  ASSUMED
*******************************************************************************


**********************************  W A R N I N G **************************
DSEL     CARD ENCOUNTERED DSENEL ASSUMED
*******************************************************************************

**********************************  W A R N I N G **************************
SEL      CARD ENCOUNTERED SENEL  ASSUMED
NO FURTHER WARNINGS FOR SEL      XSEL    LSEL    CSEL    CARDS WILL BE ISSUED
NO FURTHER WARNINGS FOR DSEL     XDSEL   LDSEL   CDSEL   CARDS WILL BE ISSUED
*******************************************************************************
```



Columns	
1 - 7	COMMENT
8 - 78	TEXT

COMMENT card is used for explanatory text. It may be placed anywhere in the deck to aid in documenting the data, amplifying or explaining it. Typical uses would be:

(1) Following the second AIRFLD card, to describe in detail an option being processed.

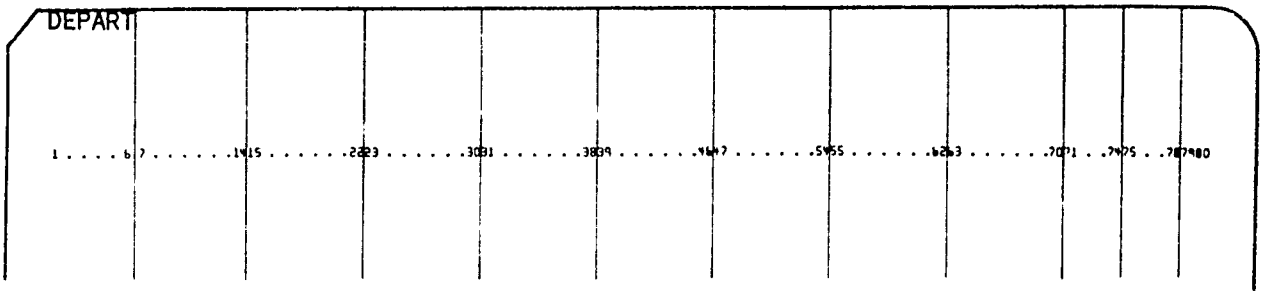
(2) Following the second AIRFLD card, to describe groupings of aircraft for processing.

(3) Immediately preceding a FLTTRK card, to describe the flight track which follows (radar pattern, overhead landing, etc.).

(4) At any point where textual information would be helpful in explaining what is being done if such is not straight-forward.

COMMENT cards do not have a continuation feature. If more than 71 columns of text are required, use additional COMMENT cards.

DEPART KEYWORD



See Figure for printout examples

Columns

1 - 6 DEPART Keyword

7 - 14 For the ALT field, specify the altitude to which the aircraft must climb. The entry in the Chronicle will print as:

CLIMB TO ****** FT

15 - 22 In the DIST field, specify the distance to be flown as measured from the current aircraft position. The corresponding Chronicle entry is:

PROCEED FOR ****** FT

23 - 30 In the RAD field, specify the radial which should be intercepted (in combination with the navaid name in NI -(See Col 71- 74). If no heading was specified, the program assumes that the radial is to be intercepted. If the value is positive, the message is:

INTERCEPT **** ****** RAD

whereas when the entry is negative, it is assumed that the following is intended:

INTERCEPT **** ****RAD (INBOUND)

31 - 38	In the HEAD field specify the magnetic heading onto which the aircraft must turn. The Chronicle will echo:

```
TURN TO HEADING  ****** FT
```

39 - 46	Blank
47 - 54	Specify altitude restrictions. The restriction is of the type "at or below" the certain altitude. The restriction is interpreted as follows:

```
RESTRICTIONS
FOR            ***** FT OR
UNTIL ***        *** RAD
STAY BELOW     **** FT
```

55 - 62	The distance restriction
63 - 70	The radial restriction which is meaningful together with altitude restriction
71 - 74	The NAVAID code for instruction (NI)
75 - 78	The NAVAID code for restriction (NR)

The departure procedure is the most powerful method of entering flight track information into the program.

The departure procedure as entered on a DEPART card is logically equivalent with entering a flight track on a FLTTRK card. The result is very different, however, since the DEPART card does not generate a flight track at the time of entering, but only "compiles" the information. The explicit definition by means of a FLTTRK card will cause all subsequent aircraft referenced in a FLIGHT card to follow exactly the same ground track. The implicit definition by means of a DEPART card will cause all subsequent aircraft referenced in a FLIGHT card to generate the flight track appropriate to the performance characteristics of each particular aircraft.

Each aircraft/mission combination has associated with it a certain altitude profile and a turn radius. When a pilot's instruction is to climb to a given altitude and then turn to a certain heading*, the flight track generated by these instructions will vary with the performance characteristics of the aircraft flown. The DEPART card allows the user to specify only the clearance received by the pilot. The program will then generate the corresponding flight track.

It is also possible to include altitude restrictions in such a procedure. If an aircraft is to stay below a certain altitude until a specific point, this may be included in the description of the procedure. The program will then modify the altitude profile specified for the non-restricted performance and insert such portions of level flight as may be necessary to enforce the restriction. For this part of the program to work satisfactorily, one should not start with an altitude profile which already has level flight segments in it, since the resulting altitude profile in unpredictable.

The increased data entry capability is offset by a decrease in diagnostic efficiency. Since the DEPART is a highly contextual statement, the diagnostic capability per pass is limited. That this is so, can easily be seen. If an error occurs, the program cannot check the remainder of the procedure since one cannot lay out the flight track beyond the point where the error occurred. Similarly, if a warning was issued because the program found that some choices were nonsensical, the correction of that problem will change the context in which the remainder of the procedure must be interpreted.

It bears repetition at this point to review the meaning of ERROR and WARNING as issued by the program. An error is issued by the program when the program cannot proceed with the calculations. As such, it points to an error in the data input. A warning is issued by the program when the program detects

* The program assumes all headings and radials to be in degrees magnetic.

a condition where the likelihood of errors in the input is considerably higher than usual. The program cannot decide whether or not the data were in error and processing is still possible. One must, however, not forget that the qualification "higher than usual" implies that it is possible, at any time, to give erroneous information to the program which will go undetected. An error summary showing no errors and no warnings only conveys to the user the information that the data cards were syntactically and semantically correct statements of the NOISEMAP language. No diagnostic is provided as to whether the data correctly describes runway layouts, flight paths, noise and performance data or operations of the air base under study.

The execution of a departure procedure is signified by the message, FOLLOWS DEPARTURE PROCEDURE, following the alphabetic descriptor of the aircraft as printed in the Chronicle when a FLIGHT card is recognized. (If an error or warning message was printed as a result of the FLIGHT card, the message will appear underneath the last message banner.) This entry is then followed by the diagnostics, if any, generated during the departure procedure execution. After completion of the procedure, the altitude/distance curve is printed, followed by a listing of maneuvers executed. If during the "compilation" of the procedure, an error was detected which would cause the execution of the procedure to be erroneous or impossible, the program will only print the message:

EXECUTION OF PROCEDURE SKIPPED DUE TO PREVIOUS ERROR(S)

This error may also be caused by a missing altitude profile, which is always considered an error, even when no reference to an altitude is made in the wording of the procedure. One should note that a missing navaid does not give this message. Therefore, although the "skipped execution" message appears immediately after certain navaid errors, the reason for the skipping is never due to missing navaids.

Errors may be detected at two different points. Some errors will be found when the DEPART card is read, others will not be found until the subsequent FLIGHT card is read. The errors which are deferred to the FLIGHT card are not necessarily undetectable at an earlier stage. It is more convenient and more efficient to check the item at a later time, and better diagnostics can then often be provided. An example is shown below:

```
CLIMB TO      1500 FT THEN
TURN TO HEADING 270

PROCEED DIRECT TO NAVAID NNV
   RESTRICTIONS
   FOR NEXT  46000 FT
   STAY BELOW 1000 FT
```

It is a rather glaring error to enter a restriction to 1000 ft. in the second step after first having allowed the aircraft to climb to 1500 ft. in the first. Nonetheless, the program will not detect this error until after the FLIGHT card has been read. At the point where all other illegal altitude restrictions will also be detected, the error message will be generated:

```
ALT. REST.  1000 FT ILLEGAL AFTER  25477 FT WHEN A/C IS AT 1687 FT.
```

indicating that after reaching 1500 ft. the aircraft has turned to the assigned heading of 270 (during which maneuver it gained an additional 187 ft. of altitude). Then, when the next instruction step was encountered (proceed direct to navaid NNV), the restriction to 1000 ft. was found which was at that moment clearly illegal. The flight track which has been generated thus far will, however, be plotted if a PLOT card is encountered. The message following the above error will read:

```
PROCEDURE ABANDONED AFTER  1 STEP(S)
```

indicating that only the first step was executed and its flight track written on an internal file for later plotting. The current altitude profile and flight track will be printed after this message.

The first four columns of the card contain the instruction to be executed. The next three columns contain the (optional, restriction. The DEPART card itself must not contain a restriction only or the error message:

RESTRICTION PRECEDES FIRST INSTRUCTION

will be printed. Subsequent continuation cards may contain either or both types of entry. A card which has no data coded on it will be read and ignored. The total number of allowable continuation cards varies with the contents of the cards.

The ALT field in the instruciton contains the altitude to which the aircraft must climb. The DIST field in the instruction contains the distance to be flown as measured from the current aircraft position.

The HEAD field contains an entry indicating the headings onto which the aircraft must turn. The entry in the RAD field (in combination with the navaid code in NI) gives the intercept instruction which will move the aircraft from its current position onto the radial. No motion along the radial will take place, however. If this is desired, it must be specified as the next instruction step.

If an entry is present in the HEAD field, however, the program will assume that upon reaching the specified radial,the turn must be started:

PROCEED TO **** **** RAD

One more instruction remains: no entry in ALT, DIST, RAD, or HEAD but only an entry in NI. This has the following meaning:

PROCEED DIRECT TO NAVAID ****

In that case, the program will find the radial which is tangent to a turn initiated immediately, and having completed the turn move the aircraft to the navaid along this radial. All radial values and headings conform in the Chronicle entries to common aviation practice of giving leading zeros: a heading of 90 degrees will print as 090.

The error messages for headings and radials are similar. No radial or heading should ever be larger than 360 degrees:

ILLEGAL ENTRY TURN ****

ILLEGAL ENTRY **** ****

The navaid identifier must be non-blank for any navaid referenced. The negative value of a radial is only allowed where it makes sense: when intercepting a radial. It isn't allowed when a heading is also specified. In that case, the " - " sign will appear in the listing as in:

PROCEED TO NNV - 400 RAD

followed, of course, by an illegal entry error message.

Since an aircraft must first become airborne, before a turn-to-heading instruction is allowed the following error is self-explanatory:

ILLEGAL ENTRY TURN *** AS FIRST INSTRUCTION

In any event, the very first step must move the aircraft off the ground. If this is not the case, the program will print:

AIRCRAFT REMAINS ON GROUND DURING FIRST INSTRUCTION

after the listing of maneuvers executed.

Having discussed the individual entries on the card, we now check the semantics of combining them. The altitude and distance can appear by themselves on the card with the meaning given earlier. If both appear, the event which occurs FIRST will take precedence. This is evidenced by the word "OR" which now appears in the Chronicle:

```
CLIMB TO      *** FT OR
PROCEED FOR ****** FT
```

where the implication is whichever comes first. If only these two entries are coded, the aircraft will be moved the appropriate distance. If a heading is also specified, however, the aircraft will be turned onto this heading as evidenced by the noise word "then"

```
CLIMB TO        **** FT OR
PROCEED FOR   ****** FT THEN
TURN TO HEADING  ***
```

Matters can be complicated one step further:

```
CLIMB TO        **** FT OR
PROCEED FOR   ****** FT OR
PROCEED TO    ******* RAD THEN
TURN TO HEADING
```

Again the implication is that of whichever comes first. The meaning of the following is not necessarily obvious:

```
CLIMB TO        **** FT OR
PROCEED FOR   ****** FT OR
INTERCEPT ***    *** RAD  (INBOUND)
```

The program will check which event occurs first:

1. Altitude reached
2. Distance flown
3. Turn initiated to intercept the radial

If the first two conditions do not occur before the turn is started to intercept the radial, the third alternative is chosen. If however, either of the first two conditions occurs before the third, this will take precedence and in that case, the radial will not be intercepted. In the first two alternatives, the aircraft heading will not change, but in the third, it will. The resulting flight paths can therefore be very different! The user is advised to obtain a plot of his flight tracks and to check the maneuvers executed listing after each flight listing. If it is desired that the first two conditions are checked first, and to intercept the radial after altitude or distance is reached, the instruction should be split and put on two cards:

```
CLIMB TO       **** FT OR
PROCEED FOR  ****** FT
INTERCEPT ****  *** RAD (INBOUND)
```

Continuation cards, therefore, allow us to construct procedures of more than one step. On occasion, there is no difference in the meaning whether one or two cards are used. Since the blank line between two steps has the same meaning as a THEN phrase, the following two entries are equivalent:

```
CLIMB TO       ***** FT THEN
TURN TO HEADING   ***

CLIMB TO       ***** FT

TURN TO HEADING   ***
```

In the second case, the computer considers the instruction as a two-step instruction, which takes up more space than the one-step instruction of the first method. This "unnecessary" step is counted as a step in determining the complexity of the procedure.

The error messages, which are associated with the instruction part of a DEPART card, but which have not yet been discussed, are generated at the time the procedure is executed for a particular aircraft. Since these messages may be influenced by the presence of restrictions, we will discuss the restrictions first and then come back to the errors.

Two examples of Departure procedures are shown in Figure 5.

THE RESTRICTION PART OF THE DEPART CARD

The restriction part of a DEPART statement can be used to introduce altitude restrictions. The restriction is of the type "at or below" rather than "at or above". The restriction is interpreted as follows:

```
RESTRICTIONS
UNTIL ***      *** RAD
STAY BELOW    **** FT

RESTRICTIONS
FOR           ***** FT
STAY BELOW    **** FT

RESTRICTIONS
FOR           ***** FT OR
UNTIL  ***     *** RAD
STAY BELOW    **** FT
```

The NAVAID code for a restriction is placed in the NR (Navaid Restriction)field.

+++ DEPARTURE PROCEDURE

PROCEED FOR 17000 FT THEN
TURN TO HEADING 150

INTERCEPT LLS 078 RAD (INBOUND)

INTERCEPT FLM 010 RAD (INBOUND)

PROCEED FOR 60000 FT

********** END OF PROCEDURE **********

+++ F-100 AIRCRAFT NO. = 99 MISSION NO. = 88
OPERATIONS - DAY 10.000 , NIGHT 0.000

********** W A R N I N G **********
UNSPECIFIED TURN RADIUS RESET TO 6000 FT
****

********** W A R N I N G **********
A/C GONE BEYOND ALTITUDE PROFILE AFTER 3 STEPS
****

PROFILE GENERATED -- DISTANCE ALTITUDE

DISTANCE	ALTITUDE
0	0 FT
6000	0 FT
8000	100 FT
100000	19700 FT
115673	19700 FT

FLIGHT TRACK -- MANEUVER EXECUTED / DISTANCE AFTER COMPLETION / HEADING

MANEUVER EXECUTED		DISTANCE AFTER COMPLETION	HEADING
PROCEED	17000 FT	17000 FT	32 DEG
TURN RIGHT	119 DEG	29419 FT	150 DEG
PROCEED	54888 FT	84307 FT	150 DEG
TURN RIGHT	108 DEG	95617 FT	258 DEG
PROCEED	12935 FT	108552 FT	258 DEG
TURN LEFT	68 DEG	115673 FT	190 DEG
PROCEED	60000 FT	175673 FT	190 DEG

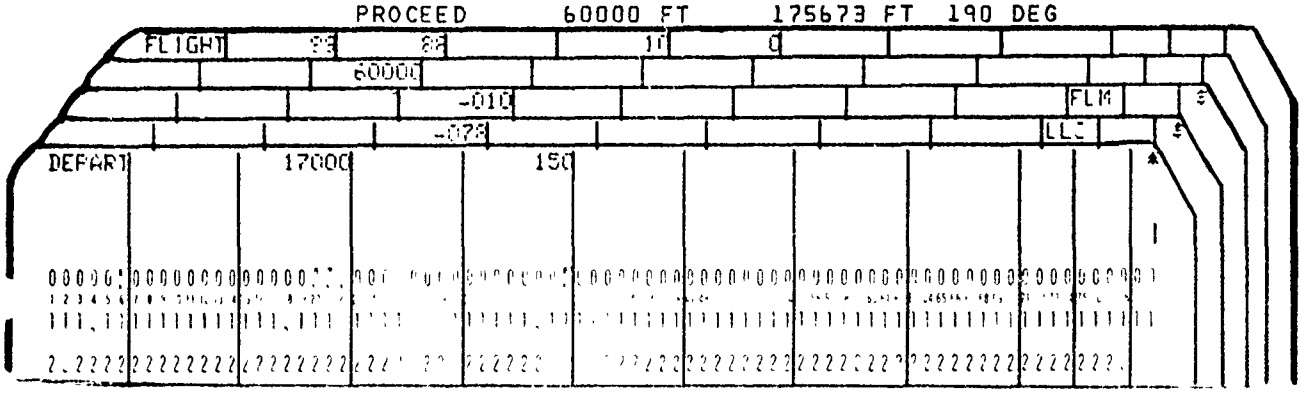


FIGURE 4. F-100 TYPE PROCEDURE EXAMPLES

+++ DEPARTURE PROCEDURE

PROCEED FOR 17000 FT THEN
TURN TO HEADING 150
RESTRICTIONS
FOR 60000 FT
STAY BELOW 7500 FT

INTERCEPT FLM 010 RAD (INBOUND)

PROCEED DIRECT TO NAVAID FLM

********** END OF PROCEDURE **********

+++ F-100 AIRCRAFT NO. = 99 MISSION NO. = 88
OPERATIONS - DAY 10.000 , NIGHT 0.000

PROFILE GENERATED -- DISTANCE ALTITUDE

DISTANCE	ALTITUDE
0	0 FT
6000	0 FT
8000	100 FT
42795	7500 FT
60000	7500 FT
117265	19700 FT

FLIGHT TRACK -- MANEUVER EXECUTED

MANEUVER EXECUTED		DISTANCE AFTER COMPLETION	HEADING
PROCEED	17000 FT	17000 FT	32 DEG
TURN RIGHT	119 DEG	29419 FT	150 DEG
PROCEED	24554 FT	53973 FT	150 DEG
TURN RIGHT	40 DEG	58162 FT	190 DEG
PROCEED	51619 FT	109780 FT	190 DEG

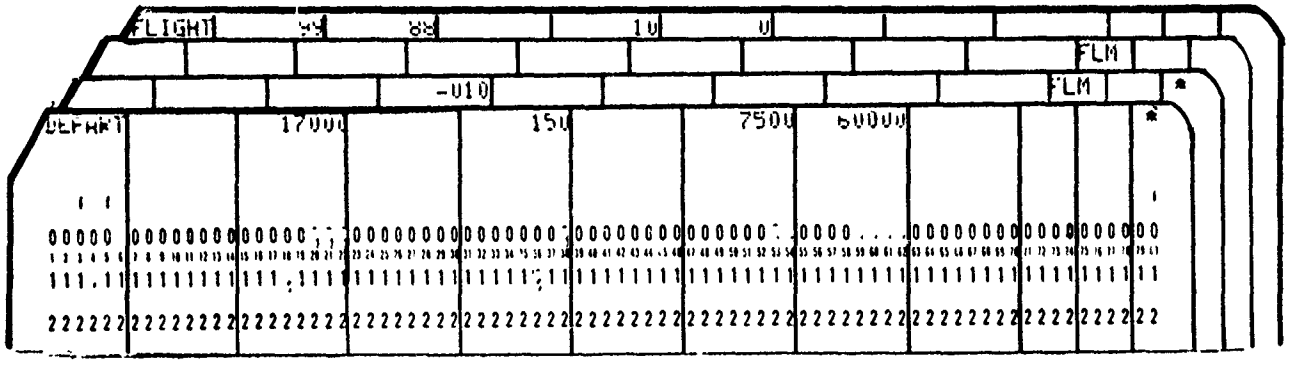


FIGURE 5. CONTINUED

The meaning of the "OR" is different for restrictions than it was for instructions. It signifies that the restriction is in effect until either a radial is crossed or until a distance has been flown, whichever is greater. If an error is detected in the restriction, the message will read:

```
ILLEGAL RESTRICTION -- ALTITUDE =    **** FT
                       DISTANCE =    **** FT  NAVAID = ***  *** RAD
```

The message may appear more than once; it is issued for each item in error. The error pertains to the item immediately preceding the message. A navaid can cause this message when either the NR field is left blank, or the radial is not in the range from 1 to 360. If the navaid name is missing, this will be indicated in the Chronicle message, but if at the same time the radial has an illegal value this will not result in a second diagnostic message.

If an altitude is specified and neither a distance nor a radial is specified, it is assumed that the altitude restriction will stay in effect for all distances. This corresponds to climbing to a given altitude and then maintaining level flight. The Chronicle entry reads simply:

```
RESTRICTIONS
STAY BELOW     **** FT
```

and no further message is generated. At the time an aircraft performs this procedure, error messages may or may not result depending on the wording of the procedure and the performance characteristics of the aircraft. In any event, the altitude profile printed at the end of the procedure will reflect this condition. It is good practice to check each altitude profile generated from a procedure which contained restrictions even when no messages were generated.

The distance in the phrase "FOR **** FT" in a restriction is counted from the position of the aircraft just before the instruction part is executed. Or equivalently, distance references for both instructions and restrictions are computed from the same point: the end point of the previous procedure step.

An altitude restriction, once in effect, will stay in effect until it is satisfied. For example:

```
PROCEED FOR        15000 FT

   RESTRICTIONS
   FOR             18000 FT
   STAY BELOW       2100 FT

PROCEED FOR         6000 FT
```

will have the following effect. The aircraft will move 15000 feet at or below 2100 feet; the aircraft will then move for another 6000 feet but during the first 3000 feet the 2100 foot restriction remains in effect.

This becomes particularly complicated when a radial is referenced. If the aircraft on its current heading will cross the desired radial, the restriction is clear. If it does not cross the radial, there are two possibilities.

1. The aircraft proceeds away from the radial. In that case, the radial reference is deleted. If a distance was also specified, the distance reference will remain. If the aircraft moves toward the radial at a later time, the radial reference will <u>not</u> be reinstated. If no distance reference exists, the entire restriction is deleted:

   ```
   *** *** RAD DELETED FROM RESTRICTION
   ```

   or

   ```
   *** *** RAD DELETED FROM RESTRICTION
       *** FT  RESTRICTION RESCINDED
   ```

2. The aircraft is not proceeding away from the radial. In that case, the aircraft is either moving parallel to the radial, or the aircraft is on the "opposite" side of the navaid (Figure 6). In that case the message is:

```
*** *** RAD NOT INTERSECTED
```

Neither case will generate an ERROR condition, but the user should carefully analyze his Chronicle and satisfy himself that the restrictions are properly incorporated in the execution of the procedure.

We have seen that restrictions are not deleted until satisfied. If the following instruction is read:

```
PROCEED FOR  16000 FT THEN
TURN TO HEADING  260

        RESTRICTIONS
        UNTIL LAX  060  RAD
        STAY BELOW  1500 FT

PROCEED FOR 20000 FT
```

the program may compute that the aircraft will intersect the 060 radial after 16000 ft. No message is therefore generated for the first step. After turning it is, however, possible that the radial is not intersected and the aircraft is not moving away from the radial (in the sense of the program).

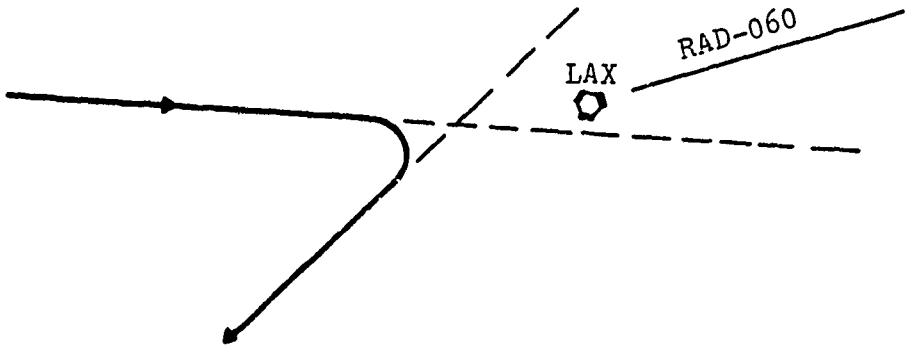


FIGURE 6. Aircraft trajectory where radial is not intersected nor does the aircraft move away from radial

In that case, the restriction remains in effect and the aircraft will remain at an altitude not higher than 1500 ft. This may or may not cause an ERROR later (e.g., when an instruction to climb to a higher altitude is given). It is because of such sometimes unexpected interpretations of a procedure that one should carefully check the flight track and altitude profile generated.

Sometimes it is desirable to give a set of altitude restrictions as for instance:

```
CLIMB TO 3500 FT

    RESTRICTIONS
    FOR           20000 FT
    STAY BELOW     1000 FT
    FOR           40000 FT
    STAY BELOW     2000 FT
    FOR           60000 FT
    STAY BELOW     2500 FT
```

This is communicated to the computer by a DEPART card on which the first restriction appears on the DEPART card itself and the subsequent two restrictions appear on two continuation cards. The instruction field of the continuation card is left blank. A restriction on a continuation card is appended to the last instruction encountered and remains in effect for as many instruction steps as required to satisfy it. If in the above example, the DEPART card had no restriction punched in it, but three continuation cards were used (one for each restriction), the result would have been the same. It is recommended that restrictions are entered for increasing altitudes, but it is not necessary to do so. The three restrictions above could have been entered in any order.

FURTHER ERROR MESSAGES

There are many warning and error messages which may be generated in the execution of a procedure. Some of these, referring to navaid references in restrictions, have already been discussed. The following messages are discussed in about the same order as they would be generated by the program.

When a navaid is referred to in a procedure, it must be defined to the program before a FLIGHT card is read. The first time a navaid is found to be missing, the error message:

```
NAVAID *** NOT KNOWN
```

will be printed. On subsequent execution of the departure after a different FLIGHT card, the message will not be repeated unless the first message was:

```
NAVAID *** NOT KNOWN WILL OVERFLOW IF PRESENT
```

This message indicates that the navaid was not known at the time; furthermore, the navaid directory is full and no space can be found for the item. This means that a navaid not used in the procedure must be deleted to make space for the

required navaid. A listing will be printed of all navaids known to the program the first time that this condition occurs after space has been previously available in the directory.

The warning:

A/C GONE BEYOND ALTITUDE PROFILE AFTER ** STEPS

indicates that the aircraft has gone beyond the distance for which an altitude profile is defined. The program will keep the aircraft in level flight. This is the same action as that which occurs when the total length of a FLTTRK is more than specified on the altitude profile. In the case of the FLTTRK, no message is generated, however.

If a reference is made in an instruction of an unknown navaid, the program will, when it reaches that instruction, print the basic error message:

NAVAID MISSING *

This message will repeat for each FLIGHT card where it is appropriate. If an altitude or a distance was also specified, the program will continue laying out the flight track. In that case, the message:

(IT IS IGNORED)

is appended. If this option is not open to the program, the word

ESSENTIAL

appears before the

NAVAID MISSING

message and the procedure is terminated.

A warning is printed when a radial is already past when it appears in the instruction. If no altitude or distance is also specified, the message is an error, and is preceded by the word ESSENTIAL:

(ESSENTIAL) *** *** RAD ALREADY PAST

A similar warning or error can be issued when the radial is not intersected by the current heading of the aircraft:

(ESSENTIAL) *** *** RAD NOT INTERSECTED

The same fixup is taken: if an altitude or distance is present, the radial reference is ignored, else the procedure is terminated.

When an altitude restriction is issued, the aircraft must be at an altitude equal to or lower than the restriction. If this is not the case, the program will issue the following message, after which the procedure is terminated:

ALT. REST. **** FT ILLEGAL AFTER **** FT WHEN A/C IS AT **** FT

This means that either the aircraft performance data do not match the procedure or that the procedure is incorrectly phrased. Errors in coding the cards can also cause this error, of course. Any correction will have to be considered on an individual basis, and no general rules can be given.

A somewhat different variety of the above problem is expressed by:

RESTRICTIVE ALTITUDE *** NOT FOUND IN STEP * (MAX ALT = *** FT).

This message means that the altitude mentioned in a restriction cannot be found in the altitude profile. This may happen, for example, when a navaid reference causes a lower altitude restriction to be extended "to infinity". One should carefully check to see that the procedure is worded correctly and that the

restriction chosen by the program is the desired one. The original altitude profile of the aircraft executing the procedure must, of course, extend to include all altitudes referenced in the procedure.

ALTITUDE ** CANNOT BE REACHED**

This message may be preceded by the word

ESSENTIAL.

The altitude in an instruction cannot be found in the altitude profile. This may be due to an altitude restriction which is in effect "to infinity" or it may be due to the fact that the aircraft performance data as specified in the altitude profile do not extend to high enough altitudes. The altitude profile should be expanded, the restriction changed or the procedure reworded if the error condition is raised. In the case of a warning, one should carefully check that the procedure was executed as intended. In that case, the phrase:

(IT IS IGNORED)

will appear indicating the decision made by the program. This message is also appended after:

A/C IS ALREADY AT ALT. ** FT WHEN **** FT INSTRUCTION IS GIVEN**

This indicates that the procedure does not match the performance characteristics of the aircraft: the climb to altitude instruction comes too late in the procedure. The procedure should be rephrased or it should not be followed by aircraft which climb as fast as those causing the message. If an alternative to climbing to the altitude exists, it will be taken.

When a radial is intercepted, the aircraft may overshoot the radial if the turn radius is too large to make the turn. In that case, the aircraft will ultimately get on course as shown in Figure 7.

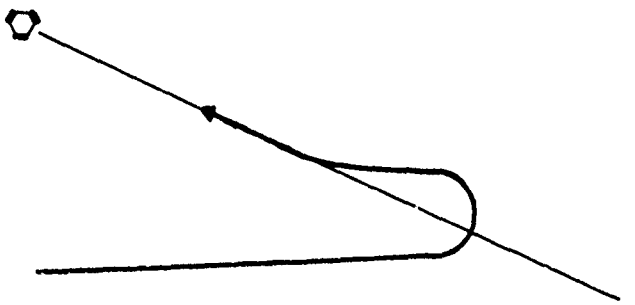


FIGURE 7. Radial Overshoot

The message corresponding to this situation is:

A/C TURN RADIUS *** TOO LARGE FOR INTERCEPT OF *** *** RADIAL.
A ** DEGREE COURSE ADJUSTMENT IS MADE

one should carefully check the runway layout plot to see what happened. Correction of the problem, if needed, can take the form of rephrasing the procedure, changing the aircraft performance, or using a different procedure for the given type of aircraft/mission combination.

When a proceed direct to a navaid instruction is encountered, the program will locate the navaid with respect to the aircraft. The aircraft will be turned onto the shortest turn to reach the navaid. If the navaid is within the turning radius of the aircraft, the program assumes that the aircraft is already at the desired location and no further action will result. The following message will appear:

CANNOT PROCEED DIRECT TO ** NAVAID-DIST = **** FT RADIUS = **** FT
A/C CONTINUES ON HEADING *** DEG

one should check that the aircraft has indeed performed the procedure as desired and rephrase the procedure if this is not the case.

When the program finishes generating an altitude profile, this new profile will now become the profile used for this aircraft/mission combination (for the duration of the procedure only). Although the program can generate a very complex altitude profile, it can only use the first 10 altitude/distance pairs for the subsequent calculation. In other words: the same limitation applies to storing a computer generated profile as applies to a user specified profile. The entire profile will be printed by the program at the conclusion of the procedure so that the user can see what happened. If a truncation occurs, it will be signified by a dashed line across the profile listing. The profile will be followed by the message:

PROFILE GENERATED EXCEEDS STORAGE AVAILABLE

and the program will keep the aircraft in level flight at the altitude specified by the 10th entry in the profile for distances larger than correspond to this entry.

When a procedure is halted abnormally, the following message will appear after the appropriate diagnostic:

PROCEDURE ABANDONED AFTER ** STEP(S)

emphasizing the fact that there remain steps in the procedure which did not get executed and which may well contain further errors.

The only errors which have not been discussed are those associated with the complexity of the procedure. The message printed as a result of a too complex procedure is

PROCEDURE TOO COMPLEX

This message may or may not be appended with an identification of a specific type of data. Table 4 associates the allowable complexity with the messages printed.

It should be mentioned that the number of distances, altitudes and navaids means the total number of references for instructions and restrictions combined. If a restriction and an instruction reference the same distance, for example, each will still generate a separate reference. Two references are generated in this case since the "compiler" of the procedure will not check the "symbol table".

TABLE 4

ALLOWABLE COMPLEXITY OF PROCEDURES

ITEM	TOTAL NUMBER ALLOWED	MESSAGE
STEPS	15	PROCEDURE TOO COMPLEX (immediately before an instruction)
RESTRICTIONS	15	PROCEDURE TOO COMPLEX (immediately after the word RESTRICTIONS)
ALTITUDES	25	PROCEDURE TOO COMPLEX ALTITUDES
DISTANCES	25	PROCEDURE TOO COMPLEX DISTANCES
NAVAIDS	15	PROCEDURE TOO COMPLEX NAVAIDS
HEADINGS	15	PROCEDURE TOO COMPLEX HEADINGS

It should be mentioned that in general, SIDs, when translated into flight track lengths, are much larger than the area of interest for DNL contours. The user can save considerable computer time by not specifying those parts of a SID which are clearly outside the range of interest. For example, consider

CLIMB TO 2500 FT THEN
TURN TO HEADING 160

INTERCEPT NNV 050 RAD (INBOUND)
INTERCEPT MMV 158 RAD

If this instruction causes the aircraft to move far away, as shown in Figure 8 a great amount of unnecessary calculation is performed. It would be more advantageous to specify

PROCEED FOR 60000 FT

instead of the two (strictly speaking) unnecessary further instructions.

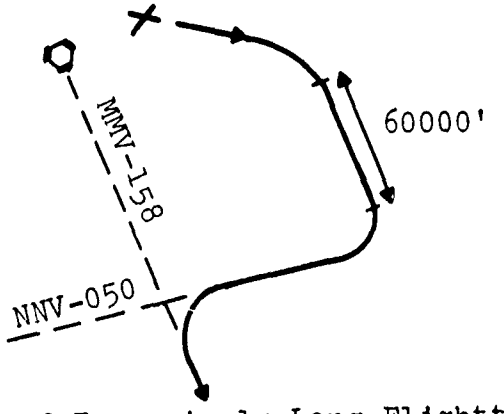


FIGURE 8. Example of Excessively Long Flighttrack in a Procedure

This saves time in that less geometric work has to be done, but also a considerable saving in computer time is realized in computing the grid. A factor of 2 to 5 gain in execution speed may be obtained when the procedure is limited to only those steps which are in the immediate vicinity of the airfield. The immediate vicinity is considered to be a radius of approximately 8 miles around the airport. As an aid in assessing after a checkout run how much of a procedure can be deleted, a listing of total distance covered is provided following each FLIGHT entry in the Chronicle.

The DEPART statement constitutes a very powerful method of entering flight tracks into the computer. It is, however, at the same time capable of creating much more data than is necessary or desirable. Only experience on the part of the user will show him what amount of detail forms the compromise between minimizing computer time and retaining all necessary features.

USING DEPART FOR VFR OPERATIONS

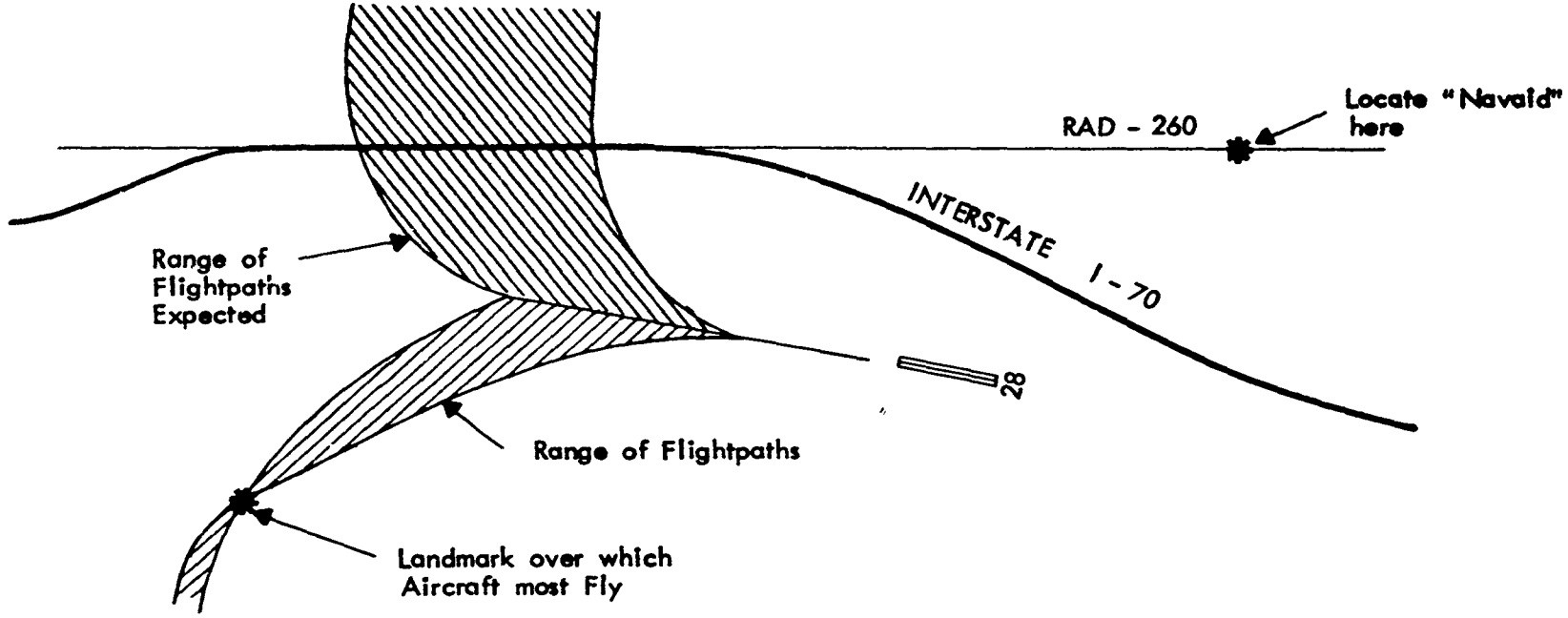
There is one item which should be pointed out. Although the DEPART statement is worded in such a way that an instrument departure is implied (IFR), the same method can be used to enter VFR instructions. To do this, one introduces what might be called "pseudo-navaids".

When a pilot's instruction is "climb to 1500 ft. then proceed to the power plant", this is essentially the same as climbing to an altitude and then proceeding direct to a navaid. In the one case, the navaid location is determined by looking on an instrument, in the other, by looking out of the window. The resulting flight path is not different and one may well use a factory or other landmark as a "navaid" for a VFR clearance.

Radial references may also be used. For instance, a "navaid" and "radial" may be selected to closely correspond to the location of a major highway, etc. A clearance containing a directive "cross the interstate at or below 2500 ft" can then become a restriction:

```
UNTIL I-70     260 RAD
STAY BELOW     2500 FT
```

where the 260 radial of a fictitious navaid I-70 corresponds to the section of freeway where the aircraft will cross (Figure 9).



2 POSSIBLE USES OF A DEPART STATEMENT FOR VFR OPERATIONS :

FIGURE 9. USING DEPART FOR VFR CLEARANCES

The user can, with the above suggestions, readily make up a large variety of VFR "procedures". Since these procedures are "invented" by the user, they must be thoroughly checked. For published SIDs, at least the user has a fair amount of confidence that the procedure makes sense for aircraft of certain performance characteristics. When a pseudo-procedure is used, the user must check the appropriateness of the instruction for the aircraft as well as the validity of the instructions. Nonetheless, the user is encouraged to gain experience in formulating VFR procedures in terms of the DEPART statement, since it is a valuable tool in modeling airfields. The only limitations are the allowable instruction set and the imagination of the user.

THE GENERATION OF AN ALTITUDE PROFILE

When a procedure is specified, the program will generate a new altitude profile for each aircraft/mission combination as it is required. The new profile may be identical to the original profile, but it may be very different.

The reading of a FLIGHT card will initiate a search for the proper altitude profile. If this flight is taking place on a flight path specified by a procedure, the program will generate a new altitude profile. The new profile is generated "along with the aircraft movements." That part of the profile which corresponds to distances from start of takeoff roll less than or equal to the distance flown by the aircraft is frozen. The profile beyond the current aircraft position can be altered.

The new profile starts off with one point specified: at distance zero the aircraft is on the ground. The following steps are repeated for as many instructions as are in the procedure. (See Figure 10).

1. The current altitude is located in the original profile and the corresponding distance is found.
2. The current distance from start of takeoff roll is located in the new profile.

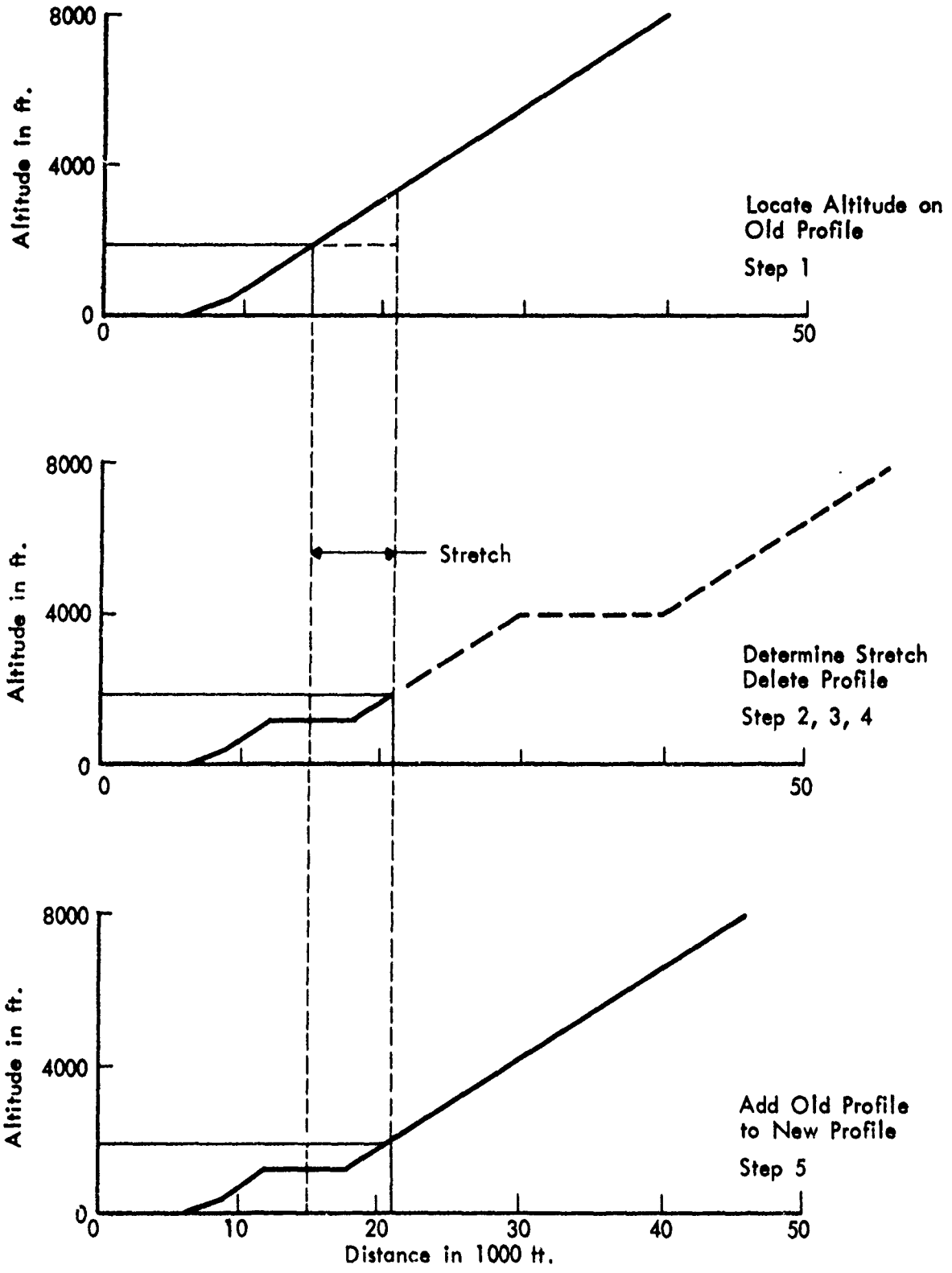


FIGURE 10. GENERATION OF ALTITUDE PROFILE

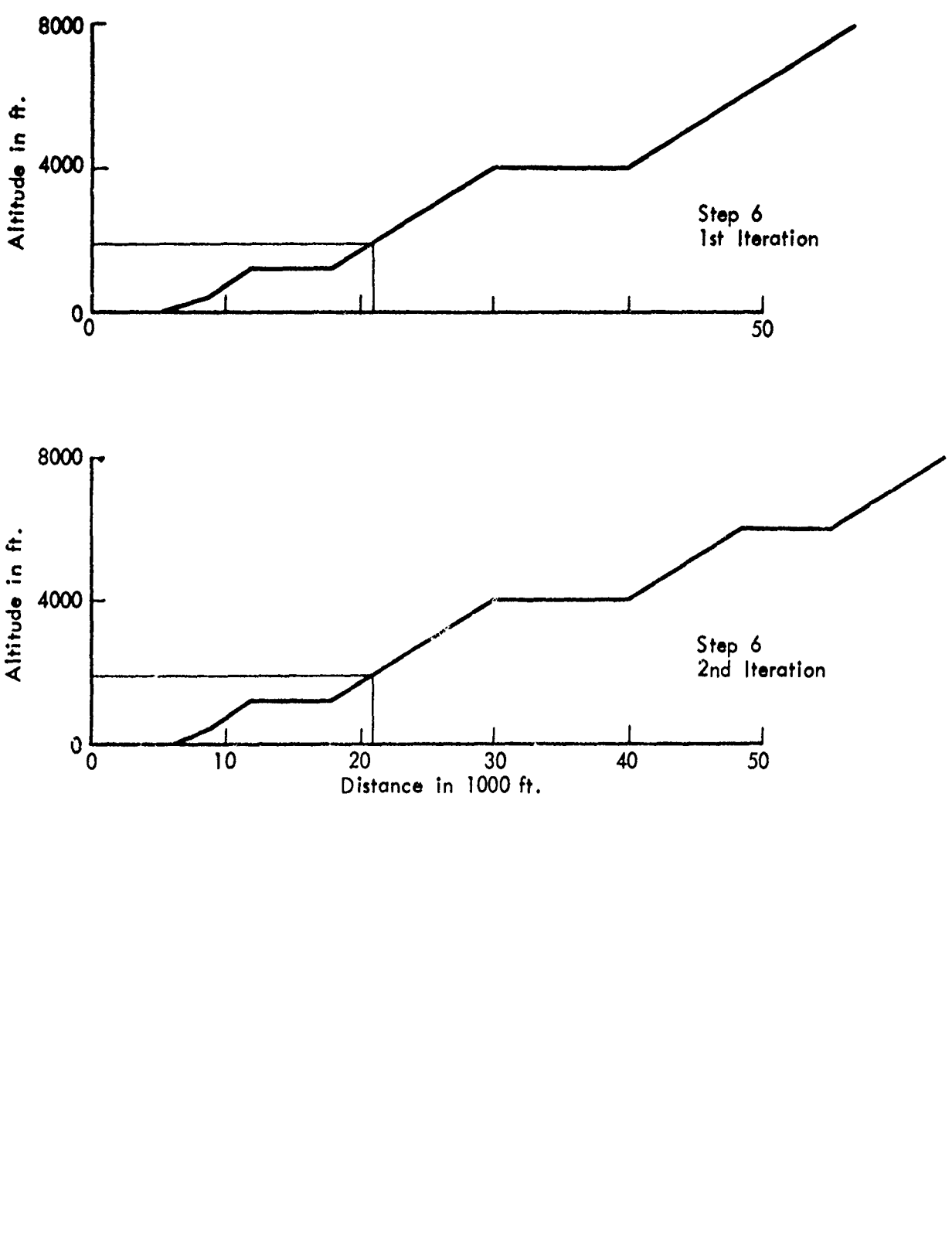


FIGURE 10. CONTINUED

3. The new profile is cut at the point where the aircraft is at this moment. Distances larger than the current position are dropped.

4. The "stretch" of the old profile is computed. The stretch is the difference between the distance actually flown minus the distance which the aircraft would have flown to get to the same altitude using the original altitude profile.

5. The part of the original altitude profile which contains altitudes larger than the current aircraft altitude is spliced behind the truncated new profile. (The proper amount of stretch is introduced along the distance axis.)

6. Altitude restrictions which are currently in effect are located. Each altitude is located in the new profile. The amount of stretch which must now be used to expand the new profile is computed. If the stretch is zero or negative, the altitude profile will automatically satisfy the restriction. If the stretch is positive, the aircraft after reaching the altitude, will be kept level at that altitude for the distance given by the stretch. All points further along the profile are extended by the same amount.

The reason that the altitude restrictions for points beyond the current aircraft position are recomputed every time is related to the fact that radial references may occur. If one occurs, the distance along the flight track where a radial is intersected depends on the aircraft heading. If during an instruction the aircraft heading changes, the distance to the radial may vary. The altitude restriction therefore may manifest itself in a different way each time the aircraft heading changes.

SAMPLE PROCEDURE

The Lewis Three Departure (Figure 11) can be used as an example of aircraft operations. The aircraft must turn 1 NM beyond the runway. Since the runway itself is 11000 ft., this distance is 17000 ft. The aircraft then turns to a heading of 150 and intercepts the FLM 010 radial. There are then three options:

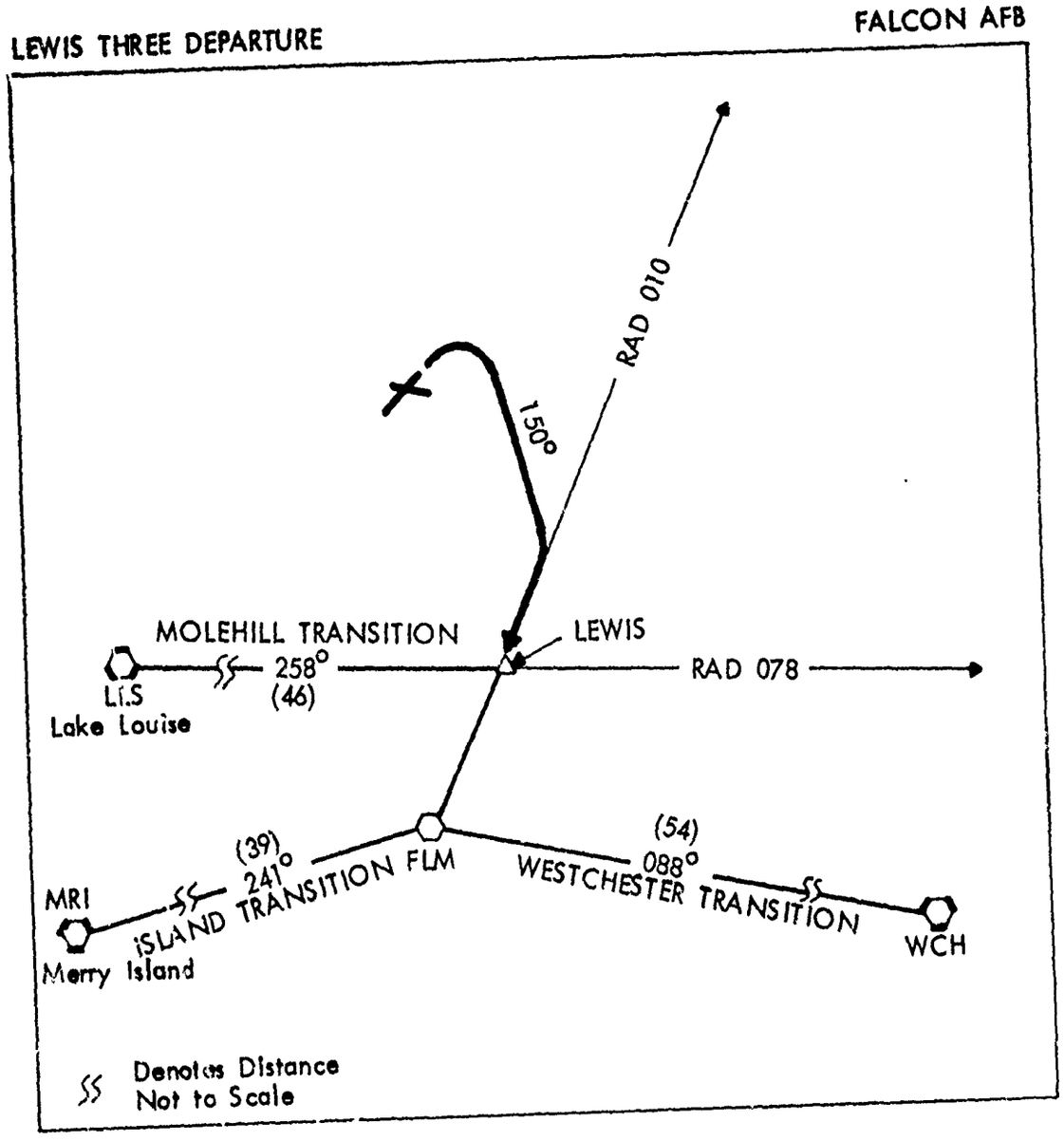


FIGURE 11. LEWIS THREE DEPARTURE

1. Molehill Transition:

   Intercept and proceed inbound along the LLS-078 radial.

2. Island Transition:

   Intercept and proceed inbound along the MRI-061 radial.

3. Westchester Transition:

   Proceed outbound along the FLM-088 radial.

When one locates FLM on the map, we see that it is well below the lower edge of the square of interest. Therefore, the Island and Westchester transitions can be ignored since they do not contribute to the DNL values but would take considerable computer time.

The Molehill transition takes place over the grid of interest and should therefore be considered. Since the LLS VORTAC is 46 miles away, there is no need to consider all 46 miles of flight track. It would be more appropriate to limit the flight track to about 10 miles.

We see that we are therefore left with two procedures. The first defines the flight track for the Molehill transition, the other reflects the other two independent departure procedures. The Molehill transition becomes:

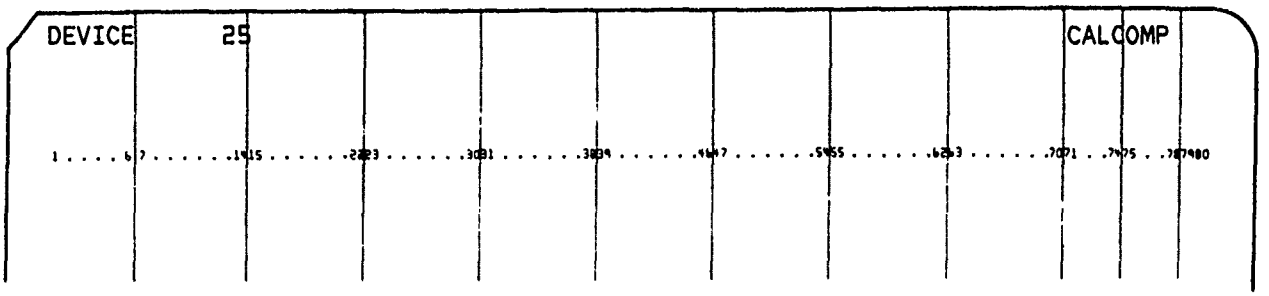
```
PROCEED FOR       17000 FT THEN
TURN TO HEADING     150
INTERCEPT FLM       010 RAD  (INBOUND)
INTERCEPT LLS       078 RAD  (INBOUND)
PROCEED FOR       60000 FT
```

The other two are:

```
PROCEED FOR              17000 FT THEN
TURN TO HEADING            150
INTERCEPT FLM              010 RAD   (INBOUND)
PROCEED DIRECT TO NAVAID FLM
```

It is fairly clear that these procedures will generate a considerably longer flight track than is strictly necessary. This is one of the things which will show up in a DATASCREEN run when actual distances can be found. It may be desirable to review the DATASCREEN listing and delete procedure steps after checking the listing the flight track for all aircraft following the procedure.

DEVICE KEYWORD



+++ SET PLOTTER PAPER WIDTH 25.0 INCH

Columns	
1 - 6	DEVICE keyword
7 - 14	Specify the plotter paper width
71 - 78	Specify the proper device type

The type of graphic device used during a DATASCREEN run can be selected with a DEVICE card. The proper device type is punched into columes 71-78. One may specify, starting in Column 71: CALCOMP, SC4020, FILMPLOT or BOTH. The SC40020 and FILMPLOT parameters are synonymous. This selection determines the device for output from GRAPH cards. The DEVICE card is primarily intended for use with the GRAPH cards. When no DEVICE is specified on a CHKPLT card, however, the information used on the last DEVICE card, if one was present, will be used.

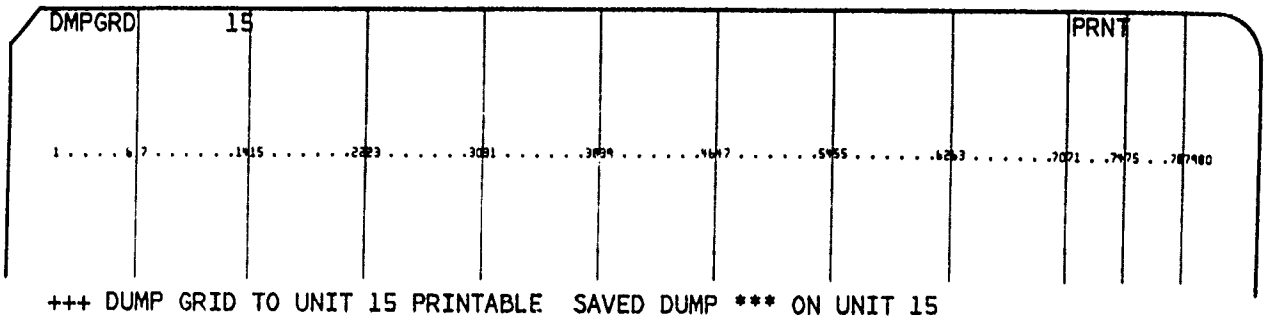
The capability has the advantage of allowing one to make altitude and exposure plots on, for example, microfilm while at the same time making a full size copy of the checkout maps on the CALCOMP to be sent to the base for approval. This particular case would result from:

DEVICE		FILMPLOT
GRAPH	20	TOGETHER
GRAPH	6	COLLECT
⋮		
CHKPLT	301	
CHKPLT	302	

The resulting film strip would then contain a complete file of all graphics for this job.

DMPGRD KEYWORD

1/ PRINTED GRID DUMP



+++ DUMP GRID TO UNIT 15 PRINTABLE SAVED DUMP *** ON UNIT 15

Columns	
1 - 6	DMPGRD Keyword
7 - 14	Specify a legal unit
71 - 74	PRNT code for a printed listing

One way to obtain a picture of the status of the grid is to get a printed listing. For a printed listing, the characters PRNT must appear in Columns 71 - 74 of the DMPGRD card. The listing obtained is in a very special format: rather than being merely a listing of the numbers, the "print dump" can be made into a map.

The spacing of the printer is such that the decimal points of all numbers have 1/2-inch separation along the print line (for 0.1" character width), and a 1/2-inch separation is maintained between successive lines (for 6 lines per inch printer spacing). With a grid spacing of 1000', this corresponds therefore to a 1" = 2000' scale map of the grid.

The resulting printout allows 5 characters per grid point. Each page will contain 25 points in the X direction (across the width of the page) and 20 in the Y-direction (down the length of the page). This fits

comfortably on standard 11 X 14 computer paper. The printout is then such that a strip from the top to the bottom of the grid is printed on five successive pages; this is followed by the next strip to the right, etc., (Figure 12).

Page 1	Page 6	Page 11	Page 16
Page 2			
Page 3			

FIGURE 12. ORDER OF PAGES IN GRID DUMP

If reasonable care is exercised in splicing the printout together to keep the distance of the decimal points of rows and columns to a 1/2-inch between successive sheets, the resulting "digital map" map be used to plot DNL (CNEL, NEF, etc.) contours by hand. This requires interpolation between neighboring points. In this way, a first estimate can quite easily be obtained. More accurate contouring can be done by hand, but this becomes quite rapidly time consuming.

The printed grid is useful when there is interest in DNL (CNEL, NEF, etc.) gradients on the ground or when one is interested in DNL (CNEL, NEF, etc.) values at locations other than the contours which a computer may have plotted. Another use is in planning studies where the influence of a procedural change on the exposure of a limited area on the ground is to be evaluated. In that case, one can compare the printout sheets obtained from several runs which contain the area of interest. Contours can then be machine plotted for only those cases which seem most promising after a preliminary inspection of the printed values.

The UNIT field specifies the logical unit onto which the grid dump is written. It is the responsibility of the user to see to it that the logical unit selected is assigned to a physical device, and that it is capable of receiving the desired form of output. Since the program is machine independent and written in FORTRAN IV, the program cannot check if a device has been assigned to a logical unit.

Table 5 shows which UNIT specifications are legal and which fixups are taken if an illegal unit is specified.

TABLE 5

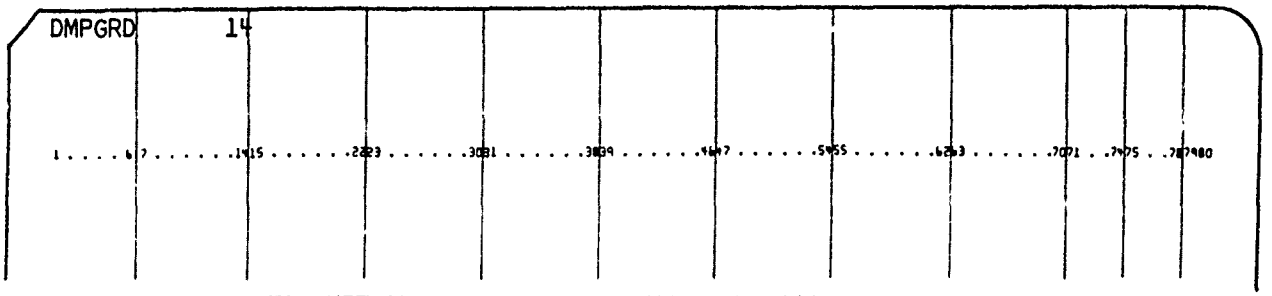
PRINTED GRID UNIT ASSIGNMENT

UNIT Specified	Dump Is Written To Unit	Warning Issued
Blank	6	NO
0	6	NO
1-5	6	YES
6*	6	NO
7-11	6	YES
12-99	as assigned**	NO
>99	6	YES

* Since Unit 6 is a file specially formatted to 84 columns maximum width, a dump there will be printed on 35 pages rather than on 20 pages of 125 columns. These pages are 15 grid values in X wide, except for the last 5 pages which contain only 10 columns.

**For up to 10 logical units referenced, the program will maintain status information. If the unit chosen was used previously for a binary dump, however, a WARNING is issued and the dump is printed on Unit 6.

2/ MAGNETIC TAPE DUMP (BINARY)



Columns	
1 - 6	DMPGRD Keyword
7 - 14	Unit number where grid is to be stored or retrieved. This number should be 12, 13 or 14 and should correspond to the unit (if binary dumps were made) specified in the baseline Chronicle. NOTE: Do not use Unit 15 - this is for printed output only!

If it is desirable to save the current status of the grid for later use by the computer, it can be stored on an external medium such as magnetic tape or any other available serial storage medium. Columns 71-74 of the DMPGRD card should be left blank. The information written on such an external medium is not useful for purposes other than use by NOISEMAP. Again, the logical unit on which one writes a dump must be assigned by the user to the desired device and be capable of receiving binary data. Unit assignment is as follows:

BINARY DUMP UNIT ASSIGNMENT

UNIT Specified	Dump is Written to Unit	Warning Issued
Blank	10	NO
1 - 9	10	YES
10	10	NO
11	10	YES
12 -99	As Assigned*	NO
>99	10	YES

*For the first 10 logical units referenced, the program will maintain status information. If the unit chosen was used previously for a printed dump, however, a WARNING is issued and the dump is written on logical unit 10.

A dump cannot be written to a logical unit with a number of 100 or larger since FORTRAN cannot handle logical unit numbers higher than 99. Also, all logical units from 1 through 11 are reserved since they may be used internally by the program or are used by GPCP.

If an attempt is made by the user to write onto any file other than in the user assignable class, a message appears to indicate the unit chosen by the program:

MANIPULATION WITH ILLEGAL FILE SAVED DUMP *** ON UNIT 10

MANIPULATION WITH ILLEGAL FILE

The last message appears when the dump is written in the Chronicle. Since the program skips to the top of the next page and starts printing the dump, no further message is given. The message may also appear if a read reference is made to a dump less than 1.

A binary dump is primarily useful when it is desirable to preserve the current status of a grid for further processing at a later time.

If a DMPGRD card references a file which has not yet been referenced, the program will print the message:

PROGRAM CATALOGED FILE AND SAVED DUMP 1 ON UNIT ***

indicating that the file status indicator has been set by the program. In the "noproc" and "nogo" mode, the word SAVED is replaced by RESERVED. A maximum of 10 external files may be referenced by NOISEMAP. If more than 10 files are referenced, the message:

FILE CATALOG FULL

is printed. In that case, a binary dump will cause an error and a dump to Unit 10, and a formatted dump is diverted to the Chronicle after a warning.

Unit 10 serves NOISEMAP as a "safety device". If it is desirable to preserve the status of the grid in binary form and other avenues are not clearly available to the program, the program will write to Unit 10. It is recommended that Unit 10 always be assigned when the program is in the "proces" mode since the program will on occasion initiate a dump to Unit 10 "on its own". The user may write on Unit 10, but cannot read this information back during the same run in which it was written. This is done as a protection since the dump number on Unit 10 is not a priori known.

A dump initiated by a DMPGRD card with the unit field unspecified will cause the dump to be written on Unit 10. Dumps on Unit 10 cannot be read back during the same run that they were written. If the user has no need for the information dumped during the remainder of the job, the use of a blank DMPGRD card will avoid using more tapes than strictly necessary.

From our previous discussion, it is clear that there is a fundamental difference between a binary and printed dump. In fact, the program will not allow the user to mix both types of output on one logical unit. The program will keep a record of the first 10 legal logical units accessed. This record contains formatted/binary status information, the current position of the tape (for binary) and the total number of dumps on this logical unit. If more than 10 units are referenced, this status record cannot be kept and an error will result.

The two formats of writing data are incompatible. The computer can read a binary tape, but formatted data cannot under any circumstance be read. On some computer systems, it is possible to equivalence two logical units. This should never be done for any binary files referenced by NOISEMAP. When a dump is written, the program maintains a count of the dumps to this unit. It is possible to access any one of these during a run provided it was written on a legal unit (12-99). If, for instance, 6 dumps were written onto tape 14, one may then proceed to read dump 4 and after some further processing write a new dump on unit 14. What happens in such a sequence of events? The program will rewind the tape, space over the first 3 dumps and read the fourth one. When a new dump is to be written, the program will space over the next two dumps before writing. If unit 14 was equivalenced with another unit, the dump counts in NOISEMAP would be erroneous. The wrong file could have been read and information beyond the 6th physical dump would be overwritten. In any event, the termination procedure will endfile and rewind each logical unit used for output. The already endfiled and rewound file would then be endfiled again at its loadpoint and all information lost.

NOISEMAP writes an encoded header on each dump taken. An end-of-information record is also present at the end of each binary file which was terminated by NOISEMAP. An attempt to mix binary and formatted data will therefore make the tape unreadable to NOISEMAP. Since NOISEMAP is written entirely in FORTRAN IV, the resulting error message may be a system error rather than a NOISEMAP

message. The action will be dependent on the FORTRAN implementation. NOISEMAP will, in the absence of any system error, print the message:

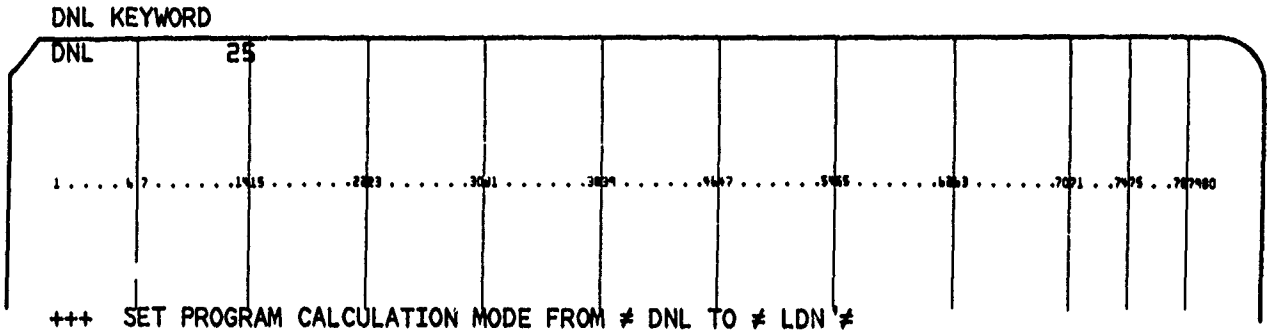
ILLEGAL TAPE HEADER

followed by a dump of information read by the program. The unit will remain inaccessible for the remainder of the airfield considered. When a new airfield is started, the file status will usually* be changed to "input only". Any attempt to get by the bad header will, however, result in the illegal tape header error as before.

This message may also appear after a DMPGRD statement if the unit to be written on was previously used for input only.

---

* If an illegal header appears in a file on which the program has already written, the file remains blocked throughout the remainder of the run.



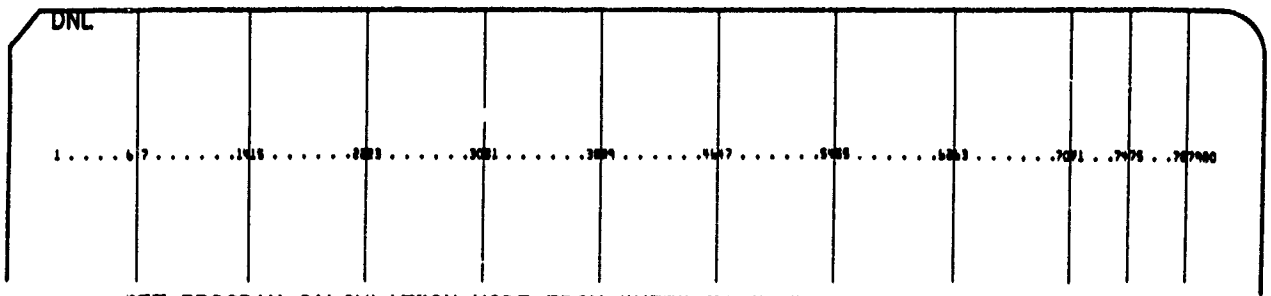

```
+++  SET PROGRAM CALCULATION MODE FROM ≠ DNL TO ≠ LDN ≠
     THE FOLLOWING FORMULA IS USED
     FLIGHTS - DNL  = SEL + 10 LOG (NDAY + 10.00 NNIGHT) - 49.40
     RUNUPS  -      = AL  + 10 LOG (NDAY + 10.00 NNIGHT) - 49.40
     GRIDWALK CUTOFF IS 25.0 DNL  (316 MARGINAL ADDITIONS SUM TO 50.0)
```

Columns	
1 - 3	DNL Keyword
7 - 14	Specify grid walk cutoff

With the DNL card, the NOISEMAP computer program will calculate day-night average levels. This is the default condition.

The program contains an internal grid walk cutoff to limit the computation to only those areas where a significant contribution is expected. The 35 DNL value, which is the program default, is suitable for most jet applications. For very low level contours or no jet operations, it may be advisable to change this limit. The desired value can be communicated to the program in the first data field of the DNL (or NEF) card.

If the NOISEMAP program has previously been set to NEF, a DNL card will have the following effect:

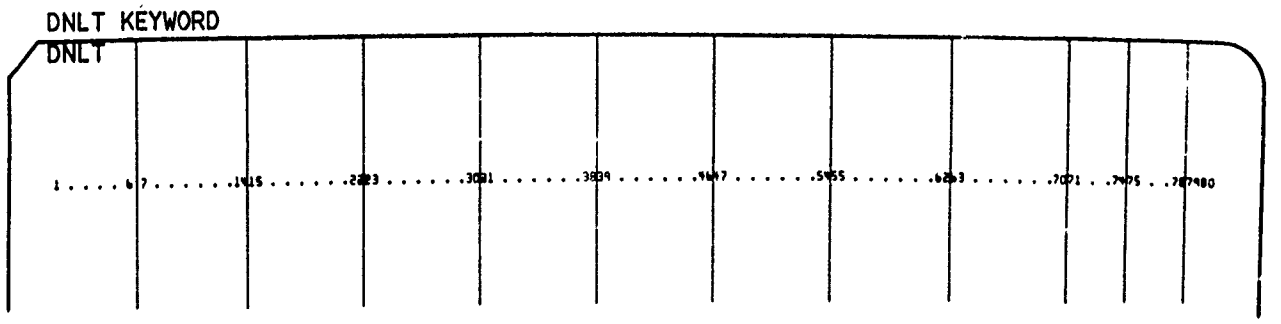



```
+++  SET PROGRAM CALCULATION MODE FROM "NEF" TO "DNL"
          DEPNL  DELETED
          EPNL   DELETED
          PNLT   DELETED
     APPROPRIATE DATA KEYWORDS ARE
          SEL       XSEL      LSEL
          DSEL      XDSEL     LDSEL
          AL        XAL       LAL
     THE FOLLOWING FORMULA IS USED
     FLIGHTS   -  DNL    =SEL    + 10 LOG (NDAY +  10.00 NNIGHT)  -  49.40
     RUNUPS    -         =AL     + 10 LOG (NDAY +  10.00 NNIHGT)  -  49.40
```

The term L_{dn} is in wide use in place of DNL. The program can therefore recognize LDN as well as DNL. Similarly, the program has no preference for the order in which tone correction (T) and runup weighting (W) are specified. This gives rise to the synonyms listed.

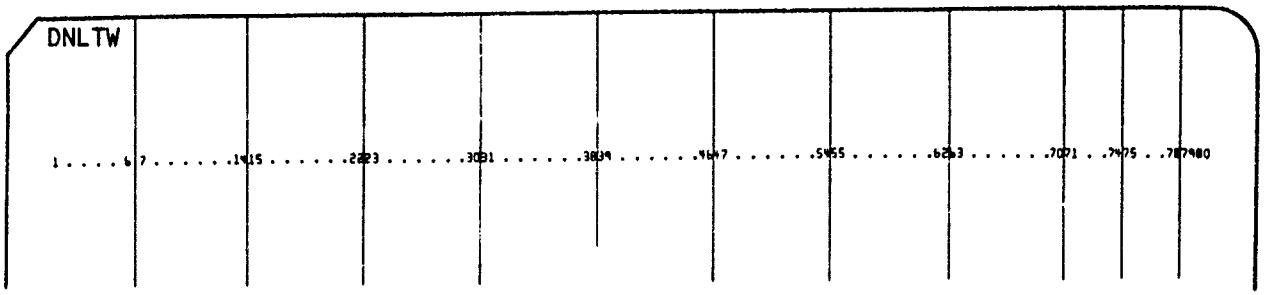
Synonymous Selection Keywords

	Keyword	Synonyms	Meaning
A.	DNL	LDN	Day-Night Average Level
B.	DNLW	LDNW	DNL with 10 dB weighting of runup noise
C.	DNLT	LDNT	DNL using tone corrected noise data
D.	DNLTW	DNLWT, LDNTW, LDNWT	DNL with both options B and C



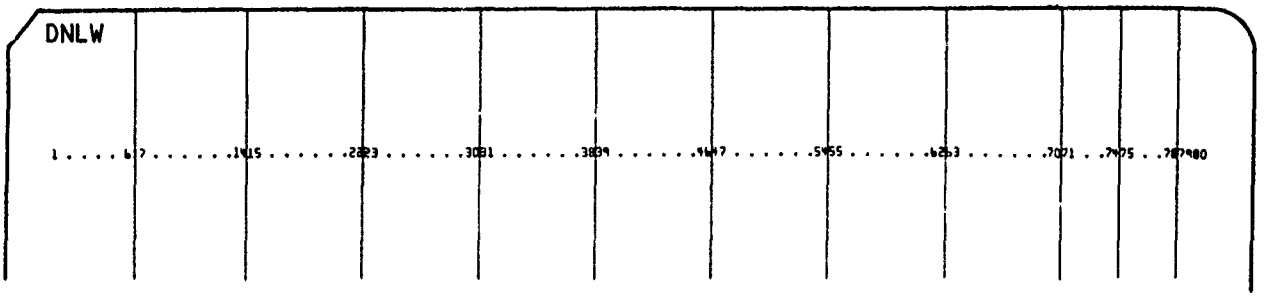
With the DNLT card, NOISEMAP will calculate day-night average levels using tone corrected noise data (SELT and ALT).

DNLTW KEYWORD



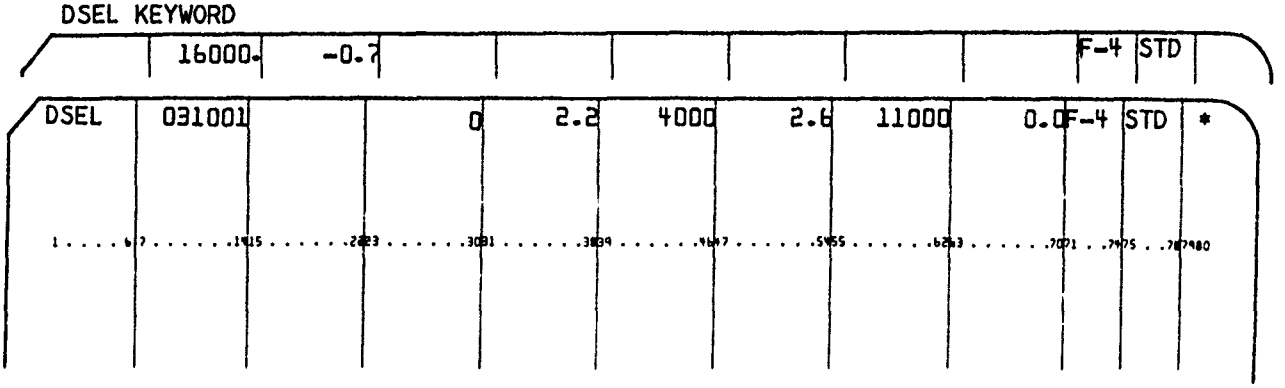
With the DNLT card, NOISEMAP will calculate day-night average levels using tone corrected noise data (SELT and ALT) and will also apply a 10 dB runup noise penalty.

DNLW KEYWORD



With the DNLW card, NOISEMAP will calculate day-night average levels assessing a 10 dB runup noise panalty.

DSEL KEYWORD



+++ DELTA-SEL PROFILE NAME = 31001 F-4 STD

TRACK DIST	REL POWER (DB)
0. FT	2.2
4000. FT	2.6
11000. FT	0.0
16000. FT	-.7

Columns	
1 - 6	DSEL Keyword
7 - 14	Delta-SEL profile identification number corresponding to that on the preceding TODSCR or LNDSCR card.
15 - 22	Blank field
23 - 70	Cumulative track distance and delta correction pairs. Entry in Columns 23-30 will be zero (0). for either landing or takeoff delta corrections and the corresponding entry in Cols. 31-38 will be for the delta correction at the start of takeoff roll for takeoffs or the delta correction over the threshold for landings. Additional paired entries are used to describe the delta correction profile. Continuation cards are used as necessary.
71 - 78	Same identification as shown on TODSCR or LNDSCR card.
79 - 80	If additional card needed, enter an asterisk (*) in Col. 80.

The purpose of the Delta-SEL profile is to introduce changes in the aircraft noise output as it proceeds through the course of its flight. Frequently, an offset or delta must be added to the SEL profile to account for engine power and speed changes. All profiles (whether for takeoffs or landings) are conceived to start at the runway threshold and to head away from the airfield. The profile is constructed by defining a sequence of (track distance, offset) coordinate pairs. This sequence of coordinates is used by the program to determine the offset level at any point along the flighttrack. Figure 13 shows an illustration of a simple Delta-SEL profile. The program makes no distinction between profiles used for takeoffs and those used for landings. Only the flight descriptor (takeoff or landing) which uses the profile determines whether the profile is used for a takeoff or for a landing, and the two are not mutually exclusive. Although takeoff adjustments are generally numerically different from landing adjustments, the program does not attach a takeoff or landing label to a profile. The first coordinate point (which has a track distance of zero) will be aligned with the takeoff threshold for takeoffs and with the landing threshold for landings.

Data field one contains the numeric name of the profile. This number may be any nonzero, positive integer. If a negative number is used, the program will automatically convert it to positive. If zero is used, the following warning message will be printed:

ILLEGAL NAME

The number may be up to 8 digits long. The name must be unique among all entries in this data set. If it is not unique, the old profile of the same name will be lost.

Data field two is not used. Therefore, leave this field blank. Starting with data field three, the coordinates are entered. Data fields three and four contain the first coordinate pair (track distance and offset, respectively). Succeeding coordinate pairs are entered in data fields five and six, and seven

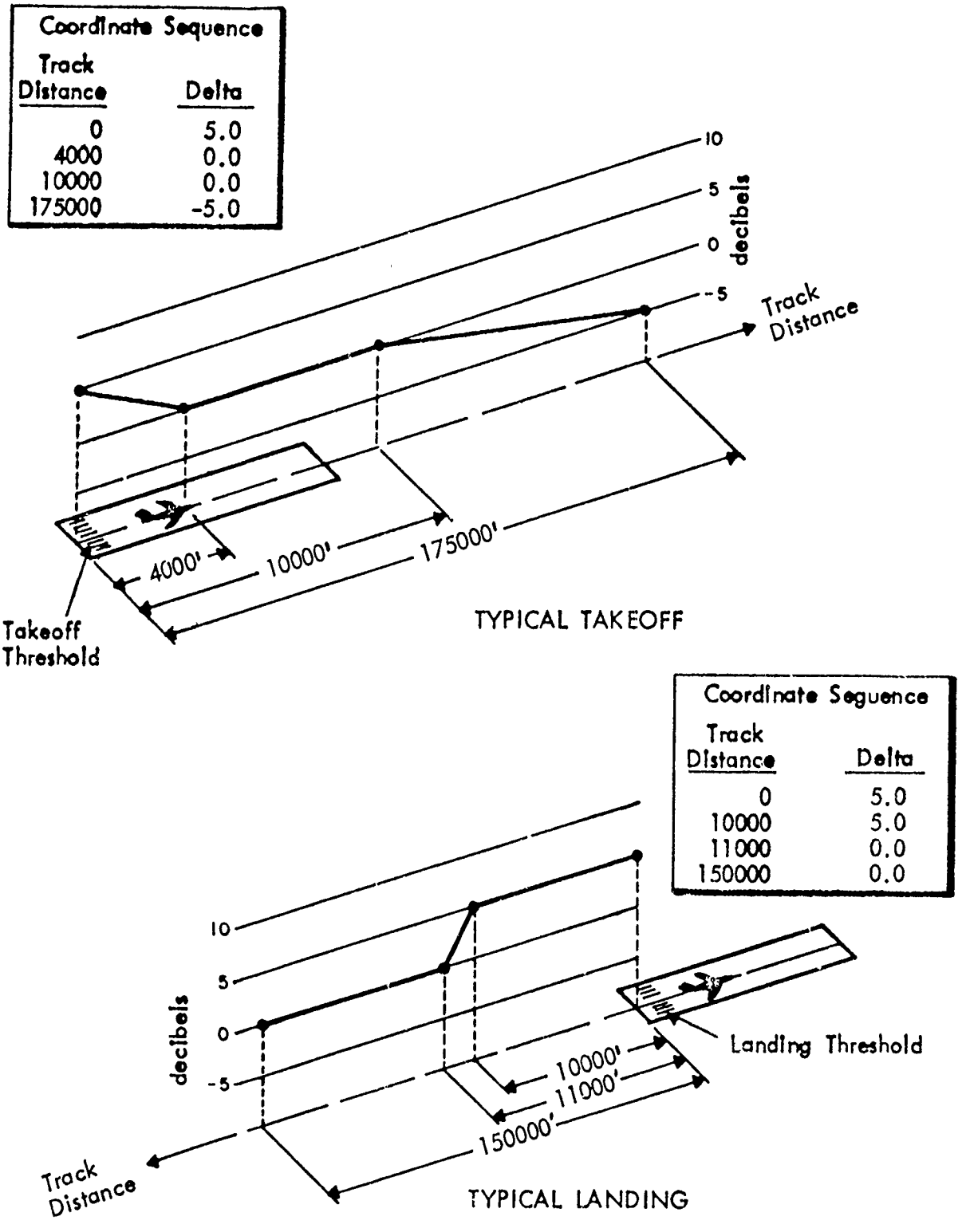


FIGURE 13. ILLUSTRATION OF DELTA · SEL PROFILE

and eight. If more than three coordinates are to be entered, continuation cards may be used. Each continuation card must have the keyword field left blank and an asterisk (*) in Column 80. Four coordinate pairs may be entered on each continuation card, starting with data field one.

The distance coordinate may be in either feet or in meters. However, be certain that the correct UNITS specification is in effect. The offset coordinate is always in decibels. There are only four restrictions on the coordinates. First, the track distance of the first coordinate must be zero. If it is not, the following warning message will be printed:

INITIAL TRACK DIST NOT ZERO

Second, all track distances must be positive numbers (with or without decimal points) and must be ascending in value. If they are not, the following warning message will be printed:

TRACK DISTANCE(S) NOT POSITIVE OR NOT ASCENDING

Third, the number of coordinate pairs must be at least two, but not more than ten. If the number of pairs does not fall in this range, the following warning message will be printed:

NUMBER OF COORDINATES RESTRICTED 2 TO 10

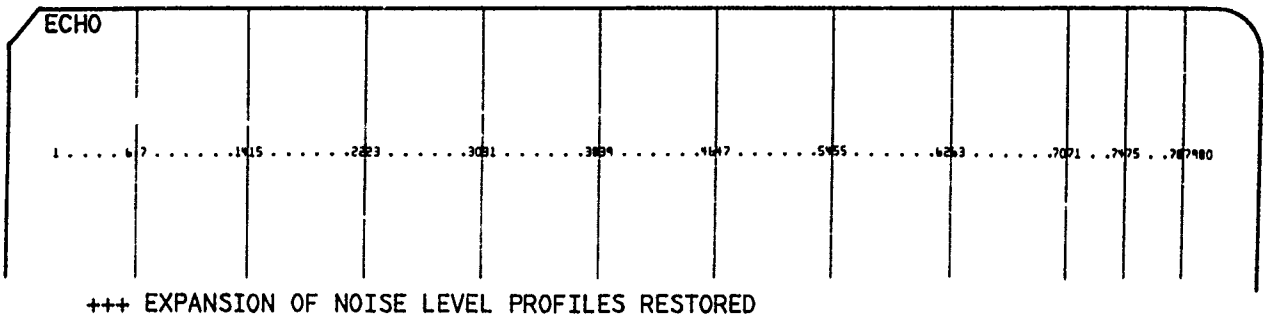
Fourth, the amount of offset may be positive, negative, or zero. However, the value (which may appear with or without a decimal point) is restricted to plus or minus 200 dB. If the value is outside of this range, the comment:

OUT OF RANGE

will be printed next to each offending coordinate, and the following warning message will also be printed:

REL POWER OUT OF RANGE

ECHO KEYWORD



+++ EXPANSION OF NOISE LEVEL PROFILES RESTORED

Chronicle listing of standard noise profile 031031 with "ECHO" card would appear as:

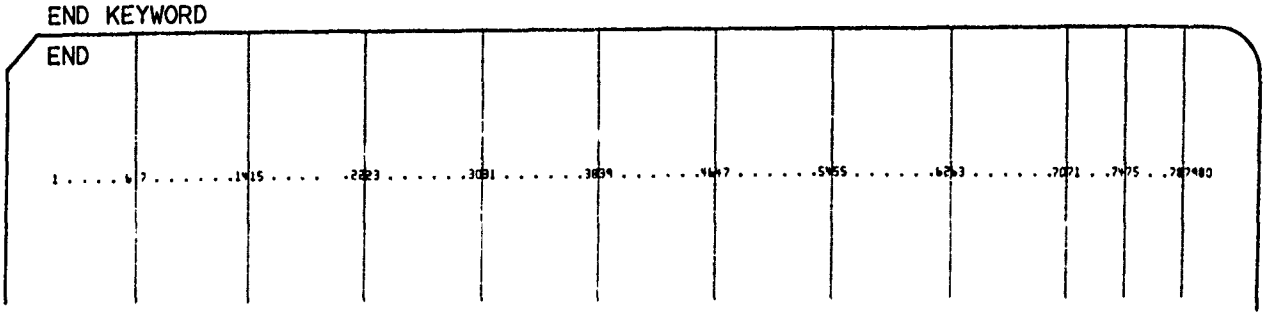
```
+++  FLIGHT NOISE LEVEL PROFILE (SEL    )   NAME=   31031  F-4
COMMENT 031031A0 OMEGA 6.6 06 JAN 76 F-4     1000 FT  300 KTS  59 F  70 PCT
COMMENT 031031A0 TURBOJET          SPEED BRAKE OUT
COMMENT 031031A0 TAKEOFF POWER           100%  RPM
                    INTEG. ≠A≠-WEIGHTED NOISE LEVEL
          DIST        GRND-TO-GRND  AIR-TO-GRND
        ----------    ------------  -----------

