

(14) **FAA-AEE-**
Report FAA-EE-79-10

LEVEL 4

(13)

(6)

INM

AD A 079622

**INTEGRATED NOISE MODEL
VERSION 2**

PROGRAMMER'S GUIDE

(15) **DOT-PPA-FA-865**

**DDC
RECEIVED
JAN 16 1980
RECEIVED**

(16) **Thomas / Connors
Robert / Hinckley**

(11)
September 1979

(12) **A
129**

DDC FILE COPY



DESTRUCTION SCHEDULE A
Approved for public release
Distribution Unlimited

**DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC 20591**

411 031

Handwritten signature

80 1 21 062

DISCLAIMER NOTICE

**THIS DOCUMENT IS BEST QUALITY
PRACTICABLE. THE COPY FURNISHED
TO DDC CONTAINED A SIGNIFICANT
NUMBER OF PAGES WHICH DO NOT
REPRODUCE LEGIBLY.**

1. Report No. FAA-EE-79-10		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle INM, Integrated Noise Model, Version 2 - Programmer's Guide				5. Report Date September 1979	
7. Author(s) Thomas Connor, Robert Hinckley, et al				6. Performing Organization Code	
9. Performing Organization Name and Address Department of Transportation Transportation Systems Center Kendall Square Cambridge, Massachusetts 02142				8. Performing Organization Report No.	
12. Sponsoring Agency Name and Address Federal Aviation Administration 800 Independence Ave., S.W. Washington, D.C. 20591				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. PPA FA-865	
				13. Type of Report and Period Covered Programmer's Guide	
15. Supplementary Notes				14. Sponsoring Agency Code	
16. Abstract This document contains information on the procedures to implement the Integrated Noise Model (INM), Version 2 on to a computer system. The INM is a collection of computer programs which can calculate the aircraft noise environment in the vicinity of an airport. The INM is available from the FAA in the form of a magnetic tape. INM Version 2 supersedes Version 1 which was released in January 1978. This document replaces "FAA Integrated Noise Model, Version 1, Computer Installation Instructions" (Report No. FAA-EQ-78-03).					
17. Key Words		18. Distribution Statement		Accession For	
		DISTRIBUTION STATEMENT A Approved for public release; Distribution Unlimited		A 25 GP	
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 129	
				22. Price	

411 031

411 031

CONTENTS

<u>Section</u>		<u>Page</u>
1.0	INTRODUCTION.....	1-1
2.0	TAPE CHARACTERISTICS.....	2-1
3.0	INSTALLATION INSTRUCTIONS.....	3-1
	3.1 Installation Procedures.....	3-1
	3.2 Conversion Problems.....	3-4
4.0	DATA BASE AND TRANSLATOR.....	4-1
5.0	PROGRAM DESCRIPTION.....	5-1
6.0	FUNCTIONAL AND LINKAGE DIAGRAMS.....	6-1
7.0	SUBROUTINE DESCRIPTIONS.....	7-1

LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
6.0-1	Functional Flow Diagram for the Contour Analysis Model.....	6-2
6.0-2	Subroutine Linkages for the Contour Analysis Model.....	6-3
6.0-3	Functional Flow Diagram for the Grid Analysis Model.....	6-4
6.0-4	Subroutine Linkages for the Grid Analysis Model.....	6-5
6.0-5	Subroutine Linkages for the Contour Plotting System.....	6-6

1.0 INTRODUCTION

A set of computer programs has been generated for the Federal Aviation Administration for the computation of noise exposure values due to aircraft operations around airports. The collection of programs is called the Integrated Noise Model (INM). The INM will compute noise exposure values for the following noise metrics: Noise Exposure Forecast (NEF); Day-Night Average Sound Level (Ldn); Community Noise Equivalent Level (CNEL); Equivalent Sound Level (Leq); and the Time Above A-weighted Sound Levels (TA).

The INM is comprised of the following programs which operate separately:

- o The Contour Analysis
- o The Grid Analysis Model
- o The Contour Plotting Packages
- o Data Base Translator
- o Data Base Formatter Listing Generator

While the contour analysis and grid analysis models operate independently, they share the subroutines which read the input data and perform single-event noise calculations. The contour plotting package uses as its primary input the definition for contour point locations which are output by the contour analysis models.

These programs are written in the FORTRAN IV language. An effort has been made to conform to the current ANSI standards, in order to allow for multiple installations of the INM. However, the user is cautioned that known differences from the standard exist, (see Section 3.2) and that further differences may not be documented. Version II of the INM is currently operating on CYBER 175 and CDC 6600 systems, and the plot routines are used on ZETA and CALCOMP plotters.

This manual is intended for use by computer programming personnel, familiar with the protocols of the FORTRAN programming language, who need to know the external characteristics of the Integrated Noise Model and its internal processing in order to install it on their own operating system. A more used-oriented description of the capabilities and use of the models is contained in the INM User's Guide (Version 2.4). Also available at the Federal Aviation Administration (FAA) is extensive preliminary documentation on other model options, the algorithms used in the models and individual subroutine characteristics. It is FAA's intention to organize and publish this material in further supplementary manuals.

Requests for information, source code tapes, manuals, or other assistance should be sent to:

Federal Aviation Administration
Office of Environment and Energy, AEE-120
800 Independence Avenue, S.W.
Washington, D.C. 20591

or telephone (202) 426-3396. Manuals and tapes may be available
at cost.

2.0 TAPE CHARACTERISTICS

The INM release tape has the following characteristics:

9-track

800 RPI

odd parity

EBCDIC

Unlabeled

The first 14 files are blocked using 39, 80-character card images per block. The last block will, if necessary, be padded with nulls to fill out 3120 characters. Files 15-19 are blocked using 25, 132-character line images per block, the last block padded to fill out 3300 characters.

Files 1 through 8 are FORTRAN IV source code

Files 9 through 14 contain input data

Files 15 through 19 contain sample output

File 1: VERSUN6, the Contour Analysis main routine

File 2: GRID5, the Grid Analysis main routine

File 3: All subroutines called by VERSUN6 or GRID5

File 4: The CALCOMP - compatible contour plotting routine

File 5: The ZETA - compatible contour plotting routine

File 6: The database translator program

File 7: The database formatted listing generator

File 8: Input Module
File 9: The database
File 10: Example input data for the Contour Analysis, Case 1
File 11: Example input data for the Contour Analysis, Case 2
File 12: Example input data for the Grid Analysis, Case 3
File 13: Example input data for the Grid Analysis, Case 4
File 14: Example input data for the Grid Analysis, Case 5
File 15: Output from Case 1
File 16: Output from Case 2
File 17: Output from Case 3
File 18: Output from Case 4
File 19: Output from Case 5

3.0 INSTALLATION INSTRUCTIONS

The following instructions are intended to serve as a guideline to the conversion of the Integrated Noise Model as supplied by FAA to another machine and operating system. These are not intended to dictate the precise nature of the installation, as each installation is system-dependent. All references made to the CDC 6600 and its operating system are by way of example only and should not be construed as endorsements of those products.

3.1 INSTALLATION PROCEDURES

- (a) Set up the appropriate user name, charge number, or other accounting information to validate the run.
- (b) Log the tape supplied by FAA into the system.
- (c) Attempt to read the tape
- (d) Verify that the tape characteristics match the documented characteristics. If not, try other characteristics until the tape can be read. As a last resort, contact FAA.
- (e) Copy the files from tape to disk (optional; disk files are more expensive but more convenient than tape).
- (f) Get listings or dumps of at least part of every file on the tape, and verify that all files match their documentation and that all documented routines and

files are present. See Section 7 for the list of programs and subroutines in the model.

- (g) Put the source code for each subroutine into a separate section of a library, so that each can be accessed and compiled separately. On the CDC 6600, use the system utility UPDATE.
- (h) Check on known compatibility problems documented in Section 3.2. If necessary, revise the machine-dependent routines CLOCK, CLOCT, DATE, EXIT, SKFIL, ZERO.
- (i) Compile each program and subroutine using the appropriate FORTRAN compiler. Correct any fatal errors and recompile.
- (j) Examine the routines for obvious incompatibilities between systems. Look for data declarations, subroutine calls, use of Hollerith strings, printer control characters, external and system routines, and non-ANSI code. Correct any incompatibilities found and recompile until the routines are error-free.
- (k) Put the relocatable code into a library so that each subroutine is accessible separately, thus facilitating correction. On the CDC 6600, use EDITI.B for the relocatable code.
- (l) Try to load each program and its associated subroutine without executing.

- (m) If a program is longer than the available memory, re-structure the program into overlays.
- (n) Check all loader maps for errors and unsatisfied externals.
- (o) Compile the data translator program. When compilation is successful, load and execute the program, creating an unformatted version of the system data base. See Chapter 4 for a more detailed discussion.
- (p) Get a listing of the data supplied for a test run. Check it against the format required by the model, as documented in the Basic User's Guide.
- (q) Execute the programs using the test data, debugging as necessary until the tables output from the model match the sample output provided in files 14-18 on the tape. Note that all calculations should match the sample output exactly. If not, check the compiler's rounding conventions.
- (r) Set up whatever programs or procedures are necessary for converting the CALCOMP plotters file into a file compatible with the available graphics devices. Verify that the test plots match the sample plots. The programs currently run on ZETA or CALCOMP plotters.
- (s) Set up the final version of the relocatable code in a user library or as a file in whatever overlay structure

was decided upon. Save the new version of the source code on tape or other backup storage medium.

- (t) Document the sequence of commands needed to run the model and append it to the Basic User's Guide and this Installation manual. Include information on the model's space and time requirements, cost, turnaround time, and system-dependent limitations.

3.2 CONVERSION PROBLEMS

<u>Item No.</u>	<u>Item Description</u>	<u>Item Category</u>
1	BLOCK DATA Initialization	IBM Restricted
2	Boolean Operations	Differences
3	Call Statement Parameters	Extensions
4	Data Initialization	IBM Restricted
5	ENTRY	Differences
6	EQUIVALENCE	Machine Dependent
7	Format: A	CDC Extension
8	Hollerith Strings	IBM Restricted
9	Hollerith Variables	IBM Restricted
10	Identifier Names	CDC Extension
11	Octal Constants	Non-IBM
12	Non-ANSI Subroutines	Differences
13	PROGRAM Statement	Non-IBM

14	RETURN I	Differences
15	Rounding	Differences
16	User-Supplied Subroutines	Machine Dependent

EXPLANATION

1. Some programming languages conform to the rule that common block variables may only be initialized in BLOCK DATA subroutines. The code may contain data initialization of such variables in other subroutines.
2. The model uses the Boolean operations AND and OR to extract characters from data words. It uses masks stored in array MASK and initialized in BLKDAT subroutine. These operations should be machine independent, provided the masks are converted properly. See No. 12 below.
3. IBM FORTRAN permits passing a statement number, N, by prefixing an ampersand:

CALL SUB (A,B,&10,C,&20)

CDC FTN FORTRAN uses the RETURNS list:

CALL SUB(A,B,C) RETURNS (10,20)

This problem will occur in subroutine PFILE in the CONTUR program.

4. Some common block variables may be initialized in DATA statements outside of BLOCK DATA subprograms. There

may be common blocks whose names begin with numbers or which are seven characters in length.

5. There are several subroutines with alternate entry points. These routines should be checked to see that local conventions for passing parameters are observed. The model passes the same parameters to alternate and main entry points.
6. EQUIVALENCE is the scourge of conversion programming efforts, since machine dependent code is often involved. Extreme care must be taken to thoroughly understand the word boundary alignments which the equivalence forces. An effort has been made to insure that all equivalences observe ANSI standards.
7. Formats of A6 or A10 are used in reading and writing data, building titles, and building variable formats (See routines HEADER and GRID). In CDC FORTRAN, such formats read data into a single word.
8. Hollerith strings may not be used in IBM FORTRAN assignment statements, but may appear in the model.
9. Care must be taken to declare Hollerith variables long enough to hold the required string. In particular, check that the arrays used in HEADER to hold the title information are the proper size and that the building process assigns these variables appropriately.

10. There may be seven-character names in the model, although some care has been taken to use only six-character names.
11. Octal constants may have to be converted to hexadecimal if a conversion to IBM is done. Also, the length of the constants used must be adjusted in conversion to any non-CDC machine. These constants are used in the Boolean operations discussed in No.2 above. There are 21 octal constants in array MASK, which is initialized in Block Data subprogram BLKDAT. The length of the first 17 constants may be adjusted by subtracting (or adding) zeroes on the right until the constant will fill one word on the machine. For the last four words, adjust with zeroes on the left. This adjustment will work as long as the machine has a word length of at least 23 bits. If the word length is smaller, serious conversion problems will result.
12. The INM assumes that system routines exist to provide the data (DATE), the time of day (CLOCK), and to end the program (EXIT).
13. PROGRAM is strictly a CDC convention, used to identify the main program name, and indicate the logical unit numbers of all input and output files used during program execution.

14. CDC method of returning to a statement number passed through RETURNS. IBM uses *. This occurs in subroutine PFILE in program CONTUR.
15. There are two system dependent subroutines which the user must supply: SKPP (with entry points SKPPFF, SKPPFL, SKPPBL, SKPPBF) and SKPP1 (with entry point SKPPFX). Called by routines SKFIL and SKREC, they are used to skip forward and backward on both files and records. CDC 6600 assembly language which interfaces with the Record Manager utility is provided.

4.0 DATA BASE AND TRANSLATOR

Standard aircraft performance and noise information is stored in the INM Data Base. The contents of this data base are presented in the Data Base Report (Report No. FAA-EE-79-11). This data is supplied by the FAA, along with the INM, in the form of a FORTRAN-readable formatted data file. However, the INM programs, for reasons of both efficiency and security, read an unformatted version of this data file. It is the installer's responsibility to create this unformatted data file. To this end, FAA is supplying a FORTRAN data translator program, which will read the formatted data base from magnetic tape and will create the appropriate file on disk.

The program expects that the formatted data base will be input on logical unit number 3, and it writes the unformatted version to logical unit 4. The unformatted data base is intended to reside on disk; it should contain fewer than 7000 words, so that storage costs will be minimal. It is recommended that the translator program and the formatted data base be kept on a back-up storage medium, such as tape or cards, as there will be little need for them once the unformatted data base is installed.

The formatted data base is used by the INM Selective Data Base Printing Program (INMPRI). The formatted data base is input on logical unit 4 (OLDDAT). The print control cards (see Section 2 of Data Base #5 Report, Volume 1) are input on logical unit 5 and the program writes the data base listing to logical unit 6. Like the data base translator, the data base listing generator is written in ANSI FORTRAN.

5.0 PROGRAM DESCRIPTION

The Integrated Noise Model provides two general capabilities: The grid analysis program predicts noise values at user specified locations and the contour analysis program produces the coordinates of points defining a contour of a specified noise level. To create a contour map; i.e., read the coordinates from the contour analysis output and plot them, one of two plotting routines may be used. The two programs provided on the INM tape are compatible with ZETA and CALCOMP hardware, respectively.

The above programs are written in CDC FORTRAN IV with two COMPASS 3.0 assembly language subroutines. These subroutines use the CDC Record Manager for file positioning. The above programs use the following I/O units in the following manner:

<u>Unit</u>	<u>Purpose</u>
2	Output from the contour analysis to be input to a plotting routine
3	Scratch file used for storing flight information
5	Input data file (INPUT)
6	Listable output (OUTPUT - except in ZETA routine)

<u>Unit</u>	<u>Purpose</u>
7	Database
8	Plotfile output from CALCOMP routine

The ZETA routine writes the plotfile to OUTPUT.

The database is provided in listable form (File 8 on the tape). For reasons of efficiency, however, the INM reads the database from a binary file. This file is created using the database translator program (File 6). Here unit 3 is used to input the database as it appears on the tape and unit 4 is for the binary output file.

To produce a labeled report of the contents of the database, the database, formatted listing generator (File 7) is provided in the tape. With it, one may request individual data sets or all data sets associated with an aircraft type. Input to this program includes the database as it appears on the tape on unit 4 and a set of user commands on unit 5. (See Appendix of User's Guide.) The output listing is produced on unit 6.

6.0 FUNCTIONAL AND LINKAGE DIAGRAMS

Figures 6.0-1 through 6.0-5 depict functional and linkage diagrams.