           200. FT        122.7        127.7
           250. FT        121.1        126.1
           315. FT        119.3        124.3
           400. FT        117.5        122.5
           500. FT        115.7        120.7
           630. FT        113.9        118.9
           800. FT        112.1        117.1
          1000. FT        110.3        115.3
          1250. FT        108.5        113.5
          1600. FT        106.7        111.7
          2000. FT        104.8        109.9
          2500. FT        102.8        107.9
          3150. FT        100.6        105.8
          4000. FT         98.1        103.6
          5000. FT         95.1        101.2
          6300. FT         92.8         98.6
          8000. FT         83.5         95.7
         10000. FT         84.9         92.5
         12500. FT         80.9         89.0
         16000. FT         76.2         85.2
         20000. FT         70.9         81.1
         25000. FT         64.9         76.7
```

Version 3.4 will not echo back the values on SEL cards. A heading is provided and embedded comment cards[1] are listed to identify the profiles. The actual values can be printed as in earlier versions by inserting a card with keyword ECHO. A NOECHO card will stop the listing of the profiles.

[1] Comment cards are embedded in the profiles on the standard noise library.

END KEYWORD

END



The END card forms the last card in a data deck. It causes the termination of the current airfield much the same as the AIRFLD card does. In addition, the END card causes the proper end-of-information records to be written on all user files. In the case of the plot file for GPCP, all appropriate control cards to terminate a GPCP run will be written on units 8 and 11 if any PLOT cards were encountered during the run.

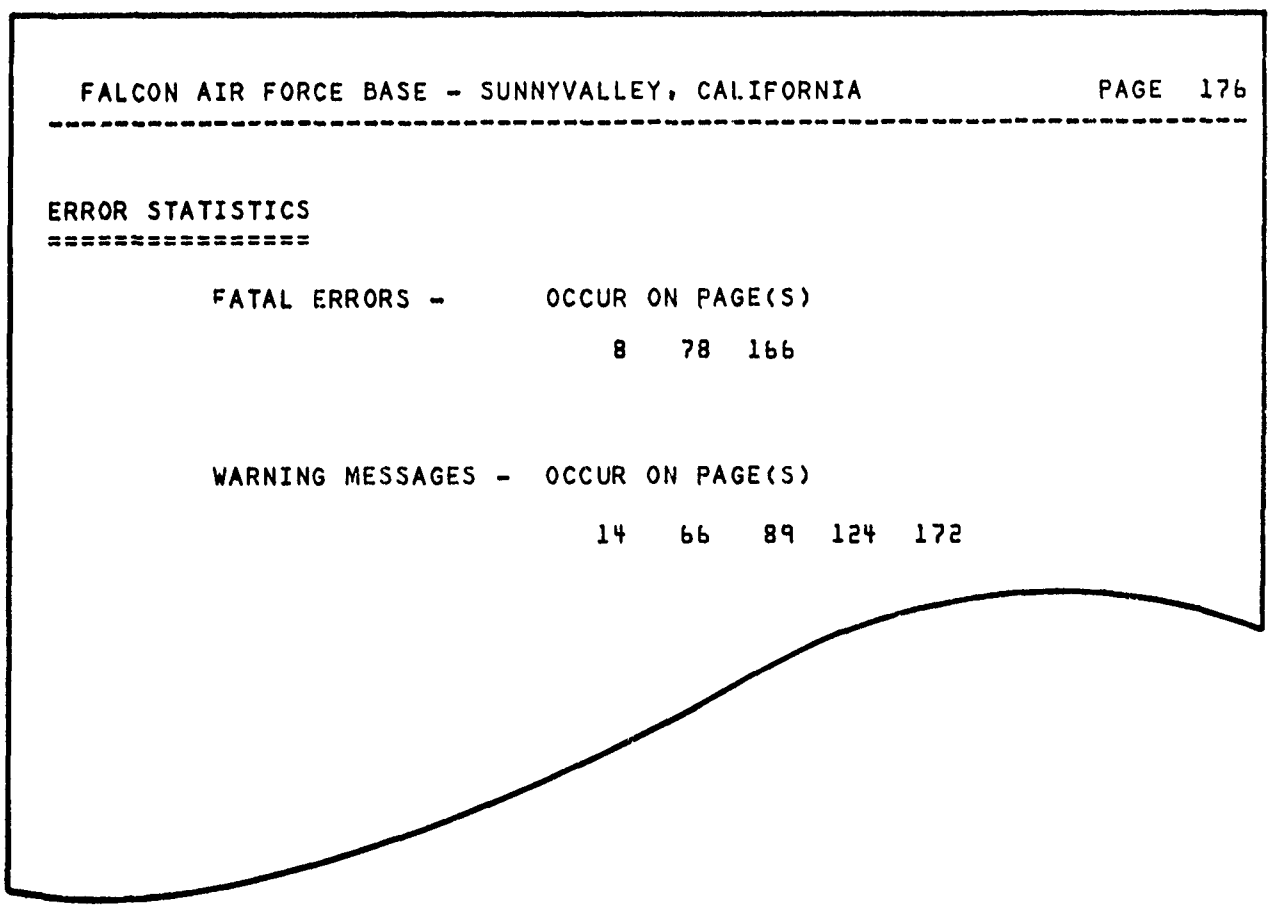
All binary files with "input only" status are rewound. All files open for "read and write" receive an end-of-information record readable by the program before being rewound. This record is always written if the tape was write accessible and referenced during "proces" mode. Even if an old end record was present, it will be overwritten with a new one. The entire file status catalog is printed in the Chronicle. If desired, one can tear this section off the main listing and keep it with the reels of tape for later reference.

Only one error can occur due to reading an END card. This happens when the END card is encountered before an AIRFLD card was read. In this unlikely event the message will be:

END CARD ENCOUNTERED DURING INITIALIZATION

As in all cases where an error occurs, the program will terminate abnormally during initialization.

At the conclusion of an airfield, the program prints a summary of error and warning messages. This summary consists of a listing of the page numbers on which errors and warnings occurred during this airfield. If none occurred in a category, the word NONE will be printed. The program can keep track of up to 56 pages with errors and up to 200 pages with warnings. An example of a typical error summary is shown in Figure 14.



```
  FALCON AIR FORCE BASE - SUNNYVALLEY, CALIFORNIA                PAGE  176
-------------------------------------------------------------------------

ERROR STATISTICS
================

          FATAL ERRORS -       OCCUR ON PAGE(S)
                                   8    78   166


          WARNING MESSAGES -   OCCUR ON PAGE(S)
                                  14    66    89   124   172
```

FIGURE 14. TYPICAL ERROR SUMMARY

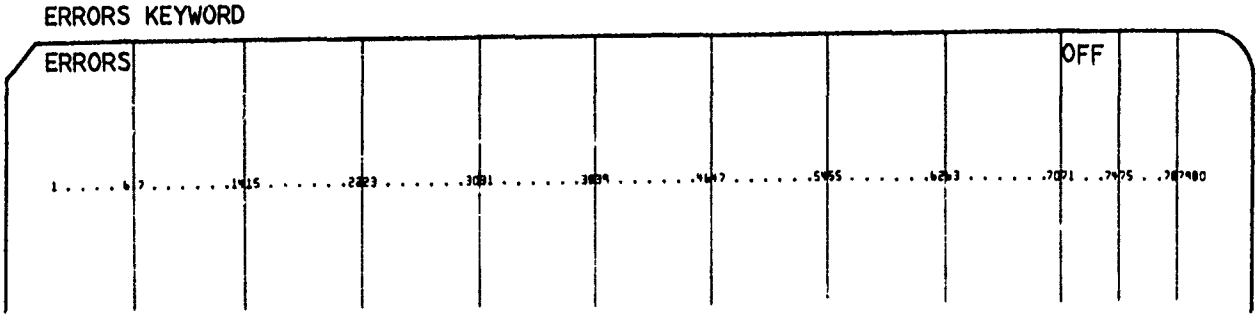
If the program found errors or warnings on more pages than it could keep track of, the error count beyond the last page number which could be stored will be printed as signified by the following message appended to the listing:

AND IN **** MORE INSTANCES AFTER PAGE ****

Errors which occurred during the initialization procedure cause the program to stop execution with the message:

EXECUTION TERMINATED DUE TO INITIALIZATION ERRORS

ERRORS KEYWORD

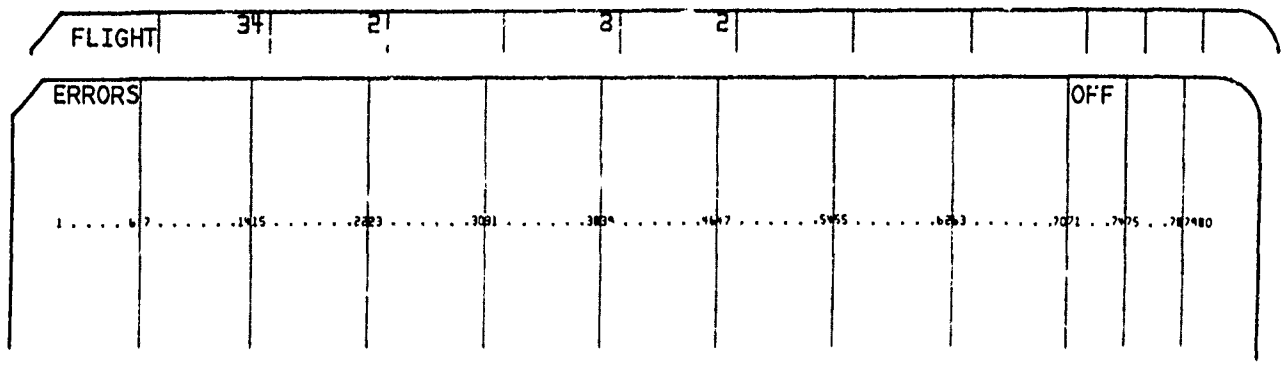


Columns	
1 - 6	Errors
71 - 73	OFF/ON

Errors due to missing noise or performance data can be suppressed. The ERRORS keyword is used with the word OFF. To restore the usual NOISEMAP error messages the ERRORS keyword with the word ON is used.

The missing data error code, described in the last paragraph, will always be listed.

It is often desirable to produce a flight track or runup map without supplying all data necessary for NOISEMAP processing, DATASCREEN will accept such decks and attempt to process them. When descriptors are missing, the program will recognize the aircraft numbers present in the standard military and civil data file and print the text accordingly. If a non-standard aircraft number is found for which no descriptor is present, the program will list this as NOT DEF. All such "not defined" aircraft are listed together in the summary as "the NOT aircraft". Note that the profiles produced by the GRAPH card are not valid if data is missing. In many cases, the program will recognize this condition and suppress the plot.




```
                    FLIGHT OPERATIONS - TRACK 24-L
                A/C  NO  MISSION      -   0701-2200  2201-0700
+++ F-4             34       2              8.000       2.000  A0B0C0D0
```

The usual NOISEMAP error messages for missing data can be suppressed by use of the ERRORS keyword. Starting in Column 71, one may punch OFF in the ERRORS card to suppress the error messages, or ON to continue listing them. Only error messages pertaining to missing noise or performance data are suppressed, all other errors are still listed. Whether or not errors are ON or OFF, DATASCREEN will always list a data code next to the operations card. This code will be listed in the space where NOISEMAP prints execution time.

The letter A in the code means a descriptor missing, the letter B indicates a missing altitude profile, a C is used for missing Δ6 profiles while for each subflight for which no noise level profile exists, the program prints a D. The letter is followed by a number which has the following meaning. A zero means that the profile itself was not specified on the descriptor card. A one indicates that a space is available for the profile. A three means that the program has already issued an earlier message with a (1) code. A four means that there is no space available for the profile, even if it were specified. The DATASCREEN error summary will list the total number of times each letter code was printed.

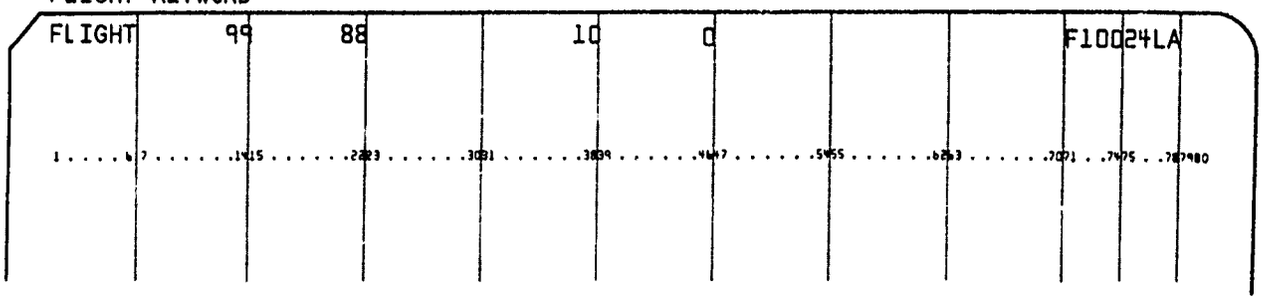
EXPAND KEYWORD

```
EXPAND
```

```
+++ EXPANSION OF DEPARTURE PROCEDURE SUPPRESSED
```

Version 3.4 does not expand the departure procedures after every FLIGHT card. This capability is useful, however, and can be started using the EXPAND keyword. As always, the NOEXPA card will stop the expansion process. Departure procedures which upon expansion contain errors will always be listed.

FLIGHT KEYWORD



+++ F-100 AIRCRAFT NO. = 99 MISSION NO. = 88
OPERATIONS - DAY 10.000 , NIGHT .000

Columns	
1 - 6	FLIGHT Keyword
7 - 14	Aircraft identification number. Must agree with aircraft identification number of a preceding TODSCR or LNDSCR card.
15 - 22	Mission number. Must agree with the mission number on a preceding TODSCR or LNDSCR card.
31 - 38	Number operations on flight track for specified aircraft/mission during daytime (0700-2200).
39 - 46	Number operations on flight track for specified aircraft/mission during nighttime (2200-0700)
71 - 78	Use same identification as on TODSCR or LNDSCR cards.

NOTE: Data field 3 is left blank. However, if the user wants to calculate CNEL contours, data field 3 (columns 23-30) would have number operations on flight track for specified aircraft mission during daytime (0700-1900), columns 31-38 number operations during evening time (1900-2200) and columns 39-46 number operations during nighttime (2200-0700).

The FLIGHT card is the action card - the one which causes the aircraft to be operated on the flight track using the specified altitude, SEL and delta-SEL profiles. It contains the number of daily operations for the specified aircraft and identification for referencing purposes.

The card will cause the flight descriptor data set to be searched for this particular aircraft/mission number. If the combination is found, the associated data are made accessible to the program and the text descriptor will be printed. If the entry does not exist, the program will instead print

INVALID

The total number of operations specified on the card must be larger than zero. Neither daytime nor nighttime operations may, of course, be negative. In any of these events, the following warning appears:

WEIGHTED OPERATIONS ***.*** ILLEGAL NO COMPUTATION FOR THIS FLIGHT

The program may issue the following mostly self-explanatory warnings and errors:

AIRCRAFT NUMBER SPECIFIED ON THE FLIGHT CARD IS NOT PRESENT IN THE DIRECTORY

ALTITUDE PROFILE NO. ***** SPECIFIED IN FLIGHT DESCRIPTOR HAS NOT BEEN ENTERED

POWER LEVEL PROFILE NO. **** SPECIFIED IN FLIGHT DESCRIPTOR HAS NOT BEEN ENTERED

INTEGRATED NOISE LEVEL PROFILE NO. ***** SPECIFIED IN FLIGHT DESCRIPTOR HAS NOT BEEN ENTERED

AIRCRAFT IS STILL ON THE GROUND AT THE END OF THE RUNWAY

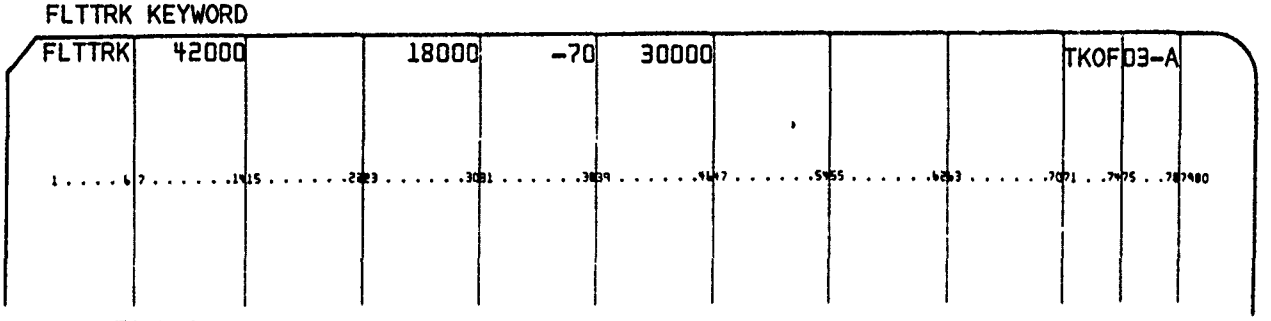
DISTANCE COVERED BY SUBFLIGHTS IS LESS THAN THE TOTAL FLIGHT TRACK

AIRCRAFT IS NOT AIRBORNE AT THE START OF TURN

In the preceding, the "power level profile " is a delta SEL profile, the "integrated noise level profile" an SEL profile. In the last error, the implication is that the turn is the first one in the flight track.

Sometimes DATASCREEN runs are made with incomplete data sets. To avoid excessive errors messages when a flight card is encountered, the error messages associated with missing data can be suppressed with an ERRORS card.

FLTTRK KEYWORD



+++ TAKE-OFFS FLIGHT TRACK 03-A
PROCEED 42000 FT
TURN LEFT 70 DEG WITH 18000 FT RADIUS
PROCEED 30000 FT

Columns

1 - 6	FLTTRK Keyword
7 - 70	Eight data fields containing up to four radius and angle pairs. The first entry of each pair is a turn radius or a straight line distance. The second entry of each pair is an angle in degrees or zero for a straight line segment. Cumulative length of segments should be between 200,000 and 400,000 feet for departure and arrival tracks to assure closure of noise contours for noisier slow climbing aircraft. Cumulative length for closed loop tracks is the total distance around the track.
71 - 74	Must be either TKOF for flight tracks beginning with a takeoff or LAND for flight tracks beginning with landings.

75 - 78 Flight track identifier. Use runway identifier plus alphabetic flight track identifier. Optional COMMENT cards may be used preceeding each FLTTRK card to further identify these tracks.

80 Continuation indicator. Enter an asterisk (*) in Column 80 if additional line or arc segments are required to describe the flight track; otherwise leave blank.

FLTTRK continuation cards:

7 - 80 are the same as for the FLTTRK card. Note: only Cols. 1-6 in FLTTRK continuation cards are blank.

The FLTTRK card is used to describe the path over the ground flown by individual aircraft. It may be used by more than one aircraft, and in the sequence of card processing, it will apply to all flights which follow until another FLTTRK, a RUNWAY, a RNPPAD, an AIRFLD or an END card is encountered.

A straight flight track is entered by coding the length of the straight line segment in the RADIUS field. The ANGLE field is to be left blank. The first segment specified must be a straight line segment. The error

FLIGHT TRACK DOES NOT START WITH A LINE SEGMENT

will be printed in the chronicle if this is not done.

A curved track requires an entry in ANGLE as well as the RADIUS field. The RADIUS field describes the radius of the turn. The ANGLE field describes the angle over which the turn must be made. Righthand turns are coded by using a positive value for the angle; a lefthand turn requires a negative entry in the ANGLE field. If the angles specified exceeds 360 degrees, a warning will be printed:

ANGLE SPECIFIED ON FLTTRK CARD IS GREATER THAN 360 DEGREES

The flight track on a FLTTRK card is either a takeoff or a landing. The program must be told which type a given track is. This is accomplished by entering in Columns 71-74 the four characters TKOF for a takeoff or LAND for a landing. To correlate a printout early with a flight track map, one may put some identifier in Columns 75-78. This identifier will print in the Chronicle but it will not appear on any plot generated by the program.

The program allows a user to input up to 25 segments in a flight track. If more complex flight tracks are entered, the error:

TOO MANY SEGMENTS IN FLIGHT TRACK

will be printed in the chronicle. If this happens, one should carefully check his flight track and delete unnecessary complexities.

The program will keep reading continuation cards and list entries even after the storage capacity is exceeded. A very similar message may be generated after a FLIGHT card:

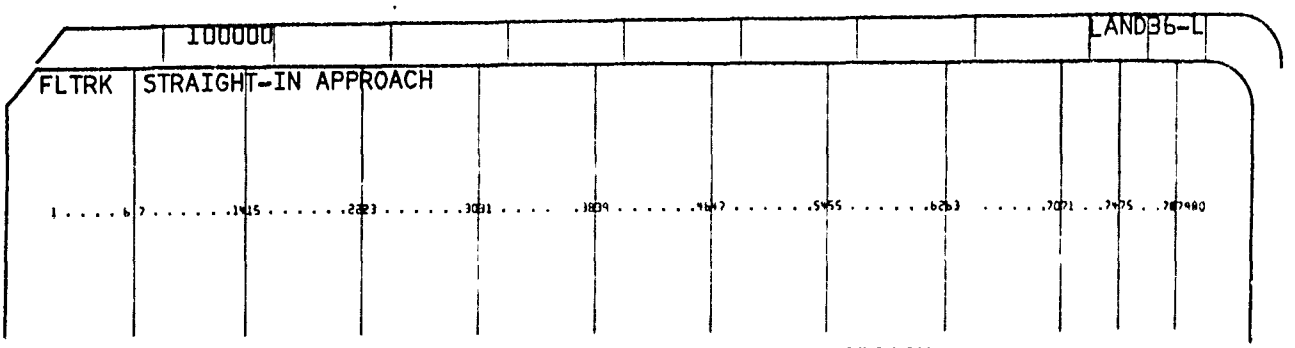
TOO MANY SEGMENTS IN FLIGHT PATH

This message means that the internal working storage for the program in which the information for all altitude, delta EPNL profiles and subflights is kept is exceeded. The combined complexity for all information for this FLIGHT/FLTTRK combination is too large to be handled.

A continuation card without a blank keyword field will result in the error

ILLEGAL CONTINUATION AFTER 'FLTTRK' CARD

For documentation purposes, it is often desirable to identify a particular flight track with English text. The COMMENT card provides one option to accomplish this. In addition, version 3.4 allows one to write a comment directly on the FLTTRK, DEPART or RNPPAD card. This feature operates in a fundamentally different fashion from COMMENT. Rather than listing the test as a comment, the program will store the information internally and print it as a heading wherever appropriate. Also, the NOLIST feature will not inhibit printing of these headings.

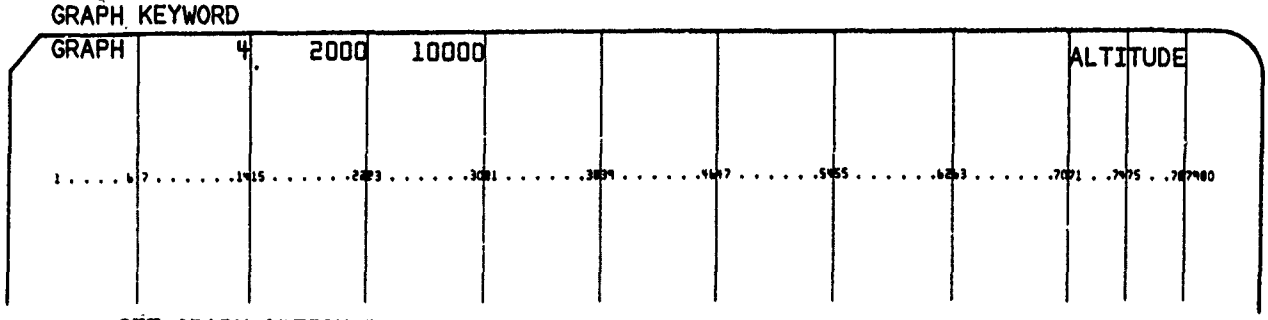


To use this feature, all one need do is to have at least one non-numeric character in columns 7 - 70. The first thirty (30) characters after the keyword are saved as text identification and the remainder of the card is ignored.

On FLTTRK cards, the text field (Col. 71 - 74) will be examined. If this field contains the TKOF or LAND identifier, it will be recognized. One may, however, leave these columns blank and punch them in the first continuation card (which contains the actual data in usual form). The common practice of supplying an identifier in Column 75 - 78 should be continued. If the user does not specify a code, the program will assign it one. Program assigned codes are numeric and are preceded by a dollar sign ($). The same convention as for track type holds for the track code. It may appear on either card. The use of a continuation character in Col. 80 of the text card is optional.

If only valid numeric characters are found in these columns on the FLTTRK, DEPART or RUNPAD card, the program assumes that the card is an "old style" card.

GRAPH KEYWORD



+++ SET GRAPH OPTION FOR NEXT 4 FLIGHTS TO ALTITUDE

Columns	
1 - 5	GRAPH Keyword
7 - 14	Specify the number of consecutive flight cards for which graph options are in effect
15 - 22	Specify a scale (units/inch)
23 - 30	Specify a higher or lower altitude (number of feet/inch)
71 - 73	Specify the type of plot desired (for example, ALTITUDE, EXPOSURE, TOGETHER)

NOISEMAP has the capacity of printing an altitude profile plot on logical unit 15. This feature, using the PICTUR card, remains available on DATASCREEN. In addition, however, the screening program can make a plot on a graphical device of the altitude profile as well as the single event exposure along the flight track. Whereas the line printer display may cover up to 4 pages, the plots will always be on a single 8 1/2 x 11 sheet of paper (actual plot size is 7 x 9 inches). In the case of a microfilm plot each plot will be on a separate frame.

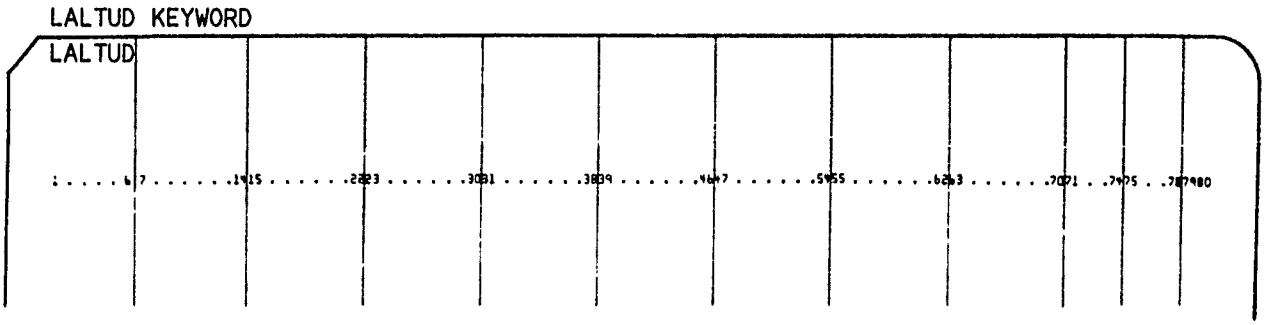
To produce these graphic outputs, the keyword GRAPH is used. The type of plot desired is punched in columns 71 - 78. If the word ALTITUDE is present, an altitude plot will be made. If the word EXPOSURE is present, then an exposure plot will be made. To obtain both types, one should not use both cards in succession, since the second one will cancel the effect of the first one. The word TOGETHER should be used if both plots should be on the same page. To obtain the plots on separate pages, use the word SEPARATE. If one desires to obtain a graphics for several successive FLIGHT cards, one may specify a repeat count in the first data field of the GRAPH card. This is exactly analogous to the PICTUR card.

There is an additional graphic output. Rather than producing a graph for each individual FLIGHT card, one can combine all altitude profiles for a given FLTTRK or DEPART card on one plot. This graph is produced upon encountering a sequence dependent card other than FLIGHT. To initiate the collecting of altitude profiles, the word COLLECT is placed in columns 71 - 77. Note that although ALTITUDE, EXPOSURE, TOGETHER and SEPARATE are mutually exclusive, the COLLECT option is independent. To collect altitude profiles for more than one track, a repetition factor can again be specified. A separate plot will be made for each track.

One may desire to plot only a selected set of altitude profiles for a given FLTTRK or DEPART card. To suspend the collection process, punch a GRAPH card with the word OFF in columns 71-73. To continue, use a card with ON in columns 71-72. Note, however, that ON is not equivalent with COLLECT. A COLLECT card will start a new frame causing any previously collected profiles to be plotted immediately, while ON only continues the collection process. Note, however, that when an OFF card precedes each flight track or departure card, the repetition factor will still "see" those FLTTRK or DEPART cards, even though perhaps ON is never specified.

The program will cover the area from brake release to 80000 ft. at a scale of 1" = 10000 ft. If a different scale is desired, the units per inch should be specified in data field 2. For example, if 150000 ft. is the range of interest, then a 20000 could be used to cover the area from brake release to 160000 ft. Similarly, the aircraft altitude is from zero to 6000 ft. at 1" = 1000'. If a higher altitude is needed (or a lower one), the proper number of feet per inch should be entered in data field 3. This field has, of course, no meaning for exposure plots, the dynamic range is always from 130-60 dB whatever scale or unit is being used.

When using the CALCOMP plotter, these plots will appear in order, interspersed by CHKPLT plots if these are in the deck. On a 30-inch drum lotter, 3 plots will be made across the page. The DEVICE card should be used to select the output device, as described below. When microfilm is used as an output medium, then each plot will become the next frame on the film strip. The microfilm grid lines will carry the same annotation as the paper copy, although the nature of the medium is such that no particular scale is associated with the grid.



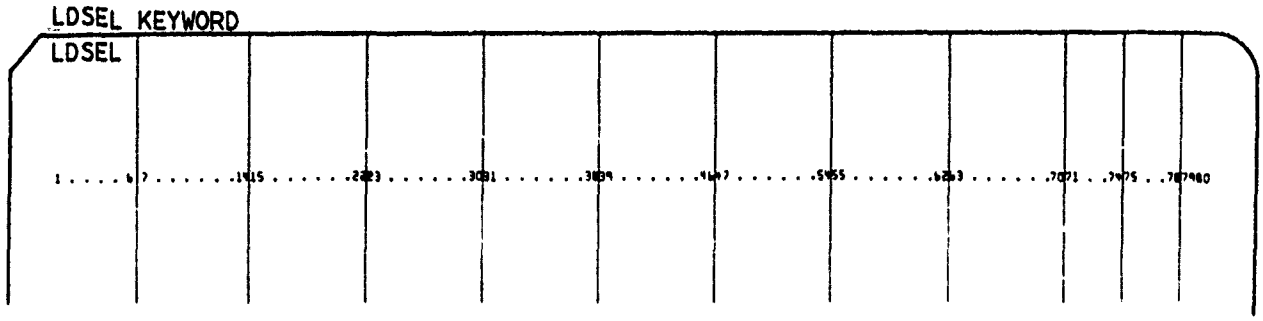
A complete listing of all entries in the altitude profile data set may be obtained by using LALTUD in the keyword field (Columns 1-6) of the card. Upon recognizing this keyword, the program will print the following:

+++ LIST ALL FLIGHT ALTITUDE PROFILES

No further data is required on this card.

A complete listing of the parameters for all entries in the data set will be printed. In addition, if any FLIGHT card referenced an aircraft whose altitude profile was not in the data set, this profile number will be listed with an asterisk(*) printed next to it.

At the end of the listing, the program will print the total number of entries in the data set. This number includes the active entries which were explicitly entered, as well as those which were missing when called upon by a FLIGHT card. In addition, the number of free library entries remaining is printed.



A complete listing of all entries in the Delta-SEL profile data set may be obtained by using LDSEL in the keyword field of the card. Upon recognizing this keyword, the program will print the following:

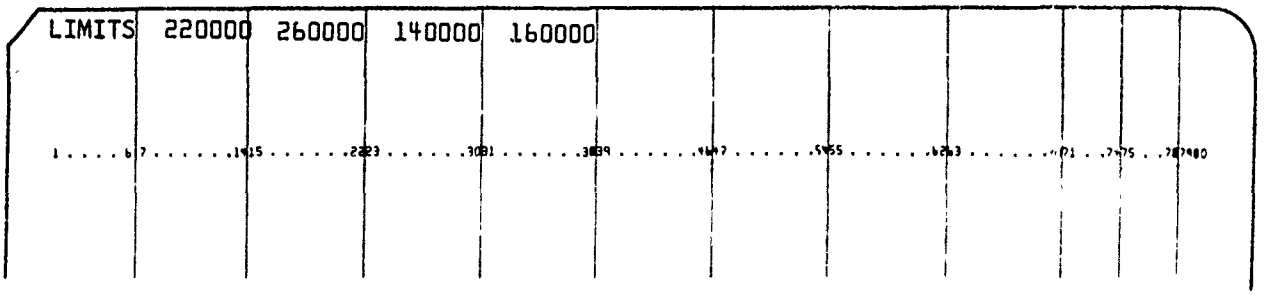
+++ LIST ALL FLIGHT POWER LEVEL PROFILES

No further data is required on this card.

A complete listing of the parameters for all entries in the data set will be printed. In addition, if any FLIGHT card referenced an aircraft whose Delta-SEL profile was not in the data set, this profile number will be listed with an asterisk (*) printed next to it.

At the end of the listing, the program will print the total number of entries in the data set. This number includes the active entries which were explicitly entered, as well as those which were missing when called upon by a FLIGHT card. In addition, the number of free library entries remaining is printed.

LIMITS KEYWORD




```
+++  LIMIT COMPUTATIONS TO THE RECTANGLE DESCRIBED BY
     THE LINES X =  220000.0 -  260000.0  Y =  140000.0 -  160000.0 FT
     PREVIOUS  X =  200000.0 -  299000.0  Y =  100000.0 -  199000.0 FT
     PGM. USES X =  220000.0 -  260000.0  Y =  140000.0 -  160000.0 FT
```

Columns	
1 - 6	LIMITS
7 -14	X_1 = X coordinate of grid specifies the minimum coordinate value
15 -22	X_2 = X coordinate of grid specifies the maximum coordinate value
23 -30	Y_1 = Y coordinate of grid specifies the minimum coordinate value
31 -38	Y_2 = Y coordinate of grid specifies the maximum coordinate value

In many applications, it is not necessary to compute a complete 100x100 point grid. When a smaller area is sufficient, a considerable cost saving may be achieved by using the LIMITS card. This card allows one to specify the maximum and minimum coordinate values for which computations will be done.

The user can specify any rectangle contained inside the grid. The x and y values specified by the user should reference the same coordinate system used for other geometric input. If the rectangle specified by the user does not correspond to a set of internal grid lines, the program will select a rectangle made up of grid lines which just encloses the requested boundaries. In any event, the program will print the coordinates used for computation. When an area is specified which lies partially outside the grid boundaries, a warning message will be printed and the rectangle truncated at the boundary as for example:

```
THE LINES X = 276500.0 -  290000.0  Y =  170000.0 -  220000.0 FT
PREVIOUS  X = 200000.0 -  299000.0  Y =  100000.0 -  199000.0 FT

********************** W A R N I N G **************************
LIMITS SPECIFY AREA OUTSIDE GRID BOUNDARY
***************************************************************

PGM. USES X =  276500.0 - 290000.0  Y =  170000.0 -  199000.0 FT
```

The LIMITS CARD reduces the number of grid points that are calculated. Noise from the entire flight track is still considered. The calculated noise levels within the limited grid will therefore be the same with or without the limits card.

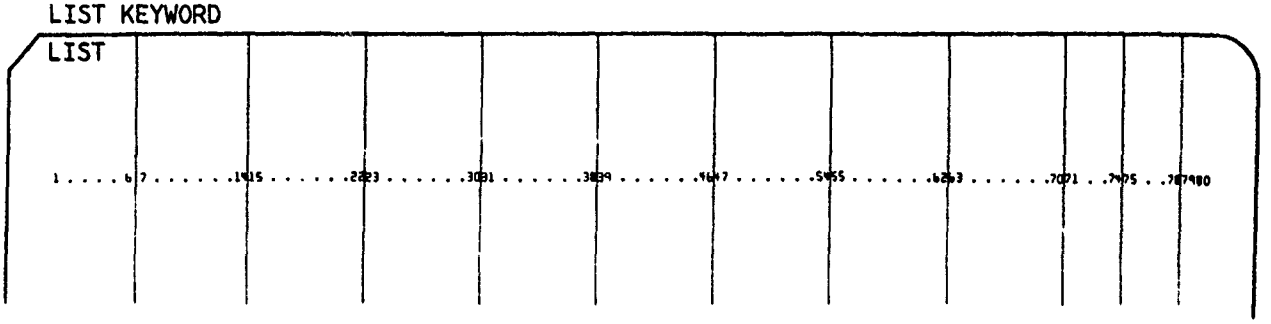
When a LIMITS card is encountered, the grid values computed up to that point remain unchanged. When a smaller area is selected, the points outside the new boundary remain. Conversely when a larger area is specified, the originally "empty" points will not receive a new value. It is not recommended to specify an area such that the rectangle encloses only a single line of grid points since the results may be unpredictable.

An ADDGRD or LODGRD card will list the calculation boundaries in effect when the dump was written. This does *not*, however, mean that data points outside this region may not be present in such a dump. This is because any arbitrary dump may be added to the grid at any time irrespective of the LIMITS in effect at that moment. There are no program errors associated with grid areas which do not correspond to the present limits. The user may determine for himself that the addition of dumps are meaningful for his applications. Dumps written by previous versions of the program will also correctly list their boundaries when read by version 3.4.

Since the LIMITS card refers to the coordinate system defined by the AIRFLD card, each AIRFLD card will reset the grid area to the full 100x100 points. Just prior to the start of a new airfield, the program will therefore print the message

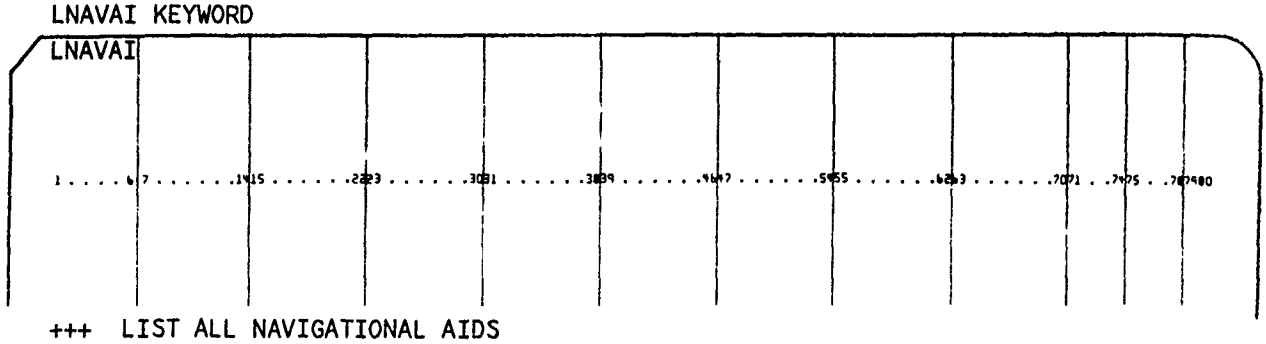
```
RESET TO X = ******.* - ******.*  Y = ******.* - ******.* FT
IN PREPARATION FOR NEXT AIRFIELD
```

LIST KEYWORD



Comments will not be listed when a NOLIST card is encountered. To resume listings, a LIST card can be placed in the deck. The default mode of the program is LIST.

LNAVAI KEYWORD



+++ LIST ALL NAVIGATIONAL AIDS

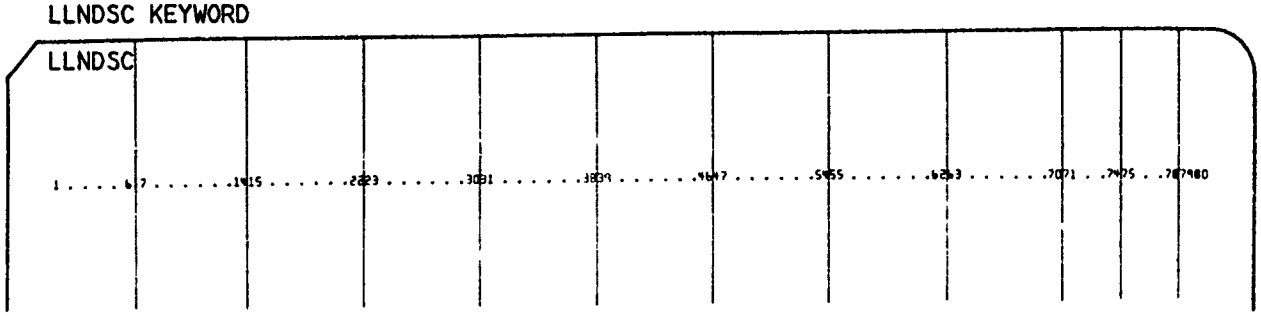
A complete listing of all entries in the navaid data set may be obtained by using the keyword LNAVAI.

A complete listing of all navaids in the data set will be listed. This listing includes the alphanumeric code and the (x,y) coordinate pair for each entry. If a FLIGHT card followed a DEPART card which referenced a navaid which was not present in the data set, the code characters used on the DEPART card will be listed followed by the words "forced entry" as in:

SMA FORCED ENTRY

The listing of navigational aids may on occasion be initiated by the program. Since it is not due to a card, the card identifier '+++" will not appear in the margin. This listing is printed when the navaid table is full as an added diagnostic to expedite deleting unnecessary entries.

LLNDSC KEYWORD



(SEE LTODSC)

LNDSCR KEYWORD

```
LNDSCR 030.    009.          030009.                  030051. 1000000.F100STD
```

```
+++  LANDING DESCRIPTOR CLASS NO -        30   A/C -F100 STD
                      MISSION NO -         9
                        ALT PROF -         0
                        POW PROF -     30009
                        TURN RAD -       0.0 FT
                SUBFLIGHT NOISE PROF   TRACK LIMITS(FT)
                    1       30051        0.0 TO1000000.0
```

Columns	
1 - 6	LNDSCR keyword for landing paths and overhead landings
7 - 78	(See the explanation for TODSCR keyword).

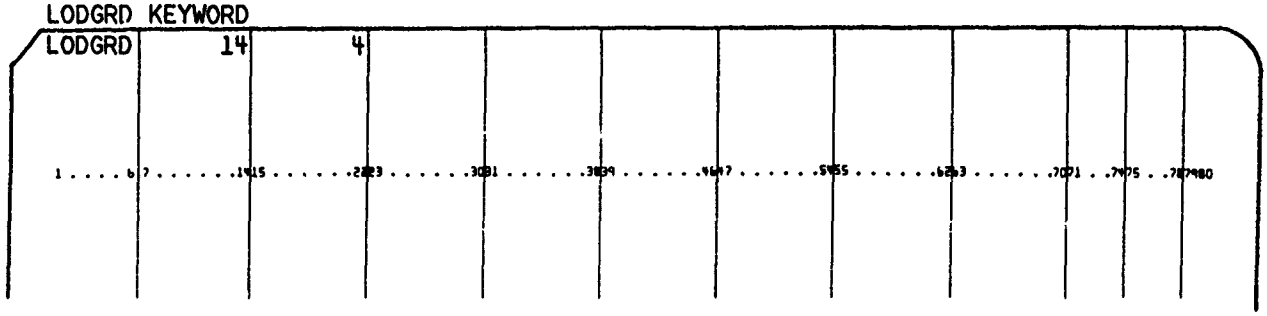
The SEL, Altitude and Delta-SEL profiles are tied together by the flight descriptor. The landing descriptor specifies the noise and performance characteristics of a particular type of aircraft on a particular type of mission.

Although the parameter fields on the TODSCR and LNDSCR are layed out exactly alike,a logical separation is made between them in order to improve the error diagnostics of the program.

A given mission for a given aircraft will obviously have one specific altitude profile associated with it. Similarly, one Delta-SEL profile is necessary to specify all offsets due to moderate changes in power setting or changes in speed of the aircraft.

For landings, these fields are commonly left blank. By so doing, the program is instructed to compute (1) its own altitude profile for this aircraft based on a normal glide slope approach to the runway and an assumed 50 foot height over the runway landing threshold and (2) its own Delta-SEL profile with zero offset from the SEL profile specified. If the user desires to override this feature he may specify the numeric names of either or both of these profiles (which must then ultimately be entered in their own respective data sets).

LODGRD KEYWORD

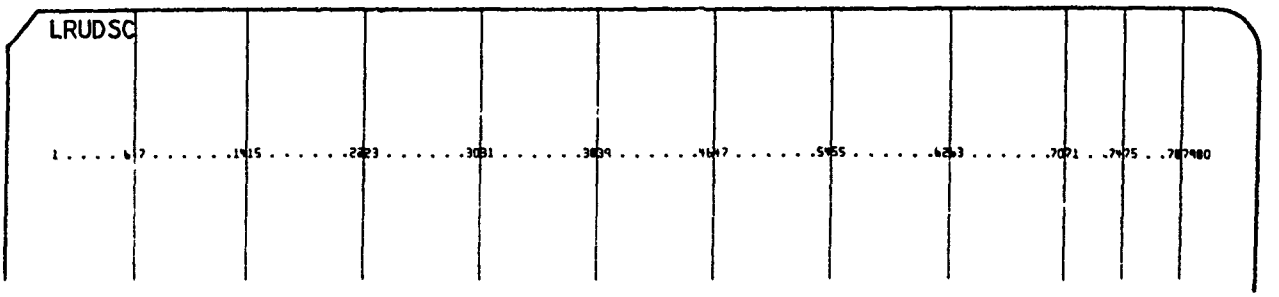


LODGRD card loads a previously computed grid from a specified tape unit.

Columns	
1 - 6	LODGRD Keyword
7 - 14	Unit number
15 - 22	Dump number of dump to be retrived. This is used to specify a particular dump on the unit designated for loading onto the working grid.

The LODGRD card causes the grid to be cleared and then adds the data from the dump number specified.

LRUDSC KEYWORD



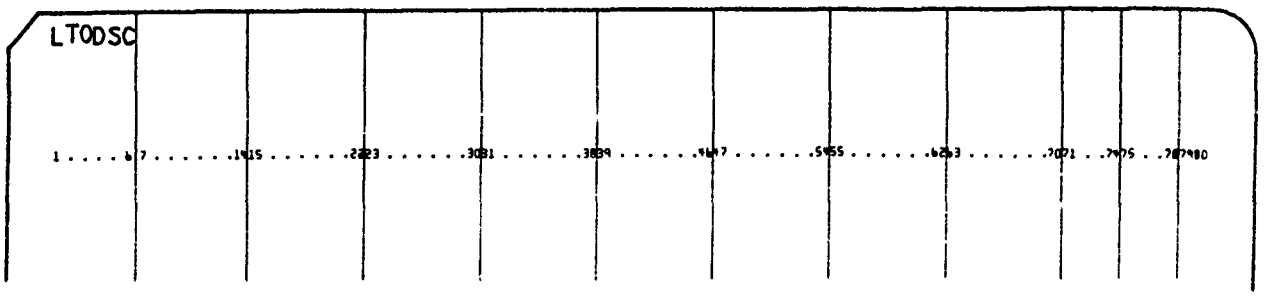
+++ LIST ALL RUNUP DESCRIPTORS

A complete listing of all entries in the runup descriptor data set may be obtained by using LRUDSC in the keyword field of the card.

A complete listing of the parameters for all entries in the data set will be printed. In addition, if any runup card referenced an aircraft which was not in the data set, the aircraft number and thrust number will be listed and an asterisk (*) printed next to the thrust number.

At the end of the listing, the program will print the total number of entries in the data set. This number includes the active entries which were explicitly entered, as well as those which were missing when called upon by a RUNUP card. In addition, the number of free library entries remaining is printed.

LTODSC KEYWORD

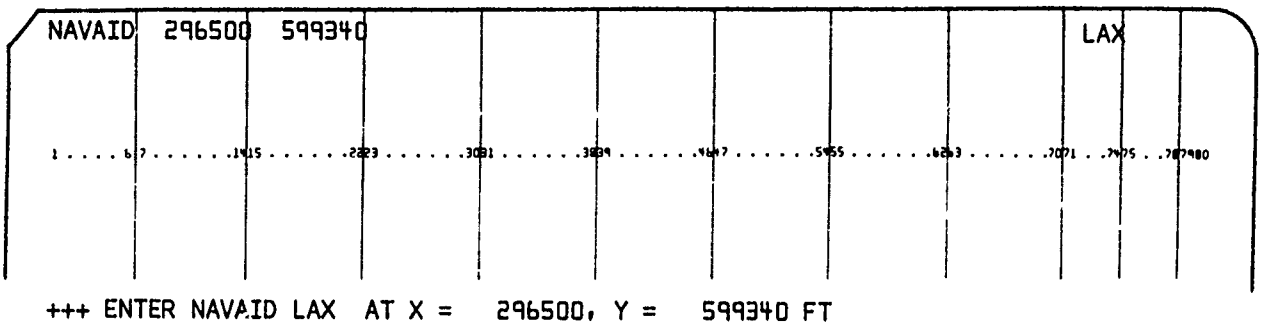


A complete listing of all entries in the takeoff descriptor and landing descriptor data sets may be obtained by using LTODSC or LLNDSC in the keyword field of the card. No further data is required on this card. Upon recognizing either keyword, the program will print the following:

+++ LIST ALL FLIGHT DESCRIPTORS

A complete listing of the parameters for all entries in both data sets will be printed. In addition, if any FLIGHT card referenced an aircraft which was not in the data set, the aircraft number and mission number will be listed and an asterisk (*) printed next to the mission number. At the end of the listing, the program will print the total number of entries which were explicitly entered, as well as those which were missing when called upon by a FLIGHT card. In addition, the number of free library entries remaining is printed.

NAVAID KEYWORD



+++ ENTER NAVAID LAX AT X = 296500, Y = 599340 FT

Columns	
1 - 6	NAVAID Keyword
7 - 14	X-coordinate of navigational aid with respect to the grid origin on the AIRFLD card
15 - 22	Y-coordinate of navigational aid
71 - 74	Navigational aid identifier - usually two or three letters - the call sign of the navigational aid

NAVAID card is used to identify and locate only air navigational aids such as VORTACs, TACANs, VORs, and NDBs, with respect to the above airfield. They should not be used to identify PAR, ASR, GCA, ILS or other aids to navigation which do not provide bearings and/or radial information.

The navaid coordinates referred to the map used for entering airfield geometry are placed in data fields one and two. The navaid identifying code is entered in the first alpha field (columns 71-74). It is important to recognize that a blank space in this field has meaning. If the usual three letter codes are used, there is a difference between 'LAX' and 'LAX '. To the program, these are distinct entries and one should take care to consistently

left or right justify the navaid codes on NAVAID cards as well as DEPART cards. Only one navaid can be entered per card, but continuation cards may be used.

If more navaids are entered than the program can store, the program will print the warning:

TABLE FULL

Although it will continue reading and listing cards, they will be ignored. If a new entry is made with the same alphanumeric code as an existing entry, the program will issue a warning:

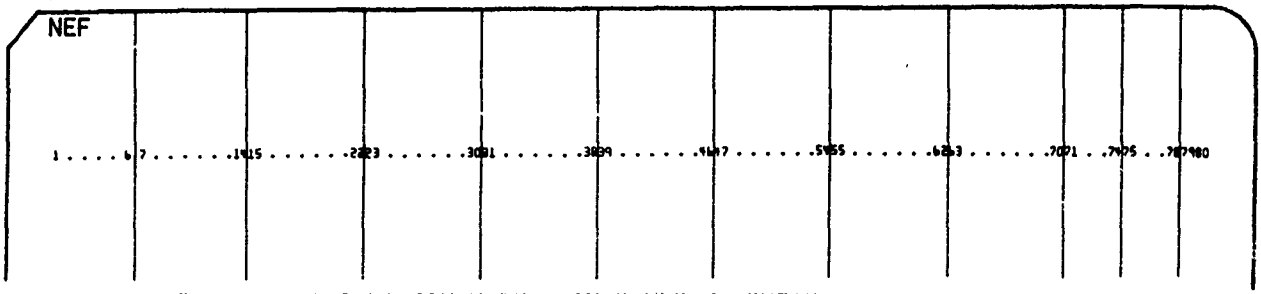
A PREVIOUS ENTRY FOR **** HAS BEEN DELETED

The reason for printing a warning rather than a simple message as is done in noise and performance data is that, although modifying operational parameters during the calculation for an airbase is fairly routine, moving navaids around is at the very least a suspicious activity.

Any reference to a navaid must include a nonblank entry in Columns 71-74. If a blank identification code is used, the program cannot retrieve the information and the entry is lost. This is signified by the warning:

NAVAID NAME MISSING

```
NEF KEYWORD
NEF
```



```
+++  SET PROGRAM CALCULATION MODE FROM "DNL" TO "NEF"
          DSEL   DELETED
          SEL    DELETED
          AL     DELETED
     APPROPRIATE DATA KEYWORDS ARE
          EPNDB    XEPNDB   LEPNDB   CEPNDB
          DEPNL    XDEPNL   LDEPNL   CDEPNL
          PNLT     XAL      LAL      CAL
     THE FOLLOWING FORMULA IS USED
     FLIGHTS   -  NEF   =EPNL  + 10 LOG (NDAY +  16.67 NNIGHT)  -  88.00
     RUNUPS    -        =LDEPN + 10 LOG (NDAY +  16.67 NNIGHT)  -  88.00
     GRIDWALK CUTOFF IS    0.0 NEF    (  32 MARGINAL ADDITIONS SUM TO 15.0)
```

With the NEF card, the NOISEMAP computer program will calculate Noise Exposure Forecast (NEF). Since the NEF keyword EPNDB is the only one which does not end in L for "level" the keyword EPNL can be used synonymously. Similarly, LEPNL and LEPNDB, and XEPNL and XEPNDB can be used interchangably.

In any event, it is the *first* data card which determines the quantity computed as shown in Table 6. It is, for example, futile to declare the contour type NEF but follow it with SEL data. The program will upon encountering an SEL data card as the first data card return to DNL. When different types of noise data are intermingled, the program mode is set by the first type encountered and the incompatible data causes the error.

```
KEYWORD ****** IS NOT COMPATIBLE WITH THE ***** CALCULATION OPTION.
```

TABLE 6

AUTOMATIC MODE SELECTION

The first data card of the set:	causes program to be:
SEL, DSEL, AL	DNL
EPNL, EPNDB, DEPNL, PNLT	NEF
SELT, DSELT, ALT	DNLT

It is permissible to change from one type to another by placing a card with the appropriate keyword in the deck. When such a card is encountered, the program will switch to the desired unit type. When the grid is not saved, it will be written to unit 10. The program will eliminate incompatible data from the internal data tables and will list the status (KEPT or DELETED) as shown in the example. The keyword recognizer is also modified so that the keywords appropriate for the particular contours will be recognized. The formula used for the new contour type is also listed.

The end-of-airfield processing will not take place if the following or the preceding card is an AIRFLD card since the listing would be repeated. When a selection card precedes an AIRFLD card, the cross-reference listing may be meaningless or non-existent since the data library tables are shared when a selection card is encountered. It is better to practice to place the selection card as the first after the AIRFLD card. If a contour selection card appears anywhere else in the deck, a message is listed in the chronicle:

FOLLOWING END-OF-AIRFIELD PROCESSING IS DUE TO CHANGE FROM ***** TO *****

The next line printed after such a listing is:

THE ABOVE END-OF-AIRFIELD PROCESSING WAS DUE TO CHANGE FROM ***** TO *****

followed by the warning message:

AN 'AIRFIELD' CARD NEITHER FOLLOWS NOR PRECEDES THIS ***** CARD.

When the keyword used is for a selection already in effect, the warning message:

CHANGE IS TRIVIAL .... EXECUTION CONTINUES

will be printed. In the processing mode, an unsaved grid will cause a precautionary dump on unit 10 to be taken.

When the contour type selected uses the same data as the previous contour type (e.g., DNL and DNLW), the compatible data is automatically kept. The power level profiles (DEPNL, DSEL, DSELT) are unique in one respect. Under certain circumstances, it may be desirable to keep these adjustments unchanged from one contour type to the next, even through the keyword should change (e.g. DSEL to DSELT). To carry forward this information, the word KEEP may be punched into columns 71-74 of the selection card. The chronicle listing will then show:

DSEL KEPT

This has the meaning "DSEL data kept and relabeled DSELT" for the case cited above.

During the initialization, a recallable data base may be constructed. The data base will have associated with it the characteristics of the last contour type selected during initialization. When a new AIRFLD card is encountered, the data base is reset to the initialization value if the initialization value is compatible. If the data base is not compatible, the internal storage will be cleared, and all data will be lost including the power level data even though the KEEP option was originally used. The NODATA card can be used, as always, to carry data across airfields.

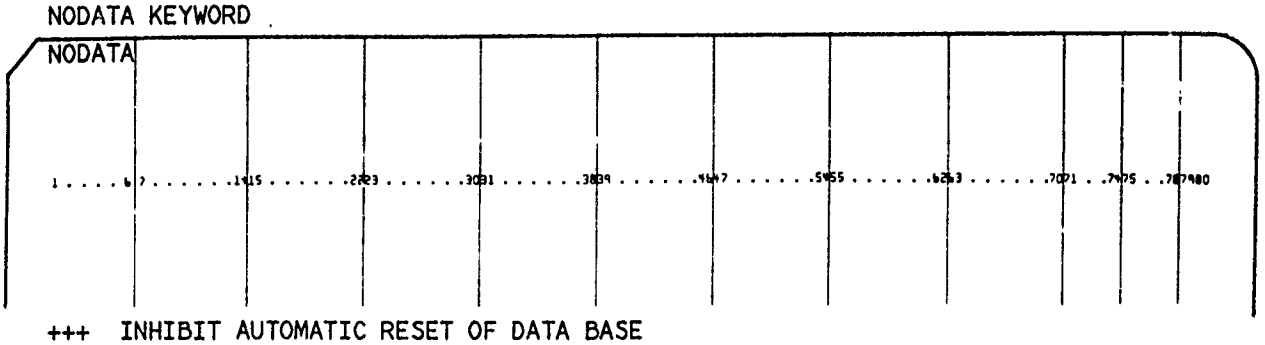
When a data card is encountered which contains a keyword which is valid for a different contour type, the usual invalid keyword message listing the card field by field is suppressed. Instead a chronicle message:

KEYWORD ****** IS NOT COMPATIBLE WITH THE ***** CALCULATION OPTION

is printed. This is done because a deck with the wrong type of data would print much trivial output. Printouts are reduced by a factor of about 4.5 in this way. If a continuation card is missing for an incompatible keyword, this will result in an imbedded error message:

CONTINUATION CARD MISSING FOR THIS CARD

NODATA KEYWORD

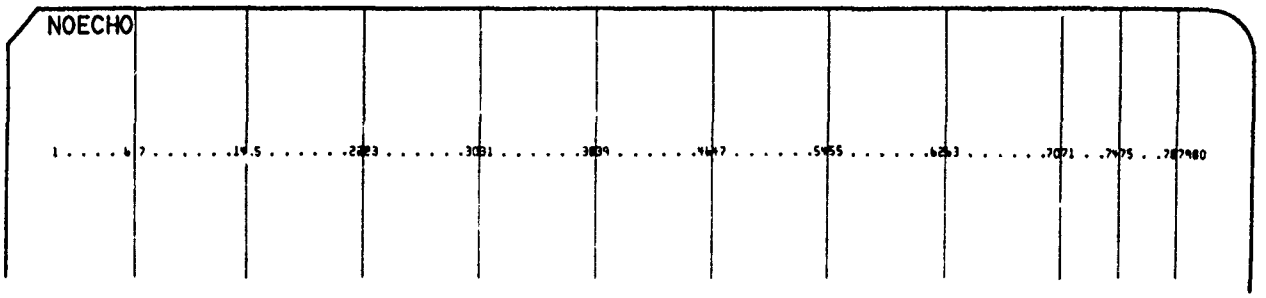


+++ INHIBIT AUTOMATIC RESET OF DATA BASE

At times, it is undesirable to have the program reset the data base automatically at the start of an airfield. In that case, the control card NODATA will suppress this feature.

The inhibit feature is removed as soon as a RESET is encountered. If the NODATA card occurs in the initialization, the program will not write a file on unit 4, thereby limiting the amount of scratch disk space. The word PERMANENTLY is then appended to the usual NODATA message and subsequent RESET cards will cause a NOISEMAP error.

NOECHO KEYWORD



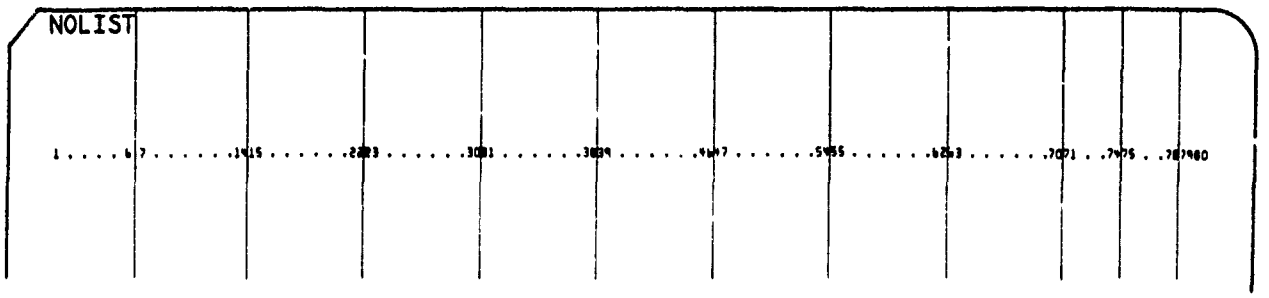
With "NOECHO" card, the noise profile 031031 will be suppressed and listing would appear as:

```
+++ FLIGHT NOISE LEVEL PROFILE (SEL     )   NAME=   31031  F-4
COMMENT 031031A0 OMEGA 6.6 06 JAN 76 F-4      1000 FT  300 KTS  59 F  70 PCT
COMMENT 031031A0 TURBOJET          SPEED BRAKE OUT
COMMENT 031031A0 TAKEOFF POWER              100%  RPM
                    INTEG. ≠A≠-WEIGHTED NOISE LEVEL
          DIST         GRND-TO-GRND  AIR-TO-GRND
          ----------   ------------  -----------
```

Version 3.4 will not echo back the values on SEL cards. A heading is provided and embedded comment cards[1] are listed to identify the profiles. The actual values can be printed as in earlier versions by inserting a card with keyword ECHO. A NOECHO card will stop the listing of the profiles.

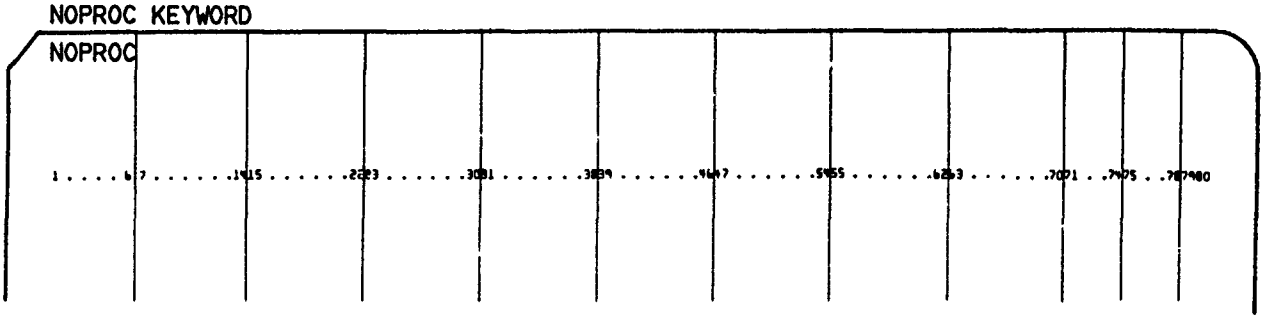
[1] Comment cards are embedded in the profiles on the standard noise library.

NOLIST KEYWORD



Comments will not be listed when a NOLIST card is encountered. To resume listings, a LIST card can be placed in the deck. The default mode of the program is LIST.

NOPROC KEYWORD



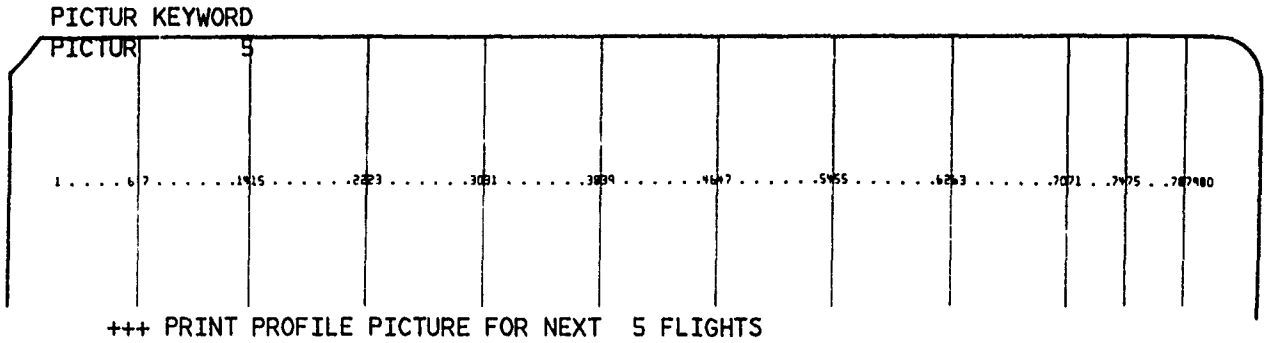
+++ ENTER NON-PROCESSING MODE

INPUT DATA WILL BE CHECKED BUT NO COMPUTATIONS PERFORMED

Columns

1 - 6 NOPROC

A NOPROC card causes processing of data to be terminated. The input data will continue to be checked, but noise exposure data will not be calculated.



Columns	
1 - 6	PICTUR
7 - 14	Specify number of FLIGHT cards to be printed (display of altitude profiles) following the PICTUR card.

To facilitate checking out the altitude and power level adjustment profiles, one may obtain a graphic representation on the line printer. The output is placed like that of the printer plot, on logical unit 15.

The PICTUR card provides printer-plots of altitude profiles for use in verification of input data and for graphical documentation of aircraft client profiles and performance data. The user must specify the number of FLIGHT cards following the PICTUR card for which plots are desired. To obtain these plots, TODSCR/LNDSCR, ALTUDE, DSEL and FLIGHT cards must be present in the deck.

The symbol used to trace out the altitude profile is the digit 1, 2 or 3, indicating which subflight power profile is appropriate at each point. A legend identifying the main profile for each subflight is printed on the top of each page.

Break points in the power adjustment profile are indicated by a row of asterisks down from the profile. The offset value corresponding to the break point is printed underneath the horizontal axis. To avoid printing the values of closely spaced offsets on top of each other they are printed staggered on three lines.

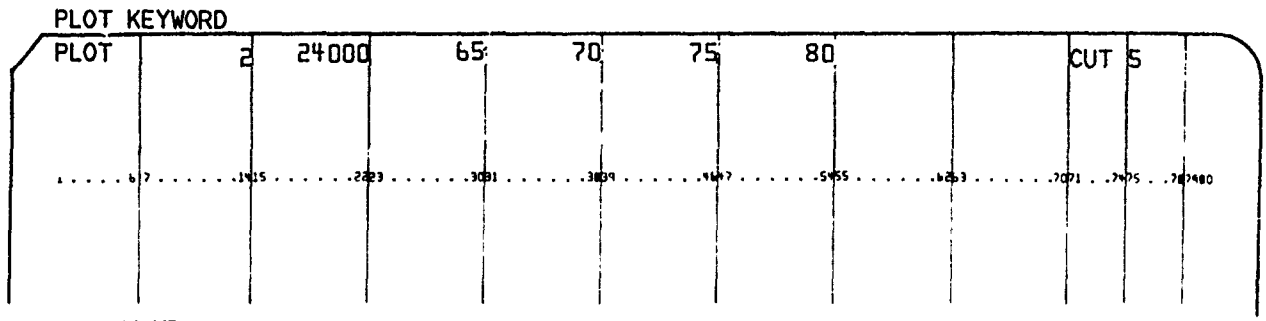
On each page, the airbase name, aircraft class and mission number, the corresponding alpha-numeric descriptor test as well as the runway number, flight track identification (col. 74-78 on the FLITRK card) and the number of the card in the deck is printed. The card number is also printed in the chronicle between the alpha-numeric descriptor and the aircraft number. This establishes a cross-reference between the graphs and the cards in the deck.

The program will print a message in lieu of a graph when the altitude profile or the flight descriptor is not present. This message will give the reason why no graph could be made. A missing power adjustment profile will cause only a zero to be printed at the origin of the graph.

With up to 4 pages of printout for each FLIGHT card, it is a simple matter to print enormous quantities of paper with this option. It is therefore necessary to supply a count in the first data field indicating for how many FLIGHT cards a display should be printed. If the number specified is negative, zero, or is left blank, a value of 1 is assumed.

The altitude is displayed along the ordinate axis. The scale is such that one inch corresponds to the grid spacing. For example, if the grid spacing is the usual 1000 ft, the vertical axis will be 1 inch = 1000 ft. Along the abscissa, which shows the distance from brake release, the scale is compressed by a factor of 10. In the example above, the horizontal axis would show a scale of 1 inch = 10,000 ft. For most applications, this will

result in a printout of at most 4 pages. In order to avoid excessive numbers of pages being printed for very long flights or when a keypunch error is made the program will never print more than 4 pages per flight. If necessary, the scale of either or both axes will be compressed so that no axis will ever exceed 2 pages.




```
+++  PLOT   CUT 5   WIDTH ** IN, OPT = 2, SCALE 1 TO  24000 (1 IN =  2000 FT)
                    GPCP CONTROL CARDS ON UNIT 11
                    CONTOURS ARE   --   65   70   75   80
                    THERE ARE  *** ANNOTATION RECORDS  ****      DATA POINT
```

Columns	
1 - 6	PLOT Keyword
7 - 14	PLOT Option (See Table 7)
15 - 22	Scale. Enter 24000 for standard USGS 7-1/2 minute output (1" = 2000' = 24000"). Enter 62500 for USGS 15 min (1" = 6080') output. Other scales may be specified as required.
23 - 70	Value of Contours desired
71 - 78	Text to identify plot, if desired.

Program NOISEMAP computes an array of DNL values. Contours of equal DNL can be obtained by interpolation between the values of the grid. This may be done by hand but is more efficiently done by computer. The program can produce output in such a format that CALCOMP's contouring program GPCP can read the data cards and control cards required to produce contours through GPCP.

The PLOT card yields output acceptable to GPCP for contouring. It should be used when plotter-produced smooth-line contours are required as output.

The user has several options at his disposal, even within the confines of a "standard" NOISEMAP/GPCP run. These options are specified in the OPTION field of the PLOT card and listed in Table .

TABLE 7

PLOT OPTIONS

OPTIONS	ACTION TAKEN BY THE PROGRAM
±1	Mark grid points on the map
±2	Do not mark grid points
±3	Mark grid points and post local DNL value
±4	Same as (1) but suppress flighttrack map
±5	Same as (2) but suppress flighttrack map
±6	Same as (3) but suppress flighttrack map
±7	Same as (5) but mark runways and labels

If the option is positive, all GPCP control cards other than the first three will be put on the same tape as the DNL data cards. If the option is negative, the GPCP control cards will be punched on the card punch (unit 8).

If the user leaves the OPTION field blank, the program will default to option = 2. This will not cause any error or warning message, in keeping with the basic philosophy of the program that all standard defaults will not result in diagnostics. If any option other than the set form -7 to + 7 is used, the program will issue a warning and set the option to the value 2.

If ground runup areas were entered on a RNPPAD card, the location will appear on the map as an aircraft outline. The orientation of the outline is the aircraft orientation assumed on the pad. The exact location of the pad as specified on the RNPPAD card is given by the apex of the V of the tail. Any NAVAID which was entered will appear on the map as a star (*) with the

code underneath. Any of the annotation records described above will not appear if it falls outside of the map area. The entire flighttrack map is omitted if the user specifies an option with absolute value 4, 5 or 6.

The plots can be made to any arbitrary scale smaller than 1:5000. If it is attempted to make a plot to a scale larger than 1:5000, the program will issue a warning and set the scale to 1:24000 (corresponding to 1 inch equals 2000 feet). The desired scale is communicated through the SCALE parameter on the PLOT card. The scale parameter contains the denominator part of the scale. If a scale of 1:36000 is desired, the SCALE field on the card should read 36000. If the scale field is left blank, the scale defaults to 1:24000 without the issuance of a WARNING.

The output from NOISEMAP which will later be used by GPCP will mostly appear on logical unit 11 with some output on logical unit 8, which is assumed to be a card punch. The punched cards and the tape from the device assigned to logical unit 11 should be kept together since the combination of these is required for a successful plot. Combining cards of one run with a tape from another run may lead to serious errors.

The file written on unit 11 is formatted to correspond with the normal GPCP input format. Although each record is in card-image format, it is recommended that this file be not punched in cards since each PLOT card may produce up to 11000 records on unit 11.

Furthermore, the deck generated on the punch cannot simply be combined with the tape 11 cards to produce a correct deck of input cards for GPCP. The user wishing to use cards only, is advised to study the CALCOMP manual to find out how the decks should be combined and which cards should be repunched.

The input to GPCP can be regarded as two sets of data cards. The first set contains control cards which allow the user to specify certain operations to be performed. These cards indicate what contours are desired, the scale of the plot and whether to draw a border or to stop the plotter for pen changes, etc. The second set of cards contains the values of the individual (random) control points to be contoured.

Although the control card part of the GPCP compatible output can be made available to the NOISEMAP user on punched cards, it is for most purposes unnecessary to punch them and they can be included on the tape file. In that case, only 3 cards will be punched. It is recommended that the card images be written on tape; in this way, there is never any problem to replot contours since the data and the control cards are together on the tape and cannot be separated.

When an option with absolute value 1, 2 or 3 is selected, the program will produce two sets of maps, which can be plotted on top of each other or which may be plotted on separate sheets to make overlays.* The first plot produced is a set of DNL contours as specified below. The plotter will then draw a border and stop. At this point, the operator may start on a fresh sheet of plotter paper or he may continue on the same sheet; when continuing on the same sheet, he may wish to change pen weight or ink color. When the plotter is restarted, the program will draw a layout of all runways, flighttracks and runup areas used by the program.

---

* Online plotters may not be capable of stopping to change paper.

These "annotation records" are put on as follows: All runways will appear on the map with a width equivalent to 250 feet. If a runway number was given on the RUNWAY card, it will appear on the map. A displaced landing threshold will be shown as a bar across the runway at the point where the threshold is located. All flighttracks originating on this runway will be drawn. This includes the flighttracks explicitly defined on a FLTTRK card as well as those generated by the computer from a procedure. This process is repeated for all runway and flighttracks.

The annotation records which we have discussed are sensitive to the scale of the plot. Not only does the flighttrack layout scale properly, but the labeling of the runways, etc., will also scale up and down, except that no character will be plotted which is smaller than 0.07". The reason for this is simply the limitation of the plotter hardware; when the characters become smaller than 0.07" they become illegible due to the limitations of the plotter resolution and due to the finite width of the pen.

The desired contour values must be inserted on the fields designated "contour values". The PLOT data card can be continued on as many continuation cards as are required to specify all desired contours. The use of continuation card is fundamentally different from the use of a new PLOT card. In the former case, more contours are plotted on the same map; in the latter, a new plot is started.

The options with absolute value other than 2 or 5 merit careful consideration. If it is desired to indicate where exactly the grid points are located on the map, option 1 or 4 can be used. In that case, the plotter will mark each grid point by a plus symbol (+). When the posting of the DNL value of each grid point is desired, this may be accomplished by the use of an

absolute value of 3 or 6. It is recommended that this be done only if there is an urgent need to do so since the posting of DNL values on the plotter is excessively time consuming.*

The output from GPCP is a graphic display. If this is written on a plotter, GPCP will produce a map which may consist of more than one sheet of plotter paper. The size of each section of the plot is determined by the width of the plotter drum.

If no contrary instructions are given, NOISEMAP will assume a paper width of 28 inches. This allows some space for annotation and splicing for a 30 inch drum. The size of the plotter page can be set by the user to any other value by means of the WIDTH card. The width should be in available inches of plotter paper. It should be pointed out that if a small drum plotter is used an inordinate amount of splicing must be done to arrive at a complete map. Additionally, it becomes very difficult to maintain adequate registration of successive sheets since some stretch will invariably occur in the paper even if the humidity is tightly controlled.

If plots are made on a flatbed plotter, the user should satisfy himself that the plotter will be able to handle the size of the map without hitting any limit switches. This means in practice that if the flatbed plottable width is W inches, the largest scale allowable is the one for which:

$$SCALE = (1.2 * 10^7) / W$$

This is due to the fact that GPCP is designed for use with drum plotters and therefore the X-direction is assumed to be infinite. The program will plot the total X-direction and as much as can be accomodated of the Y-direction

---

* In the unlikely event that a map of DNL values is required without plotting any contours, a very high DNL value should be specified on the first contour location (>100). Maps of this sort are more efficiently generated on the printer.

on the given paper width. The next sheet will contain the next higher band of Y-values. This procedure is totally unworkable on a flatbed where the paper cannot move under program control.

Many additional features are available from GPCP. The interested user is referred to the CALCOMP manual for these. The NOISEMAP output is complete, however, in the sense that a user need not know anything at all about the control card structure of GPCP as long as he runs all contouring jobs with the data provided by NOISEMAP.

During the execution of the program, the GPCP control cards may be punched on the card punch (unit 8) or they may be written on unit 11 which also contains the grid data cards.* The program will print in the Chronicle the unit on which the control cards are written. If the unit on which they appear changes, this will also be indicated. The deck, which is punched on Unit 8, will contain all the parameters necessary to switch the input routines of GPCP back and forth between the two files and no further user action is required to ensure that a deck and its corresponding tape can be processed by GPCP. The messages are:

```
GPCP CONTROL CARDS ON UNIT **

GPCP CONTROL CARDS ON UNIT ** TRANSFERRED FROM UNIT **
```

Since the GPCP routines will always start from a card input, a run which is entirely written to unit 11 will always display as the first message:

```
GPCP CONTROL CARDS ON UNIT 11 TRANSFERRED FROM UNIT 8
```

since the three cards necessary for the GPCP initialization will always be punched.

---

* Plot options are given in Table 7.

The PLOT card cannot give rise to an error, but several different warnings may be issued. These are associated with missing continuation cards, illegal plot options, scale too large or request for contours lower than 55. The messages dealing with contour values lower than 55 DNL require further clarification. The problem centers around the interpretation and calculation of such contours. The meaning of DNL contours lower than 55 in terms of land planning is not very well defined. If one requests a contour lower,the 55 DNL program will issue the warning:

CONTOURS BELOW 55 ARE NOT CONSIDERED RELIABLE

A related problem is that contours below 45 are not valid since the program will not compute grid values less than 37 DNL.When various flights are accumulated on a grid, it is quite possible that contour values lower than 45 DNL will result in incorrect contours. Since they are of doubtful value even when computed correctly, these contours will be suppressed. Since a value lower than 45 DNL is also lower than 55 DNL, the message will read:

CONTOURS BELOW 55 ARE NOT CONSIDERED RELIABLE
FURTHERMORE CONTOURS BELOW 45 ARE SUPPRESSED

If all contours desired are suppressed, the program will ussue the warning:

ALL CONTOURS REQUESTED WERE SUPPRESSED

The program will print in the Chronicle the number of control points and annotation records:

THERE ARE **** ANNOTATION RECORDS **** DNL DATA POINTS

In general, this is a for-the-record message. It may, however, appear as a warning when fewer than 100 control points would be written to tape 11 or if no annotation records are present. When zero annotation records and no control points are found, the program has found an empty grid. This would occur if a PLOT card follows a CLRGRD card. The annotation records can also be missing when a CLRGRD card is followed only by FLIGHT cards before a PLOT card is encountered.

The fact that at least 100 control points are needed is due to the limitations of GPCP. Plots with fewer than 100 points are ignored as if the program was in "noproc" mode: only the flighttrack map is plotted. If the number of data points is very low, it is quite possible that nonsense contours will still appear around the edge of the map.

When options of absolute value > 3 are specified, the message will read:

RUNWAY LAYOUT SUPPRESSED **** DNL DATA POINTS

The remaining, self-explanatory messages are:

PLOT OPTION ******* IS ILLEGAL, A VALUE OF 2 IS ASSUMED

SCALE 1 TO ******* ILLEGAL, SET TO 1 TO 24000

CONTINUATION CARD MISSING

PRINT KEYWORD

```
PRINT      15
```

```
+++  DUMP GRID TO UNIT 15 PRINTABLE  SAVED DUMP *** ON UNIT 15 SPECIAL FORMAT
```

Columns

1 - 5	PRINT Keyword
7 - 14	Specify unit

A way of producing a printed listing of NEF (CNEL, DNL, etc.) values is by inserting a PRINT card.

The PRINT card is used to produce printed grids the same way a DMPGRD card with the PRNT option does, except that empty grid points are suppressed entirely. Since the format used to print this map must be computed for each individual line of print, this method is more time consuming than the DMPGRD dump. The chronicle message for this type of dump has the extra identification "SPECIAL FORMAT".

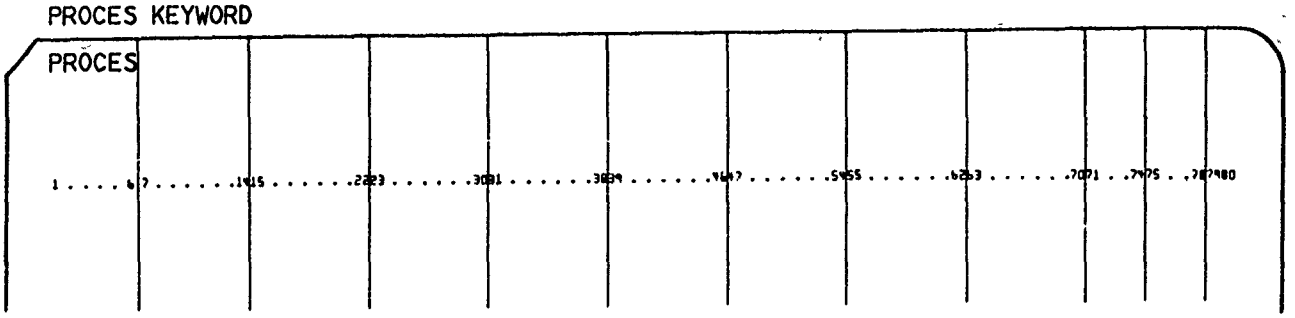
It is recommended that dumps be written on units other than 6 if a map is to be spliced together from a printout, since the 84 character width of the Chronicle causes 35 instead of 20 pages to be printed. If the dump appears in the Chronicle, it will follow immediately after the message:

```
+++  DUMP GRID TO UNIT 6 PRINTABLE
```

or

```
+++  DUMP GRID TO UNIT 6 PRINTABLE  THIS DUMP IS PRINTED IN SPECIAL FORMAT
```

PROCES KEYWORD




```
+++  ENTER PROCESSING MODE
     CONTOUR COMPUTATIONS WILL BE PERFORMED
```

Columns	
1 - 6	PROCES

Upon encountering a PROCES card, NOISEMAP will immediately start processing data. Without the PROCES card, NOISEMAP checks data but does no calculations of noise exposure. If a previous error has been detected, the processing will be deferred and the following message is printed:

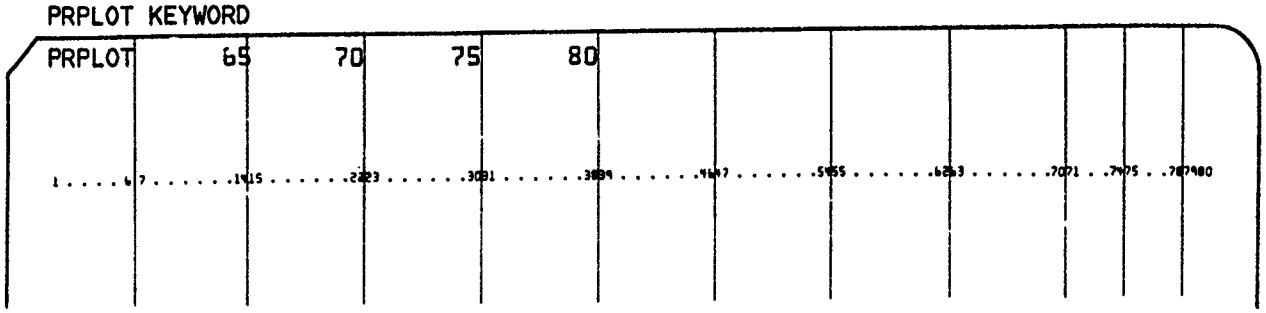
```
+++  ENTER PROCESSING MODE   DEFERRED DUE TO PREVIOUS ERROR
     INPUT DATA WILL BE CHECKED BUT NO COMPUTATIONS PERFORMED
```

If an error is detected after the PROCES card, the program automatically stops processing data.

A program running in "proces" mode will upon entering the "nogo" mode write a dump on unit 10. Dumps on unit 10 are inaccessible to the user during the job. During a later run, the same physical volume may be mounted on a different logical unit and be read from that unit. A similar protection feature is invoked when a CLRGRD card is encountered during a "proces" run. If the then current grid status was not preserved in any form, a dump on unit 10 will be taken. The corresponding message is in both cases:

```
CURRENT GRID STATUS INACCESSIBLE      SAVED DUMP *** ON UNIT 10
```

PRPLOT KEYWORD




```
+++  PRINTER PLOT
     DNL    VALUES REQUESTED
            65.0  70.0  75.0  80.0
     THERE ARE  3643 DNL    DATA POINTS
     PRINTED PLOT ON UNIT 15
```

Columns	
1 - 6	PRPLOT
7 - 70	Specify contours for plotting computations in these data fields

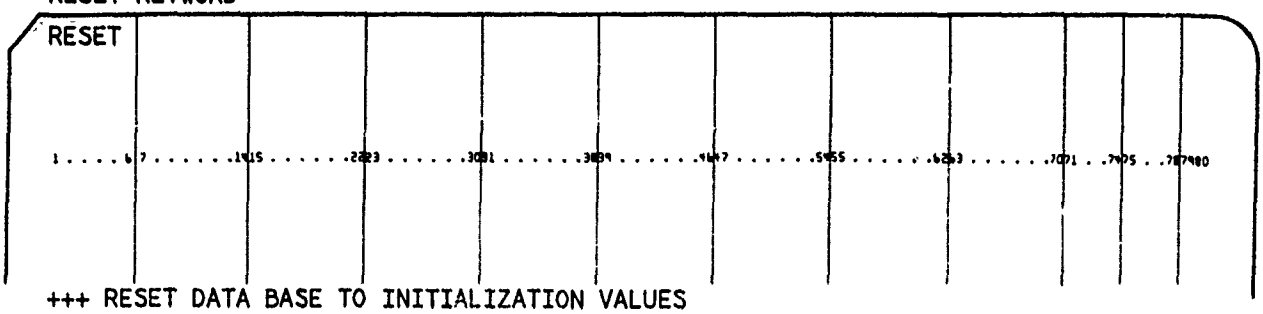
It is often desirable to obtain a rough idea of the location and shape of contours before attempting to make a plot on a graphic output device. As a convenience for those users, as well as an aid to those who need to draw contours by hand through a printed grid (PRINT card), a printer-plot package has been developed.

These printer-plots are not as accurate as those obtained on the plotter, and they are not designed to take the place of the standard graphics. The resolution is, first of all, limited by the 10 characters per inch/6 lines per inch resolution of the line printer. Second, the algorithm for finding the location of contours was purposely kept very simple. As a consequence extraneous points often occur in high-gradient areas and horizontal portions of contours are sometimes hard to locate.

Printer-plots, like printed dumps, are always to a scale such that adjacent grid points are ½ inch apart. To facilitate registration of printer-plots and printed grids, the location of each grid point is marked by a dot on the printer-plot. The grid spacing will be printed in the page heading on each page of a printed dump and printer-plot. This value will always be in feet even if the program is used in metric mode.

The letters of the alphabet are used on the printer to identify the location of the contours. A legend containing the contour value associated with each symbol is printed at the beginning of a printer-plot as well as in the chronicle. The letter A is always used for the highest contour value, B for the next highest, etc. Contour values may be specified in any order. The program will always sort them in descending order and remove duplications. Blank fields are ignored.

RESET KEYWORD

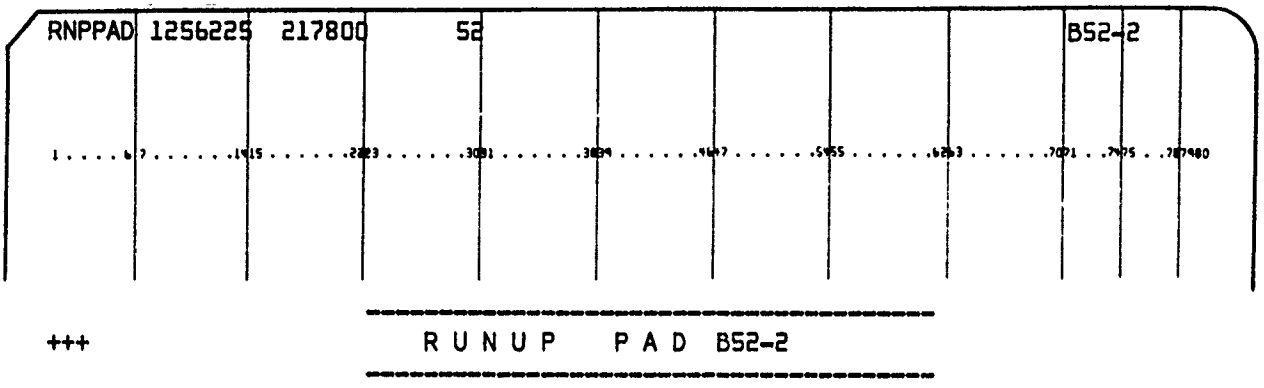


+++ RESET DATA BASE TO INITIALIZATION VALUES

In order to allow the user to start each airfield with the unmodified data base of the initialization procedure, each AIRFLD card will cause the data base to be reset to its initialization value. This is accomplished by writing the data base on unit 4 when the first AIRFLD card is found and reading this file back at any time a new AIRFLD card is encountered. The user may perform this also at his own discretion by means of the RESET card.

A RESET card always causes an error if used during the initialization procedure.

RNPPAD KEYWORD



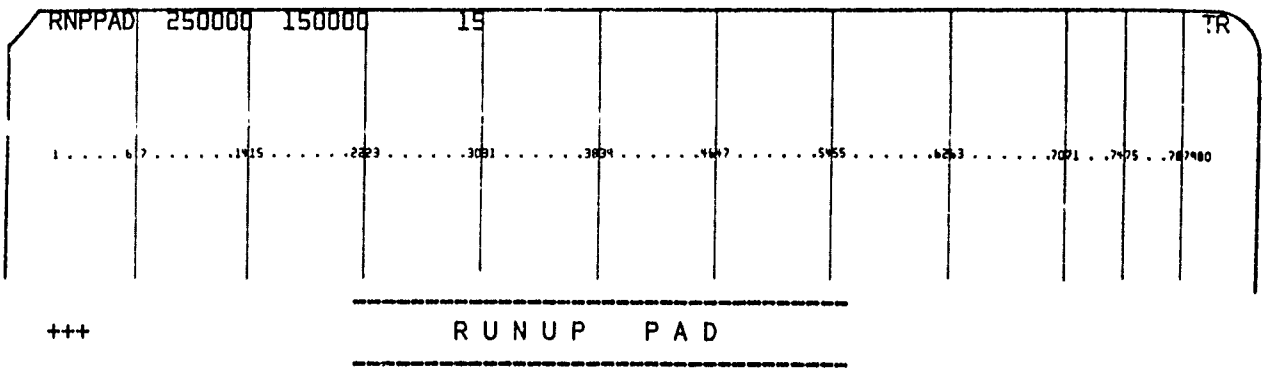
+++ R U N U P P A D B52-2

X = 1256225 FT, Y = 217800 FT. HEADING = 52.0 DEG.

Columns	
1 - 6	RNPPAD Keyword
7 - 14	The X-coordinate
15 - 22	The Y-coordinate
23 - 30	The magnetic heading of the nose of the aircraft or intake of the engine in degrees
71 - 78	Plain text runup pad identification. Use any meaningful identification, e.g., aircraft type, location of pad, or facility number.

The RNPPAD card has a similar relationship to the RUNUP cards as the RUNWAY card has to the FLIGHT card. They "orient" the aircraft properly for flying or ground runup with respect to the designated airfield. Since a runup is located at a point, only a single pair of X-Y coordinates are necessary to describe the location, but since runups are directional in nature, the magnetic heading of the nose of the aircraft or the intake of the engine is required for a complete description.

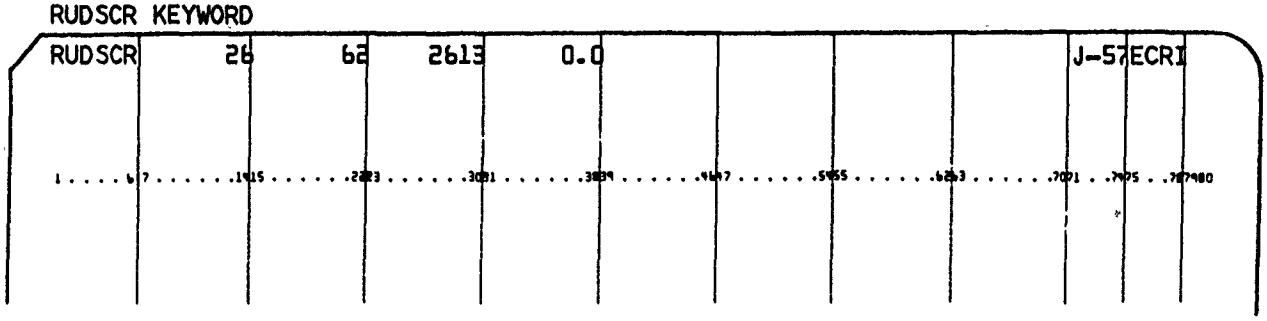
Headings on runup pads are specified in degrees magnetic. This is consistent in that all headings used by the program are in degrees magnetic. The headings used as input are usually not obtained from checking the compass on the parked aircraft, but from reference to a base map. Experience has shown that converting such readings into degrees magnetic is often done incorrectly. When columns 79-80 are non-blank, the program will consider the heading to be in degrees true. It is recommended that the symbols TR be used for this purpose.



X = 25000 FT, Y = 150000 FT, HEADING = 15.0 DEG. TRUE (10.0 MAGNETIC)

No conflict arises since a continuation for a RNPPAD card has no meaning. If the keyword is misspelled, however, the error routine will not recognize the special meaning of this unique use of the continuation field and print an additional message that the continuation card is missing.

RUDSCR KEYWORD



+++ RUNUP DESCRIPTOR

AC CLASS	THRUST	DESCRIPTOR	AL PROF	AL OFFSET
26	62	J-57ECR1	2613	-0.00

Columns

1 - 6 RUDSCR Keyword

7 - 14 Aircraft identification number

15 - 22 Thrust number. This is the percent thrust of the engine for the duration of the runup described.

23 - 30 AL profile number. Using the noise data for the specified aircraft which is nearest to the power setting provided in the runup data.

31 - 38 AL offset. Leave blank. Exception: For correcting differences in aircraft when substitution of one aircraft noise data for another is necessary due to lack of noise data base, or for runups of more than one engine.

71 - 78 Plain text aircraft or engine identifier. Indicate type of aircraft or engine rather than runup pad identifier unless both (see example) will fit in 8 columns.

The runup descriptor card (RUDSCR) performs a similar function as the TODSCR and LNDSCR cards.

The first two data fields of the card contain the aircraft number and thrust number, respectively, which in combination are referred to as the numeric name. All future references to this runup will be made via this numeric name; therefore, the name chosen must be unique among all entries in the data set. The numbers may be any non-zero positive integer. If negative numbers are entered, the program will automatically convert them to positive.

Data field three contains the number of the AL profile to be associated with this runup. Only the numeric name of the profile is entered as a part of the descriptor. By definition, it must be a non-zero positive integer, and must be right justified in the data field.

A negative number will automatically be converted to positive.

If zeros are entered in any of the first three data fields (or any are left blank), the entry will not be made into the library and the following warning message will be printed:

INVALID AC CLASS, THRUST, OR AL PROF

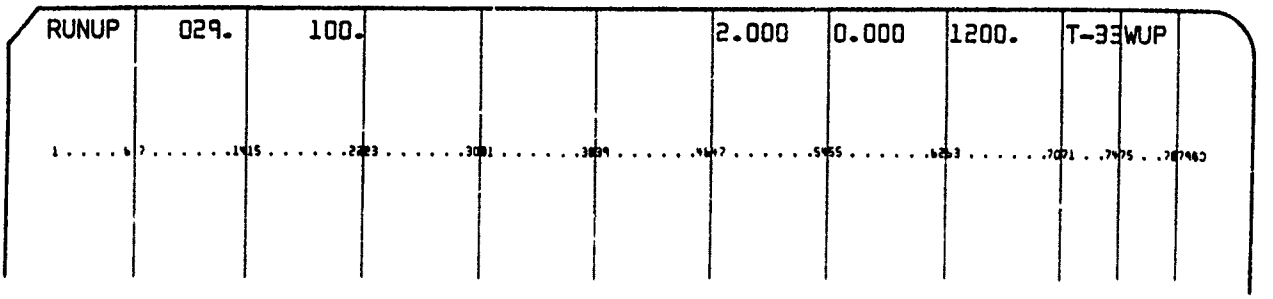
The fourth data field contains the AL offset. Frequently, several aircraft will produce similar noise level patterns, the only difference being the magnitude of the level. In such cases, a single AL profile may suffice for these aircraft. The offset specifies the value in decibels which will be added to the AL values to determine the ultimate noise level of the aircraft. The number (with or without a decimal point may be positive, negative, or zero,

but is limited in range to plus or minus 200 dB. If the value entered on the data card is outside of this range, the following warning message will be printed:

OFFSET OUT OF RANGE

A text description of the aircraft may also be entered (although it is not mandatory). This description will be printed each time the aircraft is used by the program and provides an easy means for identifying the airplane. The description is entered in the text field of the data card and may be up to eight characters in length (any Hollerith characters are legal).

RUNUP KEYWORD



		GROUND OPERATIONS - RUNUP PAD		WUPD DURATION	
	A/C NO	THRUST	-	0701-2200	2201-0700 EACH RUN
++	T-33WUP	29	100	2.000	0.000 1200.000

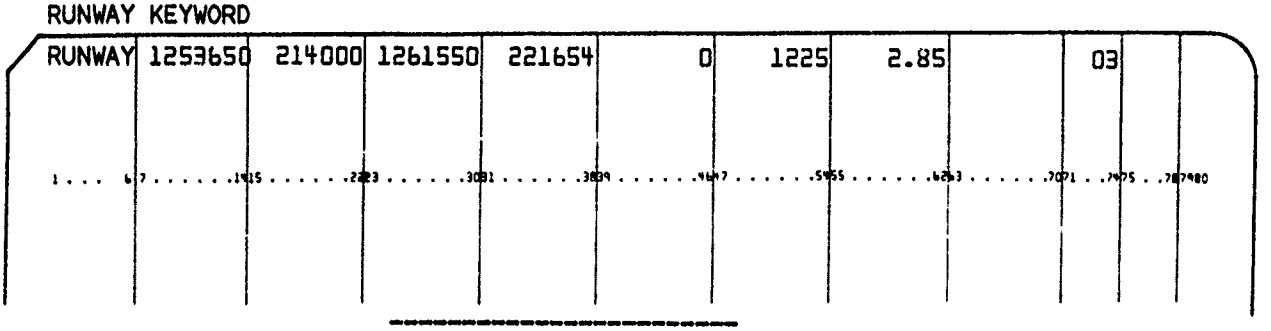
Columns

1 - 6	RUNUP Keyword
7 - 14	Aircraft identification number. Same as in preceding RUDSCR card
15 - 22	Thrust number. Must be identical to that on preceding RUDSCR card.
47 - 54	Number of daytime (0700-2200) runups
55 - 62	Number of nighttime (2200-0700) runups
63 - 70	Duration in sec. of each runup enumerated in the preceding data fields. NOTE: If duration of daytime and nighttime runups differ, they may be entered on separate RUNUP cards with all other entries remaining the same, or the number of night or day runups may be adjusted so that the product of the number of day (night) runs and the duration equals the total day (night) runup time at that power setting as given in the data.
71 - 78	Aircraft or engine type identifier in plain text.

Ground runups are also described by a sequence of sequence dependent cards. The sequence is initiated by a RNPPAD card followed by as many RUNUP cards as necessary to describe the runups at the runup pad given on the RNPPAD card.

The actual runup time for aircraft is communicated on the RUNUP card and also the number of day and night runups. This card, similar to the FLIGHT card, causes execution of the runup operations.

RUNWAY KEYWORD



+++ R U N W A Y 03

LENGTH 11000 FT, GLIDE SLOPE 2.85 DEG, HEADING 32 DEG
START(1253650, 214000) END(1261550, 221654)
DISPLACEMENTS - TAKEOFF 0, LANDING 1225

Columns	
1 - 6	RUNWAY
7 - 14	X - coordinate of beginning of runway (This end will be the end for which the runway is named; for example, 03,19R). Always a positive number. (XSTART)
15 - 22	Y-coordinate of beginning of runway (YSTART)
23 - 30	X-coordinate of opposite end of runway (XEND)
31 - 38	Y-coordinate of opposite end of runway (YEND)
39 - 46	Displacement of takeoff threshold in feet. Must be a positive number. If takeoffs are not normally made from the end of the runway, but are begun some some distance down the runway, then this distance should be entered. Distances less than 200 feet should be ignored. (In the case of overruns used for takeoff, the runway ends specified must include the overruns and the true runway length must be shown by displacing the landing threshold the length of the overrun.)

47 - 54 Displacement of landing threshold in feet. Must be a positive number. If a threshold is established for landings which is different from the runway end or start of takeoff roll, then the distance of the displacement should be entered. This would generally occur where there is a relatively short runway surface with overruns which has a load-bearing keel that is used for takeoffs, although some long runways may have displaced landing thresholds.

55 - 62 Glide slope of the ILS (Instrument Landing System) or PAR (Precision Approach Radar). Typical glide slopes range from 4.5° to 2.5°, although there are a few exceptions. This information can be obtained from high altitude instrument approach charts.

71 - 74 Runway identifier. Should consist of two digits for single runways or two digits and an alphabetic identifier L, R or C (for parallel runways). Column 71 is always left blank. Runway 3 would be entered as 03. Runway 5L would be 05L.

The RUNWAY card starts a sequenced group of cards describing the operations on that runway. To define the runway, we define its centerline. The beginning and end of the runway centerline is carefully measured from the map and noted. Since the runway can be operated as either 03 or 21 we must first define the directionality.

(1) Directionality of Runway Operations

Operation of the runway as 03 implies that the aircraft operating on it fly toward the north. This is therefore the way in which we define the directionality. For runway 03, the south end should be coded in the XSTART, YSTART fields. The north end will then be coded in the XEND, YEND fields. For Runway 21, the opposite applies.

(2) Admissible Runway Length

The values coded in the XSTART, YSTART, XEND and YEND fields are centerline coordinates, defining runway length as well as orientation. If a runway is longer than 16000 feet (4876m), a diagnostic will be printed in the chronicle:

RUNWAY LENGTH IS GREATER THAN 16000 FT

This is a warning to indicate that an unusually long runway was encountered, which may indicate a keypunch error.

(3) Displaced Threshold

In many cases, there are displaced thresholds. Most often these occur for landings but they may equally well occur for takeoffs. (Intersection takeoffs are in this category.) For displaced thresholds, the amount of displacement should be entered on the appropriate fields on the card. On Runway 03, the displacement is 1225 feet, leaving 9775 feet of available runway. (The aircraft is generally assumed at 50 feet AGL over the threshold for landing operations.) The displaced threshold for landings is shown on a plot as a bar across the runway. It should be emphasized that when a displaced threshold is given, all landings without exception will use this threshold. (See 4, Displaced Threshold not Used by All Aircraft.) Takeoff threshold are implemented similarly, except that it applies to departures and that no threshold location is shown on the map.

The following errors may occur:

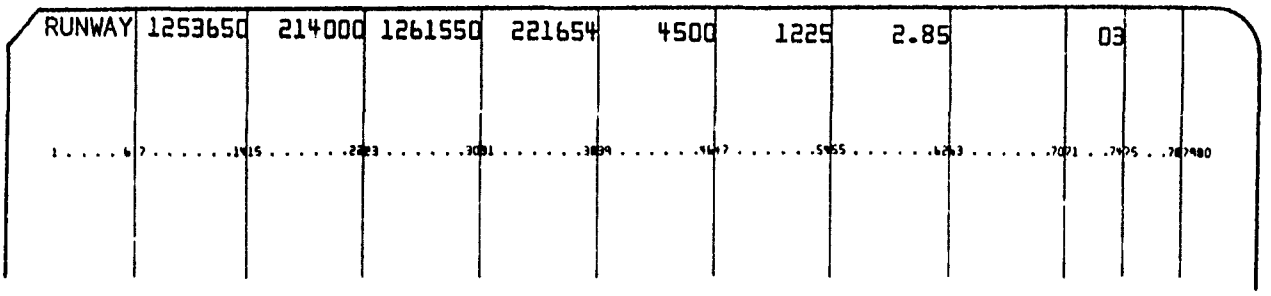
TAKEOFF DISPLACEMENT IS ILLEGAL

LANDING DISPLACEMENT IS ILLEGAL

The displacement in that case is either larger than the runway length or it is negative.

(4) Displaced Threshold Not Used by All Aircraft

If only some aircraft make intersection takeoffs, we therefore need an additional RUNWAY card to describe these operations. When only certain types of aircraft use a displaced threshold, the runway with displaced threshold and the runway without displaced threshold should be considered entirely separate. Although the two RUNWAY cards describe operations on the same physical runway, they are logically distinct to the program. We therefore need an additional set of cards to describe these operations.



(5) Displaced T/O Threshold

High performance aircraft will often make an intersection takeoff on Runway 21. The card is,of course, almost identical to the card for Runway 03, except that the ends are interchanged. The label is not 21, and there is no threshold displacement for landings. Small fighter aircraft will make intersection takeoffs. We will consider those operations which use the full runway length first. Since for these aircraft there is no displaced T/O threshold, the T/O DISPL field is left blank on the card.

Since not all aircraft do this, we have first considered the aircraft which use the full length of the runway. The intersection takeoff is equivalent with a displaced takeoff threshold: the start of the takeoff roll is not at the

physical end of the runway. A displaced threshold on a RUNWAY card will cause all takeoffs to start from that point. If aircraft routinely back up into an overrun area before takeoff, the end of the overrun area becomes effectively the end of the runway and this point should be coded on the RUNWAY card since negative thresholds are not allowed. Since landings will use the normal threshold, a landing displacement equal to the length of the overrun area must then be included.

(6) Glide Slope

The program has the capability of generating a landing profile from a glide slope. The program will assume an aircraft altitude of 50 feet AGL over the (displaced) landing threshold. If no value is given or the value 0 is coded, the program will assume a 3° slope. Legal slopes are contained in the interval $0.5° \leq \text{SLOPE} \leq 10°$. Any other value results in the error:

ILLEGAL GLIDE SLOPE

If a steeper or shallower approach is desired, the user will have to specify such an altitude profile explicitly. That is, he will have to compute the necessary altitude-distance curve and enter it on an ALTUDE card.

(7) Runway Number

The runway number may be entered in the text field of the card. This information will be printed in the chronicle. It will also be put on the runway when a plot is made which includes a flight track map. On the plot, the four characters of the field will be centered, so that the left two characters will be to the left of the runway centerline, the remaining two to the right. The number will appear in the "clear zone" for the runway. It will be in a direction such that an aircraft landing on the runway will see it right side up.

(8) Runway Width

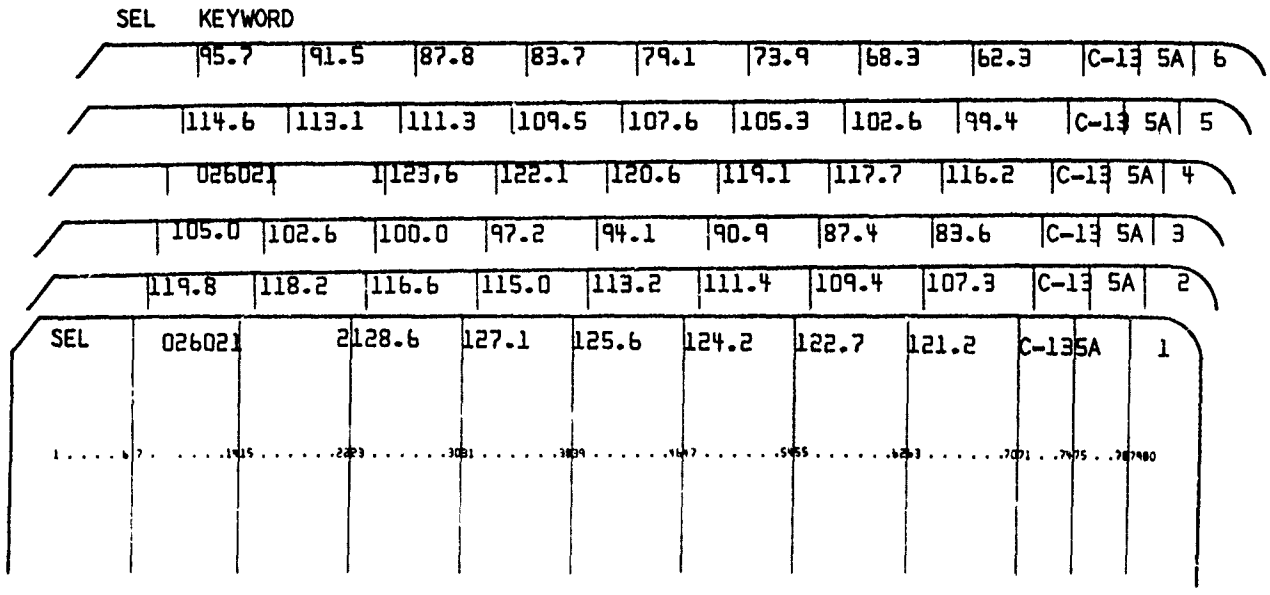
All runways will always be plotted as a 250 foot wide strip, irrespective of the actual width of the runway. Since the width is of no importance in the DNL calculation, no provision is made to enter this item into the computer.

(9) Inactive Runways

The next step after defining a runway and its direction of operation, is to define the operations on this runway. If the runway is closed, no operations take place and no further cards are required. If the runway is used but the operations on this runway are not considered for inclusion in an DNL map, we may also omit any further cards. It is clear that we could have omitted the RUNWAY card altogether in these cases. By putting the card in, we will, however, get a complete runway layout on any subsequent plot when we ask for a runway/flight track map.

(10) Non-Empty Sequences After a RUNWAY Card

The RUNWAY card concludes any previous sequence and initiates a new one. If the RUNWAY is not inactive a FLTTRK or a DEPART card is the next card . A FLTTRK or DEPART card describes the flight track which aircraft follow while airborne. Each FLTTRK or DEPART card can be followed by as many FLIGHT cards as are appropriate to this particular flight track or procedure. When all FLIGHT cards for a particular flight track have been read, the next flight track or procedure for this runway may be entered. This card is then followed by as many FLIGHT cards as necessary. The process is entirely recursive; any number of legal sequences of FLTTRK, DEPART and FLIGHT cards constitutes a legal sequence.



+++ FLIGHT NOISE LEVEL PROFILE (SEL) NAME= 26021 C-135A

INTEG. ≠A≠-WEIGHTED NOISE LEVEL

DIST	GRND-TO-GRND	AIR-TO-GRND
200. FT	123.6	128.6
250. FT	122.1	127.1
315. FT	120.6	125.6
400. FT	119.1	124.2
500. FT	117.7	122.7
630. FT	116.2	121.2
800. FT	114.6	119.8
1000. FT	113.1	118.2
1250. FT	111.3	116.6
1600. FT	109.5	115.0
2000. FT	107.6	113.2
2500. FT	105.3	111.4
3150. FT	102.6	109.4
4000. FT	99.4	107.3
5000. FT	95.7	105.0
6300. FT	91.5	102.6
8000. FT	87.8	100.0
10000. FT	83.7	97.2
12500. FT	79.1	94.1
16000. FT	73.9	90.9
20000. FT	68.3	87.4
25000. FT	62.3	83.6

	Columns	
Card 1		
	1 - 6	SEL Keyword
	7 - 14	SEL identification number
	15 - 22	Numeric 2 to indicate that the following noise data is for air-to-ground noise data
	23 - 70	Air-to-ground noise data for distance 200, 250, 315, 400, 500 and 630 feet in the respective data fields
	71 - 78	Aircraft identifier
	80	Continuation code
Card 2		
	1 - 6	Blank
	7 - 70	Air-to-ground noise data for 800, 1000, 1250, 1600, 2000, 2500, 3150 and 4000 ft in the respective data fields
	71 - 78	Same as card 1
	80	continuation code
Card 3	1 - 80	same as card 2 except data for 5000, 6300,8000,10000, 12500,16000, 20000 and 25000 respectively
Card 4	1 - 6	Blank
	7 - 14	SEL identification number same as card 1
	15 - 22	Numeric 1 to indicate ground-to-ground noise data
	23 - 80	Same as card 1 except ground-to-ground noise data
Card 5	1 - 80	Same as card 2 except ground-to-ground noise data
Card 6	1 - 80	Same as card 3 except ground-to-ground noise data

The purpose of the SEL profile is to define the aircraft noise exposure level as a function of the slant distance between the observer and the flight path. This profile is constructed by specifying the single event Sound Exposure Level (SEL) at a number of fixed distances. These distances encompass a range of 200 feet to 25,000 feet. The 22 fixed distances increase in a fashion such that each distance is 1.259 times as great as the previous one.

To completely describe the noise propagation characteristics, two profiles are necessary. One profile is used when both the noise source and the observer are on the ground, and is referred to as the "ground-to-ground" profile. The other profile is used when the noise source is in the air and the observer is on the ground, and is referred to as the "air-to-ground" profile. These two profiles <u>together</u> form one complete entry in the data set.

(1) Entering An SEL Profile

The keyword to be used for entering an SEL profile is SEL, which is left justified in the keyword field of the data card. Upon recognizing this keyword, the program will print:

+++ FLIGHT NOISE LEVEL PROFILE (SEL)

This is the first of exactly six data cards which will be required.

Data field one contains the numeric name of the profile. The number may be any nonzero, positive number. If a negative number is used, the program will automatically convert it to positive. If zero is used, the following warning message will be printed:

ILLEGAL NAME

The number may be up to 8 digits long. The name must be unique among all entries in this data set. If it is not unique, the old profile of the same name will be lost.

Data field two contains a "2" in column 22. This is a propagation code which identifies the next 22 data fields to be SEL values making up the "air-to-ground" profile.

Data fields three through eight contain the first six of these SEL values. Two additional continuation cards containing eight SEL values each, are necessary to complete the first profile. Each continuation card must have the keyword field left blank and column 80 must have a continuation code.

The next three continuation cards contain the "ground-to-ground" profile. The data format, essentially the same as for the first three cards, is as follows:

The keyword field of the first card is left blank, and data field one must contain the exact same numeric name as appeared with the "air-to-ground" profile. Data field two must contain a "1" in column 22. This is a propagation code which identifies the next 22 data fields to the SEL values making up the "air-to-ground" profile. If the numeric names do not agree, or the wrong propagation code appears, the following warning message will be printed:

INVALID NAME AND/OR PROPAGATION CODE NAME = ***** P.C. = ***

Data field three through eight contain the first six of the SEL values. The two additional continuation cards contain the remaining sixteen SEL values. The first two cards in this set must have continuation code in column 80. Column 80 of the last card is left blank.

The program performs a few simple checks for the completeness of the data. Specifically, it checks to see that the first data card is followed by exactly five continuation cards and that the keyword field of each continuation is left blank. If a keyword is encountered on one of the cards, the program assumes that one or more data cards were inadvertently omitted, and the following warning message will be printed:

MISSING CONTINUATION CARD

If the program encounters a card without continuation code in column 80 (other than on the sixth card), the program will assume that it prematurely encountered the sixth data card and will print the following warning message:

MISSING CONTINUATION CODE OR MISSING DATA

If either of these two conditions should occur, the program will cease to interpret any further cards as belonging to the SEL profile. The SEL values themselves have only two important restrictions. First, the value (which may appear with or without a decimal point) is restricted to plus or minus 200 dB. If the value is outside of this range the comment:

OUT OF RANGE

will be printed next to each offending number and the following warning message will also be printed:

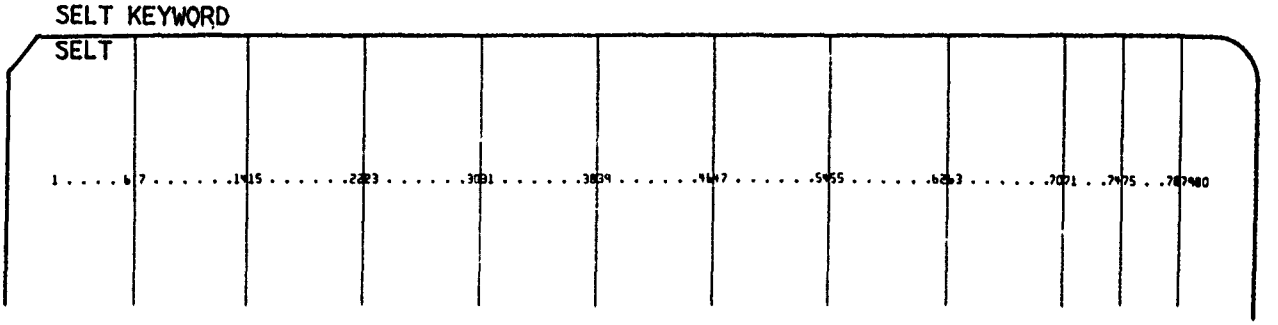
NOISE LEVEL DATA OUT OF RANGE

Second, it is logical that the noise exposure should decrease as the distance between the aircraft and the observer increases. Therefore, consecutive entries in each of the two profiles must be decreasing in value. If this is not the case, the following warning message will be printed and the offending profile will be identified by its propagation code (1 or 2):

NOISE LEVELS NON-DECREASING FOR PRPGTN CODE = **

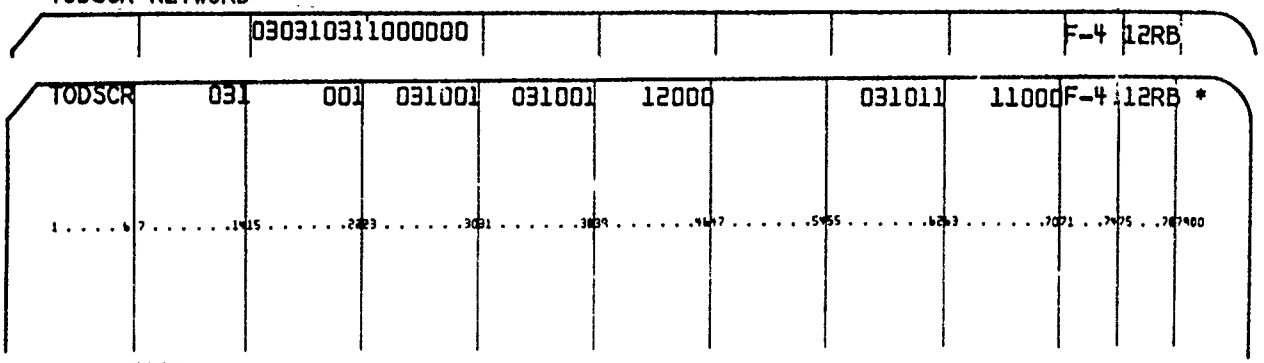
SELT KEYWORD

SELT



The SELT cards are identical with SEL card except the data is assumed to be tone corrected.

TODSCR KEYWORD