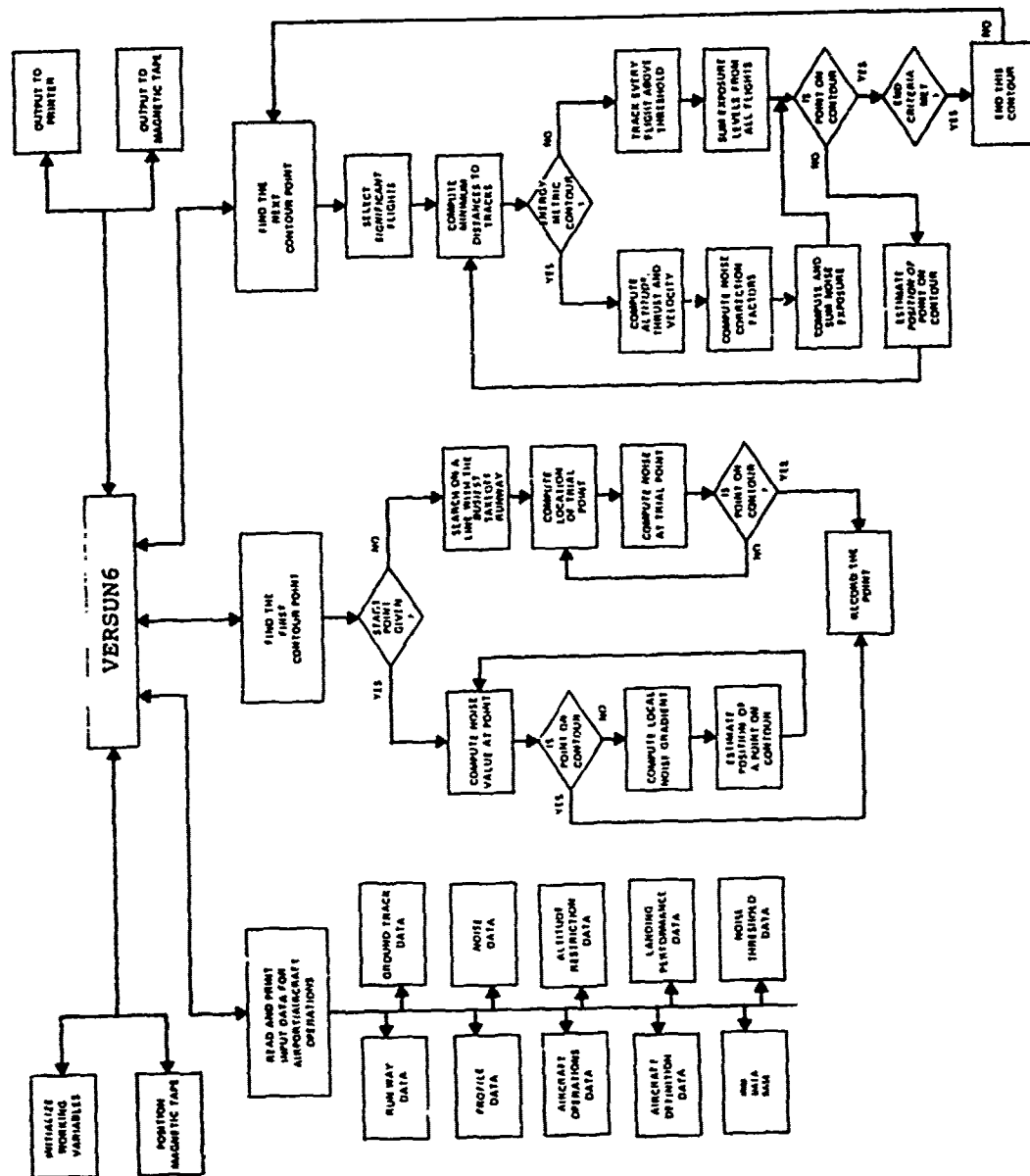


FIGURE 6.0-1. FUNCTIONAL FLOW DIAGRAM FOR THE CONTOUR ANALYSIS MODEL

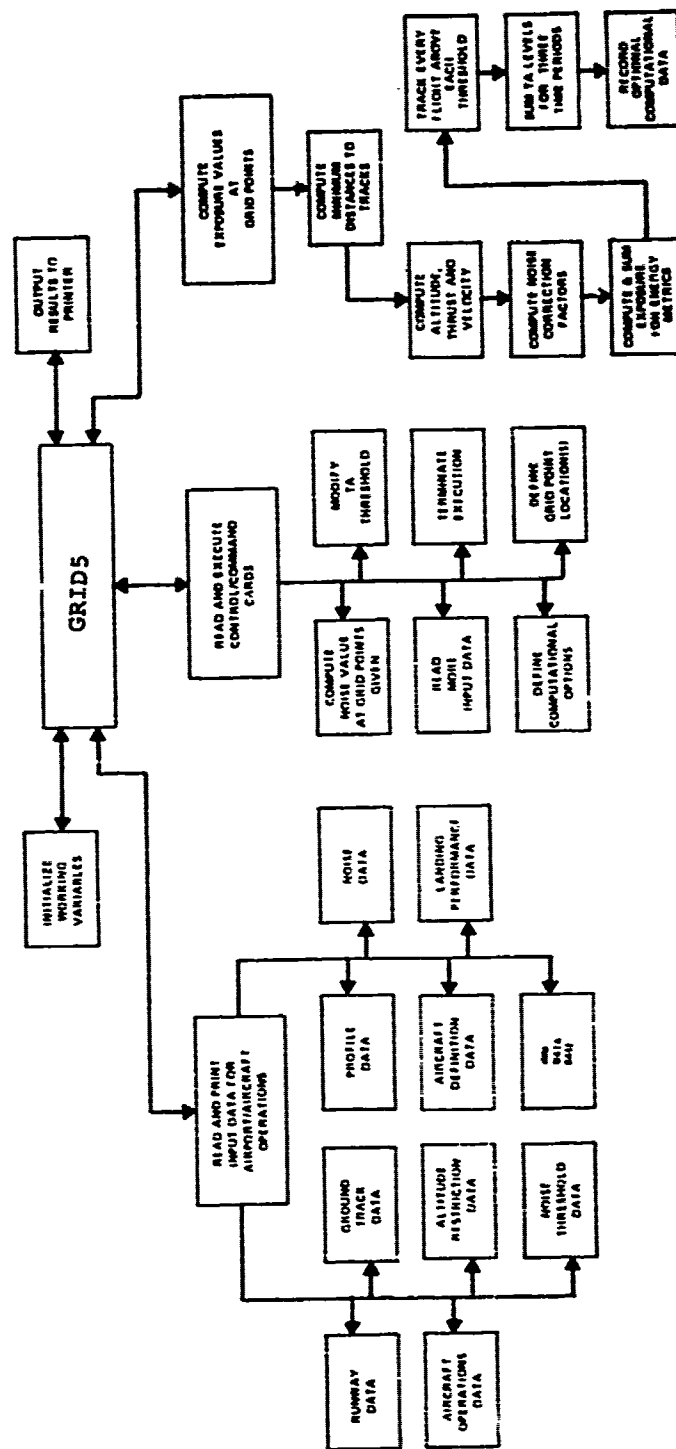


FIGURE 6.0-3. FUNCTIONAL FLOW DIAGRAM FOR THE GRID ANALYSIS MODEL

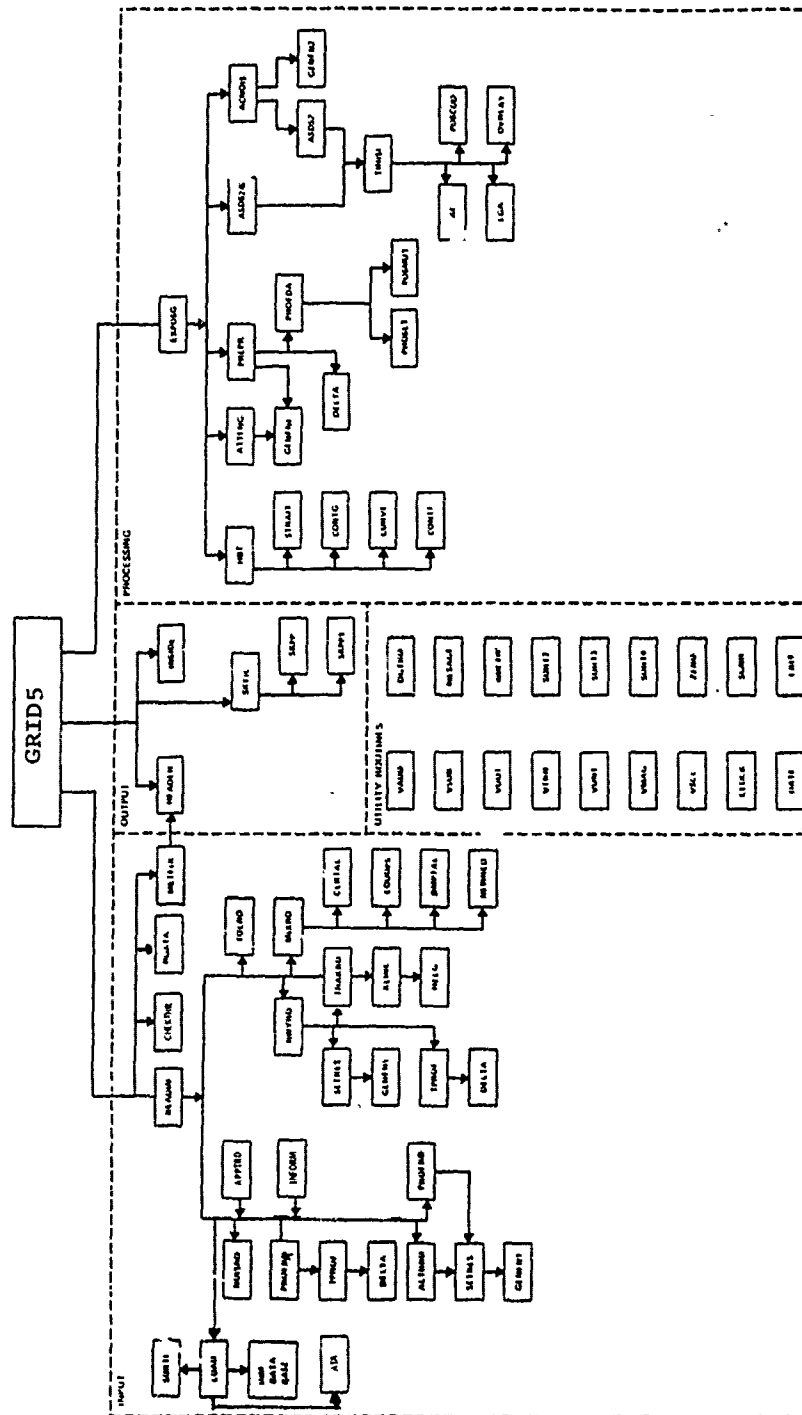


FIGURE 6.0-4. SUBROUTINE LINKAGES FOR THE GRID ANALYSIS MODEL

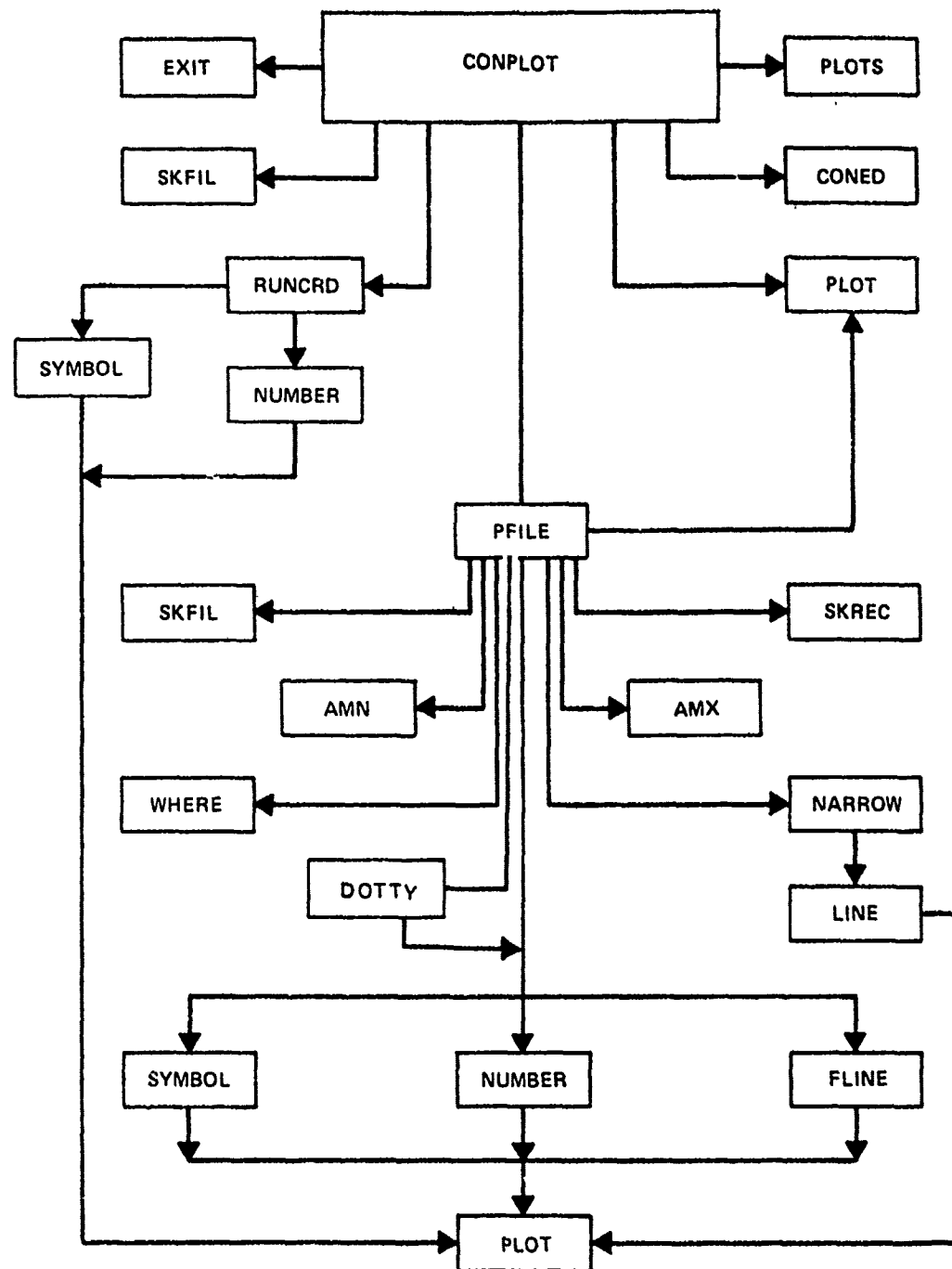


FIGURE 6.0-5. SUBROUTINE LINKAGES FOR THE CONTOUR PLOTTING SYSTEM

7.0 SUBROUTINE DESCRIPTIONS

This section contains a brief description of each of the routines used in the three programs of the Integrated Noise Model. These descriptions will include each routine's purpose, call sequence, entry points, returns, external routines called input, and output.

They are presented in the following order:

- NOISE main program

- GRID main program

- Subroutines called by NOISE and GRID, listed alphabetically

Main Program VERSUN 6

```

*****
*** NOTICE TO USER:
*** THE INTEGRATED NOISE MODEL IS AN OFFICIAL STANDARD
*** FAA COMPUTER PROGRAM FOR CALCULATING AIRPORT NOISE.
*** NO CHANGES, ADDITIONS, OR DELETIONS ARE AUTHORIZED TO
*** THE SOURCE CODE EXCEPT AS AUTHORIZED BY THE
*** FAA IN OFFICIALLY DESIGNATED REVISIONS.
***
*****
C      THIS IS FAA INTEGRATED NOISE MODEL VERSION 01.00.000.00
C      DATE 11/78
C      MAIN PROGRAM *****NOISE1***
C      THE USER IS REFERRED TO THE BLOCK FLOW
C      DIAGRAM APPEARING IN OTHER DOCUMENTATION FOR A COMPLETE
C      OVERVIEW OF SUBROUTINE CALLS. THE SUBROUTINE CALLS
C      MADE DIRECTLY BY NOISE1 INVOLVE THE FOLLOWING
C      ROUTINES:
C      (APPROXIMATELY IN ORDER OF APPEARANCE)
C      DATE EXIT LOGO ZERO
C      METRIC READIN CLOCK HEADER
C      FIRST WINDS HEIGHT VTXN
C      PLINE VSND PRTH CLOCK
C      VADD VVAG VSCV GRADIE
C      EXPDISE
C
C      NOISE1 IS CALLED BY NO OTHER PROGRAM.
C      NOTES: SUBROUTINES FIRST, WINDS, AND HEIGHT ACTUALLY
C      LOCATE THE CONTOUR POINTS. EXPCHE DETERMINES EXPOSURES AT THESE
C      POINTS. SEE PAGE 2-92 OF WYLE REPORT (PROGRAMMER'S MANUAL)
C      TOL IS THE ACCEPTABLE DIFFERENCE IN EXPOSURE BETWEEN TWO POINTS.
C      THE FOLLOWING SUMMARIZES LOCAL VARIABLES USED IN NOISE1.
C      AIRCFT-STORAGE FOR AIRCRAFT DEFINITION RECORDS
C      MAXPNT - USER PROVIDED MAXIMUM # OF POINTS
C      NAMEPR - OUTPUT TITLE SEE DATA STATEMENT<
C      DATEPR - BUFFER FOR DATE
C      DEFOPS - DEFAULT OPERATIONS SEE BLOCK DATA<
C      DEFTOL - DEFAULT CONTOUR TOLERANCE SEE BLOCK DATA<
C      DEFTOT - DEFAULT TOTAL OPS SEE BLOCK DATA<
C      DEFVAL - DEFAULT CONTOUR VALUE SEE BLOCK DATA<
C      DELS - MAXIMUM ALLOWABLE DISTANCE BETWEEN CONTOUR POINTS
C      HEACTM - INTERMEDIATE RESULT IN DEFAULT STEP SIZE COMPUTATION
C      GRADV - LAST COMPUTED UNIT GRADIENT VECTOR COMPONENTS
C      I-CONTOUR INDEX OR CONTROL FLAG
C      ICHT - FIRST 8 CHARACTERS CONTROL TAPE/NOTAPE FEATURE;
C      REMAINDER IS BUFFER FOR ECHOED USER COMMENTS. IN
C      OTHER ROUTINES IDENTICALLY NAMED APRAYS
C      CONTAIN NUMERIC INFORMATION READ IN FROM DATA CARDS.
C      ICHTCH - FLAG FOR END OF AIRCRAFT DEFINITION RECORD
C      IDUMPC - EXECUTIVE CONTROL FLAG: 0=ERROR, -1=PLOT, +=CONTINUE
C      IDUMPR - "DUMP " 1 ASCII COMPARISON STRINGS FOR CONTROL WORDS

```

```

C      IEDIT - "EDIT"      !
C      IERROR - DUMP FLAG: 0=NO DUMP, 1=SHORT DUMP,
C      2=FULL DUMP, 3= FULL DUMP
C      IGC - ERROR FLAG FOR SUBROUTINE METFIX (NONZERO = EXIT)
C      IPAGE - PAGE COUNTER !
C      IPSIZ - NUMBER OF CONTOURS
C      IST - CONTROL WORD (START, EDIT, DUMP, ETC) BUFFER
C      ISTOP - "END"      !
C      ISTART - "START"    !
C      ITAPE - "TAPE"      !
C      ITITLE - OUTPUT TITLE
C      ITR - TRACK NUMBER
C      ITRG - TRACK GROUP NUMBER
C      ITT - FLIGHTS USED TO FIND LATEST CONTOUR POINT
C      IX - FLAG, SWAP POINTS AT CONTOUR CLOSURE
C      IXPOT - POINT COUNTER
C      LINCNT - LINE COUNTER ! CONTROL APPEARANCE OF PRINTED OUTPUT
C      LPT - LAST PLOT INDICATOR
C      LPT - LAST POINT INDICATOR
C      MAXPTS - INTERNALLY COMPUTED ETC
C      METLEV - VALUE OF CURRENT NOISE EXPOSURE METRIC
C      MOP - "MOP"      !
C      MORE - PLOT CONTROL VARIABLE
C      NECT - COORDINATE POINT NUMBER (ON OUTPUT PAGE)
C      NEV - EXPOSURE AT CURRENT CONTOUR POINT
C      NOTAPE - "NOTAPE"   !
C      NPLOT - PLOTTING OPTION CONTROL FLAG
C      NPOT - CONTOUR COUNTER
C      NPL - PUNYAY NUMBER
C      NPMR - PRIMARY METRIC NUMBER
C      NYS - THE NUMBER OF TIMES THE SUBROUTINE EXPOSE HAS BEEN CALLED
C      PNT - PERCENT OF TOTAL NOISE REPRESENTED BY FLIGHTS INCLUDED
C      IN EXPOSURE COMPUTATION OF CURRENT CONTOUR POINT
C      PNTS - DEFAULT NUMBER OF POINTS IN CONTOUR
C      P2 - COORDS OF LAST GOOD POINT ON CONTOUR
C      POC - COORDINATES OF FIRST POINT FOUND ON CONTOUR
C      PX - X AXIS PX EQUIVALENCEDX
C      P3 - FIRST GUESS AT POSITION OF NEW CONTOUR POINT, CONTAINS NEW
C      POINT ON RETURN
C      P4 - X AXIS PC; USER'S GUESS AT FIRST POINT ON CONTOUR
C      PX - USER INPUT CONTOUR END POINT
C      RANG - SLANT RANGES
C      STEPS - DEFAULT NUMBER OF STEPS IN CONTOUR
C      T - ELAPSED TIME IN PROGRAM
C      TOL - CONTOUR ERROR TOLERANCE
C      TOLC - SPARE COPY OF TOL
C      TAP - CONTOUR TAP DRK
C      XX - DISTANCE FROM "LAST POINT" ON CONTOUR TO STARTING POINT
C      Y22 - VECTOR DISPLACEMENT BETWEEN STARTING AND
C      ENDING CONTOUR POINTS

C      THE COMMON BLOCK CROSS REFERENCE LIST
C      /A1TIT/ - TITILE,IT
C      /ASD23/ - BLOCK DATA, ASDT, LOAD, ASD2TH, ASD2G,CKBETH
C      /ASD2H/ - BLOCK DATA, OVLAY, ASD1, TITILE, LOAD, ASD2TH,
C      TAPDR, ASD2G, ASD22G, CKBETH
C      /BKK/ - BLOCK DATA, NEVPNT, SIFT, ASDT, LOAD, TOLRD, EXPCSE, ASD2TH,

```


/ADDSP/ - ASPROF GENERATED IN PREPP
 ASPROF - FLIGHT PERFORMANCE PROFILE FOR A/C TYPE OF CURRENT FLIGHT.
 THIST MODIFIES THIS PROFILE.
 DISTANCES ARE ALWAYS MEASURED IN FEET FROM THE RUNWAY
 TAKEOFF THRESHOLD.
 DCL - DETERMINES SIZE OF NEXT TIME INCREMENT (1 - 5 DB).
 WHETHER DCL INCREASES RESOLUTION OCCURRING TIME.
 TNSC - ANOTHER CHECK FOR TIME STEP SIZE. MUST NOT BE <1.
 LARGER TNSC MEANS LARGER JUMPS IN NOISE LEVEL, POORER
 RESOLUTION. SEE WYLE REPORT OF SCMPCE.
 DINT - INITIAL TIME INCREMENT IN SECONDS
 DMINT - SMALLEST ALLOWABLE TIME STEP
 DMAXT - LARGEST ALLOWABLE TIME STEP
 DMIN - SMALLEST ALLOWABLE REAL TIME
 DMAX - LARGEST ALLOWABLE REAL TIME
 CVETA - ANGULAR VELOCITY IN RADIANS PER SEC WITH WHICH A/C
 IS ALLOWED TO CHANGE ITS NOSE-UP AND BANKING ANGLES
 NTH - THRESHOLD VALUES FOR WHICH EXCEEDANCE TIMES WILL BE
 CALCULATED. NUMBER OF THESE = NTH LN /THBLOCK/
 TOTATT - TOTAL TIMES OVER WHICH THIST HAS CALCULATED EXCEEDANCES
 ASDST - THRESHOLD LEVEL EXCEEDANCE TIMES FOR EACH OBSERVER (SECONDS)
 ENERGY - ACCUMULATED NOISE ENERGY ABOVE LOWEST THRESHOLD LEVEL (ONE FLYBY)

/PK/
 TOL2 - CONTOUR ERROR TOLERANCE
 TOL - SPARE COPY OF TOL2 OBSERVED SOMETIMES
 XVAL - VAL VALUES CONTRIBUTIONS FROM ALL DEFINED FLIGHTS< PLUS
 CONTRIBUTION FROM SIGNIFICANT FLIGHTS<
 VAL - CONTOUR VALUE LEVEL<
 TNPV1 - NOISE CONTRIBUTION OF SIGNIFICANT FLIGHTS
 NYS - RECORDS NUMBER OF TIMES THROUGH EXPOSE OR FOR CURRENT CONTOUR POINT
 IPRCR - ERROR FLAG
 TOTCR - PROXIMITY TO CONTOUR, FACTOR USED FOR LOOP CHECK
 COMPUTATION, USED ONLY IF SMALLER THAN TOL2
 TOTCR2 - NO LONGER USED

/PLK2/
 FLITEP - FLIGHT PATH INFORMATION
 IF THE FIRST INDEX IS THE CONTENTS OF FLITEP , < IS

1	0. FOR STRAIGHT SEGMENT
2	1. FOR CIRCULAR SEGMENT
	STRAIGHT - X-COORD. OF SEGMENT
	STARTING POINT
	CIRCULAR - X-COORD. OF TURN
	CENTER
	STRAIGHT - Y-COORD OF SEGMENT
	START POINT
	CIRCULAR - Y-COORD OF TURN
	CENTER
	STRAIGHT - LENGTH OF SEGMENT
	CIRCULAR - RADIUS. POSITIVE IF
	TURNING LEFT, NEGATIVE IF
	TURNING RIGHT LOOKING
	IN A DIRECTION AWAY FROM
	THE RUNWAY, I.E. AS IF
	IT WERE A T/O<
	STRAIGHT - X-COMPONENT OF
	UNIT VECTOR IN DIRECTION
	OF SEGMENT
	CIRCULAR - TURN ANGLE

C 6 STRAIGHT - Y-COORD. OF UNIT
 C VECTOR IN DIRECTION OF
 C SEGMENT
 C CIRCULAR - ANGLE BETWEEN LINE
 C FROM TURN CENTER TO
 C SEGMENT START, WITH
 C POSITIVE X-AXIS
 C 7 ATTITUDE AT SEGMENT START
 C SPEED IN KNOTS AT SEGMENT START
 C
 C THRUST OVER SEGMENT IN LBS/
 C ENGINE
 C
 C
 C
 C /CONST/
 C DT - 3.14159
 C
 C /DEFAULT/
 C IFFDEF - CURRENT FILE INDICATOR
 C DEFTOT - DAILY TOTAL OPERATIONS
 C STEPS - DEFAULT NUMBER OF STEPS IN CONTOUR
 C POINTS - DEFAULT NUMBER OF POINTS IN CONTOUR
 C DEFTOT - DEFAULT CONTOUR TO EPANCF
 C DEFOPS - DEFAULT OPERATIONS QUESTION MARK< NEVER USED<
 C DEFTV - DEFAULT CONTOUR THRESHOLD
 C
 C /DIRVTV/
 C DC - DIRECTIVITY CHARACTERISTICS OF A/C NOISE
 C DCALPHA - ALPHABETIC AIRCRAFT ENGINE< TYPES TO WHICH DC RELATE
 C
 C /EXAPD/
 C DP - COEFFICIENTS OF FUNCTIONS DESCRIBING EXCESS ATMOSPHERIC
 C ABSORPTION OF NOISE FOR EACH AIRCRAFT TYPE
 C
 C /GRADVTV/
 C GRADV - LAST COMPUTED UNIT GRADIENT VECTOR COMPONENTS
 C DEFTV - SAME AS GRADV, GRADIENT MAGNITUDE
 C
 C /GRDDBLK/
 C ASDANS - ASDS MODE II CUMULATIVE TIME ABOVE THRESHOLD BY TRACK
 C FOR ALL FLIGHTS (FROM THISI)
 C (1,N) = REQUESTED T/A
 C (2,N) = - 10 DB FROM REQUESTED T/A
 C ASDANS - AS ASDANS FOR ASDS MODE III
 C AS2TH - MINIMUM THRESHOLD - ASDS MODE II-X
 C AS2MX - MAXIMUM ETC
 C AS3TH - MINIMUM THRESHOLD - ASDS MODE III (DOSE)
 C AS3MX - MAXIMUM ETC
 C
 C /GRDDBLK/
 C ASDANS - ASDS NOISE EXPOSURE VALUES FROM CALLS TO EXPOSE BY GRADIE
 C DEWAPE - IDENTICALLY NAMED VARIABLES IN GR2BLK<
 C ASDANS - DOSE EXPOSURE VALUES FROM GRADIE
 C AS2TH - MINIMUM THRESHOLD - ASDS MODE II-X
 C AS2MX - MAXIMUM ETC
 C AS3TH - MINIMUM THRESHOLD - ASDS MODE III (DOSE)
 C AS3MX - MAXIMUM ETC

/GRDOUT/
 POINT - COORDS OF CURRENT CONTOUR POINT FOR EXPOS
 ASDSPR - CUMULATIVE SUMMATION OF TIME ABOVE SIX THRESHOLD FOR 3
 DEFINED TIME PERIODS (INCLUDING CURRENT ONE)
 OTHERS - ESTIMATED VALUES OF OTHER NOISE METRICS AT CURRENT POINT
 ASDS?1 - T/A FOR 6 THRESHOLDS
 FOR 3 TIME PERIODS FOR CURRENT FLIGHT ONLY

/GOPS/
 RC - FIRST GUESS AT POSITION OF NEW POINT; NEW POINT ON RETURN
 RIN - COORDINATES OF PRESENT TRIAL CONTOUR POINT
 POK - COORDS OF POSITION OF VAL? CONTOUR SEARCH TEST POINT<
 W - SIGN OF EXPOSURE VALUE
 VAL1 - PREVIOUS TRIAL EXPOSURE VALUE FOR CURRENT "POINT"
 VAL2 - LATEST TRIAL EXPOSURE FOR ETC
 D - DISTANCE BETWEEN CONTOUR POINTS

/METRIC/ - INITIALIZED BY METFIX
 NMET - METRIC NUMBER 2**INTEGER NUMBER OF METRIC IN STANDARD LIST<
 NVALS - TABLE OF EXPOSURE VALUES AT CONTOUR POINTS
 FOR METRICS OTHER THAN PRIMARY
 PRMFCT - VALUE SUBTRACTED FROM FINAL SUMMATION OF SINGLE
 EVENT NOISE EXPOSURE APPLIES TO PRIMARY METRIC<
 ALTFCT - APPLIES TO ALTERNATE ETC
 PRWME - EVENING WEIGHTING FACTOR FOR PRIMARY METRIC
 PRWNY - NIGHT WEIGHTING FACTOR, PRIMARY METRIC
 ALTW - MULTIPLYING FACTOR IF ALTERNATE METRIC IS NEL
 ALTW - EVENING WEIGHTING FACTOR FOR ALTERNATE METRIC
 ALTW - NIGHT WEIGHTING FACTOR FOR ALTERNATE METRIC
 NUMPR - PRIMARY METRIC NUMBER NOISE MEASURE USED<
 1=NEF, 2=LDN, 3=CNEL, 4=LEQ, 5=ASDS, 6=DCSE
 NMAST - FLAG ARRAY INDICATING ALTERNATE METRIC NUMBER
 METIT - NAME OF NOISE METRIC ASCII LITFRAI<
 METLEV - METRIC LEVEL NEVER "USED"

/MIXDT/
 IA - NUMBERS INDICATING NOISE CURVE SETS AND PERFORMANCE PROFILES
 FOR UP TO 50 A/C TYPES:
 (1,1): NOISE CURVE SET NUMBER
 2: PROFILE FOR 0 - 100 NAUTICAL MILES
 3: " 700 - 1000 "
 4: " 1000 - 1500 "
 5: " 1500 - 2000 "
 6: " 2000 - 2500 "
 7: " 2500 - 3000 "
 8: " 3000 AND GREATER
 NAMES - NAMES OF A/C TYPES QUESTION MARK<
 MAC - LARGEST AIRCRAFT DEFINITION NUMBER IN CASE
 TALLY - CUMULATIVE OPERATIONS FOR D/E/N, LANDING AND 7 TAKEOFF STAGES
 NCHAC - TABLE OF AIRCRAFT TYPES FOR TINIET

/NOISE/
 SLPNG - SLANT RANGES (LOGARITHMS INTERNALLY, BUT INPUT AS
 REAL NUMBERS)
 GRNDA - GROUND ATTENUATION
 PWRG - AIRCRAFT THRUST TABLE (POWER SETTINGS FOR NOISE CURVE SET)
 LNOISE - EPNL DATA FOR NOISE CURVES (AT UP TO 6
 LNOISE - EPNL DATA FOR NOISE CURVES (AT UP TO 8 DISTANCES)
 NDAC - NUMBER OF DEFINED AIRCRAFT

NOISE - NOISE CURVES, CNEL
 CONCERN - TABLE OF CUTOFF DISTANCES ABOVE WHICH FURTHER NOISE COMPUTATIONS
 ARE NOT PERFORMED

/PROFIL/
 APPTHR - AIRCRAFT THRUST SETTINGS TABLE
 MATCH - TABLE OF AIRCRAFT TYPES REFERENCED BY PROFILE NUMBER

/PROFNT/
 PR - PROFILE RESTRICTIONS
 NSEGS - NUMBER OF SEGMENTS IN PERFORMANCE PROFILE
 TGPI - INDICATES TAKEOFF (+1.0) OR LANDING (-1.0)
 STR - START RANGE (DISTANCE FROM ANALYSIS POINT TO AIRCRAFT
 CLOSEST APPROACH)
 ITYPE - APPROACH PROFILE LOOKUP ARG (A/C TYPE)

/PLOTR/
 - FILLED BY TIMSI IF NPLP IS POSITIVE
 KK - NUMBER OF POINTS IN THE TIME HISTORY
 TAPL - SCHED ARRIVAL TIMES (SECONDS). WORDS 491,492 ARE PLOT SCALE
 WPL - A - WEIGHTED NOISE LEVELS (DB) CORRESPONDING TO TGPI
 COORD - A/C POSITION AND ORIENTATION CORRESPONDING
 TO TGPI, ASPL. SECOND INDEX MEANS:
 1 - X COORD, 2 - Y COORD,
 3 - ANGLE IN RADIANS OF A/C LONGITUDINAL AXIS WITH POS X - AXIS

/PLOTB/
 IPSIT - NUMBER OF CONTOURS
 DEIS - MAXIMUM ALLOWABLE DISTANCE BETWEEN CONTOUR POINTS (SEARCH)
 NPLT - NUMBER OF PLOTS PHYSICALLY DISTINCT QUESTION MARK<<
 XAP - AREA ACCUMULATOR
 PT - COORDS OF LAST GOOD POINT ON CONTOUR
 PSFAC - PLOT SCALE FACTOR

/RESTR/
 - PARTIALLY INITIALIZED BY SETRES
 RESTR - PROCEDURE NUMBER ABATEMENT TYPE< ASSIGNED TO EACH TRACK
 ENDR - DISTANCE ALONG TRACK TO END OF RESTRICTION INDEXED BY RESTR
 STR - DISTANCE ALONG TRACK TO BEGINNING OF RESTRICTION
 IGBT - TABLE OF RESTRICTION TYPES INDEXED TO ORGSTR, ORGEND, ETC<
 "NOISE ABATEMENT"<
 RCUR - TABLE OF CUTBACK CLIMB GRADIENTS INPUT TAKEOFF<
 ICRNCC - CUTBACK MODE OVERRIDE ARRAY
 REHAT - ALTITUDE ABOVE GROUND AT END OF TAKEOFF RESTRICTION
 ORGSTR - DISTANCE FROM BRAKE RELEASE POINT WHERE TAKEOFF
 RESTRICTIONS BEGIN, INDEXED BY "RESTRICTION NUMBERS"
 ORGEND - ETC WHERE RESTRICTIONS END, ALSO INDEXED BY ETC
 BOUNDARIES OF ABATEMENT PROCEDURE<

/RWYTT/
 APALT - AIRPORT PRESSURE ALTITUDE
 APTMP - AIRPORT TEMPERATURE DEGREES KELVIN INTERNALLY<
 XA - TABLE OF RWYWAY START BRAKE RELEASE COORDS ARRIVAL<
 XD - TABLE OF RWYWAY END COORDS DEPARTURE<
 RL - RWYWAY LENGTHS

/RWYTT/
 RWSE - CUMULATIVE NUMBER OF OPERATIONS INDEXED BY
 DEPARTURES 1<, ARRIVALS 2<; RWYWAY: DAY, EVENING, NIGHT

NAME - TABLE OF RUNWAY NAMES, 1 -> DEPARTURE, 2 -> ARRIVAL
 NRWY - NUMBER OF DEFINED RUNWAYS
 IRBIS - NUMBER OF BUSIEST TAKEOFF RUNWAY
 CONTS - NUMBER OF AIRCRAFT TYPES, ETC

/SCRACH/

X - X COORDINATES OF CURRENT CONTOUR
 Y - Y ETC
 NEV1 - NOISE EXPOSURE
 PRCP - TABLE OF AIRCRAFT PERFORMANCE GROUND TRACK ALTITUDE

/TGROUP/

DCON - CONTAINS THE DISTANCE THE TRACKS IN A GROUP HAVE
 IN COMMON FOR UP TO 25 GROUPS SIGH
 ITRG - GROUP NUMBERS INDEXED BY TRACK NUMBERS

/THRLOC/

NTRK - TRACK NUMBER
 NTS - NUMBER OF TRACK SEGMENTS IN CURRENT TRACK
 NPS - NUMBER OF PROFILE SEGMENTS
 NORS - NUMBER OF OBSERVATIONS
 ITAC - A/C NUMBER
 NSTEP - MAXIMUM ALLOWABLE NUMBER OF TIME STEPS IN ONE SEGMENT
 NTH - THRESHOLD NUMBER
 DSTRK - DISTANCE (FEET) FROM POINT OF CLOSEST APPROACH TO FIRST OBSERVER
 MEASURED ALONG GROUND TRACK AT THRESHOLD OF RUNWAY WHICH
 WOULD BE USED IF IT WERE A TAKEOFF TRACK. CANNOT BE LONGER
 THAN TRACK. IF NEGATIVE, START OF TRACK WAS CLOSEST APPROACH
 T1 - +1 FOR TAKEOFF, -1 FOR LANDING
 LCHECK - SET TRUE IF T1HISI EXPECTED TO CHECK ARGS & PARAMETERS
 T1 /ASDSRL/
 DETH - TRUE IF DETAILED DIAGNOSTICS DESIRED
 VC - UP TO 20 VECTORS POINTING TO HYPOTHETICAL OBSERVERS
 NPIP - NUMBER OF TIMES ACTUAL NOISE LEVEL TIME HISTORY AND A/C POSITION,
 DIRECTION DEPOSITED IN TGPI, APLI, COORD. IF
 NPIP IS LESS THAN OR EQUALS ZERO, TGPI AND APLI AREN'T FILLED. IF ACTUAL
 NUMBER OF TIME STEPS EXCEEDS THIS, T1HISI WICCUPS.
 LENERGY - TRUE IF ACCUMULATED ENERGY NOISE LEVELS ARE TO BE CALCULATED

/TITLE/

TIT1 - DESCRIPTIVE HEADINGS OF AIRCRAFT DATA BASE FILE
 TANNER - USER PROVIDED HEADER FOR OUTPUT
 AT - CONTOUR OUTPUT TITLE
 AALT - AIRPORT ALTITUDE
 TMT - ANOTHER OUTPUT TITLE
 TPD - MORE TITLE PUBLISH

/TRACK/

ITR - TABLE OF RUNWAY NUMBERS FOR EACH TRACK 0 IF TRACK IS UNDEFINED
 ITSEG - CONTAINS THE NUMBER OF TRACK SEGMENTS FOR A GIVEN TRACK
 IN THE LOW ORDER 7 BITS OF THE WORD. THE HIGH
 ORDER 15 BITS CONTAIN INFORMATION REGARDING THE TRACK SEGMENTS
 FOR A GIVEN TRACK. IF THE BIT IN POSITION 1, COUNTING FROM
 THE HIGH ORDER TO THE LOW ORDER, IS A BINARY 0,
 THEN SEGMENT 1 IS STRAIGHT. IF 1, IT'S A TURN.
 MASK - BINARY MASKING CONSTANTS USED TO PLAY WITH ITSEG, ITPRAC, ETC
 DPARM - FOR STRAIGHT SEGMENTS: START COORDS X,Y,
 LENGTH, UNIT VECTOR COMPONENTS ALONG DIRECTION X,Y,
 FOR CIRCULAR SEGMENTS: TURN CENTER COORDS X,Y, RADIUS
 * = PD, - = MC, TURN ANGLE RADIANS, ANGLE BETWEEN
 CHORD FROM START TO CENTER AND POSITIVE X DIRECTION

WTD - TOTAL TRACK DISTANCES FROM BEGINNING OF TRACK TO
 END OF EACH SEGMENT EXCEPT THE LAST<
 MIN - SMALLER OF 1/2 MINIMUM TURN RADIUS OF SHORTEST
 SEGMENT LENGTH FOR EACH TRACK

 /TRAFIK/ - PARTIALLY INITIALIZED BY MIXRD
 NTT - TOTAL NUMBER OF DISTINCTLY DEFINED FLIGHTS
 (TOTAL USED TO FIND A CONTOUR POINT)
 ITT - FLIGHTS USED TO FIND LATEST CONTOUR POINT
 ITPRAC - TABLE OF ENCODED PROPERTIES OF !SIGNIFICANT! FLIGHTS
 FLIGHT IDENTIFICATION CODES (POSITION 0 LSB)
) - 2 : NOISE CURVE SET NUMBER MINTS 1

) - 12: PERFORMANCE PROFILE NUMBER

 13 - 19: GROUND TRACK NUMBER

 20 - 24: TRACK GROUP NUMBER
 MOST SIG BIT: 1 IF FLIGHT !SIGNIFICANT!, 0 IF NOT
 OPS, NOPS - CONTAINS THE WEIGHTED NUMBER OF OPERATIONS FOR
 EACH INDIVIDUALLY DEFINED FLIGHT FOR ALL METRICS.
 EO, ASDS, AND DOSE ALL HAVE THE SAME WEIGHTING SO
 THE OPERATIONS FOR CURRENT FLIGHT CAN BE FOUND AT
 OPS(KX,2)
 NOPS - SEE OPS

 /VECTIR/
 VA - COORDINATE POSITION OF A/C IN AIRPORT REFERENCE FRAME
 VAPHA - UNIT VECTOR COMPONENTS FOR ALPHA IN A/C REFERENCE FRAME
 VAPHA - BETA IN A/C REF FRAME
 VAPHA GAMMA IN A/C REF FRAME
 VD - VECTOR POINTING FROM A/C TO OBSERVER NET FIXED AIRPORT<
 COORD FRAME
 VD2 - AS VD, BUT WRT TO A/C COORD FRAME

 /WIND/
 VV - WIND VELOCITIES
 DIR - WIND DIRECTIONS
 INDEX1 - LIST OF NOISE CURVE NUMBERS INDEXED TO AIRCRAFT IN USER INPUT
 INDEX1 - LIST OF NOISE CURVE NUMBERS INDEXED TO AIRCRAFT IN USER INPUT
 INDEX2 - LIST OF PROFILES ETC
 TOL - CONTOUR TOLERANCE NEVER CHANGED<
 TOL - CONTOUR TOLERANCE CHANGED SOMETIMES BY NEWPNT<
 VAL - PREVIOUS CONTOUR VALUE LEVEL<
 VAL - LATEST CONTOUR VALUE LEVEL<
 TRY1 - TRIAL NOISE EXPOSURE
 NYS - NUMBER OF ITERATIONS REQUIRED TO FIND CONTOUR POINT
 ERROR - ERROR FLAG
 TOLDB - LOOP CHECK TOLERANCE * THE STEP SIZE -- IS LOOP CLOSING?<
 TOLSIG - SIFT TOLERANCE * THE STANDARD DEVIATION<

Main Program GRIDS

MAIN PROGRAM FOR GRID ANALYSIS RUNS
 GRID CALLS THE FOLLOWING SUBROUTINES DIRECTLY
 GRID EXIT LOAD DATE
 READIN SKILL EXPOSURE PLOTTER

C NOTES: GRID MAY (BUT NEED NOT NECESSARILY) BE RUN FROM
 C TAPE INPUT GENERATED BY NOISE AND CONTOUR. IT EXPECTS A
 C "THRESH" (THRESHOLD CONTROL CARD) AND EVIDENTLY ASSUMES
 C ALL A/C, PROFILES, ETC HAVEN'T CHANGED FROM THE TAPED
 C INPUT'S RUN. SOME OF THE MOST OPAQUE CODE IN THIS
 C ROUTINE INVOLVES LABELING THE PRINTED OUTPUT TO CORRESPOND
 C TO THE PLOTTED CONTOUR
 C LOCAL VARIABLE DICTIONARY
 C A - ALTITUDE (Z COORD) OF CURRENT GRID POINT
 C AFLAG1 - X OFFSET, GRID QUADRANT
 C AFLAG2 - Y OFFSET, GRID QUADRANTS
 C ATPCRF - STORAGE FOR AIRCRAFT DEFINITION RECORDS
 C ALT - A/C HEIGHT ABOVE RUNWAY (SECONDARY SEG)
 C AVGSG - AS AVATS, WEIGHTED BY VELOCITY, SHIELDING, ATTENUATION
 C AND DECIBEL CORRECTIONS
 C BAYHEP - USER PROVIDED HEADER FOR OUTPUT
 C CONTR - NOISE CONTRIBUTION OF AIRCRAFT WITH ASSIGNED NOISE CURVES
 C AT A CHOSEN POINT
 C DA - DECIBEL CORRECTION FOR SEGMENT CLOSEST TO GRID POINT
 C DAT - DISTANCE ALONG TRACK FROM THRESHOLD TO CLOSEST POINT
 C DATEP - CONTAINS DATE M/D/YK
 C DB - DECIBEL CORRECTION FOR SECONDARY SEGMENT
 C DST - DISTANCE ALONG TRACK TO CLOSEST POINT ON SECONDARY SEG
 C DT - DISTANCE TO TRACK FROM GRID POINT
 C GA - GROUND ATTENUATION CORRECTION
 C HED1 - OUTPUT HEADER
 C HED21 - OUTPUT HEADER
 C HED22 - OUTPUT HEADER
 C HT - ALTITUDE OF AIRCRAFT (FEET), PRIMARY SEGMENT
 C I - ALL PURPOSES EVER POPULAR LOOP COUNTER WORLD FAVORITE
 C IALFA - LETTERS OF THE ALPHABET (GRID QUADRANT IDS)
 C ICHAR - QUADRANT LABEL CHARACTER
 C ICM - USER COMMENT FILED ON CONTROL CARD
 C ICCM3 - IDENTIFIERS OF METRIC TYPES (ASCII)
 C ICCN - COMMAND LITERAL ECHO
 C IEND - COMMAND LITERAL ECHO
 C IEP - FLAG TO CALCULATE ALTERNATE NOISE METRICS
 C IFIL - TAPE FILE NUMBER OF CURRENT CONTOUR
 C IPST - BUFFER FOR USER INPUT CONTROL WORD
 C IGRID - COMMAND LITERAL ECHO
 C IOP - PRINTOUT OPTIONS (COMPARISON ARRAY)
 C IOPTH - PRINTOUT OPTION FLAG ARRAY
 C INCP - COMMAND LITERAL ECHO
 C INDX1 - LIST OF NOISE CURVE NUMBERS INDEXED TO AIRCRAFT IN USER INPUT
 C INDX2 - LIST OF PROFILE NUMBERS INDEXED TO AIRCRAFT IN USER INPUT
 C ITAC - NOISE CURVE NUMBER
 C ITFIL - NUMBER OF FILES TO SKIP TAPE FOR NEXT CONTOUR
 C ITIM - NOT USED MISPELLED MAYBE
 C ITM - OUTPUT LABEL SEE DATA STATEMENT
 C ITPRAC - ENCODED REFERENCE WORD (TRACK GROUP
 C NUMBER, TRACK NUMBER, PROFILE NUMBER, ETC)
 C ITHRESH - COMMAND LITERAL ECHO
 C IXCOORD - GRID QUADRANT COORD GRID OUTPUT
 C JCCN - FLAG INDICATING DATA TO MODIFY EXISTING BASE
 C KX - FLIGHT NUMBER
 C L - NUMBER OF POINTS IN GRID KX TIMES NY
 C LJN - LOGICAL UNIT NUMBER OF CONTOUR STORAGE TAPE
 C MASK - BINARY MASKING CONSTANTS USED WITH ITPRAC, ETC
 C MAXS - SEGMENT NUMBER OF TRACK CLOSEST TO GRID POINT
 C NEXT - SEGMENT USED FOR SECONDARY CONTRIBUTION

NCON - NUMBER OF CONTIGUOUS SEGMENTS MAYBE<
 NPTT - TOTAL NUMBER OF DISTINCTLY DEFINED FLIGHTS
 NOCON - COMMAND LITERAL
 NPPF - PROFILE NUMBER
 NPTS - NUMBER OF GRID POINTS COUNTED MAYBE<
 NFW - FLEET NUMBER
 NPAR - PROCEDURE NUMBER ABATEMENT TYPE< ASSIGNED TO EACH TRACK
 NTG - TRACK GROUP ASSIGNMENT
 NTRK - TRACK NUMBER
 NUNPDS - PAGE CONTROL (LIMIT) FLAG FOR OPTIONS 3 AND 4
 NUNPTS - COUNTER TO CONTROL NUMBER OF GRID POINT LISTINGS
 PER PAGE OF OUTPUT
 NX - NUMBER OF X COORDS IN GRID
 NY - NUMBER OF Y COORDS IN GRID
 OTHERS - ESTIMATED VALUES OF OTHER NOISE METRICS AT CURRENT POINT
 P - PLANEAR COORDS OF POINT AT WHICH NOISE EXPOSURE IS CALCULATED
 Q - S & Y COORDS OF CURRENT GRID POINT IN EXPOSURE CALCULATION
 PRP - AIRCRAFT POWER SETTING
 SLRNG - SLANT RANGE
 TH - THRUST OF AIRCRAFT (POUNDS/ENGINE)
 TSH - TABLE OF 6 THRESHOLD VALUES FOR CONTOURS
 V - VELOCITY OF AIRCRAFT (KNOTS)
 VE - WIND VELOCITY
 VV - COMPONENT OF WIND VELOCITY IN DIRECTION OF TRACK SEGMENT
 WFACTS - TABLE OF WEIGHTING FACTORS FOR ALTERNATE METRICS
 X - X GRID COORDINATES
 XIG - LARGEST X-COORD ON CONTOUR
 XPP1 - X OFFSET, FEET/1000
 XPP2 - Y OFFSET, FEET/1000
 XS - STARTING X - COORD OF GRID
 ASM - SMALLEST X- COORD ON CONTOUR
 XSTD - NUMBER OF FEET BETWEEN X VALUES IN GRID
 YSTD - NUMBER OF FEET BETWEEN Y VALUES IN GRID
 Y - Y GRID COORDINATES
 YIG - LARGEST Y - COORD ON CONTOUR
 YS - STARTING Y - COORD
 YSM - SMALLEST Y - COORD ON CONTOUR
 LOGICAL INSIDE
 EXTERNAL INSIDE
 LOGICAL NCON, IORTH

Function ACNOIS

FUNCTION ACNOIS (ITAC,SLRP,THP,K,KX,J,IAPP)

36-04-74

 LOCAL VARIABLE DICTIONARY
 ACNOIS - PRIMARY METRIC LEVEL
 APOISE - TABLE OF EPNL VALUES (DATA)
 AVALS - PRIMARY AND ALTERNATE METRIC LEVELS
 APOISE - TABLE OF NEL VALUES (DATA)
 I - LAST VALUE IN X COORD 2 DIMENSIONAL INTERPOLATION LESS THAN
 INTERPOLATED X VALUE
 ITAC - A/C TYPE
 IXX - ASSIGNED LABEL VARIABLE
 J - TA CALCULATION FLAG (SET BEFORE ENTRY)
 K - ERPOR FLAG (SET BEFORE ENTRY BY CALLING ROUTINE)

C KK - ARRAY ARGUMENT OF LARGEST THRUST IN A/C THRUST SETTING TABLE
 C NOT GREATER THAN THR
 C KX - NUMBER OF OPERATIONS FOR TA CALCULATIONS
 C L - CONSTANT
 C M - NUMBER OF VALUES IN X TABLE FOR 2D INTERPOLATION
 C N - NUMBER OF Y VALUES FOR 2D INTERPOLATION
 C NOAFTB - 2 IF ONE OF THE THREE AIRCRAFT WHICH USES AFTERBURNER 06-11-79
 C THRUST IN THE FIRST COLUMN OF ITS NOISE CURVE TABLES. 06-11-79
 C IF A LANDING, THIS PART OF THE NOISE CURVE WILL BE IGNORED 06-11-79
 C NUMALT - ALTERNATE METRIC IDENTIFIERS
 C NUMPR - PRIMARY METRIC NUMBER (SEE BELOW)-
 C PWRS - POWER SETTINGS
 C SL - SLANT RANGE, LOG
 C SLRNG - TABLE OF SLANT RANGES
 C SLRR - SLANT RANGE, DECIMAL
 C THR - A/C THRUST SETTING
 C ACNOIS - FUNCTION SUBROUTINE
 C THE PURPOSE OF THE FUNCTION SUBROUTINE ACNOIS IS TO COMPUTE THE
 C NOISE EXPOSURE LEVEL FOR A SINGLE FLIGHT IN TERMS OF ANY COMBINATION
 C OF METRICS. WHILE NO ACTUAL COMPUTATIONS ARE PERFORMED IN ACNOIS
 C ITSELF, APPROPRIATE OTHER SUBROUTINES ARE ACCESSED AS NECESSARY FOR
 C EACH METRIC (I.E., NFF, LDN, CNEL, IEQ, ASDS, OF DOSE). THE SUB-
 C ROUTINES USED BY ACNOIS AND THEIR FUNCTIONS ARE AS FOLLOWS:
 C GENFN2 - LOG-LINEAR-TWO-DIMENSIONAL INTERPOLATION IN "ENERGY" METRIC
 C NOISE TABLES
 C ASDS2 - DETERMINES ASDS LEVEL
 C ASDS3 - DETERMINES DOSE LEVEL
 C ACNOIS HAS ONLY ONE ENTRY POINT AND ITW CALLING SEQUENCE IS AS
 C FOLLOWS: ACNOIS(ITAC, SLR, THR, K, KX, J)
 C WHERE
 C ITAC - NOISE CURVE SET NUMBER ASSOCIATED WITH THE AIRCRAFT FOR THIS
 C FLIGHT.
 C SLR - THE MINIMUM SLANT DISTANCE FROM THE POINT BEING ANALYZED TO
 C THE AIRCRAFT FOR THIS FLIGHT.
 C THR - THE CORRECTED NET THRUST IN POUNDS PER ENGINE AT THE POINT OF
 C MINIMUM SLANT DISTANCE (ABOVE) FOR THIS FLIGHT.
 C K - INDICATED WHETHER TO COMPUTE THE EXPOSURE LEVELS FOR THE
 C ALTERNATE METRICS IN ADDITION TO THE PRIMARY METRIC. IF K IS EQUAL
 C TO 1, THE ALTERNATES ARE ALSO COMPUTED. OTHERWISE, ONLY THE PRIMARY
 C IS COMPUTED.
 C KX - THE NUMBER OF THIS FLIGHT. IT IS ONLY MEANINGFUL HERE IF ASDS
 C OR DOSE LEVELS ARE BEING COMPUTED AND KX IS TRANSFERRED TO FUNCTION
 C SUBROUTINES ASDS2 AND/OR ASDS3.
 C J - INDICATES WHETHER OR NOT TO COMPUTE LEVELS FOR THE ASDS AND DOSE
 C ALTERNATE METRICS. IF J IS LESS THAN 5, THE LEVELS ARE NOT COMPUTED
 C ; OTHERWISE, THEY ARE COMPUTED.
 C IN ADDITION TO THE CALLING ARGUMENTS, ACNOIS ALSO RETRIEVES
 C INFORMATION FROM LABELED COMMON BLOCKS/NOISE/ AND/METRIC/. /NOISE/
 C CONTAINS SLANT DISTANCE (SLRNG) DATA CORRESPONDING TO STROED EPNL
 C VALUES (ANOISE) AND NET VALUES (BNOISE). THE RESPECTIVE POWER
 C SETTINGS ARE INCLUDED AS WELL (PWRS). /METRIC/ CONTAINS THE NUMBERS
 C (1-6 BELOW) CORRESPONDING TO THE PRIMARY METRIC (NUMPR) AND THE
 C ALTERNATE METRICS (NUMALT).
 C THE FUNCTION ACNOIS IS CALLED BY ONLY ONE PROGRAM, FUNCTION
 C SUBROUTINE EXPCSE, AND IS CALLED MANY TIMES DURING EXECUTION.
 C ACNOIS HAS TWO EXIT POINTS. IF ALTERNATE EXPOSURE LEVELS ARE NOT
 C COMPUTED, THE LEVEL FOR THE PRIMARY METRIC IS COMPUTED AND THE EXIT
 C RETURN IS IMMEDIATE. IF THE ALTERNATES ARE COMPUTED, THE PRIMARY IS
 C COMPUTED FIRST, THEN THE ALTERNATES. THE SECOND EXIT RETURN COMES

```

C AFTER THE FUNCTION NAME IS SET TO THE VALUE OF THE LEVEL FOR THE
C PRIMARY METRIC. THE LEVELS FOR BOTH THE PRIMARY METRIC AND
C ALTERNATE METRICS ARE STORED IN THE LABELED COMMON BLOCK/METRIC/
C UNDER THE NAME (AVALS). THE POSITION NUMBER OF THE LEVELS IN TABLE
C AVALS CORRESPONDS TO THE NUMBER OF THE METRIC AS FOLLOWS:
C 1 VFF
C 2 LDN
C 3 CNF
C 4 YEQ
C 5 YDS
C 6 DQSE

```

Function AL

```

FUNCTION AL (V,AVD,F,J)

C *****

C LOCAL VARIABLE DICTIONARY

C ABSPJ - ABSOLUTE VALUE OF DISTANCE CRITERION
C ABSPJ - ABSOLUTE VALUE OF EXPOSURE CUTOFF DISTANCE FOR NOISE CURVE 11
C A1 - A WEIGHTED ECISEY LEVEL
C AL1 - CONTRIBUTION FROM THE JET EXHAUST TO VALUE AL
C AL2 - CONTRIBUTION FROM FRONT FAN
C AL3 - CONTRIBUTION FROM F
C AL3 - CONTRIBUTION FROM REAR FAN
C AVD - RETURNS MAGNITUDE OF VECTOR V TO CALLING PROGRAM
C B7 - ELEVATION ANGLE
C DC - TABLE OF CUTOFF DISTANCES FOR THE SEVERAL NOISE CURVES
C DC7 - PI MINUS APPROPRIATE CUTOFF ANGLE FROM DC
C DJ - VALUE OF AN APPROXIMATING FUNCTION USED IN EXHAUST NOISE COMPUTATION
C
C WYATT - ANOTHER INTERMEDIATE RESULT (SO SEE THE WYLE BOOK OR
C LOOK UP THE BUGGERING TECHNICAL REFERENCES, THE EARLIEST IS
C FROM 1954...)
C F - THRUST SETTING OF THE AIRCRAFT
C FP - THRUST SETTING USED IN PREVIOUS CALL
C FR - THRUST RATIO
C FRFF - INTERMEDIATE RESULT
C GJET - SLOPE AND INTERCEPT VALUES FOR LINEAR APPROXIMATIONS TO
C EQUATION FOR D(THETA) ON PAGE PAGE 2-11 OF WYLE
C RESEARCH PROGRAMMERS MANUAL, WCR77-7, DCT-CS-50256)
C TRJ - INTERMEDIATE RESULT
C TRFF - INTERMEDIATE RESULT
C JP - AIRCRAFT NUMBER FROM PREVIOUS CALL
C CP - COEFFICIENTS OF FUNCTIONS DESCRIBING EXCESS ATMOSPHERIC
C ABSORPTION OF NOISE FOR EACH AIRCRAFT TYPE
C +FF - INTERMEDIATE RESULT FROM FRONT FAN COMPUTATION
C PFR - INTERMEDIATE RESULT FROM REAR FAN COMPUTATION
C PID -
C PID2 - PI DIVIDED BY TWO
C PJ - YET ANOTHER INTERMEDIATE RESULT
C PSI - AN ANGLE IN DEGREES
C PSIDEG - PSI EXPRESSED IN DEGREES
C PSIZ - A SIMILAR ANGLE TO PSI IN A DIFFERENT PLANE
C IFM - INTERMEDIATE RESULT
C TEMLOG - LOG TEM
C TLOGS - LOGARITHMS OF THE DEFAULT THRESHOLDS

```

```

C      "2 - THRUST RATIO      (NOT RELATED TO ANY SURVEILLANCE ACTIVITIES, HANA)
C      "3 - THRUST RATIO
C      "4 - THRUST RATIO
C      V - FIRST THREE LOCATIONS ARE VECTOR FROM AIRCRAFT TO ANALYSIS POINT
C
C      A1 - FUNCTION SUBROUTINE
C      THE FUNCTION SUBROUTINE A1 COMPUTES THE A-WEIGHTED DECIBEL LEVEL AT
C      A POINT FROM A FLIGHT AT A GIVEN POSITION. THIS SUBROUTINE IS USED
C      IN THE CALCULATION OF ASDS AND DCSE LEVELS. SUBROUTINE A1 DOES NOT
C      USE ANY EXTERNAL SUBROUTINES BUT CONTAINS THREE INTERNAL SUBROUTINES
C      A1 HAS ONE ENTRY POINT ONLY AND THE CALLING SEQUENCE IS:
C      A1(V, AVD, F, J)
C      WHERE
C      V - A VARIABLE OF DIMENSION 3 OR N RE SUCH THAT THE FIRST 3
C      LOCATIONS DEFINE A VECTOR POINTING FROM THE AIRCRAFT TO THE ANALYSIS
C      POINT AND
C      V(1) = X-COORDINATE
C      V(2) = Y-COORDINATE
C      V(3) = Z-COORDINATE
C      AVD - THE MAGNITUDE OF VECTOR V IS COMPUTED BY A1 AND RETURNED VIA
C      THIS ARGUMENT.
C      F - THE THRUST SETTING OF THE AIRCRAFT.
C      J - A NUMBER CORRESPONDING TO THE AIRCRAFT FOR THIS FLIGHT. VALID
C      NUMBERS ARE AS FOLLOWS: (ALL JET AIRCRAFT)
C      1-1-NOT USED.
C      4-2-ENGINE STOL
C      1-4-ENGINE NARROW BODY TURBOJET
C      6-2-ENGINE NARROW BODY TURBOFAN
C      7-2-ENGINE NARROW BODY (QUIET NACELLE)
C      8-2-ENGINE NARROW BODY TURBOFAN
C      9-2-ENGINE NARROW BODY (QUIET NACELLE)
C      10-4-ENGINE NARROW BODY TURBOFAN
C      11-4-ENGINE NARROW BODY (QUIET NACELLE)
C      12-2-ENGINE WIDE BODY
C      13-2-ENGINE WIDE BODY
C      14-4-ENGINE WIDE BODY
C      A1 IS CALLED BY ONLY ONE PROGRAM, SUBROUTINE TIRISI, BUT IS CALLED
C      MANY TIMES WHEN THE ASDS OR DCSE METRICS ARE COMPUTED. VARIABLE
C      INFORMATION IS PASSED TO A1 THROUGH THE ARGUMENTS V, F, AND J AS
C      PREVIOUSLY DISCUSSED. "FIXED" DATA IS RETRIEVED FROM LABELED COMMON
C      BLOCKS/DIRVTY//ALINIT/AND/EXAPP/. DATA REFLECTING THE DIRECTIVITY
C      CHARACTERISTICS OF NOISE EMISSIONS FOR THE ENGINE TYPES (I.E.
C      AIRCRAFT TYPES) IS FOUND IN (DC) WHICH IS CONTAINED IN /DIRVTY/.
C      THE VARIABLES IN /ALINIT/ ARE NOT REALLY FIXED IN THE SENSE THAT
C      THEY DON'T CHANGE, BUT ARE USED BY A1 TO INDICATE TO ITSELF WHAT
C      VARIABLES WERE USED FOR THE PREVIOUS CALL. IF THE THRUST (FP) AND
C      AIRCRAFT NUMBER (JP) WERE THE SAME LAST TIME AS FOR THE CURRENT CALL
C      (F AND J RESPECTIVELY), A SIGNIFICANT NUMBER OF INITIALIZATION
C      COMPUTATIONS MAY BE OMITTED SINCE THE RESULTS ARE UNCHANGED FROM
C      LAST TIME. THIS SAVES SOME COMPUTATION TIME. THE VARIABLES IN (PP)
C      CONTAINED IN /EXAPP/ CONSIST OF COEFFICIENTS OF FUNCTIONS DESCRIBING
C      EXCESS ATMOSPHERIC ABSORPTION OF NOISE FOR EACH AIRCRAFT TYPE.
C      THERE IS ONLY ONE EXIT RETURN FROM A1 AND IT IS USED UNDER ALL
C      CONDITIONS. THE A-WEIGHTED DECIBEL LEVEL IS RETURNED THROUGH THE
C      FUNCTION NAME AND THE DISTANCE BETWEEN THE ANALYSIS POINT AND THE
C      AIRCRAFT (I.E., THE MAGNITUDE OF V) IS RETURNED VIA THE CALLING
C      ARGUMENT AVD.
C      V = VECTOR FROM AIRCRAFT TO OBSERVER, F=THRUST, J=AIRCRAFT
C      TYPE INDICATOR.