```
+++  TAKEOFF DESCRIPTOR CLASS NO -        31   A/C -F-4  12RB
                      MISSION NO -         1
                        ALT PROF -     31001
                        POW PROF -     31001
                        TURN RAD -  12000.0 FT
                SUBFLIGHT NOISE PROF   TRACK LIMITS (FT)
                    1       31011          0.0 TO  11000.0
                    2       31031      11000.0 TO 1000000.0
```

Columns

1 - 6 TODSCR Keyword for departure paths and closed-loop patterns

7 - 14 Three-digit aircraft number. If using one type aircraft to represent a grouping of transient aircraft types, use number for the aircraft selected to represent the group and list all aircraft in the group on a COMMENT card.

15 - 22 Aircraft mission. A common convention is to use any positive three-digit number which has not already been used in conjunction with the aircraft number in Cols. 7-14. (For dispersed tracks, a four-digit number is used.)

23 - 30	Altitude profile number, which typically consist of six-digits (or seven if dispersed tracks). This number is a combination of the three-digit aircraft number and the three-digit (or four-digit) mission number. The number in these columns is used on the ALTUDE card following, which contains the altitude profile appropriate to the flight track, aircraft and mission being encoded.
31 - 38	Delta-SEL (DSEL) number, which typically is identical to the ALTUDE profile number above.
39 - 46	Turn radius in feet. This entry is optional except when DEPART cards are used in conjunction with the TODSCR card.
55 - 70	Subflight identification. Consists of a pair of data fields, the first containing the SEL profile number and the second data field containing the cumulative flight track length over which the specified SEL profile is to be used. Example: An F-4 departure track consists of two subflights with the following segments: Subflight 1: takeoff to afterburner cutoff (11000 ft from brake release) Subflight 2: afterburner cutoff to military power climb to the end of flight track. There will always be at least one subflight on a TODSCR card, however, in many cases, two or three (maximum) may be required. For flights requiring more than one subflight, a continuation card is required. The total length of subflights for departures should be approximately 500,000 feet

	to insure that the subflight length is greater than the flight track length. For closed-loop patterns, the best subflight length should be greater than the flight track length by approximately 1000 feet.
71 - 78	Aircraft and flight track identification. Use Columns 71 - 74 to identify aircraft type in plain text, e.g., K135, F4, etc. Use Columns 75 - 78 to identify flight track, e.g., 05A1, 17-B, etc.
79 - 80	Continuation field, if more than one subflight is required, enter an asterisk (*) in Col. 80. TODSCR continuation card utilizes only Cols. 7 - 38, with the second subflight SEL and cumulative distance in Cols. 7 - 14 and 15 - 22 respectively, and in a case of the third subflight SEL and cumulative distance in Cols. 23 - 30 and 31 - 38. The same identification in Cols. 71 - 78 shown on the first card should be reported in these columns on the second (continuation) card.

All entries are made one at a time. The keyword TODSCR means that the flight to be described is a takeoff.

The first two data fields of the card contain the aircraft number and mission number, respectively (which in combination are referred to as the numeric name). All future references to this flight will be made via this numeric name; therefore, the name chosen must be unique among all entries in the data set in which it is entered. The numbers may be any nonzero positive integer.

If negative numbers are entered, the program will automatically convert them to positive. If either of the two numbers are zero (or the field is left blank), the entry will not be made into the library and the following warning message will appear:

ILLEGAL AC/MISSION NOS

Data fields three and four contain the Altitude Profile and Delta-SEL Profile numbers to be associated with this flight.

For takeoffs, the program has no means for generating profiles automatically. Therefore, both profile numbers must be specified. By definition, they must be nonzero positive integers. Negative numbers will automatically be converted by the program to positive. If zeros are entered (or the fields are left blank), the following warning message will appear:

ALTITUDE OR DELTA-SEL PROFILE UNDEFINED

The fifth data field contains the turn radius of the aircraft. For takeoff descriptors, the turn radius will be used when the aircraft is flown according to a departure procedure, and is used to generate the flight track when the aircraft is required to make a turn. Thus, this number should be a reasonable estimate of the aircraft turning radius considering the expected performance characteristics of the aircraft within 10 nautical miles of the airfield. The turn radius may be any positive number (with or without a decimal point). If a negative number is entered, the program will automatically convert it to positive. If a zero is entered (or the field is left blank), the program will if the need arises, assume a turn radius of 6000 feet (1829 meters). Note that the distance may be specified in either feet or in meters; however be certain that the correct units specification (English or metric) is in effect. When a flight track uses a turn radius smaller than specified on the descriptor card, the following message is printed:

FLIGHT TRACK TURN RADIUS <******.* FT AS SPECIFIED ON 'FLTDSC' CARD

A flight descriptor must include at least one subflight, but may include up to three. By definition, a subflight is that portion of the total flight over which the character of the noise produced by the aircraft remains constant. That is, the noise propagation from the aircraft can be described by a single SEL vs. distance function including any offset being introduced by the Delta-SEL function. Typical situations where a single subflight would suffice are constant power takeoffs. A typical case where two subflights would be desired is an afterburner takeoff. The first subflight would cover that portion of the flight from the start of takeoff roll to the point where afterburner is secured; the second subflight would start at the point where the afterburner is secured and continue to the end of the flight.

For the first subflight, the SEL profile number and distance parameter are placed in data fields seven and eight respectively. The first subflight is assumed to start at a flight track distance of zero* and continues for a distance specified by the distance parameter. The distance parameter is always a positive nonzero number and specifies the total ground track distance traversed by the aircraft to the end of the subflight. The number may appear with or without a decimal point. If a negative number is entered, the program will automatically convert it to positive. The distance may be specified in either feet or meters; however, be certain that (1) the units are consistent with the turn radius in data field five and (2) that the correct units specification is in effect. If only one subflight is sufficient to describe the flight, then be certain to select a high enough value for the distance parameter (say 500,000 feet) so that the program will not cut the flight short in the vicinity of the airfield.

The number of the SEL profile to be associated with this subflight is entered in the 7th data field. The actual profile itself is entered into its own data set separately. The number must be a nonzero integer. If a negative number is entered, the program will automatically convert it to positive.

---

* Track distance zero is the (displaced) landing or takeoff threshold, as appropriate.

If the flight is to be composed of more than one subflight, the additional data must be entered on a continuation card. This is accomplished by placing an asterisk (*) in column 80 of the first data card to indicate that a continuation card follows. If the continuation card is inadvertently omitted, the following warning message will be printed:

MISSING CONTINUATION CARD

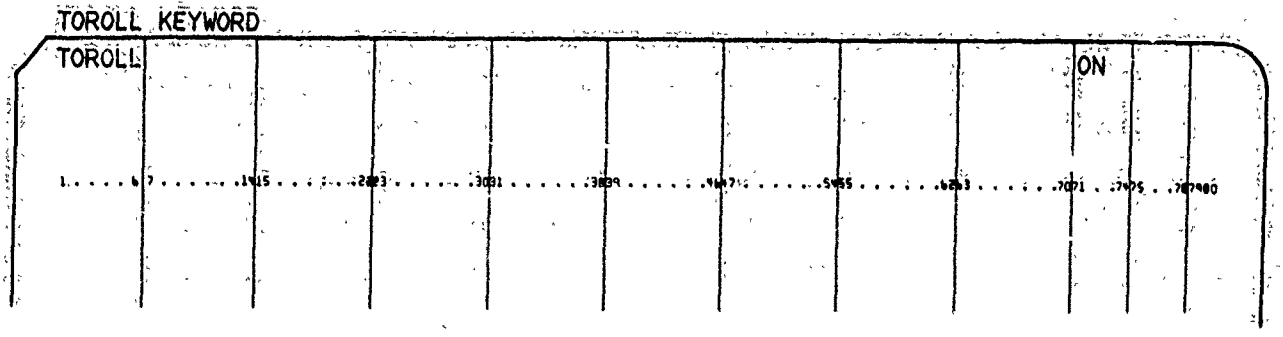
On the continuation card, the keyword field is left blank, and data fields one and two are used for the second subflight and data fields three and four are used for the third. By definition, the subflights are sequential; that is, where the first one ends, the second begins, and so on. Thus, the ending track distance for the second subflight must be numerically greater than for the first. Likewise, the third must be greater than the second. If the input data does not conform to this convention, or if a track distance of zero is entered, then the following warning message will be printed:

SUBFLIGHT END DIST MUST BE GREATER THAN BEGIN DIST

The program will not recognize any subflight whose SEL profile number is specified as a zero. Furthermore, once a zero SEL profile number has been encountered, the program will cease to look for additional subflights. Thus, an SEL profile number of zero in the first subflight will result in no subflights being defined. On the other hand, an attempt to enter more than three subflights will overflow the storage capacity of the library. If either of these two conditions should occur, the following warning message will be printed:

NUMBER OF SUBFLIGHTS RESTRICTED 1 TO 3

A text description of the aircraft may also be entered (although it is not mandatory). This description will be printed each time the aircraft is used by the program and provides an easy means for identifying the airplane. This description is also used in the DATASCREEN summary by aircraft. Although aircraft are listed and sorted alphabetically by aircraft and mission number, it is assumed that the first four characters of the text description are the aircraft type and they will appear in the header information of the summary. The description is entered in the text field of the first data card and may be up to eight characters in length (any Hollerith characters are legal). Although the description need only be entered on the first card, it is recommended that any continuation cards also carry this description in the text field for precautionary purposes.



+++ TAKEOFF ROLL SIDELINE ALGORITHM ENABLED

Columns	
1 - 6	TOROLL
71 - 73	ON/OFF

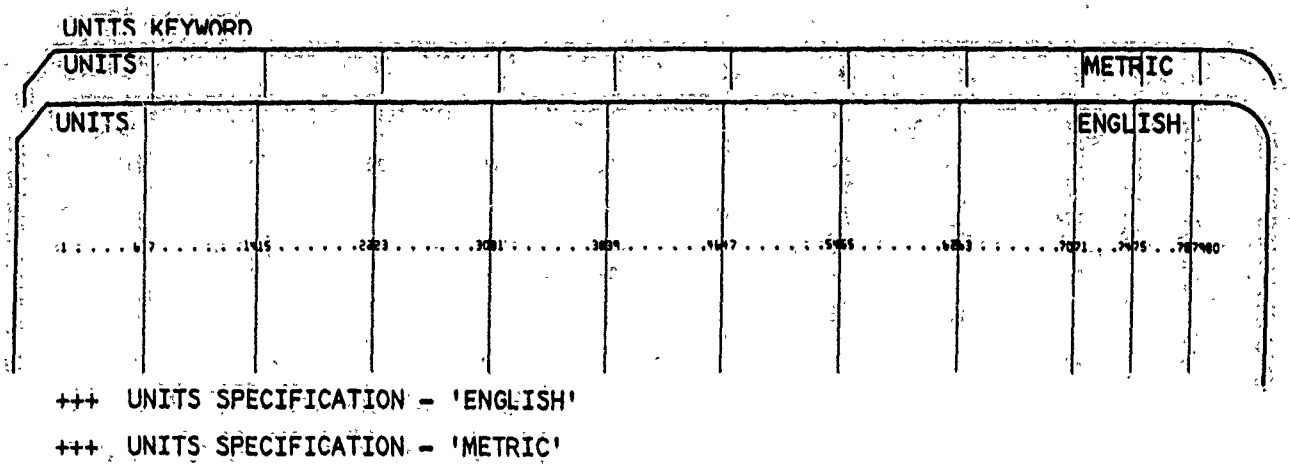
To obtain a more realistic model for the noise exposure during the initial ground roll, a new algorithm was developed. A description of the alternate method is described in a report entitled "Calculation of Sideline Noise Levels During Takeoff Roll". This report was prepared for Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio 45433. It is necessary, in order to obtain valid results, that the DSEL profile be coded differently because the algorithm will take care of some of the adjustments which had to be entered manually before. Full instructions on the preparation of the DSEL profile are given in Appendix A of the report (AMRL-TR-76-123).

The program default mode is TOROLL - OFF. This forces the user to explicitly start the new computations with a TOROLL card. As a consequence, decks prepared prior to this version of NOISEMAP will execute properly.

The user must prepare his data in accordance with the instructions of Appendix A of items 1 thorugh 7 only. The ground runup part must NOT be added. The necessary computations will be automatically generated by NOISEMAP. As a consequence, there will also not appear a ground runup listing in the chronicle, and no reference to this part of the model will appear in the DATASCREEN operations summary.

The algorithm can be turned on and off at will by repeated use of the TOROLL card placing the proper function "ON" or "OFF" in columns 71 to 73. Because this card requires special DSEL profiles, and has a profound influence on the manner in which computations are performed, the chronicle echo for this card is enclosed in a banner of asterisks.

The new sideline algorithm is effective only for take-offs. Since touch-and-go operations may be coded as either take-off or landing, the results will be different. The program will not realize that a T/G operations contains a take-off section when it is coded as a landing. Consequently, the sideline algorithm will not be used, even though it is currently enabled under these conditions.



+++ UNITS SPECIFICATION - 'ENGLISH'

+++ UNITS SPECIFICATION - 'METRIC'

Columns	
1 - 5	UNITS
71 - 78	Specify Units

The program will by default process all input and output in English units (feet, inches). It is possible, however, to process metric data by using a UNITS card coded METRIC. Although the program internally uses English units, input data will be converted from metric to English units and on output, the internal representation will be converted to metric.

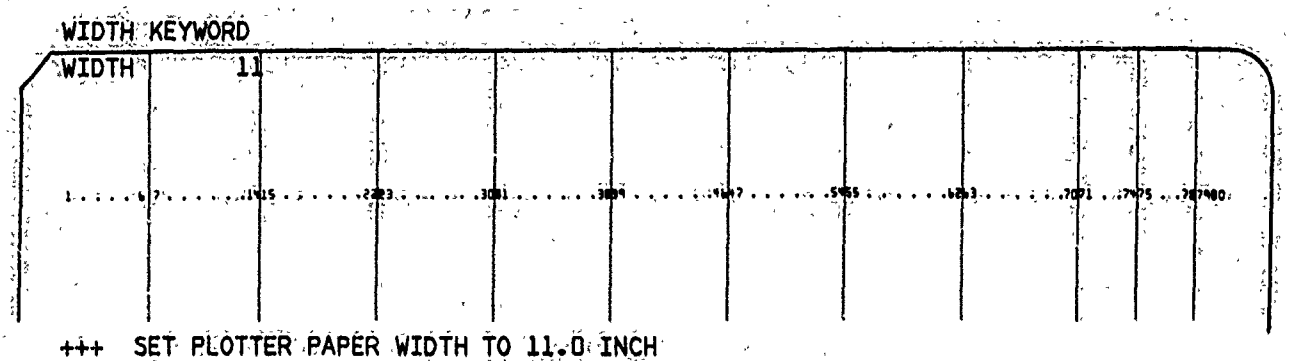
By using UNITS cards with METRIC and ENGLISH at the appropriate places in the deck, it is possible to combine data cards of either type in one deck. One may for instance, use ALTUDE card coded in English units and process a runway layout in metric units, which is convenient when preparing contour maps

for areas other than the USA. When the metric option is used, the text "1 inch = **** FEET" is omitted from the legend on any contour map.

If the specification on a units card is unrecognizable or altogether missing, the program will print the "units" specified followed by the error message:

INVALID UNITS SPECIFICATION - EXECUTION TERMINATED

The units become undefined at this point making further processing meaningless. The card input file is positioned immediately after the END card in the deck. Usual end of job processing by the Termination Procedure takes place.



+++ SET PLOTTER PAPER WIDTH TO 11.0 INCH

Columns	
1 - 5	WIDTH
7 - 14	Specify the size of plotter paper

If the user does not specify otherwise, the program will assume 28 inches of usable plotter paper width. This reflects the use of a 30 inch drum leaving an inch of border for annotation, etc. The plotter size may, however, be set to a different value.

The size on the WIDTH card is handled differently than all other distances communicated to the program. When the UNITS option is English, the paper width should be in inches; if the metric option is selected, the paper width should be in centimeters. In that case, the message printed would be:

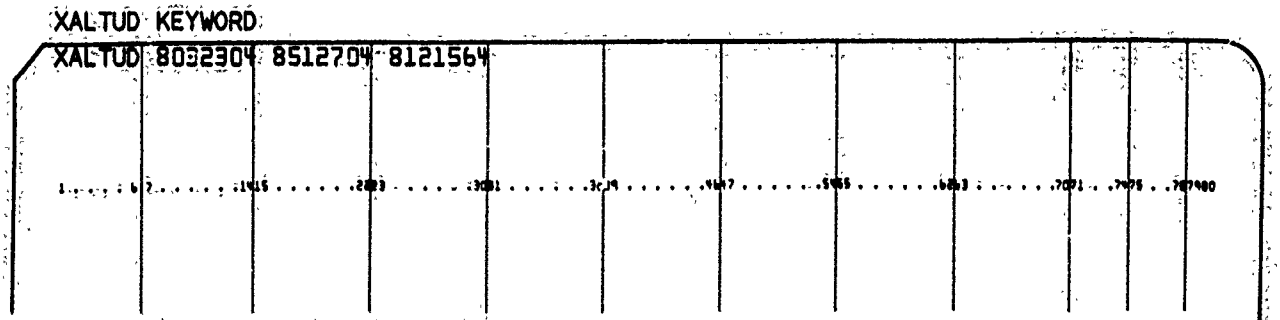
*** SET PLOTTER PAPER WIDTH TO ---- CM (**.* INCH)

Irrespective of the units selected, the legend written in the Chronicle for a PLOT card will always give the paper size to the nearest inch.

The paper size must be 8 inches or more to be acceptable, otherwise one of the following warnings is issued:

PAPER SIZE TOO SMALL, SIZE LEFT AT **.* INCH

PAPER SIZE TOO SMALL, SIZE LEFT AT **** CM (**.* INCH)



+++ EXPUNGE ALTITUDE PROFILES

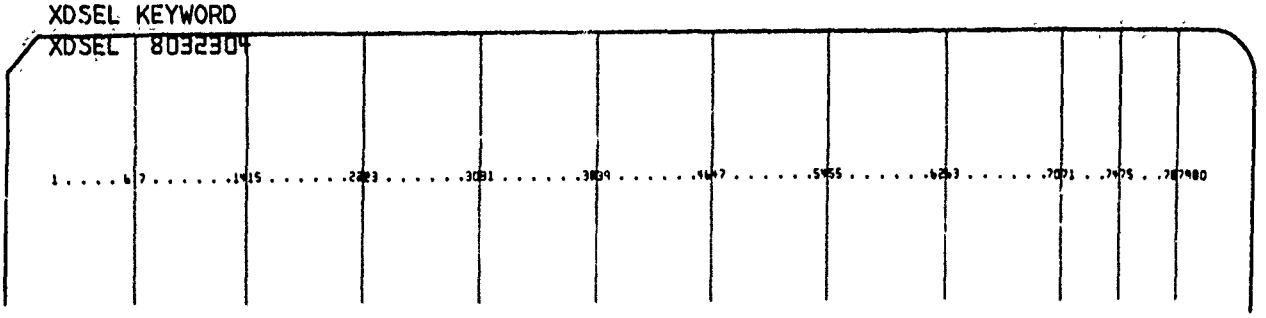
NAME
8032304
8512704
8121564

Columns	
1 - 6	XALTUD Keyword is used to delete altitude profiles
7 - 14	Name of the 1st altitude profile which should be deleted
15 - 70	The fields for additional altitude profiles which the user would like to delete
71 - 78	Blank field
80	If additional card needed, enter an asterisk (*) in Col. 80.

The profiles to be deleted are referenced by their numeric name. Data field one contains the numeric name of the first profile to be deleted, data field two contains the name of the second, and so on. Eight numeric names will fit on one card. If more than eight profiles are to be deleted, continuation cards may be added. However, each continuation card must have the keyword field left blank and an asterisk (*) must appear in Column 80 of the preceding card. The last continuation card does not have an asterisk (*) in Column 80. The data set is searched for each of the specified numeric names. If the name is found, the profile number is printed. If the name is not found, the profile number is printed along with the phrase:

NOT FOUND

XDSEL KEYWORD



+++ EXPUNGE POWER LEVEL PROFILES

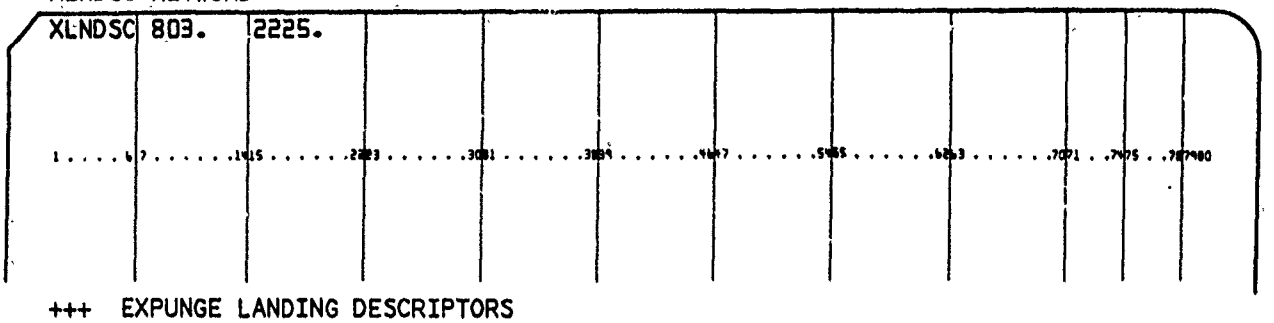
NAME
8032304

Columns	
1 - 6	XDSEL Keyword
7 - 14	The first delta-SEL name which should be deleted
15 - 70	Fields for 7 more delta-SELs
71 - 78	Blank
79 - 80	If additional card needed, enter an asterisk (*) in Col. 80.

The profiles to be deleted are referenced by their numeric name. Data field one contains the numeric name of the first profile to be deleted, data field two contains the name of the second, and so on. Eight numeric names will fit on one card. If more than eight profiles are to be deleted, continuation cards may be added. There is no limit to the number of continuation cards whcih may be used. However, each continuation card must have the keyword field left blank and an asterisk (*) must appear in Column 80 of the preceding card. The last continuation card should not have an asterisk (*) in Column 80. The data set is searched for each of the specified numeric names. If the name is found, the profile number is printed. If the name is not found, the profile number is printed along with the phrase:

NOT FOUND

XLNDSC KEYWORD

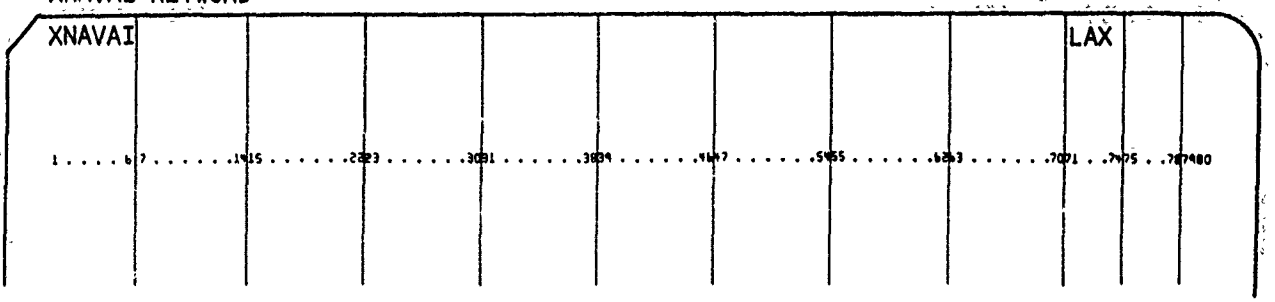


+++ EXPUNGE LANDING DESCRIPTORS

AC CLASS	MISSION	OPERATION	DESCRIPTOR
803	2225	'LANDING	4TFL G

XLNDSC card delete landing descriptors from their respective data sets. (Note: See all description about this card on the page with XTODSC keyword).

XNAVAI KEYWORD



Columns	
1 - 6	XNAVAI Keyword
71 - 74	The code for navaid

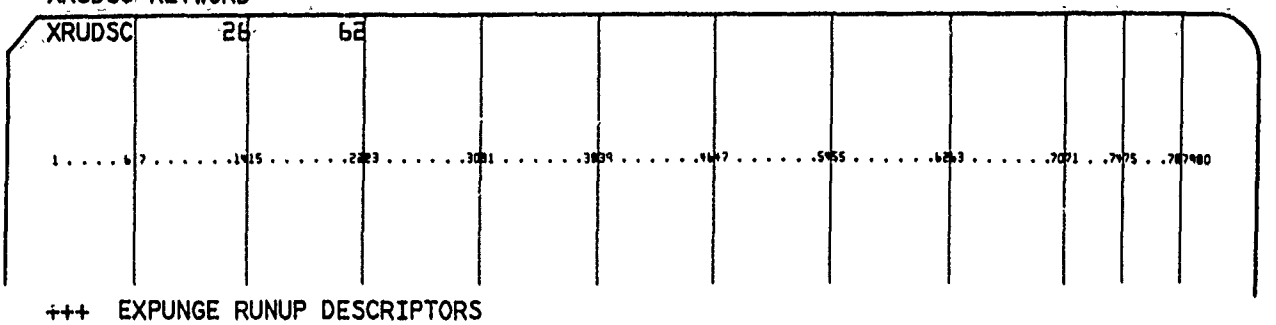
The keyword to be used for deleting a navaid entry from the data set is XNAVAI. Upon recognizing this keyword, the program will print:

+++ EXPUNGE NAVAID

The code for the navaid to be deleted is placed in the first alpha field (column 71-74) of the card. Only one navaid may be deleted per card. If the program cannot find the entry, the program will issue the warning:

ENTRY **** NOT KNOWN

XRUDSC KEYWORD



+++ EXPUNGE RUNUP DESCRIPTORS

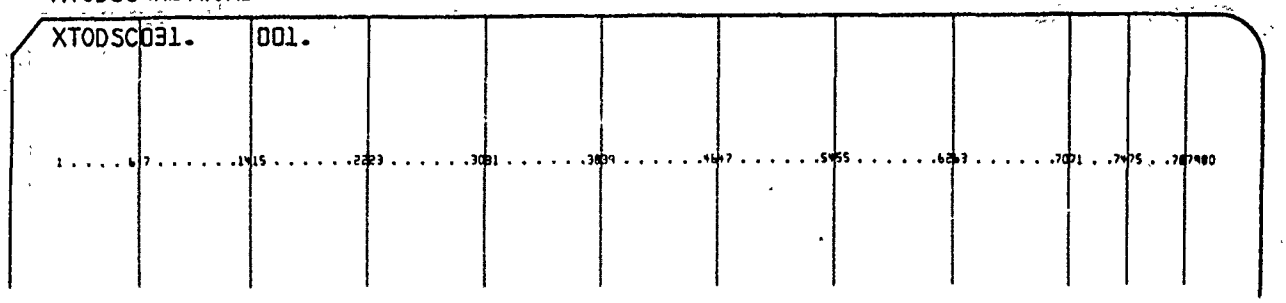
AC CLASS	MISSION	OPERATION	DESCRIPTOR
26	62	RUNUP	J-57 ECRI

Descriptors are referred to by their numeric names (aircraft number and thrust number). The first two data fields contain the numeric name of the first descriptor to be deleted, the second two data fields contain the numeric name of the second descriptor to be deleted, and so on. Four numeric names will fit on one card. If more than four aircraft are to be deleted, continuation cards may be added. There is no limit to the number of continuation cards which may be used. However, each continuation card must have the keyword field left blank and an asterisk (*) must appear in column 80 of the preceding card. The last continuation card should not have an asterisk (*) in column 80. For each of the specified numeric names, the data set is searched. If the name is found, the aircraft number, thrust number, and text description are printed. If the name is not found, the specified aircraft number and thrust number are printed, and the phase:

NOT FOUND

is printed in place of the text description.

XTODSC KEYWORD



+++ EXPUNGE TAKEOFF DESCRIPTORS

AC CLASS	MISSION	OPERATION	DESCRIPTOR
031	001	TAKEOFF	F4 12RB

Columns		
1 - 6	XTODSC - Keyword for deleting of takeoff descriptions	
7 - 14	A/C number	one takeoff descriptor
15 - 22	A/C mission	
23 - 38	2nd takeoff descriptor	
39 - 54	3rd takeoff descriptor, etc.	

XTODSC card deletes takeoff descriptors from their respective data sets.

Descriptors are referred to by their numeric names (aircraft number and mission number). The first two data fields contain the numeric name of the first descriptor to be deleted, the second two data fields contain the numeric name of the second descriptor to be deleted, and so on. Four numeric names will fit on one card. If more than four aircraft are to be deleted, continuation cards may be added. There is no limit to the number of continuation cards which may be used. However, each continuation card must have the keyword field left blank and an asterisk (*) must appear in column 80 of the preceding card. The last continuation card should not have an asterisk (*) in column 80. For

each of the specified numeric names, the data set is searched. If the name is found, the aircraft number, mission number, and text descriptor are printed. If the name is not found, the specified aircraft number and mission number are printed, and the phrase:

NOT FOUND

is printed in place of the text descriptor.

4.0 OPERATIONS SUMMARY

To make the final approval of data input more convenient, DATASCREEN produces a set of summary tables for flights and runups. These summaries list all operations by aircraft type as well as by runway or runup pad. The summaries include space for making corrections and for certification by the proper authorities.

The summary by aircraft precedes the summary by runway (or runup pad). Aircraft in the listing are sorted by the aircraft/mission number under which they were entered irrespective of the alphanumeric text on the descriptor card. However, this text information is used in the report according to the following convention. The first four characters should contain the aircraft name (e.g., B52G, F111, etc.); the remaining four characters can be used for further identification as appropriate. These first four characters will then be used as a heading in the summary by aircraft. When the first four characters are not the same for all aircraft with the same aircraft number, then all such aircraft will still be listed, but the heading used will be the first four characters of the first aircraft of the listing.

The flight summary will list every flight including the flight track name in the report. For runups this information is not presented, but the total runup time at all pads is computed. The runup times are listed in hours, minutes, and seconds (hh.mm.ss).

The program will recognize as a touch-and-go any aircraft which has an altitude profile with a terminating altitude of less than 300 ft. Such flights are identified by an asterisk next to their operations and are counted as both a takeoff and a landing.

Touch-and-go flights must descend to below 300 ft. on their final approach. They must also return to the start of the flight track. Warning messages (unique to DATASCREEN) will be issued if these conditions are not satisfied.

When the track type of TKOF or LAND is omitted from the FLTTRK card the program cannot tell if it is a landing or a takeoff. If it is not a touch-and-go the program will then print a dollar sign next to the operations and list in the summary a special UNDEFINED category. The undefined operations are counted in the total for the base.

When FLTTRK cards are used a code such as 24-L should be used in Column 75 - 78 to make cross reference easy. When no information is present the program will assign it the value $XXX where XXX is the card number in the deck. Departure procedures do not have this identification feature. Instead the program will also use the card number, but an asterisk (*) is used in place of the dollar sign.

*U.S.Government Printing Office: 1979 -- 657-002/400