```

Subroutine ALTRRD

SUBROUTINE ALTRRD (IGO,NR,IDUMP)

LOCAL VARIABLE DICTIONARY

C R - RESTRICTION END
 C G - RESTRICTION GRADIENT
 C GCRN - INPUT TAKEOFF GRADIENT
 C ICBOC - INTEGER CUTBACK NUMBER CUTBACK OVERRIDE
 C ICBT - INTEGER CUTBACK TYPE
 C IDUMP - DUMP ERROR FLAG) RESTRICTION NUMBER ()
 C IGO - ERROR FLAG
 C IGO - ALTERNATE RETURN FROM MESSAGE
 C IIR - FLAG SET IF IRET IN MESSAGE IS LESS THAN ZERO
 C IT - LOOKUP ARG, TRACK NUMBER TO RESTRICTION NUMBER
 C ITR - FIRST 20 X COORDINATES OF CONTOUR
 C J - PERFORMANCE PROFILE NUMBER (CALL TO SETPES)
 C NR - RESTRICTION NUMBER
 C NRT - RESTRICTION TYPE
 C NRX - RESTRICTION NUMBER AS INPUT
 C NTRP - PROCEDURE NUMBER ASSIGNED TO GROUND TRACK
 C OPSSTR - WHERE PROCEDURE STARTS
 C ORGENO - WHERE PROCEDURE ENDS
 C S - RESTRICTION START
 C ALTRRD - SUBROUTINE
 C ALTRRD IS USED TO DECIDE THE OPTIONAL NOISE ABATEMENT TAKE OFF
 C PROCEDURES FROM THE INPUT DATA AND SUBSEQUENT INITIALIZATION OF
 C ASSOCIATED VARIABLES.
 C ALTRRD USES EXTERNAL SUBROUTINES MESSAGE AND SETRES.
 C THE SUBROUTINE ALTRRD HAS ONLY ENTRY POINT AND THE CALLING SEQUENCE
 C IS AS FOLLOWS:
 C CALL ALTRRD (*,NR,IDUMP)
 C WHERE
 C * - MEMORY ADDRESS OF ERROR RETURN
 C NR - ERROR INDICATOR WHICH IF NOT EQUAL TO ZERO MEANS AN ERROR HAS
 C BEEN DETECTED
 C IDUMP - PASSED TO SUBROUTINE SETRES AS A DIAGNOSTIC OUTPUT FLAG.
 C THE SUBROUTINE ALTRRD IS USED BY ONLY ONE PROGRAM, SUBROUTINE READIN
 C AND WILL NORMALLY, ALTHOUGH NOT NECESSARILY, BE CALLED ONCE DURING
 C THE INPUT PHASE OF EXECUTION.
 C ALTRRD RECEIVES ALL OF ITS INPUT DIRECTLY FROM INPUT DATA CARDS.
 C THERE ARE TWO EXIT RETURNS FROM SUBROUTINE ALTRRD. THESE ARE AT
 C LINES NUMBERED 60 AND 61 OF THE SUBROUTINE LISTING IN SECTION 5.
 C THE RETURN AT LINE 60 IS AN ERROR RETURN TO READIN WHICH WILL CAUSE
 C THE RUN TO BE TERMINATED IMMEDIATELY. THE RETURN AT LINE 61 IS THE
 C NORMAL RETURN.
 C WHILE ALTRRD PERFORMS NO COMPUTATIONAL PROCESSING, SEVERAL TABLES IN
 C LABELED COMMON BLOCK/RESA/T/ARE INITIALIZED AS FOLLOWS:
 C ICBT - CONTAINS THE TYPE OF NOISE ABATEMENT PROCEDURE.
 C GCRN - CONTAINS THE INPUT TAKEOFF GRADIENT
 C OPSSTR - CONTAINS THE DEFINITION OF WHERE THE PROCEDURE STARTS
 C ORGENO - CONTAINS THE DEFINITION OF WHERE THE PROCEDURE ENDS
 C NRX - CONTAINS THE PROCEDURE NUMBER ASSIGNED TO EACH GROUND TRACK.

Subroutine APPTRD

C	SUBROUTINE APPTRD(IGD,ICNT)	03-14-79
C		03-28-79
C	LOCAL VARIABLE DICTIONARY	03-28-79
C		03-28-79
C	DUM - USED TO STORE APPROACH PARAMETERS TEMPORARILY	03-28-79
C	I - ORDINAL APPROACH PARAMETER I.D. NUMBER	03-28-79
C	K - ACTUAL APPROACH PARAMETER I.D. NUMBER	03-28-79
C	ST 100 - NEW	03-28-79
C	LT "MAXAPP" - EXISTS ON DATA BASE (REPLACEMENT)	03-28-79
C		

Function ASDS2

```

FUNCTION ASDS2 (ITAC,KX)

*****

LOCAL VARIABLE DICTIONARY

MTH - WORD 1 IS USER DEFINED THRESH MINUS 5 DB, WORD 2
      IS USER DEFINED THRESHOLD AS INPUT
MTHNS - TIMES ABOVE THRESHOLD VALUES IN MINUTES
ASD7 -
ASD7X - DISTANCE FROM RUNWAY THRESHOLD TO START OF A/C TRACKING
        ALONG GROUND TRACK
ASD7YX - DISTANCE FROM RUNWAY THRESHOLD TO END OF A/C TRACKING
        ALONG GROUND TRACK
ASD7ANS - RUNNING TOTALS OF TIMES ABOVE THRESHOLDS
ASD7MT - SEE ASD7X
ASD7Y - SEE ASD7YX
ASD7S2 - THE VALUE OF THE ASDS METRIC FOR THIS FLIGHT AND THRESHOLD
ASD7S3 - (EXPOSURE) DOSEAGE FOR THIS FLIGHT AND THRESHOLD
ASD7ST - TIME ABOVE THRESHOLD IN SECONDS
ASD7PFC - TABLE OF AIRCRAFT PERFORMANCE PROFILES
CONCERN - TABLE OF CUTOFF DISTANCES FOR NOISE CONTRIBUTION
CMTRESH - TABLE OF DEFAULT THRESHOLDS MINUS 5 DB
O - TOTAL OPERATIONS FUDGED TO OPS PER MINUTE
O2 - USER DEFINED DOSE TIMES (UNITS NEED NOT BE MINUTES...)
OINT - INITIAL TIME STEP EQUALS DMINT
P - OPERATIONS DIVIDED BY SIX TENTHS FOR UNKNOWN REASON
I - THRESHOLD NUMBER
IGD - ERROR RETURN
ITAC - NOISE CURVE SET NUMBER FOR THIS FLIGHT
ITACT2 - A/C TYPE FOR THIS RETRIEVED AS MTHAC(ITAC),LOCAL VAR
IVX - ASSIGNED LOCAL VARIABLE
J - OBSERVED NUMBER
K - NUMBER OF POSITION OF FLIGHT DEFINITION IN TABLE ITPRAC
      IN LABELED COMMON BLOCK /TRAFIK/
MDET - LOGICAL FLAG, TRUE PRODUCES DIAGNOSTIC PRINTOUT
MTHAC - TABLE OF A/C TYPES FOR THIS
MTHN - NUMBER OF ASDS2 (DOSE) THRESHOLDS
MTHS - NUMBER OF OBSERVERS
MPS - NUMBER OF PROFILE SEGMENTS
MPPGS - NUMBER OF SEGMENTS IN THE PERFORMANCE PROFILE
MTH - NUMBER OF THRESHOLD VALUES
OPS - WEIGHTED NUMBER OF OPERATIONS FOR EACH FLIGHT FOR ALL METRICS

```

```

C      PR -
C      SLP - SLANT RANGE
C      SCMPNO - MAXIMUM DISTANCE FROM AIR
C      SCMENC - MAXIMUM DISTANCE FROM AIRCRAFT ABOVE WHICH FURTHER COMPUTATIONS
C              WILL NOT BE PERFORMED
C      TH2 - USER'S ASDS2 THRESHOLD
C      TH3 - USEPS
C      TH4 - USER ASDS2 (DOSE) THRESHOLDS
C      TI - SAME AS TOR
C      TORL - TAKEOFF OR LANDING FLAG, POS IS TAKEOFF, NEG LANDING, VALUE 1.
C      ASDS2 - FUNCTION SUBROUTINE
C      THE FUNCTION SUBROUTINE ASDS2 IS RESPONSIBLE FOR CONTROLLING THE
C      DETERMINATION OF THE ASDS EXPOSURE VALUE FOR A SPECIFICALLY DEFINED
C      FLIGHT INCLUDING ALL OPERATIONS FOR THE FLIGHT. THE SUBROUTINE
C      THISI IS CALLED TO DETERMINE THE EXPOSURE FOR A SINGLE OPERATIONS.
C      THE FUNCTION ASDS2 IS CALLED BY FUNCTION SUBROUTINES ACHOIS AND
C      EXPOSE AT THE ASDS2 ENTRY POINT. THE CALLING SEQUENCE FOR ASDS2 IS
C      AS FOLLOWS:
C      ASDS2 (ITAC, KY)
C      WHERE
C      ITAC - NOISE CURVE SET NUMBER CORRESPONDING TO THIS FLIGHT.
C      KY - THE NUMBER OF THE POSITION OF THE FLIGHT DEFINITION IN LABELED
C      COMMON BLOCK/TRAFFIC/. TABLE ITTRAC.
C      OTHER INPUT TO FUNCTION ASDS2 IS PROVIDED IN LABELED COMMON BLOCKS
C      /PROFVI/, /TRAFFIC/ AND /ASDS22/. THE FOLLOWING WILL DESCRIBE THE
C      RELEVANT INFORMATION IN THOSE BLOCKS.
C      COMMON BLOCK      TABLE      DESCRIPTION
C      /PROFVI/          ISPROF      PERFORMANCE PROFILE FOR THIS FLIGHT.
C                        NSFGS       NUMBER OF SEGMENTS IN THE PERFORMANCE
C                        "           PROFILE.
C                        TORL        INDICATES TAKEOFF OR LANDING OPERATION.
C                        "           A VALUE OF +1.0 INDICATES TAKEOFF, -1.0
C                        "           INDICATED LANDING.
C                        SLP         DISTANCE FROM THE ANALYSIS POINT TO THE
C                        "           AIRCRAFT AT THE POINT OF CLOSEST
C                        "           APPROACH.
C      /TRAFFIC/         CPS         CONTAINS THE WEIGHTED NUMBER OF
C                        "           OPERATIONS FOR EACH INDIVIDUALLY DEFINED
C                        "           FLIGHT FOR ALL METRICS. LEQ, ASDS AND
C                        "           DOSE HAVE THE SAME WEIGHTING SO THE
C                        "           OPERATIONS FOR THE CURRENT FLIGHT CAN BE
C                        "           FOUND AT CPS (KX,4).
C      COMMON BLOCK      TABLE      DESCRIPTION
C      /ASDS22/          TH2         USER DEFINED ASDS THRESHOLD
C                        NTH        NUMBER OF DOSE THRESHOLDS
C                        TH3         USER DEFINED DOSE THRESHOLDS
C                        TT         USER DEFINED DOSE TIMES
C      THERE ARE TWO NORMAL EXIT RETURNS FROM ASDS2 AND ONE EXIT
C      TERMINATION. THE TWO NORMAL EXIT RETURNS ARE AT LINES NUMBERED 88
C      AND 167 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE
C      167 IS USED WHEN THE VARIABLE SLP IS OF SUFFICIENT MAGNITUDE THAT
C      THISI NEED NOT BE CALLED AND THE VALUE OF ASDS FOR THIS FLIGHT IS
C      IDENTICALLY ZERO. THE EXIT AT LINE 96 (STATEMENT NUMBER 30)
C      TERMINATES ALL FURTHER EXECUTION AFTER AN ERROR CONDITION HAS BEEN
C      ENCOUNTERED IN THE SUBROUTINE THISI. THIS EXIT IS COMMON TO BOTH
C      THE ASDS2 AND ASDS2 FUNCTIONS.
C      THE VALUE OF ASDS FOR THIS FLIGHT IS RETURNED FOR THE USER DEFINED
C      THRESHOLD THROUGH THE FUNCTION NAME. THE VALUES OF ASDS FOR A
C      THRESHOLD LESS THAN THE USER DEFINED THRESHOLD AS WELL AS THE USER
C      DEFINED THRESHOLD ARE SUMMED CUMULATIVELY IN THE FIRST TWO LOCATIONS
C      OF TABLE ASDS IN LABELED COMMON BLOCK/GRDBK/. THE RESULTS ARE

```

```

C RETURNED IN TERMS OF MINUTES ABOVE THRESHOLD.
C THE PROCESSING PERFORMED BY ASDS2 CONSISTS OF INITIALIZING VARIABLES
C FOR THE CALL TO TINI1 AND CONVERTING THE RESULTS OF THE COMPUTATION
C PERFORMED BY TINI1 TO MINUTES FROM SECONDS. THE FOLLOWING ARE THE
C VARIABLES INITIALIZED AND THEIR VALUES.
C VARIABLE      VALUE/DEFINITION
C NTH           NUMBER OF THRESHOLD VALUES = 2
C ALTH (1)      USER DEFINED THRESHOLD MINUS 5 DB
C ALTH (2)      USER DEFINED THRESHOLD
C ASPROF        AIRCRAFT PERFORMANCE PROFILE
C NPS          NUMBER OF PROFILE SEGMENTS
C VARIABLE      VALUE/DEFINITION
C TL*           SAME AS TOLT (SEE COMMON BLOCK DESCRIPTIONS)
C               COMPUTATIONS WILL NOT BE PERFORMED.
C SOMETH*       MAXIMUM DISTANCE FROM AIRCRAFT ABOVE WHICH FURTHER
C DMINT*        MINIMUM TIME STEP CALCULATED MAX. OF (1, 2.) WHERE A=
C               1+ (SL2-1000)/10000 "IN. OF (ABOVE RESULT, 10. ,
C               DMINT/2
C SIN*         INITIAL TIME STEP = SMINT
C ITACT*        AIRCRAFT TYPE FOR TINI1 RETRIEVED AS KTCHAC (ITAC),
C               A LOCAL VARIABLE.
C
C *INITIALIZED POINTWISE FOR ASDS2 AND ASDS3 CALLS.
C ASDS2 - FUNCTION SUBROUTINE (ENTRY IN ASDS2)
C THE FUNCTION SUBROUTINE ASDS3 IS AN ALTERNATE ENTRY POINT IN THE
C FUNCTION SUBROUTINE ASDS2 AND COMPUTES THE DOSE EXPOSURE VALUE FOR
C ONE FLIGHT. SUBROUTINE TINI1 IS CALLED TO DETERMINE THE TIME ABOVE
C THRESHOLDS AND ASDS2 CONVERTS THESE TO DOSE BY THE FOLLOWING:
C  $DOSE(I) = T(2) * (T(1)/D(1) + T(2)/D(2) + 000 + T(M)/D(M)) * 100$ 
C WHERE
C M = NUMBER OF OPERATIONS IN FLIGHT I
C T1 = USER-DEFINED TIME ABOVE THRESHOLD 1 IN MINUTES
C T2 = COMPUTED TIME ABOVE THRESHOLD 2 IN MINUTES
C DOSE I = EXPOSURE CONTRIBUTION OF FLIGHT I IN PERCENT
C ASDS2 IS CALLED BY THE SAME SUBROUTINE AS ASDS2.
C THE CALLING SEQUENCE FOR ASDS3 IS:
C ASDS3 (ITAC, KX)
C WHERE THE ARGUMENTS ITAC AND KX ARE AS DEFINED FOR ASDS2. THE INPUT
C VARIABLES ARE, LIKEWISE, AS DEFINED FOR ASDS2.
C ASDS2 HAS ONE EXIT RETURN AND ONE EXIT TERMINATION IN COMMON WITH
C ASDS3 AT LINES NUMBERED 157 AND 26, RESPECTIVELY IN THE LISTING, AND
C THEY ARE BOTH USED FOR THE SAME REASONS AS DESCRIBED FOR ASDS2.
C THERE IS AN ADDITIONAL EXIT RETURN FOR ASDS3 AT LINE NUMBER 152.
C THIS RETURN IS USED AFTER A SUCCESSFUL CALL TO TINI1.
C THE DOSE VALUE FOR THE CURRENT FLIGHT IS RETURNED TO THE CALLING
C PROGRAM VIA THE FUNCTION NAME. THE CUMULATIVE SUM FOR ALL FLIGHTS
C IS RETURNED AS THE FIRST VALUE OF ASPANS.
C IN ADDITION TO THE COMPUTATION OF THE DOSE VALUE, SEVERAL VARIABLES
C ARE INITIALIZED, SOME OF WHICH HAVE BEEN DESCRIBED IN THE ASDS2
C DISCUSSION, SUBSEQUENT TO EACH CALL TO ASDS3. THOSE WHICH DIFFER
C FROM THE ONES DESCRIBED EARLIER ARE:
C VARIABLE      VALUE/DEFINITION
C NTH           NUMBER OF THRESHOLDS=N2TH
C ALTH          USER DEFINED DOSE THRESHOLDS

```

Function ASDS2G

FUNCTION ASDS2G (ITAC,KX)

LOCAL VARIABLE DICTIONARY

1 - 725 BY SECONDS

AS2M - DISTANCE FROM RUNWAY THRESHOLD TO START OF A/C TRACKING
ALONG GROUNDED TRACK

AS2MX - DISTANCE FROM RUNWAY THRESHOLD TO END OF A/C TRACKING
ALONG GROUNDED TRACK

AS2M - SEE AS2M

AS2MX - SEE AS2MX

ASDS2G - ASDS EXPOSURES FOR GRID OUTPUT

ASDS2I - TIME ABOVE SIX THRESHOLDS FOR THREE DEFINED TIME PERIODS

ASDS2G - CUMULATIVE SUMMATION OF THE ASDS2I VALUES

ASDS2G - TIMES ABOVE THRESHOLD VALUES IN SECONDS

ASDPF - PERFORMANCE PROFILE FOR THIS FLIGHT

B - DIFFERENCE BETWEEN EVENING AND NIGHT OPS PER SECONDS

C - DIFFERENCE BETWEEN EVENING AND NIGHT OPS TIME UNITS ARE SECONDS

C - DIFFERENCE BETWEEN DAY AND EV

C - DIFFERENCE BETWEEN DAY AND NIGHT (NOT EVENING) OPERATIONS, AGAIN
TIME UNITS ARE SECONDS

CONCFM - TABLE OF CUTOFF DISTANCES FOR NOISE CONTRIBUTION

CTRESH - TABLE OF VALUES $\leq$ OR LESS THAN THE DEFAULT THRESHOLDS

C - B ASDS VALUES INCREMENTAL BY FLIGHT SEGMENT

C - USER DEFINED DOSE TIME UNITS

DMINT - INITIAL TIME STEP EQUALS DMINT

DMAXT - MAXIMUM ACCEPTABLE TIME STEP

E - HANA

ERR - ERROR RETURN

ITAC - NOISE CURVE SET NUMBER FOR A/C FOR FLIGHT

ITACTP - A/C TYPE FOR THIS RETRIEVED AS MACHAC(ITAC),LOCAL VAR

IVX - ASSIGNED LABEL

KX - POS OF DEFN OF THIS FLIGHT IN TABLE ITPRAC

LOGIT - LOGICAL FLAG, TRUE MEANS PRODUCE DIAGNOSTIC OUTPUT

MACHAC - TABLE OF A/C TYPES FOR THIS

MTH - NUMBER OF THRESHOLDS

NPS - NUMBER OF PROFILE SEGMENTS

TC - SAME AS TORI

TORI - INDICATES TAKEOFF OR LANDING, AS PLUS OR MINUS ONE

ASDS2G - FUNCTION SUBROUTINE

THE FUNCTION SUBROUTINE ASDS2G IS RESPONSIBLE FOR CONTROLLING THE
DETERMINATION OF THE ASDS EXPOSURE VALUES FOR A SPECIFICALLY DEFINED

FLIGHT, INCLUDING ALL OPERATIONS FOR THE FLIGHT.

ASDS2G CALLS THE SUBROUTINE THISI.

THERE ARE TWO ENTRY POINTS TO ASDS2G AT THE NAMES ASDS2G AND ASDS3G.

THE CALLING SEQUENCE FOR ASDS2G IS:

ASDS2G(ITAC,KX)

WHERE

ITAC - THE NOISE CURVE SET NUMBER ASSIGNED TO THE AIRCRAFT FOR THIS
FLIGHT.

KX - THE POSITION OF THE DEFINITION OF THIS FLIGHT IN THE TABLE

ITPRAC (THE FLIGHT DEFINITION TABLE).

EXPOS2G IS THE ONLY SUBROUTINE TO CALL ASDS2G.

THE INPUT TO ASDS2G, WITH THE EXCEPTION OF THE VARIABLE TH2, IS THE
SAME AS FOR ASDS2 WITH THE ADDITIONAL INPUT FROM LABELED COMMON

C BLOCK/GRD2RK/ HAVING THE VARIABLE ASDS2T WHICH CONTAINS THE SIX
 C POISE LEVEL THRESHOLDS FOR WHICH THE TIME ABOVE IS TO BE COMPUTED.
 C THERE ARE TWO EXIT RETURNS AND ONE EXIT TERMINATION FROM ASDS2G,
 C LOCATED AT LINES NUMBERED 87, 97 AND 101 IN THE SUBROUTINE LISTING
 C IN SECTION 5. THE RETURN AT LINE 87 IS A NORMAL RETURN AFTER
 C COMPUTATIONS HAVE BEEN COMPLETED. THE EXIT AT LINE 87 CAUSES
 C IMMEDIATE TERMINATION OF EXECUTION AND IS USED IF ERROR ARE ENCOUNTERED
 C IN THIS. THE RETURN AT LINE 101 IS A NORMAL RETURN AND IS
 C USED WHEN ASDS2G DETERMINES THAT THE LOWEST THRESHOLD WILL NEVER BE
 C EXCEEDED BY THE FLIGHT IN QUESTION AT THE POINT BEING ANALYZED AND
 C ALL INDIVIDUAL TIMES ARE SET TO ZERO. NOTE THAT THE RETURNS AT
 C LINES 87 AND 101 ARE COMMON TO BOTH ASDS2G AND ASDS3G.
 C THE OUTPUT FROM ASDS2G IS PASSED TO THE CALLING THROUGH THE FUNCTION
 C NAME AND LABELED COMMON BLOCK/GRD077/ WHOSE VARIABLES ARE DESCRIBED
 C AS FOLLOWS:
 C VARIABLE DESCRIPTION
 C ASDS2P CUMULATIVE SUMMATION OF THE TIME ABOVE SIX THRESHOLDS FOR
 C THREE DEFINED TIME PERIODS, UP TO AND INCLUDING THIS
 C FLIGHT.
 C ASDS2T THE TIME ABOVE SIX THRESHOLDS FOR THREE DEFINED TIME
 C PERIODS, FOR THIS FLIGHT ONLY.
 C OTHERS VALUES FOR THE OTHER FIVE METRICS-VEF,LDN,CNEI,LEQ, AND
 C DOGE-IN THAT ORDER.
 C THE THREE TIME PERIODS MENTIONED IN THE ABOVE DEFINITIONS CORRESPOND
 C TO THE FOLLOWING HOURS IN A CALENDAR DAY:
 C DAY - 0000 TO 2400
 C EVENING - 1200 TO 2200
 C NIGHT - 0000 TO 0700 AND 2200 TO 2400
 C THE PROCESSING PERFORMED BY ASDS2G, OTHER THAN INITIALIZING
 C VARIABLES, CONSISTS OF COMPUTING THE TIMES ABOVE THE SIX THRESHOLDS
 C FOR THE ABOVE TIME PERIODS FOR ALL THE OPERATIONS DEFINED FOR THIS
 C FLIGHT, GIVEN THE TIMES ABOVE FOR ONE SUCH FLIGHT. ADDITIONALLY,
 C THE TIMES ABOVE THE THRESHOLDS MUST BE CONVERTED FROM SECONDS TO
 C MINUTES.

Subroutine ASD2TH

SUBROUTINE ASD2TH (I70)

C LOCAL VARIABLE DICTIONARY
 C D3 - THRESHOLD TOLERANCES (ACCEPTABLE CONTOUR VARIATION)
 C I - LOOP COUNTER
 C ICMT - USER TITLE
 C IGC - ERROR FLAG
 C J - LOOP COUNTER
 C NPTH - NUMBER OF THRESHOLD VALUES
 C TH - FIRST USER SPECIFIED THRESHOLD
 C THR - USER SPECIFIED THRESHOLDS (2 - 20)
 C *****
 C ASD2TH - SUBROUTINE
 C ASD2TH READS THE ASDS THRESHOLD VALUE FROM THE INPUT DATA.
 C NO EXTERNAL SUBROUTINES ARE USED BY ASD2TH.
 C THE SUBROUTINE ASD2TH HAS FOUR ENTRY POINTS, ASD2TH, ASD3TH, ASDANC
 C AND ASDCCF. ALL HAVE THE SAME CALLING SEQUENCE AS FOLLOWS:
 C CALL ASDXXX(*)
 C WHERE

C * - MEMORY LOCATION FOR ERROR RETURN.
 C VXX - 2TH, 3TH, 4TH OR CON AS REQUIRED FOR DESIRED ENTRY.
 C NOTE THAT THE ENTRIES ASDANC AND ASDCON ARE NOT USED AT THIS TIME
 C BUT ARE INCLUDED FOR LATER UPGRADING OF THE PROGRAM. CALLS USING
 C THESE ENTRY POINTS WILL CAUSE AN IMMEDIATE ERROR RETURN WHICH WILL
 C TERMINATE EXECUTION.
 C THE ENTRY ASD2TH IS NORMALLY CALLED ONLY ONCE PER RUN BUT AT THE
 C PSPPS DISCRETION MAY BE CALLED MORE THAN ONCE, BUT ONLY THE
 C THRESHOLD READ DURING THE FINAL CALL WILL BE USED.
 C ASD2TH HAS 2 EXIT RETURNS AT LINES NUMBERED 9 AND 11 IN THE
 C SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE NUMBER 9 IS AN
 C ERROR RETURN AND IS USED IF THE USER DEFINED ASDS THRESHOLD IS LESS
 C THAN 64 DB OR GREATER THAN 115 DB. EXECUTION WILL BE TERMINATED IF
 C THIS RETURN IS USED. THE NORMAL RETURN IS AT LINE 11 AND IS USED
 C IF THE RETURN AT LINE 9 IS NOT USED.
 C THE VARIABLE TH? IN LABELED COMMON BLOCK/ASDS23/IS SET EQUAL TO THE
 C USER DEFINED THRESHOLD VALUE.
 C THE ASD3TH ENTRY IS CALLED ONLY BY SUBROUTINE READIN DURING THE
 C INPUT PHASE. NORMALLY, ASD3TH IS CALLED ONLY ONCE SINCE ONLY THE
 C LAST OF MULTIPLE CALLS WOULD BE EFFECTIVE.
 C ASD3TH HAS FOUR EXIT RETURNS AT LINES NUMBERED 19, 25, 26 AND 28.
 C THE RETURN AT LINE 19 IS AN ERROR RETURN AND IS USED IF THE NUMBER
 C OF THRESHOLDS REQUESTED BY THE USER IS NOT BETWEEN THE NUMBERS 0 AND
 C 20. THE RETURN AT LINE 25 IS AN ERROR RETURN AND IS USED IF ANY OF
 C THE INPUT THRESHOLDS IS LESS THAN 64 OR GREATER THAN 115 DB. THE
 C RETURN AT LINE 26 IS AN ERROR RETURN AND IS USED IF ANY OF THE USER
 C DEFINED TIME ABOVE THRESHOLD IS LESS THAN OR EQUAL TO ZERO MINUTES.
 C ALL ERROR RETURNS WILL RESULT IN EXECUTION TERMINATION. THE NORMAL
 C RETURN IS AT LINE 28.
 C ASD3TH READS ITS DATA FROM THE INPUT DATA CARDS AND INITIALIZES THE
 C VARIABLES N3TH, TH3 AND D3 IN LABELED COMMON BLOCK/ASDS23/.
 C

Subroutine ATA

C SUBROUTINE ATA(PPRF,I,K)	03-08-79
C	03-08-79
C SUBROUTINE ATA HANDLES THE SIMULATION OF THE ATA TAKEOFF PROCEDURE.	03-08-79
C THIS IS ACCOMPLISHED BY THE TRANSPOSITION OF THE ACCELERATION SEGMENT	03-08-79
C FROM INITIALIZATION AT 3000 FT. AGL TO INITIALIZATION AT 1000 FT. AGL.	03-08-79
C ONLY THE SET OF COMMERCIAL JETS ARE IMPACTED BY THE OPERATION OF THIS	03-08-79
C SUBROUTINE. THE PROGRAMMER WAS THOMAS I. CONTOP, APR-110, JANUARY,	03-08-79
C 1979.	03-08-79
C VARIABLES:	03-08-79
C PPRF=ARRAY CONTAINING THE PARAMETERS OF A TAKEOFF PROFILE;	03-08-79
C GROUND DISTANCE, ALTITUDE, THRUST AND SPEED.	03-08-79
C I=PROFILE NUMBER	03-08-79
C K=AIROCRRAFT TYPE NUMBER	03-08-79
C ACCSPD=ARRAY CONTAINING THE ZERO FLAPS SPEED	03-08-79
C VZP=ZERO FLAPS SPEED	03-08-79
C ACCDST=TOTAL LENGTH OF ACCELERATION SEGMENT	03-08-79
C ACCALT=CHANGE IN ALTITUDE IN ACCELERATION SEGMENT	03-08-79
C PCIMB=FINAL CLIMB GRADIENT	03-08-79
C FTHRST=FINAL CLIMBOUT THRUST	03-08-79
C	03-08-79

Function ATTENG

FUNCTION ATTENG (X,Z,ITAC,PWR,V)

```

C      COMPUTES GROUND ATTENUATION PER SAE AIR923 ) SIMPLIFIED(
C
C      ALSO COMPUTES ENGINE SHIELDING AND VELOCITY CORRECTIONS.
C      LOCAL VARIABLE DICTIONARY
C      1 - ELEVATION ANGLE, DIFFERENT ATLAS
C      ATTENG - SUM OF VELOCITY SHIELDING AND GROUND ATTENUATION CORRECTIONS
C              (RETURNED)
C      BETA - ELEVATION ANGLE
C      BY - INTERPOLATION POINT (SLANT RANGE) IN TABLE OF GROUND ATTENUATION
C      GNDATH - ATTENUATION AT GIVEN POINT ) INTERPOLATED(
C      GNDTA - TABLE OF GROUND ATTENUATIONS (BY ASCENDING VALUES OF SLRNG)
C      I - INDEX OF LARGEST VALUE IN GNDTA LESS THAN GNDATH
C      ITAC - AIRCRAFT TYPE
C      M - NUMBER OF POINTS IN TABLE OF ATTENUATIONS
C      PWR - POWER SETTING
C      SLRNG - TABLE OF SLANT RANGES (ASCENDING ORDER)
C      V - VELOCITY
C      X - HORIZONTAL DISTANCE TO FLIGHT GROUND TRACK.
C      Z - AIRCRAFT HEIGHT ABOVE RUNWAY
C      ATTENG - FUNCTION SUBROUTINE
C      FUNCTION ATTENG COMPUTES THE VELOCITY CORRECTION, ENGINE SHIELDING
C      CORRECTION, AND EXCESS GROUND ATTENUATION CORRECTION FOR THE SINGLE
C      EVENT NOISE COMPUTATIONS ASSOCIATED WITH THE REF, LDN, CMEL, AND LEQ
C      METRICS.
C      ATTENG USES THE FUNCTION SUBROUTINE GENFN1 FOR INTERPOLATION PURPOSES.
C      THE SUBROUTINE ATTENG HAS ONLY ONE ENTRY POINT AND THE CALLING
C      SEQUENCE IS:
C      ATTENG (X, Z, ITAC, PWR, V)
C      WHERE
C      X - HORIZONTAL DISTANCE TO THE FLIGHTS GROUND TRACK
C      Z - AIRCRAFT HEIGHT ABOVE RUNWAY LEVEL
C      ITAC - NOISE CURVE NUMBER ASSOCIATED WITH THE AIRCRAFT FOR THIS
C      FLIGHT
C      PWR - AIRCRAFT THROUST SETTING IN POUNDS PER ENGINE
C      V - AIRCRAFT VELOCITY IN KNOTS
C      EXPOSED IN THE ONLY SUBROUTINE THAT CALLS ATTENG.
C      ATTENG RECEIVES ITS INPUT DATA FROM THE CALLING ARGUMENTS AS WELL AS
C      TABLES SLRNG AND GNDTA IN LABELED COMMON BLOCK/NOISE/.
C      ATTENG HAS FOUR EXIT RETURNS AT LINES NUMBERED 17, 23, 28 AND 30 IN
C      THE SUBROUTINE LISTING IN SECTION 2. THE RETURN AT LINE 17 IS USED
C      IF THE SHIELDING AND GROUND ATTENUATION CORRECTION VALUES NEED NOT
C      BE COMPUTED DUE TO THE PROXIMITY OF THE ANALYSIS POINT TO THE GROUND
C      TRACK (I.E., THE AIRCRAFT IS DIRECTLY OVERHEAD). THE RETURN AT LINE
C      23 IS USED IF THE ELEVATION ANGLE AT THE OBSERVER POINT BETWEEN THE
C      GROUND PLANE AND THE AIRCRAFT IS GREATER THAN 10 (0.17453 RADIAN).
C      THE RETURN AT LINE 28 IS USED IF THE COMPUTED VALUE FOR GROUND
C      ATTENUATION IS LESS THAN OR EQUAL TO ZERO. THE RETURN AT LINE 30
C      IS USED IF NONE OF THE OTHERS ARE USED.
C      ATTENG COMPUTES THE VELOCITY SHIELDING AND GROUND ATTENUATION
C      CORRECTION VALUES FOR A GIVEN FLIGHT AND RETURNS THE RESULT AS THE
C      SUM OF THEM ALL VIA THE FUNCTION NAME.

```

Subroutine BDATA

```

SUBROUTINE BDATA(DUM)
BLOCK DATA
*****
      MASK CONTAINS BINARY MASKING CONSTANTS USED FOR GENERATING
      MASKING SCHEME FOR VARIABLE "ITPRAC" IN VERSION 2:
      BITS 0 - 5   APPROACH PARAMETER I.D. (ORDINAL)
      BITS 6 - 10  NOISE CURVE I.D. (ORDINAL)
      BITS 11 - 15  PROFILE I.D. (ORDINAL)
      BITS 16 - 25  TRACK NUMBER
      BITS 26 - 30  TRACK GROUP NUMBER
      MASK(18) - MASK(22) ARE USED TO EXTRACT THIS INFORMATION

```

TEMP
 TEMP
 03-30-79
 03-30-79
 03-30-79
 03-30-79
 03-30-79
 03-30-79
 03-30-79
 03-30-79
 03-30-79
 03-30-79

Subroutine CHEKTHR

```

SUBROUTINE CHEKTHR(IGO)
C THIS SUBROUTINE COMPARES SAMPLE THRUST SETTINGS SPECIFIED IN THE DATA
C BASE AND BY THE USER FOR COMPATIBILITY. THESE SETTINGS ARE FOUND IN
C THE MAXIMUM AND MINIMUM NOISE CURVE THRUST SPECIFICATIONS-
C ARRAY "THRS", IN THE APPROACH PARAMETER DATA- ARRAY "APPTH", AND
C IN THE STORED TAKEOFF PROFILES- ARRAY "PROP".
C A FATAL ERROR MESSAGE IS ISSUED IF THE FOLLOWING INEQUALITIES ARE
C VIOLATED:
C   USE CRV MIN -20 PERC. (LT) APP. THRST. -3 (LT) USE CRV MAX
C   USE CRV MIN (LT) T.O. THRUSTS (LT) USE CRV MAX + 20 PERC.
C AND IF AN AIRCRAFT IS DEFINED WITH A CONFLICTING NO.
C OF ENGINES

```

03-20-79
 03-05-79
 03-05-79
 02-05-79
 03-05-79
 03-05-79
 03-20-79
 03-05-79
 03-20-79
 03-05-79
 03-05-79
 03-05-79
 03-25-79
 03-25-79

Subroutine CKBETW

```

SUBROUTINE CKBETW (A,VA1,E,VB,LL,VH1,VH2,NPTS)
*****
LOCAL VARIABLE DICTIONARY
A - EXPOSURE AT V11
B - EXPOSURE AT V5
C - SCRATCH VARIABLE USED FOR EXPOSURE DIFFERENCES, RATIOS, ETC
DELS - MAXIMUM STEPSIZE BETWEEN POINTS
E - WORKING EXPOSURE
F - WORKING EXPOSURE
G - WORKING EXPOSURE
H - RETURN VARIABLE FOR STATUS OF CANDIDATE POINT, NONZERO I NO GOOD
NPTS - NUMBER OF POINTS IN CONTOUR
PZ CANDIDATE CONTOUR POINT
TOL - CONTOUR TOLERANCE
TOL2 - CONTOUR TOLERANCE , NEVER CLOBBED
TOLLOP - PROXIMITY TO CONTOUR FACTOR FOR LOOP CHECK COMPUTATION
VA1 - VECTOR ORIGIN TO FIRST OF BRACKETING POINTS
VA2 - CONTOUR VALUE

```

```

C      VB - VECTOR ORIGIN TO SECOND OF BRACKETING POINTS
C      VE - WORKING VECTOR
C      VG - WORKING VECTOR
C      VMAX - MAXIMUM ACCEPTABLE EXPOSURE VALUE (CONTOUR LEVEL PLUS TOL)
C      VMIN - MINIMUM ACCEPTABLE EXPOSURE VALUE (CONTOUR LEVEL MINUS TOL)
C      VST - RESULTANT OF VE MINUS VG
C      VTEM - SCRATCH COPY OF VE
C      X - X COORDS OF PREVIOUSLY COMPUTED CONTOUR POINTS
C      Y - Y COORDS OF PREVIOUSLY COMPUTED CONTOUR POINTS

```

Subroutine CKLOOP

```

SUBROUTINE CKLOOP (RIN,X,EPIS,X,Y,DELS,TOL2,TOLCP)

```

```

C      *****
C      LOCAL VARIABLE DICTIONARY
C      DEFS - STEP SIZE
C      DLI - DISPLACEMENT ANGLE (TOLERABLE BETWEEN SUCCESSIVE POINTS)
C      I - LOOP COUNTER
C      J - YES, IT IS LOOPING
C      NPTS - TOTAL POINTS IN CONTOUR LESS LATEST THREE
C      NPTS - NUMBER OF POINTS IN CONTOUR
C      PD - NORMALIZED DOT PRODUCT OF RP,PR OR RP,RP
C      RP - AS RP, OPPOSITE DIRECTION
C      PRMAG - LENGTH OF RP (YES, THATS RP)
C      RIN - NEW (CURRENT) POINT
C      RP - DIFFERENCE VECTOR BETWEEN A GIVEN AND NEXT PREVIOUS POINTS
C      RP - DIFFERENCE VECTOR BETWEEN NEW AND A GIVEN POINTS
C      TOL2 - STEP DEVIATION TOLERANCE
C      TOLCP - STEP DEVIATION TOLERANCE
C      ROUTINE CHOOSES MINIMUM OF TOL2, TOLCP
C      X - CONTOUR COORDINATES
C      Y - CONTOUR COORDINATES
C      CKLOOP - SUBROUTINE
C      THE SUBROUTINE CKLOOP IS USED TO DETERMINE IF THE CONTOUR BEING
C      CALCULATED FOR ASDS OR DASE IS "LOOPING."
C      THE FUNCTION SUBROUTINES VTAG AND VDOT ARE USED BY CKLOOP.
C      SUBROUTINE CKLOOP HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
C      CALL CKLOOP (RIN, X, NPTS, X, Y, DELS, TOL2, TOLCP)
C      WHERE
C      RIN - A VARIABLE OF DIMENSION 2, THE FIRST TWO LOCATIONS OF WHICH
C      CONTAIN THE X- AND Y-COORDINATES, RESPECTIVELY, OF A CANDIDATE POINT
C      ON THE CONTOUR.
C      X - A RETURN VARIABLE INDICATING THE STATUS OF THE CANDIDATE POINT.
C      X=0, INDICATES POINT IS OK,
C      X=1, INDICATED POINT IS NOT OK.
C      NPTS - THE NUMBER OF THE CONTOUR POINTS THUS FAR GENERATED.
C      Y - THE X-COORDINATE FOR THE CONTOUR POINTS.
C      DEFS - THE MAXIMUM STEPSIZE BETWEEN POINTS.
C      TOL2 - THE CURRENT CONTOUR ERROR TOLERANCE.
C      TOLCP - PROXIMITY TO CONTOUR FACTOR FOR LOOP CHECK COMPUTATION.
C      WILL ONLY BE USED IF VALUE IS LESS THAN TOL2.
C      THE CKLOOP SUBROUTINE IS CALLED ONLY FROM THE SUBROUTINE NWAADS AND
C      WILL ONLY BE CALLED IF ASDS OR DASE CONTOURS ARE BEING COMPUTED. IT
C      WILL BE CALLED MANY TIME PER RUN.
C      THE INPUT TO CKLOOP IS PROVIDED ENTIRELY FROM THE CALLING ARGUMENTS.

```

C THERE ARE THREE EXIT RETURNS FROM CKLOOP AT LINES NUMBERED 5, 21 AND
 C 23 IN THE LISTING OF THE SUBROUTINE IN SECTION 5. THE RETURN AT LINE
 C 5 IS USED IF THE NUMBER OF POINTS GENERATED THUS FAR IS NOT
 C SUFFICIENT TO PERFORM THE LOOP CHECK. THE RETURN AT LINE 21 IS
 C USED IF THE POINT IN QUESTION IS TOO CLOSE TO A SECTION OF THE
 C CONTOUR WHICH HAS ALREADY BEEN COMPUTED (I.E., A LOOPING CONDITION
 C EXISTS).
 C THE PROCESSING PERFORMED BY CKLOOP CONSISTS OF DETERMINING HOW CLOSE
 C A CANDIDATE CONTOUR POINT IS TO THE PORTION OF CONTOUR ALREADY
 C COMPUTED. THE RESULT IS THEN COMPARED TO A CRITERION VALUE TO
 C DETERMINE IF THE PROGRAM COMPUTATIONS AND RESULTS ARE PROCEEDING IN
 C A LOGICAL MANNER. IN ITS SEARCH FOR THE "NEXT POINT" ON A CONTOUR,
 C IT IS POSSIBLE THAT THE PROGRAM COULD FIND ONE IN A REGION FOR WHICH
 C THE CONTOUR HAS ALREADY BEEN CALCULATED, PARTICULARLY IN REGIONS
 C WHERE THE BOUNDARIES OF THE CONTOUR ARE CLOSE TOGETHER. IF THIS
 C WERE ALLOWED TO HAPPEN, THE SUBSEQUENT POINTS ON THE CONTOUR WOULD
 C JUST RETRACE THE PATH ALREADY DESCRIBED BY PREVIOUS POINTS. THIS
 C KIND OF BEHAVIOR, IF LEFT UNCHECKED, COULD CONTINUE INDEFINITELY.
 C THUS THE PURPOSE OF CKLOOP IS TO CATCH THE PROCESS IN TIME FOR
 C CORRECTIVE ACTION TO BE TAKEN.

SUBROUTINE CLOCK

This subroutine is System Dependent and must be supplied by the
 user. Subroutine CLOCK Resets/Initializes the run time clock
 variable. It is called from the Contour Analysis Main Program and
 is used in conjunction with subroutine CLOCKT to compute each
 contour's run time.

SUBROUTINE CLOCKT (T1)

This subroutine is System Dependent and must be supplied by the
 user. Subroutine CLOCKT interrogates the system's run time clock
 and returns variable T1. Variable T1 contains the elapsed time
 since subroutine clock was called. These 2 routines provide a
 means of computing contour run time. Subroutine CLOCKT is also
 called from the contour Analysis Main Program.

Function CONF

```

FUNCTION CONF (A)

*****

A - RADIUS OF CURVATURE OF TURN

CONF - CORRECTION TO NOISE LEVEL CAUSED BY TRACK GEOMETRY

PI - CONSTANT EQUALS THREE SOMETHING
CONF - FUNCTION SUBROUTINE
CONF IS USED TO COMPUTE CORRECTIONS TO NOISE LEVELS CAUSED BY TRACK
GEOMETRY
CONF USES NO EXTERNAL SUBROUTINES.
CONF HAS ONLY ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
CONF (A)
WHERE
A - TURN ANGLE, IN RADIANS, OF A CIRCULAR SEGMENT IN A TRACK
DEFINITION.
ONLY THE SUBROUTINE CURVE USES THE FUNCTION CONF BUT MAY USE IT
MANY TIMES DURING EXECUTION.
THE INPUT DATA FOR CONF IS THE CALL ARGUMENT.
CONF HAS ONLY ONE EXIT RETURN.
THE VALUE COMPUTED BY CONF IS RETURNED VIA THE FUNCTION NAME.
THE PROCESSING PERFORMED BY CONF IS THE COMPUTATION OF THE MINIMUM
VALUE OF  $2.0$  OR  $6\pi/11$ .

```

Function CONTG

```

FUNCTION CONTG (DD,NT)

*****
LOCAL VARIABLE DICTIONARY
CONTG - CORRECTION TO NOISE LEVEL CAUSED BY TRACK GEOMETRY
DD - DISTANCE TO SEGMENT
DMIN - (INPUT DATA TABLE) CONTAINS THE VALUE OF THE SHORTEST
STRAIGHT SEGMENT OR ONE HALF THE SHORTEST TURN RADIUS,
WHICHEVER IS FASTER, FOR EACH TRACK (SIMILAR TO OLD
NEW CAR WARRANTIES...)
NT - TRACK NUMBER
R - EFFECTIVE RADIUS
CONTG - FUNCTION SUBROUTINE
CONTG IS USED TO COMPUTE CORRECTIONS TO NOISE LEVELS CAUSED BY TRACK
GEOMETRY.
CONTG USES NO EXTERNAL SUBROUTINES.
THERE IS ONLY ONE ENTRY TO CONTG AND THE CALLING SEQUENCE IS:
CONTG (D, NT)
WHERE
D - IS THE DIFFERENCE IN THE DISTANCES FROM AN ANALYSIS POINT TO THE
CLOSEST TRACK SEGMENT AND TO THE NEXT-TO-CLOSEST SEGMENT ON THE SAME
TRACK.
NT - TRACK NUMBER.
ONLY SUBROUTINE HBT USES CONTG BUT MAY USE IT MANY TIMES.
THE INPUT DATA FOR CONTG IS FROM THE CALL ARGUMENTS AND THE TABLE
DMIN IN LABELED COMMON BLOCK/TRACK/. THE TABLE DMIN CONTAINS THE
VALUE OF THE SHORTEST STRAIGHT SEGMENT OR ONE-HALF THE SHORTEST TURN

```

C RADIUS, WHICHEVER IS LEAST, FOR EACH TRACK.
 C CONTG HAS ONLY ONE EXIT RETURN.
 C THE VALUE COMPUTED BY CONTG IS RETURNED VIA THE FUNCTION NAME.
 C THE VALUE COMPUTED BY CONTG IS $(D/DMIN(MT))^{**2}$ AND FORMS A PART OF
 C A LARGER EQUATION BEING COMPUTED IN SUBROUTINE HBT.

Subroutine Curve

SUBROUTINE CURVE (IGO1,IGO,ROO,P,DD,TAU,DB,IE)

LOCAL VARIABLE DICTIONARY

R - RADIUS OF CURVATURE (AS $P/2$)

ALPHA - ANGLE AT ORIGIN BETWEEN TURN CENTER AND
POINT OF INTEREST

DB - NOISE LEVEL CORRECTION FOR POINTS INSIDE TURN

DD - DISTANCE TO SEGMENT OF INTEREST

IE - ERROR DISABLE FOR IGO

ANGLE TRAVERSED GREATER THAN TURN ANGLE (

IGO - ERROR FLAG) SEE IF (

IGO1 - FLAG, TURN ANGLE GREATER THAN 180 DEGREES

P - VECTOR

PT ANGLE (CONSTANT RADIANS)

ROO - COORDINATES OF CURRENT POINT

S - DIFFERENCE VECTOR BETWEEN P AND ROO

TAU - DISTANCE TRAVERSED ALONG TURN

TAU1 - ANGLE AT TURN CENTER BETWEEN START OF CURVE AND
POINT OF INTEREST

THETA - NUMBER OF RADIANS IN TURN

T - SIGN OF A) NEGATIVE FOR RIGHT HAND TURNS (

CURVE - SUBROUTINE

THE SUBROUTINE CURVE IS USED TO COMPUTE THE SHORTEST DISTANCE FROM A
SPECIFIED POINT TO A SPECIFIED CIRCULAR SEGMENT ON A GIVEN TRACK AND
TO COMPUTE THE CORRECTION TO THE NOISE LEVEL FOR THE CONDITION WHERE
THE POINT IS ON THE INSIDE OF A TURN.

THE SUBROUTINE CURVE USES THE FOLLOWING SUBROUTINES DURING EXECUTION

SGND - SIGN OF A REAL NUMBER

VSUB - VECTOR SUBTRACTION

VMAG - VECTOR MAGNITUDE

CONG - FUNCTION CALCULATION

CURVE HAS ONLY ONE ENTRY POINT AND IS CALLED BY ONLY ONE SUBROUTINE,
HBT, DURING EXECUTION BUT MAY BE CALLED MANY TIMES. THE FOLLOWING
IS THE CALLING SEQUENCE FOR THE SUBROUTINE CURVE:

CALL CURVE (*,*, DO, P, D, TAU, DB, IE)

WHERE

* - MEMORY ADDRESS FOR RETURN TO CALLING PROGRAM IF THE POINT IS NOT
IN THE RANGE OF THE SEGMENT.

* - MEMORY ADDRESS FOR RETURN TO CALLING PROGRAM WHEN THE POINT IS
IN THE RANGE OF THE SEGMENT AND THE TURN ANGLE IS GREATER THAN 180.

DO - VARIABLE OF DIMENSION 2, THE FIRST TWO POSITIONS OF WHICH
DEFINE THE X- AND Y-COORDINATES OF THE ANALYSIS POINT.

D - VARIABLE OF DIMENSION 5 OR MORE, THE FIRST FIVE POSITIONS OF
WHICH CORRESPOND TO THE FOLLOWING:

D(1) - X-COORDINATE OF THE CENTER OF THE CIRCULAR SEGMENT.

D(2) - Y-COORDINATE OF THE CENTER OF THE CIRCULAR SEGMENT.

D(3) - RADIUS OF CURVATURE OF THE SEGMENT. A POSITIVE VALUE

INDICATES A LEFT TURN AND A NEGATIVE VALUE INDICATES A RIGHT TURN.

D(4) - THE TURN ANGLE IN RADIANS.

D(5) - THE ANGLE, IN RADIANS, BETWEEN A LINE JOINING THE CENTER WITH

C THE START OF THE TURN AND THE POSITIVE X-AXIS. ANGLE RANGES FROM-PI
 C TO +PI.
 C D - THE DISTANCE TO THE SEGMENT FROM THE POINT WHICH IS COMPUTED BY
 C CURVE AND RETURNED TO THE CALLING PROGRAM.
 C TURN - THE DISTANCE, IN FEET, FROM THE BEGINNING OF THE TURN TO THE
 C POINT ON THE SEGMENT THAT MOST CLOSELY APPROACHES PO; COMPUTED BY
 C CURVE AND RETURNED TO THE CALLING PROGRAM.
 C RC - A NOISE CORRECTION VALUE COMPUTED BY CURVE WHEN PO IS ON THE
 C INSIDE OF A TURN.
 C IE - AN INDICATOR TO CURVE SENT BY THE CALLING PROGRAM. A NONZERO
 C VALUE INDICATES THAT THE POINT IS THE SEGMENT RANGE. OTHERWISE
 C CURVE MUST DETERMINE THIS ON ITS OWN.

 C ALL OF THE INPUT DATA FOR CURVE COMES FROM THE CALLING ARGUMENTS
 C WITH THE EXCEPTION OF THE CONSTANT FOR PI WHICH IS THE VARIABLE PI
 C IN LABELED COMMON BLOCK/CONST/.
 C THERE ARE THREE EXIT RETURNS FROM CURVE AT LINES NUMBERED 22, 37 AND
 C 39 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 22 IS
 C USED IF CURVE DETERMINES THAT THE POINT PO IS NOT IN THE SEGMENT
 C RANGE. THE RETURN AT LINE 37 IS TAKEN IF THE POINT IS IN THE RANGE
 C AND THE TURN ANGLE IS GREATER THAN 180 (PI RADIANS). THE RETURN AT
 C LINE 39 IS THE NORMAL RETURN IF THE TURN ANGLE IS LESS THAN OR EQUAL
 C TO 90 AND THE POINT IS IN THE RANGE OF THE SEGMENT.
 C DATA IS RETURNED TO THE CALLING PROGRAM THROUGH THE CALLING
 C ARGUMENTS ONLY, AS PREVIOUSLY DISCUSSED IN THE DESCRIPTION OF THE
 C CALLING ARGUMENTS.
 C THE PROCESSING PERFORMED BY CURVE CONSISTS, FIRST OF ALL, OF
 C COMPUTING THE MINIMUM DISTANCE FROM A POINT TO A CIRCULAR SEGMENT ON
 C A GROUND TRACK.
 C SECONDLY, CURVE MUST COMPUTE THE NOISE CORRECTION VALUE IF THE POINT
 C PO IS ON THE INSIDE OF THE TURN. TO DETERMINE IF PO IS ON THE
 C INSIDE OF THE TURN, THE DISTANCE BETWEEN THE POINT AND THE CENTER OF
 C THE TURN IS COMPUTED AND THE RADIUS IS SUBTRACTED. IF THE RESULT IS
 C NEGATIVE, PO IS ON THE INSIDE OF THE TURN, OTHERWISE IT IS NOT.
 C FINALLY, THE DISTANCE FROM THE BEGINNING OF THE TURN TO THE POINT OF
 C THE SEGMENTS CLOSEST APPROACH TO PO MUST BE COMPUTED. THIS IS DONE
 C SIMPLY BY MULTIPLYING THE RADIUS OF THE SEGMENT TIMES THE ANGULAR
 C DISPLACEMENT OF THE POINT

Subroutine Date (DATER)

Subroutine Date is a System Dependent Routine and must be supplied
 by the user. This subroutine returns variable DATER which contains
 the current date. Subroutine Date is called Primarily by the
 contour and Grid Analysis Main Programs for generating Report
 Headers.

Function DELTA

FUNCTION DELTA (A)

```

C *****
C
C LOCAL VARIABLE DICTIONARY
C A - PRESSURE ALTITUDE CORRECTION
C
C DELTA - DELTA CORRECTION FOR UNCORRECTED THRUST VALUES
C Z - EFFECTIVE ALTITUDE
C DELTA - FUNCTION SUBROUTINE
C DELTA COMPUTES THE DELTA (A) CORRECTION FOR UNCORRECTED THRUST
C VALUES.
C THE FUNCTION DELTA USES NO EXTERNAL SUBROUTINES.
C DELTA HAS ONLY ONE ENTRY POINT AND THE CALLING SEQUENCE IS AS
C FOLLOWS:
C DELTA (A)
C WHERE
C A - Z DISTANCE ABOVE THE GROUND AND NOT NECESSARILY THE DISTANCE
C ABOVE MEAN SEA LEVEL.
C THE FOLLOWING SUBROUTINES USE THE FUNCTION DELTA:
C TPROP, PPROP, PROPA
C DELTA WILL BE USED MANY TIMES DURING EXECUTION.
C THERE IS ONLY ONE EXIT RETURN FROM DELTA.
C THE PROCESSING PERFORMED BY DELTA CONSISTS OF COMPUTING A FUNCTION
C CORRESPONDING TO THE DELTA CORRECTION TO JET ENGINE NET THRUST,
C SIMULATING THE EFFECT OF ALTITUDE PRESSURE DIFFERENTIALS.
C
C NOISE IS ASSUMED TO BE A FUNCTION OF CORRECTED NET THRUST.
C GIVEN: AIRPLANE HEIGHT (A IN FT), DELTA RETURNS A PRESS ALT CORR
C FOR EFFICIENCY A SECOND ORDER BINOMIAL APPROXIMATION IS MADE
C FOR THE EXPRESSION:
C
C  $DELTA = P/P_0$ 
C  $= C1. - (5.0406E-6) * A^{**5.2040}$ 

```

Function DGTR

FUNCTION DGTRD (DG)

```

C *****
C
C CONST - CONVERSION FACTOR DEGREES TO RADIANS
C DG - ANGLE IN DEGREES ) IN CASE YOU DIDN'T GUESS!
C DGTRD - ANGLE IN RADIANS
C DGTRD - FUNCTION SUBROUTINE
C DGTRD CONVERTS DEGREES TO RADIANS.
C THE FUNCTION DGTRD DOES NOT USE ANY EXTERNAL SUBROUTINES.
C DGTRD HAS ONE ENTRY POINT AND THE FOLLOWING IS THE CALLING SEQUENCE:
C DGTRD (DG)
C WHERE
C DG - AN ANGLE IN DEGREES
C THE SUBROUTINES TRAFRD, WINDRD AND NEWPNT USE THE FUNCTION DGTRD.
C THE INPUT TO DGTRD IS THROUGH THE CALLING ARGUMENT.
C DGTRD HAS ONLY ONE EXIT RETURN.
C THE ANGLE VALUE IN RADIANS IS RETURNED VIA THE SUBROUTINE NAME.
C THE PROCESSING PERFORMED BY DGTRD CONSISTS OF THE FOLLOWING FORMULA:
C DGTRD=A(0.017453)

```

Function EGA

```

FUNCTION EGA (VD,Q3,IGO)
C
C *****
C   LOCAL VARIABLE DICTIONARY
C   BETA - SINE OF ELEVATION ANGLE OF VD
C   EGA - GROUND ATTENUATION
C   FBETA - WEIGHTING FACTOR, REGULAR TO EXCESS ATTENUATION
C
C   GR - DISTANCE ALONG GROUND USED TO CALCULATE EGA
C   I - ARRAY ELEMENT ARG
C   IGO - ERROR FLAG
C   LGR - LOG OF R
C   Q3 - ELEVATION OF VD
C   R - LENGTH OF VD
C   VD - DIFFERENCE VECTOR (EXTERNALLY DETERMINED)
C   X - COORDINATE OF TEST STEPS ALONG GROUND TRACK
C   XY - ATTENUATION AND DISTANCE DATA (FUNCTION OF TAN BETA)
C   Y - COORDS OF TEST STEPS ALONG GROUND TRACK
C   YY - ATTENUATION AND DISTANCE DATA (FUNCTION OF COS BETA)
C   EGA - FUNCTION SUBROUTINE
C   EGA COMPUTES THE EXCESS GROUND ATTENUATION FOR THE COMPUTATION OF LA
C   USED IN ASDS AND DOSE COMPUTATIONS. THE FUNCTION EGA DOES NOT USE
C   EXTERNAL SUBROUTINES. EGA HAS ONE ENTRY POINT AND THE CALLING
C   SEQUENCE IS:
C   EGA (VD,Q3,*)
C   VD - A DIMENSION 3 OR MORE VARIABLE, THE FIRST THREE POSITIONS OF
C   WHICH DEFINE THE X-, Y- AND Z-COORDINATES OF A VECTOR POINTING FROM
C   THE AIRCRAFT TO THE ANALYSIS POINT.
C   Q3 - THE HEIGHT ABOVE THE GROUND OF THE ANALYSIS POINT.
C   * - MEMORY LOCATION FOR ERROR RETURN IF ANALYSIS POINT IS ABOVE THE
C   AIRCRAFT (I.E., VD(3)>0).
C   THE SUBROUTINE FINISI IS THE ONLY USER OF THE FUNCTION EGA. IT WILL
C   BE USED MANY TIMES PER RUN IF ASDS OR DOSE VALUES ARE CALCULATED.
C   OTHERWISE, IT WILL NOT BE USED AT ALL.
C   INPUT DATA RELATING ANALYSIS POINT AND AIRCRAFT POSITIONAL DATA ARE
C   PROVIDED BY THE CALLING ARGUMENTS. OTHERWISE, THE ATTENUATION AND
C   DISTANCE DATA ARE CONTAINED WITHIN EGA.
C   EGA HAS FOUR EXIT PICTURES LOCATED AT LINES NUMBERED 13, 14, 18 AND
C   22 OF THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 13 IS
C   USED IF THE ANALYSIS POINT IS ABOVE GROUND IFVEY (I.E., Q3>0). THE
C   RETURN AT LINE 14 IS AN ERROR RETURN AND IS USED IF THE AIRCRAFT IS
C   BELOW THE ANALYSIS POINT (I.E., VD(3)>0). THE RETURN AT LINE 18 IS
C   USED IF THE ELEVATION ANGLE IS GREATER THEN 10. THE RETURN AFTER
C   THE EXCESS GROUND ATTENUATION HAS BEEN COMPUTED.
C   THE GROUND ATTENUATION COMPUTED BY EGA IS RETURNED THROUGH THE
C   FUNCTION NAME. ERROR INFORMATION IS TRANSMITTED BY THE RETURN AT
C   LINE 14.
C   THE PROCESSING PERFORMED BY EGA IS THE COMPUTATION OF EXCESS GROUND
C   ATTENUATION FOR ANALYSIS POINT TO AIRCRAFT ELEVATION ANGLES UP TO 10

```

Subroutine EQUOPS

SUBROUTINE EQUOPS (OPS, EOOPS, WE, WW)

WE = EVENING WEIGHTING FACTOR

WW = NIGHT WEIGHTING FACTOR

Subroutine EXIT

This subroutine is available in most FORTRAN compilers. If not, the user must supply this routine. Subroutine EXIT returns control to the operating system and, therefore, terminates the execution of the program.

Function EXPOSE

FUNCTION EXPOSE (X, Y, Z, TEST)

LOCAL VARIABLE DEFINITIONS

AS - GROUND ATTENUATION, SECONDARY

ASDAYS - ASSESS TABLE

ASDNN/ASDNN - CLOSEST DISTANCE TO THRESHOLD EXAMINED

BY ASDS II/III PCA ANALYSIS.

ASDXX/ASDXX - FARTHEST DISTANCE TO THRESHOLD EXAMINED

BY ASDS II/III PCA ANALYSIS.

ASDAYS - ASSESS TABLE

ASDNN - SIMILAR TO ASDNN FOR ASDS?

ASDXX - SIMILAR TO ASDXX FOR ASDS?

AVALS - TABLE OF NOISE EXPOSURE VALUES AT A POINT

AVT - CUMULATIVE VALUE FOR PRIMARY METRIC.

AXET - CUMULATIVE VALUES FOR SECONDARY METRIC.

DA, DB - NOISE LEVEL CORRECTIONS

DA - NOISE VALUE CORRECTION FOR CLOSEST SEGMENT

DAT - DISTANCE ALONG THE TRACK FROM THRESHOLD TO THE TRACK'S POINT OF CLOSEST APPROACH. (RETURNED)

DATRK - DISTANCE ALONG PRIMARY SEGMENT

DCRM - TABLE OF DISTANCE CRITERIA

DS - DISTANCE TO SECONDARY TRACK FROM RO

DST - DISTANCE ALONG PRIMARY SEGMENT FROM END OF RUNWAY TO CLOSEST APPROACH

DT - DISTANCE TO SECONDARY SEGMENT

DTA - DISTANCE FROM POSITION TO TRACK AT THE TRACK'S POINT OF CLOSEST APPROACH. (RETURNED)

DTP - DISTANCE FROM SECOND CLOSEST SEG ON TRK TO ORG

AS - GROUND ATTENUATION, PRIMARY

C V - GROUND SPEED (RETURNED)
 C VV - A/C VELOCITY, EXTERNALLY DETERMINED
 C VO - COORDINATE POSITION
 C WPCTRS - ENERGY METRIC WEIGHTING FACTORS
 C X1V - VALUE FOR PRIMARY METRIC AT POINT OF CLOSEST APPROACH
 C X1V2 - VALUES FOR 2NDARY METRICS AT PCA.
 C X2V - VALUE FOR PRIMARY METRIC AT SECONDARY APPROACH
 C X2V2 - VALUES FOR 2NDARY METRICS AT 2NDARY APPR.
 C Z1V - TOTAL VALUE FOR PRIMARY METRIC FOR THIS FLIGHT
 C Z1V2 - TOTAL VALUES FOR 2NDARY METRICS FOR THIS FLIGHT
 C EXPOSE - FUNCTION SUBROUTINE
 C EXPOSE IS THE EXECUTIVE SUBROUTINE ASSIGNED TO COMPUTE THE NOISE
 C EXPOSURE AT A GIVEN POINT AS A RESULT OF ALL DEFINED AIRCRAFT
 C OPERATIONS. EXPOSE TALLIES CUMULATIVE SUMS OF INDIVIDUAL
 C CONTRIBUTIONS TO FINALLY ARRIVE AT A TOTAL. THE PRIMARY INTERNAL
 C FUNCTION OF EXPOSE IS TO DECIDE WHICH QUANTITIES NEED TO BE COMPUTED
 C AND THEN ACCESS THE PROPER SUBROUTINES WHICH PERFORM THE ACTUAL
 C COMPUTATIONS.
 C THE FUNCTION EXPOSE USES THE SUBROUTINES ACKOIS, ASDS2, ASDS3,
 C ATTENG, HBT, PREPP, SIFT, AND ZERO.
 C EXPOSE HAS ONLY ONE ENTRY AND THE CALLING SEQUENCE IS:
 C EXPOSE (RC, NTST)
 C WHERE
 C RC - A VARIABLE OF DIMENSION 3 OF MORE, THE FIRST TWO POSITIONS OF
 C WHICH DEFINE THE X- AND Y-COORDINATES OF THE ANALYSIS POINT.
 C NTST - INDICATES WHETHER TO USE ALL FLIGHTS OR ONLY "SIGNIFICANT"
 C FLIGHTS IN THE COMPUTATION OF THE NOISE LEVEL AT THE ANALYSIS POINT.
 C THE SUBROUTINES THAT USE EXPOSE ARE FIRST, GRADIE, NEWPNT AND NWSADS
 C IN ADDITION TO THE MAIN PROGRAM NOISE1. EXPOSE WILL NORMALLY BE
 C CALLED MANY TIMES DURING EXECUTION.
 C THE INPUT DATA FOR EXPOSE COMES FROM ITS OWN CALL ARGUMENTS AS WELL
 C AS SOME OF THE CALL ARGUMENTS OF THE SUBROUTINES IT USES. OTHER

C DATA IS PASSED VIA LABELED COMMON BLOCKS.
 C EXPOSE HAS FOUR EXIT RETURNS LOCATED AT LINES NUMBERED 519, 522, 524
 C AND 530 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE
 C 519 IS THE NORMAL RETURN USED WHEN THE COMPUTATION OF THE NOISE
 C VALUE AT A POINT IS COMPLETE. THE RETURN AT LINE 522 IS USED WHEN
 C THE COMPUTED NOISE VALUE FOR A FLIGHT IS EXCESSIVELY LARGE, USUALLY
 C WHEN THE AIRCRAFT IS EXTREMELY CLOSE TO THE ANALYSIS POINT, AND NO
 C DIAGNOSTIC PRINTOUT IS REQUESTED. THE RETURNS AT LINES 524 AND 530
 C ARE TAKEN UNDER THE SAME CIRCUMSTANCES WHEN A DIAGNOSTIC PRINTOUT IS
 C PROVIDED.
 C THE TOTAL NOISE EXPOSURE AT A POINT, FOR THE PRIMARY METRIC, IS
 C RETURNED THROUGH THE FUNCTION NAME. OTHERS, IF ANY, ARE RETURNED IN
 C TABLE AVALS IN LABELED COMMON BLOCK/METRIC/.
 C THE PROCESSING PERFORMED BY EXPOSE CONSISTS OF COMPUTING THE NOISE
 C EXPOSURE AT A POINT FOR ALL OR SELECTED DEFINED AIRCRAFT FLIGHTS.

Function EXPOSG

SUBROUTINE EXPOSG (P00,IER,NCTA)

03-02-79

C *****
 C LOCAL VARIABLE DICTIONARY
 C AT - GROUND ATTENUATION, SECONDARY

C FORWARD AND BACKWARD TIME HISTORIES
 C
 C NUMALT - ALTERNATE METRIC NUMBER
 C
 C NUMPR - PROFILE NUMBER
 C
 C OTHERS - RUNNING TOTAL OF ALTERNATE METRIC EXPOSURES
 C POINT - CURRENT POINT
 C PERFCT - WEIGHTING FACTORS, PRIMARY METRIC
 C PROF - PROFILE TABLE
 C PWPS - A/C THRUST SETTINGS (COMMON)
 C R00 - POSITION X-Y COORDINATE (SENT)
 C R1 - TABLE OF RUNWAY LENGTHS FOR EACH RUNWAY
 C RNL - RUNWAY LENGTH
 C
 C SPT TO ZERO EXCEPT FOR LANDINGS WHERE R0
 C IS BEYOND THE STOPPING POINT OF THE AIRCRAFT.
 C SLR - SLANT RANGE (DISTANCE FROM R00 TO THE AIRCRAFT)
 C TH - THRUST (RETURNED)
 C V - GROUND SPEED (RETURNED)
 C VO - COORDINATE POSITION
 C VV - A/C VELOCITY, EXTERNALLY DETERMINED
 C WGTFRS - ENERGY METRIC WEIGHTING FACTORS
 C XV - VALUE FOR PRIMARY METRIC AT POINT OF CLOSEST APPROACH
 C XLV2 - VALUES FOR 2NDARY METRICS AT PCA.
 C XVV - VALUE FOR PRIMARY METRIC AT SECONDARY APPROACH
 C XLV3 - VALUES FOR 2NDARY METRICS AT 2NDARY APPR.
 C XVV - TOTAL VALUE FOR PRIMARY METRIC FOR THIS FLIGHT
 C XLV3 - TOTAL VALUES FOR 2NDARY METRICS FOR THIS FLIGHT
 C
 C EXPCSG - SUBROUTINE
 C THE SUBROUTINE EXPCSG CONTROLS THE COMPUTATIONS OF THE NOISE
 C EXPOSURE VALUES AT A GIVEN POINT. EXPCSG PLAYS THE SAME ROLE FOR
 C THE GRID ANALYSIS MODEL AS THE FUNCTION EXPOSE DOES FOR THE CONTOUR
 C ANALYSIS MODEL.
 C EXPCSG CALLS THE SUBROUTINES VTRN, ZFRO, HBT, PREPR, ATTENG AND
 C ACONTS WHICH ARE ALL DESCRIBED IN SECTION 2. ASDS2G AND ASDS2G ARE
 C ALSO CALLED AND THEY ARE DESCRIBED EARLIER IN THIS SECTION.
 C EXPCSG HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
 C CALL EXPCSG (A,IEP)
 C WHERE:
 C A - A VARIABLE OF DIMENSION 2 OR MORE WHICH CONTAINS THE XY-
 C COORDINATES OF THE ANALYSIS POINT IN THE FIRST TWO POSITIONS.
 C IEP - OPTIONAL OUTPUT INDICATOR.
 C IF IEP=0, NO OUTPUT
 C IF IEP=1, OUTPUT DETAILED FLIGHT DATA.
 C EXPCSG IS CALLED BY THE MAIN PROGRAM GRIDPR AND WILL BE CALLED ONCE
 C PER GRID POINT TO BE PROCESSED.
 C THE INPUT TO EXPCSG IS THROUGH THE CALLING ARGUMENTS FROM THE
 C CALLING PROGRAM AS WELL AS THE CALLING ARGUMENTS TO THE SUBROUTINES
 C THAT EXPCSG CALLS. OTHER INPUT IS PASSED THROUGH LABELED COMMON
 C BLOCKS.
 C THERE ARE TWO EXIT RETURNS FROM EXPCSG, LOCATED AT LINES NUMBERED 80
 C AND 83 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE
 C 80 IS A NORMAL RETURN. THE RETURN AT LINE 83 IS AN ERROR RETURN
 C AND IS USED WHEN THE DISTANCE BETWEEN THE ANALYSIS POINT AND AN
 C AIRCRAFT IS VERY SMALL.
 C THE OUTPUT FROM EXPCSG CONSISTS OF THE VALUES FOR THE VARIABLES IN
 C LABELED COMMON BLOCK/PRDCT/ WHICH WERE DESCRIBED IN SECTION 3.2 AND
 C THE OPTIONAL OUTPUT, IF ANY.

Subroutine FIRST

SUBROUTINE FIRST (RO,KEY1)

```

*****
LOCAL VARIABLE DICTIONARY
CON - FACTOR TO ADJUST STARTING POINT IF FIRST GUESS YIELDS
    TOO GREAT AN EXPOSURE, EITHER 1/2 OR 1/4
GRADIV - MAGNITUDE OF THE GRADIENT AT POINT
GRADN - UNIT GRADIENT VECTOR (POINTS TOWARDS GREATEST EXPOSURE CHANGE)
N - APPROXIMATE DISTANCE NECESSARY TO MOVE POINT FOR NEXT GUESS
ERRCON - ERROR FLAG, DUMMY
IRBIC - NUMBER OF BUSIEST TAKEOFF RUNWAY
KEY11 - NOISE EXPOSURE AT FIRST POINT ON CONTOUR
NOBS - NUMBER OF OBSERVERS
NUMPT - PRIMARY METRIC NUMBER
NYS - COUNTS NUMBER OF TIMES THROUGH EXPOSE (BUT THAT TIME)
P - HOLDS P00 WHILE ITS VALUE IS CHANGED, ETC
PA - PA IS THE INPUT START POINT
RCON - RCON ANOTHER FACTOR TO ADJUST POINT SEARCH, 0
RCON - RCON ANOTHER FACTOR TO ADJUST POINT SEARCH, 3/2, SEE LINE 8?
R1 - RUNWAY LENGTHS, TABLE
R1R1 - RUNWAY LENGTH OF BUSIEST RUNWAY TIMES MAGIC FACTOR RCON 3/2
R2 - RESULTANT OF R00 MINUS *
TOL - CONTOUR ERROR TOLERANCE
V1 - EXPOSURE AT P00
V2 - DIFFERENCE OF V1 AND CONTOUR VALUE
VAL - CONTOUR VALUE
VALMAX - VAL PLUS TOL, ALLOWABLE MAX VALUE ON CONTOUR
VALMIN - CONTOUR VALUE MINUS ERROR TOLERANCE
XA - RUNWAY START X,Y COORDS
XB - RUNWAY END X,Y COORDS
YD - Y END COORD OF BUSIEST RUNWAY
YST - Y START COORD OF BUSIEST TAKEOFF RUNWAY
YND - Y END COORD OF BUSIEST TAKEOFF RUNWAY
YST - Y START COORD OF BUSIEST TAKEOFF RUNWAY
FIRST - SUBROUTINE
THE PURPOSE OF SUBROUTINE FIRST IS TO FIND THE FIRST POINT ON A
CONTOUR. IT WILL USE EITHER THE GRADIENT METHOD OR THE RUNWAY
CENTERLINE METHOD TO FIND THE FIRST POINT.
THE SUBROUTINE FIRST USES THE SUBROUTINES EXPOSE, GRADIE, VHAG, VSUB
STAY, AND VENT.
THE SUBROUTINE FIRST HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
CALL FIRST (RO, KEY1)
*****
RO - A VARIABLE OF DIMENSION 2 OR MORE, THE FIRST TWO POSITIONS OF
WHICH INDICATE THE METHOD TO BE USED BY FIRST TO FIND THE FIRST
POINT. IF BOTH VALUES ARE ZERO, THE BUSIEST TAKEOFF RUNWAY METHOD
WILL BE USED. IF EITHER OR BOTH POSITIONS ARE NONZERO, THE FIRST IS
ASSUMED TO BE THE X-COORDINATE AND THE SECOND THE Y-COORDINATE OF
THE USER'S ESTIMATE AT WHERE THE FIRST POINT IS AND STARTING THERE,
THE ITERATIVE GRADIENT METHOD WILL BE USED TO FIND THE FIRST POINT.
KEY1 - THE NOISE EXPOSURE VALUE AT THE FIRST POINT ON THE CONTOUR.
ONLY THE MAIN PROGRAM NOISE1 USES THE SUBROUTINE FIRST.
THE SUBROUTINE FIRST WILL BE USED ONLY ONCE PER CONTIGUOUS CONTOUR.
NOTE THAT ONE "CONTOUR" MAY BE COMPOSED OF SEVERAL DISJOINT CONTOURS
HAVING THE SAME METRIC VALUE.
THE DATA INPUT TO FIRST IS THE CALLING ARGUMENT RO, PREVIOUSLY
DESCRIBED, AND THROUGH LABELED COMMON BLOCKS. THE FOLLOWING WILL

```

```

C DETAIL THE COMMON BLOCK INPUT.
C /BK/      TOL      CONTOUR ERROR TOLFRANCE
C           VAL      CONTOUR VALUE
C /RUNWAY/  XA       RUNWAY START XY-COORDINATES
C           YB       RUNWAY END XY-COORDINATES
C /RWYWRD/  IPBIG    NUMBER OF FASTEST TAKEOFF RUNWAY
C /METRIC/  NXPBR    NUMBER OF PRIMARY METRIC.
C
C           =NONE
C
C           =LON
C           =CMP
C           =LPO
C           =ASDS
C           =DGRS
C
C FIRST HAS TWO EXIT RETURNS LOCATED AT LINES NUMBERED 52 AND 139 OF
C THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 52 IS THE
C RETURN AFTER USING THE GRADIENT METHOD TO FIND THE FIRST POINT. THE
C RETURN AT LINE 139 IS USED AFTER THE RUNWAY METHOD WAS TO FIND THE
C FIRST POINT. THE OUTPUT OF FIRST IS RETURNED TO THE CALLING
C PROGRAM THROUGH THE CALLING ARGUMENTS. THE XY-COORDINATES OF THE
C POINT ON THE CONTOUR ARE CONTAINED IN THE VARIABLE RO, AND THE NOISE
C VALUE AT THAT POINT IS CONTAINED IN THE VARIABLE RYV1. DEPENDING ON
C THE INPUT DATA, THE SUBROUTINE FIRST WILL EXERCISE ONE OF THE TWO
C DIFFERENT METHODS TO FIND THE FIRST POINT ON A GIVEN NOISE EXPOSURE
C CONTOUR. THE USER REQUESTS THAT THE PROGRAM FIND THE FIRST POINT ON
C ITS OWN, OR CAN REQUEST THE PROGRAM TO BEGIN THE SEARCH AT A
C SPECIFIC POINT. THE USER CHOOSES THE METHOD TO BE USED BY SELECTING
C THE VALUE OF THE ESTIMATED POSITION OF THE FIRST POINT ON THE
C CONTOUR. IF THE ESTIMATE IDENTICALLY X=Y=0, THE PROGRAM WILL FIND
C THE FIRST POINT ON ITS OWN USING THE RUNWAY METHOD. OTHERWISE,
C THE GRADIENT METHOD WILL BE USED. THE FOLLOWING PARAGRAPHS DESCRIBE
C EACH OF THESE METHODS.
C
C IF THE USER CHOOSES TO DIRECT THE PROGRAM TO A SPECIFIC AREA TO
C SEARCH FOR THE CONTOUR, AN XY-COORDINATE POINT MUST BE SPECIFIED.
C THE NOISE EXPOSURE IS COMPUTED AT THIS POINT BY THE PROGRAM TO
C DETERMINE IF IT IS ON THE CONTOUR. IF SO, THE SEARCH IS OVER. IF
C NOT, THE VECTOR WHICH DEFINES AN APPROXIMATE LOCAL NOISE CONTOUR
C GRADIENT IS DETERMINED BY COMPUTING THE NOISE EXPOSURE AT TWO MORE
C POINTS: ONE AT 1 FEET IN THE POSITIVE-X DIRECTION, AND THE OTHER AT
C 1 FEET IN THE POSITIVE-Y DIRECTION RELATIVE TO THE ORIGINAL POINT.
C THE VECTOR RESULTING FROM THE DIFFERENCES BETWEEN THE ORIGINAL
C POINT AND THE TWO OTHERS WILL POINT IN THE DIRECTION OF INCREASING
C NOISE EXPOSURE FOR THE LOCAL AREA. THE DIRECTION OF THE GRADIENT
C VECTOR DETERMINES THE DIRECTION THE PROGRAM WILL PROCEED FOR THE
C NEXT TRIAL POINT. IF THE NOISE EXPOSURE AT THE ORIGINAL POINT WAS
C GREATER THAN THE SPECIFIED CONTOUR VALUE, THE PROGRAM WILL PROCEED
C IN THE SAME DIRECTION AS THE GRADIENT VECTOR. IF THE VALUE WAS
C SMALLER, THE PROGRAM WILL PROCEED IN A DIRECTION OPPOSITE THE
C GRADIENT VECTOR. THIS PROCEDURE IS REPEATED UNTIL A POINT ON THE
C CONTOUR IS FOUND.
C
C IF THE USER CHOOSES THE OPTION OF HAVING THE PROGRAM FIND THE FIRST
C POINT ON ITS OWN, THE MODEL WILL CHOOSE THE MOST HEAVILY-USED
C TAKEOFF RUNWAY AND COMPUTE NOISE VALUES ON A LINE COINCIDENT WITH
C THE RUNWAY CENTERLINE UNTIL THE CONTOUR VALUE IS FOUND OR IS
C STRADDLED BY TWO SUCCESSIVE NOISE EXPOSURE LEVEL COMPUTATIONS. IF
C STRADDLED, NOISE VALUES ARE THEN COMPUTED BETWEEN THE TWO POINTS,
C USING INTERPOLATION, UNTIL A VALUE WITHIN A PRESPECIFIED TOLERANCE
C OF THE CONTOUR IS FOUND. FOR THE INITIAL NOISE LEVEL COMPUTATIONS
C ALONG THE EXTENDED RUNWAY CENTERLINE, THE DISTANCE BETWEEN

```

C SUCCESSIVE POINTS DOWN TO HALF THE LENGTH OF THE SUBJECT PUNWAY AS
C DEFINED IN THE PROGRAM.

Function GENFN1

```

C FUNCTION GENFN1 (Y,X,XY,N,I)
C *****
C
C GENFN1 PERFORMS A LINEAR INTERPOLATION ON A TABLE Y
C GENFN1 - THE CALCULATED VALUE OF THE DEPENDENT VARIABLE CORRESPONDING
C
C TO THE CALLING ARGUMENT XX (INDEPENDENT VARIABLE)
C KK - INITIAL PARAMETER
C N - ADJUSTABLE SUBSCRIPT, ARRAY DIMENSIONING
C N - TERMINAL PARAMETER
C X CONTAINS TABLE VALUES OF INDEPENDENT VARIABLE
C XX IS THE POINT AT WHICH THE FUNCTION VALUE IS DESIRED.
C Y MUST BE STORED IN ASCENDING VALUES OF X.
C I RETURNS THE INDEX OF THE LAST ELEMENT OF X NOT .GT. XX
C NO TWO NUMBERS OF X MAY BE EQUAL.
C I RANGES FROM 1 TO N-1
C GENFN1-FUNCTION SUBROUTINE
C GENFN1 LINEARLY INTERPOLATES BETWEEN TABULAR XY-PAIR AS A
C FUNCTION OF THE FORM
C Y=F(X)
C TO DETERMINE THE VALUE OF Y AT A GIVEN X.
C GENFN1 DOES NOT USE ANY EXTERNAL SUBROUTINES.
C THERE IS ONE ENTRY POINT TO GENFN1 AND THE CALLING SEQUENCE
C IS: GENFN1 (Y,X,XY,N,I)
C WHERE
C Y-A TABLE CONTAINING THE DEPENDENT VARIABLE VALUES FOR
C ASCENDING VALUES OF THE INDEPENDENT VARIABLE X.
C X-A TABLE CONTAINING VALUES OF THE INDEPENDENT VARIABLE STORED
C ASCENDING ORDER.
C XX-A VALUE OF THE INDEPENDENT VARIABLE FOR WHICH THE
C DEPENDENT VARIABLE IS TO BE COMPUTED.
C N-THE NUMBER OF VALUES CONTAINED IN TABLES X AND Y ABOVE.
C I-ON RETURN WILL CONTAIN THE POSITION IN THE X TABLE OF THE LAST
C VALUE NOT GREATER THAN XX.
C THE FUNCTION GENFN1 IS USED BY THE SUBROUTINES ATTENG, PREPR, PROFDA
C AND SETRES.
C THE INPUT TO GENFN1 COMES ENTIRELY FROM THE CALLING ARGUMENTS.
C GENFN1 HAS ONE EXIT POINT AT THE NUMBERED 28 OF THE SUBROUTINE
C LISTING IN SECTION 1. THE CALCULATED VALUE OF THE DEPENDENT
C VARIABLE CORRESPONDING TO THE CALLING ARGUMENT XX IS RETURNED
C THROUGH THE FUNCTION NAME. THE ONLY OUTPUT CONSISTS OF THE CALLING
C ARGUMENT I, PREVIOUSLY DISCUSSED.

```

Function GENFN2

```

FUNCTION GENFN2 (Z,X,Y,VX,VY,M,N,I,J)

*****

GENFN2 DOES A 2-D LINEAR INTERPOLATION ON MATRIX Z

I RANGES FROM 1 TO M-1
J RANGES FROM 1 TO N-1
NO TWO VALS OF X OR Y OR Y MAY BE EQUAL.
I - LAST ELEMENT OF X NOT GREATER THAN XX
J - LAST ELEMENT OF Y NOT GREATER THAN YY
X CONTAINS VALUES OF 1ST INDEP. VAR. DIMEN M (ASCEND. ORDER)
Y CONTAINS VALUES OF 2ND INDEP. VAR. DIMEN N (DESCEND. ORD.)
VGRAD - GRADIENT OF X
VGRAD - GRADIENT OF Y
XX,YY POINT AT WHICH FUNCTIONAL VALUE IS DESIRED.
IF NO VALUES OF Y ARE IGNORED
ZYL - PLANE (NOT A/C) DISPLACEMENT FROM
CONTIGUOUS Z TABLE ENTRY
ZYC - AS ZYL, ORTHOGONAL COORD

GENFN2 DOES A 2-D LINEAR INTERPOLATION ON MATRIX Z
X CONTAINS VALUES OF 1ST INDEP. VAR. DIMEN M (ASCEND. ORDER)
Y CONTAINS VALUES OF 2ND INDEP. VAR. DIMEN N (DESCEND. ORD.)
XX,YY POINT AT WHICH FUNCTIONAL VALUE IS DESIRED.
IF NO VALUES OF Y ARE IGNORED
I RANGES FROM 1 TO M-1
J RANGES FROM 1 TO N-1
NO TWO VALS OF X OR Y MAY BE EQUAL.

GENFN2-SECTION SUBROUTINE
GENFN2 PERFORMS A TWO-DIMENSIONAL LINEAR INTERPOLATION
(RECTANGULAR) FOR TABULAR XYZ VALUES OF A FUNCTION OF THE FORM
Z=F(X,Y)
GENFN2 DOES NOT USE ANY EXTERNAL SUBROUTINES.
THERE IS ONE ENTRY POINT TO GENFN2 AND THE CALLING SEQUENCE IS:
GENFN2 (Z,X,Y,XX,YY,M,N,I,J)
*****
Z-TABULAR VALUES OF THE DEPENDENT VARIABLE
X-TABULAR VALUES OF THE FIRST INDEPENDENT VARIABLE STORED IN
ASCENDING ORDER.
Y-TABULAR VALUES OF THE SECOND INDEPENDENT VARIABLE STORED IN
DESCENDING ORDER.
XX,YY-VALUES OF THE FIRST AND SECOND INDEPENDENT VARIABLES,
RESPECTIVELY, FOR WHICH THE DEPENDENT VARIABLE IS TO BE
CALCULATED.
I-THE NUMBER OF VALUES IN THE 3X3 TABLE.
J-THE NUMBER OF VALUES IN THE 3Y3 TABLE.
I-OR RETURN CONTAIN THE POSITION OF THE LAST VALUE IN THE 3X3
TABLE THAT IS LESS THAN XX.
J-OR RETURN WILL CONTAIN THE POSITION OF THE LAST VALUE IN THE
3Y3 TABLE THAT IS LESS THAN YY.
THE ONLY SUBROUTINE TO USE GENFN2 IS THE FUNCTION ACNOIS.
GENFN2 WILL BE USED MANY TIMES DURING EXECUTION WHEN ENERGY METRICS
ARE CALCULATED.
ALL INPUT DATA TO GENFN2 IS THROUGH THE CALLING ARGUMENTS.
GENFN2 HAS ONLY ONE EXIT RETURN LOCATED AT LINE NUMBER 51 OF

```

C THE SUBROUTINE LISTING IN SECTION 7.
 C THE VALUE OF THE DEPENDENT VARIABLE IS RETURNED TO THE
 C CALLING PROGRAM THROUGH THE FUNCTION NAME. THE VALUE FOR I AND J

C ARE RETURNED THROUGH THE CALLING ARGUMENTS AS PREVIOUSLY DISCUSSED.

Subroutine GRADIE

SUBROUTINE GRADIE (A)

LOCAL VARIABLE DICTIONARY

A - FIRST TWO ELEMENTS ARE X,Y COORDS OF POINT FOR WHICH EXPOSURE
 WAS JUST CALCULATED

ASDANS - ASDS EXPOSURE VALUES FROM CALLS TO EXPOSE

AS2ANS - ASDS2 (DOSE) EXPOSURE FROM CALLS TO EXPOSE

FOLD - ASDANS EXPOSURE FOR FIRST SEARCH JOINT

GRADU - UNIT VECTOR IN DIRECTION OF GRADIENT

GRADMG - GRADIENT MAGNITUDE

HOLD - ASDANS EXPOSURE AT A (AT THE ARGUMENT LOCATION)

M2 - METRIC NUMBER FOR GRADIENT CALCULATION

NDS - SAME AS NDS

NEY2 - EXPOSURE AT POINT OFFSET FROM A BY 5 FEET

NEY3 - EXPOSURE AT POINT OFFSET FROM A BY 5 FEET IN OPPOSITE DIRECTION

NOS - NUMBER OF OBSERVERS

NUMPR - NUMBER OF PRIMARY EXPOSURE METRIC

NEY1 - EXPOSURE AT CANDIDATE POINT A

VO - TABLE OF TEST POINT LOCATIONS FROM NWSDS

GRADIE-SUBROUTINE

THE SUBROUTINE GRADIE IS USED TO COMPUTE THE APPROXIMATION OF
 A LOCAL NOISE EXPOSURE GRADIENT UNIT VECTOR AT A GIVEN POINT FOR
 WHICH THE NOISE EXPOSURE VALUE, USING ALL DEFINED FLIGHTS, HAS JUST
 BEEN COMPUTED.

GRADIE USES THE SUBROUTINE EXPOSE, VMAG AND VTRN.

THERE IS ONLY ONE ENTRY POINT TO GRADIE AND THE CALLING
 SEQUENCE IS:

CALL GRADIE (A)

WHERE

A-A VARIABLE OF DIMENSION 2 FOR WHICH THE FIRST TWO POSITIONS
 DEFINE THE XY-COORDINATES OF THE POINT AT WHICH THE NOISE
 EXPOSURE WAS JUST CALCULATED.

GRADIE IS CALLED BY THE SUBROUTINE FIRST AND THE MAIN PROGRAM
 NOISE1. IT WILL BE CALLED MANY TIMES DURING EXECUTION.

THE DATA INPUT TO GRADIE IS THROUGH THE CALLING ARGUMENT,
 PREVIOUSLY DISCUSSED, AS WELL AS LABELED COMMON BLOCK. THE FOLLOWING
 DESCRIBES THE INPUT VIA THE COMMON BLOCKS.

LABEL VARIABLE DESCRIPTION

/GRDNIK/ ASDANS ASDS AND DOSE NOISE EXPOSURE VALUES FROM

AS2ANS CALLS TO EXPOSURE BY GRADIE.

/METRIC/ NUMPR NUMBER OF PRIMARY METRIC.

```

C      GRADIE 4A ONLY ONE FYI" RETURN L.ATED AT LINE NUMBERED 35 IN
C THE SUBROUTINE LISTING IN SECTION 6.
C      THE OUTPUT FROM GRADIE IS THROUGH THE TABLED COMMON BLOCK
C /GRADNT/. THE XY-COORDINATE COMPONENTS FOR A UNIT VECTOR POINTING
C IN THE DIRECTION OF MAXIMUM DECREASE IN EXPOSURE ARE CONTAINED IN
C THE FIRST TWO POSITIONS OF THE VARIABLE GRADU. THE MAGNITUDE OF THE
C COMPUTED LOCAL GRADIENT VECTOR IS STORED IN THE VARIABLE GRADMG AND
C THE UNITS ARE IN FEET PER FOOT, WHERE NF CORRESPONDS TO NEF, JDN, CNEL,
C LEO, MINUTES OR PERCENT DEPENDING ON THE PRIMARY METRIC.
C      THE SUBROUTINE GRADIE IS USED TO COMPUTE THE APPROXIMATION OF
C A LOCAL GRADIENT UNIT VECTOR AT A GIVEN POINT FOR WHICH A NOISE
C EXPOSURE VALUE HAS BEEN COMPUTED. FIRST THE GRADIENT VECTOR IS
C COMPUTED AND THEN THE COMPONENTS ARE DIVIDED BY THE MAGNITUDE
C CONVERTING TO A UNIT VECTOR.
C

```

Subroutine HBT

```

SUBROUTINE HBT (RO), IT, UNIT, MAX1, MAX2, DT, DAT, DS, DS, DAS, DB)

C
C *****
C LOCAL VARIABLE DECLARATION
C AX - X COORDS OF NOISE SOURCE POINTS (BEGINNING OF RWY)
C
C MAX - TRACK SEGMENT NUMBER (FLAG IF BISECTOR) CLOSEST SEG CURVED (
C DT - PRIMARY MASK, SETS DTBIT (?)
C D - DUMMY VARIABLE FOR CALLS TO CURVE; ALSO DISTANCE BETWEEN
C TWO POINTS ON SEGMENT CLOSEST TO ORIGIN
C DA - NOISE LEVEL CORRECTION (MAX1 GEOMETRY, 0 FOR STRAIGHT SEGS)
C DAS - NOISE LEVEL CORRECTION
C DAS - DISTANCE ALONG SEGMENT FROM FAR END OF RUNWAY
C DAT - DISTANCE ALONG TRACK FROM BEGINNING OF RUNWAY
C DB - NOISE LEVEL CORRECTION (MAX2 GEOMETRY, 0 FOR STRAIGHT SEG)
C DY - DISTANCE TO SEGMENT OF TRACK CLOSEST ORIGIN
C DMV - FOR EACH TRACK, THE LENGTH OF THE SHORTEST STRAIGHT
C OF ONE-HALF THE MINIMUM TURN RADIUS, WHICHEVER IS
C SMALLEST.
C DS - DISTANCE FROM ORIGIN TO SECOND CLOSEST SEGMENT ON TRACK
C DT - DISTANCE FROM ORIGIN TO CLOSEST SEGMENT ON TRACK
C DX - 1/3 OF DY; DEFINES ONE-THIRD BOUNDARY OF CURVED SEGMENT
C F - MAGNITUDE OF NOISE ALONG ANGLE BISECTOR
C G - NOISE LEVEL CORRECTION FOR SEGMENT BOUNDARIES
C IAA - LOOP COUNTER
C IGC - ERROR FLAG
C ITSEG. (ALSO USED BY OTHER SUBROUTINES.)
C ITSEG CONTAINS THE NUMBER OF TRACK SEGMENTS FOR A GIVEN
C TRACK IN THE LOW ORDER 5 BINARY BITS OF THE WORD.
C THE HIGH ORDER 17 BITS CONTAIN INFORMATION
C REGARDING THE TRACK SEGMENTS FOR A GIVEN TRACK. IF
C THE BIT IN POSITION A, COUNTING FROM HIGH ORDER TO
C LOW ORDER, IS A BINARY 0, THEN THE SEGMENT NUMBER A
C IS A STRAIGHT SEGMENT. IF THE BIT IS A BINARY 1,
C THE CORRESPONDING SEGMENT IS A TURN (I.E., CIRCULAR
C SEGMENT).
C K - DUMMY VARIABLE FOR CLOSEST SEGMENT NUMBER
C M - DUMMY VARIABLE FOR SECOND CLOSEST SEGMENT NUMBER
C MASK MASKING CONSTANTS USED TO RETRIEVE INFORMATION FROM

```

C MAX1 - RUNWAY NUMBER OF PRIMARY NOISE CONTRIBUTOR (CLOSEST SEG)
 C MAX2 - RWY NUM OF SECONDARY CONTRIB
 C MAXS - TABLE OF RWY NUMBERS INDEXED BY TRACK NUMBER FOR
 C PRIMARY CONTRIBUTOR
 C MAXT - AS MAXS FOR SECONDARY CONTRIB
 C MID - DISTANCE TO POINT MIDWAY BETWEEN TWO CLOSEST SEGMENTS
 C NS - NUMBER OF SEGMENTS IN TRACK
 C NT - TRACK NUMBER
 C NTS - SEGMENT NUMBER FOR TRACK NT
 C NTST - FLAG: 1=CLOSEST SEGMENT KNOWN
 C PARAM - SEE ABOVE
 C POO - CURRENT POINT
 C RX - NOISE LEVEL CORRECTION AT BISECTOR (MID)
 C S1 - DISTANCE FROM POINT TO MAX1
 C S2 - DISTANCE FROM POINT TO MAX2
 C S3 - DIFFERENCE VECTOR BETWEEN POO AND AX
 C TTD THE TOTAL DISTANCE FROM THE BEGINNING OF A TRACK,
 C INCLUDING RUNWAY LENGTH, TO THE END OF EACH SEGMENT
 C EXCEPT THE LAST ONE, FOR EACH TRACK.
 C X - DUMMY VARIABLE FOR CALLS TO CURVE (DISTANCE ALONG SEG)
 C XI - 0 UNLESS CLOSEST SEGMENT IS CURVED
 C X11 - LENGTH OF CLOSEST SEGMENT
 C X12 - LENGTH OF SECOND CLOSEST SEGMENT
 C XX - DISTANCE ALONG SEGMENT SELECTED FOR CORRECTION (DEPENDS
 C ON GEOMETRY OF SEG; ALONG MAX2 TO CLOSEST APPROACH
 C FOR LOOPEL TURN, ALONG SHORTER SEG FOR HAIRPIN
 C YV - AS XX FOR ANOTHER SITUATION ?
 C HRT-SUBROUTINE
 C THE ROUTINE HRT COMPUTES A VARIETY OF QUANTITIES ASSOCIATED WITH
 C GROUND TRACK GEOMETRY.
 C HRT USES THE FUNCTIONS AND SUBROUTINES CONTF, CONTG, CURVE,
 C STRAIT, VMAG AND VSUB.
 C THE SUBROUTINE HRT HAS ONLY ONE ENTRY POINT AND THE CALLING
 C SEQUENCE IS:
 C CALL HRT (PO,NT,NTST,MAX1,MAX2,DT,DAT,DA,DS,DAS,DB)
 C WHERE
 C PO-- VARIABLE OF DIMENSION 3 OR MORE, THE FIRST TWO POSITIONS
 C OF WHICH ARE THE VALUES OF THE X- AND Y-COORDINATES OF THE
 C ANALYSIS POINT, RESPECTIVELY.
 C NT--THE GROUND TRACK NUMBER.
 C NTST--INDICATES WHETHER CLOSEST SEGMENT TO ANALYSIS POINT IS
 C KNOWN. IF NTST=1, CLOSEST SEGMENT IS KNOWN NTST=2, HRT MUST
 C FIND THE CLOSEST SEGMENT.
 C MAX1--THE NUMBER OF THE CLOSEST SEGMENT. THIS IS RETURNED BY
 C HRT TO THE CALLING PROGRAM.
 C MAX2--THE NUMBER OF THE NEXT TO CLOSEST SEGMENT. RETURNED BY
 C HRT TO THE CALLING PROGRAM.
 C DT--THE DISTANCE FROM THE ANALYSIS POINT TO THE POINT OF
 C CLOSEST APPROACH ON THE TRACK.
 C DAT--THE DISTANCE FROM THE BEGINNING OF THE TRACK, RUNWAY
 C INCLUDED, TO THE POINT OF CLOSEST APPROACH.
 C DA--CORRECTION TO NOISE LEVEL COMPUTED FOR SITUATION FOR
 C SEGMENT MAX1 DUE TO GEOMETRIC CONSIDERATIONS.
 C DS--DISTANCE FROM THE ANALYSIS POINT TO THE NEXT CLOSEST
 C SEGMENT (MAX2).
 C DAS--THE DISTANCE FROM THE BEGINNING OF THE TRACK, RUNWAY TO
 C THE POINT ON MAX2 THAT IS CLOSEST TO THE ANALYSIS POINT.
 C DB--CORRECTION TO NOISE LEVEL COMPUTED FOR THE SITUATION AT THE
 C CLOSEST POINT TO MAX2 DUE TO GEOMETRIC CONSIDERATIONS.
 C *THESE VALUES ARE ONLY COMPUTED BY HRT IF IT IS DETERMINED BY
 C HRT THAT THE NOISE COMING FROM A SECTION WILL SIGNIFICANTLY

ADD TO THE NOISE PRODUCED BY THE NORMAL CALCULATION USING
 THE VARIABLES COMPUTED AT THE POINT OF CLOSEST APPROACH.
 THE ONLY PROGRAM TO USE THE SUBROUTINE HBT IS THE FUNCTION
 EXPDSE. HBT WILL BE CALLED MANY TIMES DURING EXECUTION.
 ALL VARIABLE INPUT DATA IS PROVIDED TO HBT THROUGH THE CALLING
 ARGUMENTS R0, RT AND MTST. FIXED DATA IS ALSO ACCESSED FROM LABELED
 COMMON BLOCK/TRACK/. THE FOLLOWING DESCRIBES THE TABULAR DATA
 STORED IN THE BLOCK.

VARIABLE	DESCRIPTION
ATP	CONTAINS RUNWAY NUMBERS ASSOCIATED WITH EACH TRACK.
ITSEG	CONTAINS THE NUMBER OF TRACK SEGMENTS FOR A GIVEN TRACK IN THE LOW ORDER 5 BINARY BITS OF THE WORD. THE HIGH ORDER 15 BITS CONTAIN INFORMATION REGARDING THE TRACK SEGMENTS FOR A GIVEN TRACK. IF THE BIT IN POSITION A, COUNTING FROM HIGH ORDER TO LOW ORDER, IS A BINARY 0, THEN THE SEGMENT NUMBER A IS A STRAIGHT SEGMENT. IF THE BIT IS A BINARY 1, THE CORRESPONDING SEGMENT IS A TURN (I.E., CIRCULAR SEGMENT).
WASK	WASKING CONSTANTS USED TO RETRIEVE INFORMATION FROM ITSEG. (ALSO USED BY OTHER SUBROUTINES.)
PARAM	INFORMATION REGARDING EACH SEGMENT IN EACH TRACK. FOR TRACK NUMBER J AND SEGMENT NUMBER I

IF THE SEGMENT IS STRAIGHT
 PARAM(1,I,J) = THE X-COORDINATE OF THE START OF THE
SEGMENT.
 PARAM(2,I,J) = THE Y-COORDINATE OF THE START OF THE
SEGMENT.
 PARAM(3,I,J) = THE LENGTH OF THE SEGMENT.
 PARAM(4,I,J) = THE X-COMPONENT OF A UNIT VECTOR
POINTING IN THE DIRECTION OF THE SEGMENT.
 PARAM(5,I,J) = THE Y-COMPONENT OF THE UNIT VECTOR
DESCRIBED ABOVE.
 IF THE SEGMENT IS CIRCULAR
 PARAM(1,I,J) = X-COORDINATE OF THE CENTER OF THE
CIRCLE.
 PARAM(2,I,J) = Y-COORDINATE OF THE CENTER OF THE
CIRCLE.
 PARAM(3,I,J) = RADIUS OF CURVATURE, NEGATIVE FOR
RIGHT TURNS, POSITIVE FOR LEFT.
 PARAM(4,I,J) = TURN ANGLE IN RADIAN.
 PARAM(5,I,J) = ANGLE BETWEEN A LINE JOINING THE
CENTER WITH THE START OF THE TURN AND A LINE
POINTING IN THE POSITIVE X DIRECTION.
 THE TOTAL DISTANCE FROM THE BEGINNING OF A TRACK,
INCLUDING RUNWAY LENGTH, TO THE END OF EACH SEGMENT
EXCEPT THE LAST ONE, FOR EACH TRACK.
 FOR EACH TRACK, THE LENGTH OF THE SHORTEST STRAIGHT
OR ONE-HALF THE MINIMUM TURN RADIUS, WHICHEVER IS
SMALLEST.

THE SUBROUTINE HBT HAS TWO EXIT RETURNS LOCATED AT LINES
 NUMBERED 150 AND 156 IN THE SUBROUTINE LISTING IN SECTION 5. THE
 RETURN AT LINE NUMBER 150 IS TAKEN IF THE FIRST SEGMENT IS THE
 CLOSEST TO THE ANALYSIS POINT. OTHERWISE, THE RETURN AT LINE 156
 IS USED.

THE OUTPUT FROM HBT IS THROUGH THE CALLING ARGUMENTS AS
 PREVIOUSLY DISCUSSED. IN ADDITION, THE VARIABLE MTS IN THE LABELED

```

C COMMON BLOCK/THORBLOCK/IS SET EQUAL TO THE NUMBER OF TRACK SEGMENTS IN
C THE CURRENT TRACK BEING ANALYZED. THIS COMMON BLOCK WILL BE USED BY
C SUBROUTINE CVR13 IF ASDS OR DOSE VALUES ARE CALCULATED.
C SUBROUTINE HRT COMPUTES THE FOLLOWING QUANTITIES:
C . THE SHORTEST DISTANCE FROM A GIVEN POINT TO A GIVEN GROUND TRACK
C . THE SEGMENT NUMBER, IN THE TRACK DEFINITION, FOR THE SEGMENT
C   CLOSEST TO THE GIVEN POINT.
C . THE DISTANCE FROM THE BEGINNING OF THE TRACK TO THE POINT OF
C   CLOSEST APPROACH TO THE GIVEN POINT.
C . THE NUMBER OF ANY SECONDARY SEGMENT ON THE TRACK, FOR WHICH THE
C   NOISE CONTRIBUTION MAY BE SIGNIFICANT, ALONG WITH THE DISTANCE
C   TO THE SECONDARY SEGMENT AND THE DISTANCE FROM THE BEGINNING OF
C   THE TRACK TO THE POINT OF CLOSEST APPROACH IN THE SECONDARY
C   SEGMENT.
C . THE NOISE EXPOSURE CORRECTION VALUES FOR TRACK GEOMETRY
C THE DISTANCE TO THE SEGMENTS ARE COMPUTED BY THE SUBROUTINES STRAIT
C OR CURVE DEPENDING ON WHETHER THE SEGMENT IS STRAIGHT OR CIRCULAR.
C HRT CALLS THESE SUBROUTINES TO PROCESS THE SEGMENTS AS NEEDED AND
C DETERMINES THE CLOSEST AND NEXT TO CLOSEST SEGMENTS TO THE ANALYSIS
C POINT, THE DISTANCE TO AND ALONG THE SEGMENT. THE FOLLOWING
C PARAGRAPHS DESCRIBE THE NOISE EXPOSURE CORRECTION VALUES COMPUTED
C FOR TRACK GEOMETRY.
C THERE ARE TWO REASONS FOR THE DEVELOPMENT OF THE FOLLOWING
C ALGORITHMS. BEFORE THESE WERE DEVELOPED, THE NOISE WAS COMPUTED
C USING ONLY THE CLOSEST TRACK SEGMENT. THUS, IF A TRACK MADE A LARGE
C TURN SO THAT, IN SOME REGIONS, TWO SEGMENTS OF THE SAME TRACK ARE
C CLOSE TO THE POINT OF COMPUTATION, SEVERE DISCONTINUITIES CAN APPEAR
C IN THE NOISE FUNCTION.
C THESE CORRECTIONS REMOVE (OR REDUCE TO INSIGNIFICANCE) THOSE
C DISCONTINUITIES. ALSO, THE SINGLE EVENT NOISE DATA IN THE PROGRAM
C ARE FOR A SINGLE STRAIGHT FLYOVER. CONSEQUENTLY, IF THE FLIGHT
C TRACK IS CURVED, THE ACTUAL NOISE EXPOSURE WILL BE GREATER ON THE
C INSIDE OF THE TURN, AND LESS ON THE OUTSIDE, THAN THAT OBTAINED FROM
C THE STORED TABLES. THESE FACTORS WILL CORRECT FOR THE INSIDE OF THE
C TURN ONLY.
C MAX1 =SEGMENT NUMBER OF THE CLOSEST SEGMENT.
C MAX2 =SEGMENT NUMBER OF THE NEXT CLOSEST SEGMENT.
C S1 =DISTANCE FROM THE POINT TO MAX1.
C S2 =DISTANCE FROM THE POINT TO MAX2.
C D =S2-S1
C DM =LENGTH OF THE SHORTEST SEGMENT OF THE TRACK OR 1/2 THE
C SMALLEST TURN RADIUS, WHICHEVER IS LESS.
C DX =DM/3
C G(D) =(D/DM)2
C DA =THE DB CORRECTION IN DECIBELS TO BE ADDED ARITHMETICALLY TO
C THE NOISE COMPUTED FROM SEGMENT MAX 1.
C DB =THE DB CORRECTION IN DECIBELS FROM SEGMENT MAX 2.

```

Subroutine HEADER

```

SUBROUTINE HEADER (NPT,XX,YY,AREA,PLTS,PCNT,IT)
C
C *****
C HEADER-SUBROUTINE
C SUBROUTINE HEADER PRINTS THE COLUMN HEADING FOR THE PRINTOUT OF
C CONTOUR POINTS AND VALUES. THE FORMATS FOR THE HEADINGS ARE
C VARIABLE SINCE MORE THAN ONE METRIC MAY BE OPTIONALLY SELECTED.
C HEADER ALSO SETS UP THE PRINT FORMATS FOR ITSELF AND SUBROUTINE
C PLINE WHICH PRINTS THE DATA LINES.

```

C THE SUBROUTINE HEADER USES NO EXTERNAL SUBROUTINES.
 C THE SUBROUTINE HEADER HAS TWO ENTRY POINTS, HEADER AND PLINE.
 C THE FOLLOWING IS THE CALLING SEQUENCE FOR HEADER:
 C CALL HEADER (IND)
 C WHERE
 C IND - AN INTEGER VALUE WHICH, IF EQUAL TO ZERO, INDICATES THAT
 C , HEADER AND DATA LINE FORMAT MUST BE DETERMINED AND SET
 C UP. IF NOT ZERO, THE HEADING BLOCK IS PRINTED AS
 C PRESENTLY DEFINED.
 C THE SUBROUTINE METFIX MAKES THE INITIAL CALL TO HEADER TO SET UP
 C THE OUTPUT FORMAT STATEMENTS FOR THE COLUMN TITLES AND THE DATA
 C LINE. THE REMAIN NOISE1 MAKES ALL SUBSEQUENT CALLS AS NEEDED
 C WHENEVER A NEW PAGE OF CONTOUR DATA OUTPUT IS BEGUN.
 C THE ONLY INPUT HEADER IS THE CALLING VARIABLE IND; ALL OTHER
 C NECESSARY DATA IS CONTAINED IN HEADER.
 C THERE IS ONLY ONE EXIT RETURN FROM HEADER LOCATED AT LINE NUMBER
 C 111 IN THE SUBROUTINE LISTING IN SECTION 5.
 C THE OUTPUT FROM HEADER IS TO THE LINE PRINTER AND NO INFORMATION
 C IS RETURNED TO THE CALLING PROGRAM.
 C THE PROCESSING PERFORMED BY HEADER CONSISTS OF CONSTRUCTING
 C "FORMAT" STATEMENTS FOR FUTURE HEADER AND DATA LINE PRINTOUTS. THE
 C VARIABLES USED BY HEADER ARE ALL FULL WORD HOLLERITH DATA AND
 C POSITIONED BY HEADER DEPENDING ON THE PRIMARY METRIC, WHICH IS
 C PRINTED FIRST, AND ANY ALTERNATE METRICS, WHICH ARE PRINTED ON THE
 C SAME LINE AND TO THE RIGHT OF THE PRIMARY METRIC IN THE ORDER OF
 C THEIR ASSIGNED NUMBER (SEE SUBROUTINE ACNOIS). IN ADDITION, THE
 C NUMBER OF METRICS (N) TO BE PRINTED, A TABLE (INDX) CONTAINING THE
 C ORDER IN WHICH THE METRIC VALUES ARE TO BE PRINTED ARE CONSTRUCTED
 C FOR LATER USE BY PLINE.
 C A SECOND ENTRY POINT FOR SUBROUTINE HEADER IS AT PLINE AND THE
 C CALLING ARGUMENT IS:
 C CALL PLINE (NPT,X,Y,AREA,FITS,PCNT,IT)
 C WHERE
 C NPT - THE NUMBER OF THE CURRENT CONTOUR POINT. IF NPT IS EQUAL
 C TO ZERO, A SINGLE LINE OF MINUS SIGNS IS OUTPUT TO THE
 C LINE PRINTER TO TERMINATE THE PAGE AND NO OTHER ACTION
 C TAKES PLACE.
 C X - THE X-COORDINATE OF THE CONTOUR POINT.
 C Y - THE Y-COORDINATE OF THE CONTOUR POINT.
 C AREA - THE CUMULATIVE AREA UP TO THIS POINT.
 C FITS* - THE NUMBER OF SIGNIFICANT FLIGHTS USED WHEN SEARCHING FOR
 C THIS POINT.
 C PCNT* - THE PERCENTAGE OF THE NOISE THAT THE NUMBER OF SIGNIFICANT
 C FLIGHTS REPRESENTED.
 C IT* - THE NUMBER OF TIMES THE SUBROUTINE EXPOSE WAS USED SINCE
 C THE LAST POINT WAS FOUND.
 C *NOTE THESE ARE DIAGNOSTIC VALUES WHICH CAN BE INFORMATIVE IF
 C SOMETHING GOES WRONG DURING EXECUTION.
 C THE REMAIN PROGRAM NOISE1 IS THE ONLY USER OF THE ENTRY AT
 C PLINE. IT IS USED TO PRINT A DATA LINE OR TERMINATE A PAGE OF
 C OUTPUT.
 C THE INPUT DATA PROVIDED BY THE CALLING ARGUMENTS IS COMPLETE
 C EXCEPT FOR THE METRIC VALUES. THESE ARE RETRIEVED FROM THE TABLE
 C VALUES IN LABELED COMMON BLOCK /METRIC/. NOTE THAT THE TABLE VALUES
 C IS IDENTICAL TO THE TABLE AVALS USED IN SOME OF THE OTHER

C SUBROUTINES.

C THERE ARE TWO EXIT RETURNS FROM PLINE LOCATED AT LINES NUMBERED
 C 121 AND 222 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT
 C LINE 121 IS USED WHEN A PAGE IS TERMINATED WHILE THE RETURN AT LINE
 C 222 IS USED AFTER A DATA LINE HAS BEEN PRINTED.
 C THE ONLY OUTPUT FROM PLINE IS TO THE LINE PRINTER AND NO
 C INFORMATION IS RETURNED TO THE CALLING PROGRAM.
 C THE ONLY PROCESSING PERFORMED BY PLINE CONSISTS OF STORING THE
 C METRIC VALUES IN A TEMPORARY TABLE IN THE ORDER IN WHICH THEY WILL
 C BE OUTPUT.

Subroutine HELG

C SUBROUTINE HELG (KXX,NSX,XLX,UNIT,XR1,A)
 C *****
 C LOCAL VARIABLE DICTIONARY
 C A - RADIUS OF CURVATURE
 C APC - RADIANS OF ARC
 C DELT - ANGLE BETWEEN POSITIVE X DIRECTION AND A LINE JOINING
 C THE CENTER OF THE CURVE WITH THE BEGINNING OF THE TURN
 C KXX - RUNWAY NUMBER
 C NSX - TRACK NUMBER
 C PARAM - INDICATES TRACK SEGMENT POSITION
 C Q1 - PROJECTION OF TURN STARTING X COORD INTO GROUND TRACK PLANE
 C Q2 - PROJECTION OF TURN STARTING Y COORD INTO GROUND TRACK PLANE
 C UNIT - UNIT VECTOR, DIRECTION IS TOWARDS STARTING POINT OF TURN
 C U - NEGATIVE OF SIGN OF A
 C XLX - ARC LENGTH
 C XR1 - PROJECTION OF EXPOSURE POINT ONTO PLANE OF GROUND TRACK
 C XX - SIGNED COMPONENT OF UNIT VECTOR IN DIRECTION OF TURN
 C YY - SIGNED COMPONENT OF UNIT VECTOR IN DIRECTION OF TURN
 C HELG SUBROUTINE
 C HELG COMPUTES THE CIRCULAR SEGMENT VARIABLES FROM TRACK
 C DEFINITIONS IN THE INPUT DATA (SEE SUBROUTINE HDT, VARIABLE PARAM).
 C THE SUBROUTINE USES THE EXTERNAL SUBROUTINE SGMP.
 C THERE IS ONLY ONE ENTRY TO HELG AND THE CALLING SEQUENCE IS
 C CALL HELG (KXX,NSX,XLX,UNIT,XR1,A)
 C *****
 C KXX - THE TRACK NUMBER
 C NSX - THE NUMBER OF THIS SEGMENT
 C XLX - THE ARC LENGTH OF THE SEGMENT IN FEET
 C UNIT - A UNIT VECTOR TANGENT TO THE END POINT (NOT THE START
 C POINT) OF THE LAST SEGMENT. UNIT IS OF DIMENSION 3 OR
 C MORE, THE FIRST TWO POSITIONS OF WHICH CONTAIN THE VALUES
 C OF THE X- AND Y- COMPONENTS OF THE UNIT VECTOR.
 C XR1 - A VARIABLE OF DIMENSION 2 OR MORE, THE FIRST TWO
 C POSITIONS OF WHICH CONTAIN THE X- AND Y- COORDINATE OF
 C THE END POINT OF THE LAST SEGMENT.
 C A - THE RADIUS OF CURVATURE IN FEET. THE SIGN OF A IS
 C POSITIVE FOR A RIGHT TURN NEGATIVE FOR A LEFT TURN WHEN
 C DEFINING THE TRACK FROM THE RUNWAY OUT, IRRESPECTIVE OF
 C THE FLIGHT DIRECTION.
 C THE ONLY SUBROUTINE TO USE HELG IS TRACKD. HELG IS USED IN
 C CONNECTION WITH XLIN TO DEFINE GROUND TRACK GEOMETRY AND MAY BE
 C USED MANY TIMES DURING THE INPUT PHASE OF EXECUTION.

```

C     THE INPUT IS THROUGH THE CALLING ARGUMENTS.
C     THERE IS ONE EXIT RETURN FROM HELG AT LINE NUMBERED 20 IN THE
C     SUBROUTINE LISTING IN SECTION 7. THIS RETURN IS USED UNDER ALL
C     CIRCUMSTANCES.
C     THE OUTPUT DATA FROM HELG IS PASSED THROUGH THE CALLING
C     ARGUMENTS. IN ADDITION, APPROPRIATE LOCATIONS IN THE VARIABLE PARAM
C     IN TABLED COMMON BLOCK /TRACK/ ARE INITIALIZED.
C     THE SUBROUTINE HELG COMPUTES THE XY-COORDINATES OF THE CENTER OF
C     THE CIRCLE OF WHICH THIS SEGMENT IS A PART, THE SIGNED RADIUS OF
C     CURVATURE, THE ANGULAR DISPLACEMENT OF THE SEGMENT AND THE ANGLE
C     BETWEEN THE POSITIVE X-DIRECTION AND A LINE JOINING THE CENTER OF
C     THE START POINT OF THE TURN.
C     THE XY-COORDINATE OF THE CENTER ARE COMPUTED IN THE FOLLOWING
C     MANNER
C     LET
C
C        $X = -A/ABS(A)$ , WHERE A IS THE CALLING ARGUMENT AS DEFINED
C
C        $R = ABS(A)$ 
C
C        $UNIT(1) = W$ , WHERE UNIT IS THE CALLING
C        $UNIT(2) = W$  ARGUMENT AS DEFINED
C        $X = XR1(1) - (R)(Y)$ , WHERE XR1 IS THE CALLING
C        $YC = XR1(2) + (R)(X)$  ARGUMENT AS DEFINED
C       AND (XC,YC) ARE THE COORDINATES OF THE CENTER.
C       THE SIGNED RADIUS OF CURVATURE IS SIMPLY -A SINCE THE CALLING
C       ARGUMENT IS SIGNWISE BACKWARDS MATHEMATICALLY.
C       THE ANGULAR DISPLACEMENT OF THE SEGMENT IS THE ARC LENGTH
C       DIVIDED BY THE RADIUS AND IS EXPRESSED IN RADIAN
C        $ALP = X'X/ABS(A)$ 
C       FINALLY, THE ANGLE BETWEEN THE POSITIVE X-DIRECTION AND A LINE
C       JOINING THE CENTER OF THE CIRCLE WITH THE BEGINNING OF THE TURN CAN
C       BE EXPRESSED AS FOLLOWS
C        $DELT = ARCTANGENT -X/Y$ 
C       WHERE X AND Y ARE AS PREVIOUSLY DEFINED.
C       TO COMPUTE THE COORDINATES OF THE END POINT OF THIS SEGMENT THE
C       VARIABLE XR1 IS MODIFIED AND RETURNED AS FOLLOWS
C        $XR1(1) = YC + R \cos(WALP + DELT)$ 
C        $XR1(2) = YC + R \sin(WALP + DELT)$ 
C       THE NEW TANGENT UNIT VECTOR IS COMPUTED AND RETURNED TO THE CALLING
C       PROGRAM BY MODIFYING THE CALLING VARIABLE UNIT AS FOLLOWS
C        $UNIT(1) = -W \sin(WALP + DELT)$ 
C        $UNIT(2) = -W \cos(WALP + DELT)$ 

```

Subroutine INFORM

```

C     SUBROUTINE INFORM(MODAPP,MODPRF,MCDNC,MCDDEF)
C     THIS SUBROUTINE GENERATES A MESSAGE TO INFORM ANYONE
C     READING THE OUTPUT OF THE MODEL THAT THE USER HAS MODIFIED
C     THE AIRCRAFT DATA IN THE DATABASE OR HAS CREATED HIS OWN
C     AIRCRAFT DEFINITIONS.
C     THIS SUBROUTINE IS CALLED FROM SUBROUTINE READIN
C     RIGHT BEFORE RETURN TO THE MAIN PROGRAM.
C
C     VARIABLE DICTIONARY
C     -----
C     IFND - CONTAINS THE WORD BANDO
C     ICCM - CONTAINS CONNECTOR FOR MULTIPLE PREDICATE
C     ISUM - TOTAL NUMBER OF PREDICATES
C     MAPP - PREDICATE PERTAINING TO APPROACH PARAMETERS
C     MESS - THE ENTIRE MESSAGE IF ONLY REDEFINITION OF A
C           DATABASE AIRCRAFT WITHOUT USING ANYTHING OUTSIDE

```

05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79
05-30-79

C	OF THE DATABASE.	05-30-79
C	MODAPP - INDICATOR. IF 1 APPROACH PROFILES HAVE BEEN INPUT	05-30-79
C	MODDEF - INDICATOR. IF 1 AIRCRAFT DEFINITIONS HAVE BEEN INPUT	05-30-79
C	MODNC - INDICATOR. IF 1 NOISE CURVES HAVE BEEN INPUT	05-30-79
C	MODPRF - INDICATOR. IF 1 TAKEOFF PROFILES HAVE BEEN INPUT	05-30-79
C	INC - PREDICATE PERTAINING TO NOISE CURVES	05-30-79
C	MPRF - PREDICATE PERTAINING TO TAKEOFF PROFILES	05-30-79
C		05-30-79

Function INSIDE

LOGICAL FUNCTION INSIDE (P,X,Y,N)

```

*****
C      LOGICAL VARIABLE DICTIONARY
C      INSIDE - TRUE IF POINT WITHIN DEFINED CONTOUR, FALSE IF OUTSIDE

C      J - SELECTION FLAG (SEE LINE 110)
C      N - NUMBER OF POINTS IN CONTOUR
C      P - FIRST TWO LOCATIONS ARE X AND Y COORDS OF POINT IN QUESTION
C      PX - X VALUE OF POINT
C      PY - Y VALUE OF POINT
C      SLOPE - SLOPE OF LINE BETWEEN CONTOUR POINTS CLOSEST TO P
C      X - ARRAY OF X COORDS REPRESENTING CLOSED CONTOUR
C      Y - ARRAY OF Y COORDS REPRESENTING CLOSED CONTOUR
C      YINT - INTERCEPT OF PROJECTION OF P ONTO LINE OF SLOPE
C      YY - VALUE ON LINE FOR WHICH X EQUALS PX

C THIS FUNCTION DETERMINES IF THE POINT P(P(1),P(2)) IS WITHIN THE CLOSE
C CONTOUR WHICH IS DEFINED BY THE X AND Y ARRAYS OF N VALUES EACH.
C IF P IS CONTAINED WITHIN THE CONTOUR INSIDE=.TRUE., OTHERWISE INSIDE
C
C      X-VALUE OF POINT IN QUESTION.

C      INSIDE LOGICAL FUNCTION SUBROUTINE
C      INSIDE DETERMINES WHETHER OR NOT A GIVEN POINT IS WITHIN A GIVEN
C CLOSED CONTOUR DESCRIBED BY THE COORDINATES OF THE POINTS ON THE
C CONTOUR.
C INSIDE DOES NOT USE ANY EXTERNAL SUBROUTINES.
C THERE IS ONLY ONE ENTRY TO INSIDE AND THE CALLING SEQUENCE IS
C      INSIDE (P,X,Y,N)
C WHERE
C      P - A VARIABLE OF DIMENSION 2 OR MORE, THE FIRST TWO POSITIONS
C      OF WHICH ARE THE VALUES OF THE X- AND Y- COORDINATES OF THE
C      POINT IN QUESTION.
C      Y - A VARIABLE OF DIMENSION N OR MORE CONTAINING THE
C      X-COORDINATES OF THE CLOSED CONTOUR IN THE FIRST N
C      POSITIONS.
C      Y - A VARIABLE OF DIMENSION N OR MORE CONTAINING THE
C      Y-COORDINATES CORRESPONDING TO THE X-COORDINATES ABOVE IN
C      THE FIRST N POSITIONS.
C      N - THE NUMBER OF POINTS IN THE CONTOUR.
C      PPGM IS THE ONLY SUBROUTINE TO USE THE FUNCTION INSIDE AND WILL
C DO SO IF REQUESTED BY THE USER TO LOOK FOR THE OCCURRENCE OF
C DISJOINT CLOSED CONTOURS HAVING THE SAME METRIC VALUE (I.E., REF 50,
C CNEF 90, ECT.). THIS CAN HAPPEN WHEN THE CONTOURS ARE VERY SMALL

```

C AND THERE ARE ISOLATED (NOWCROSSING) RUNWAYS AT THE AIRPORT. THERE
 C MAY BE MANY CALLS MADE TO INSIDE DURING EXECUTION BUT WILL ALWAYS
 C OCCUR BETWEEN CONTOUR COMPUTATIONS AND ONLY AFTER CONTOURS THAT HAVE
 C CLOSED (I.E. THE POINT IS THE SAME AS THE FIRST POINT).
 C THE THE INPUT DATA TO INSIDE COMES ENTIRELY FROM THE CALLING
 C ARGUMENTS.
 C THERE IS ONLY ONE EXIT RETURN FROM INSIDE AND IT IS USED UNDER
 C ALL CONDITIONS.
 C THE OUTPUT FROM INSIDE IS PASSED TO THE CALLING PROGRAM THROUGH
 C THE FUNCTION NAME. IF THE POINT IS WITHIN THE DEFINED CONTOUR,
 C INSIDE IS SET TO LOGICAL TRUE. IF THE POINT IS OUTSIDE THE CONTOUR,
 C INSIDE IS SET TO LOGICAL FALSE.
 C SIMPLY STATED, THE PROCESSING PERFORMED BY INSIDE CONSISTS OF

C COMPUTING ALL OF THE Y-VALUES ON THE CONTOUR HAVING THE SAME X-VALUE
 C AS THE POINT QUESTION. OF THE COMPUTED Y-VALUES, THOSE GREATER THAN
 C THE Y-COORDINATE OF THE POINT ARE COUNTED. IF THE NUMBER OF VALUES
 C GREATER THAN THE Y-COORDINATE IS ODD, THE POINT IS CONTAINED WITHIN
 C THE CONTOUR. IF THE NUMBER IS EVEN, THE POINT IS OUTSIDE OF THE
 C CONTOUR.

Subroutine LOAD

SUBROUTINE LOAD(IG,MIDDLE)

 C LOCAL VARIABLE DECLARATION
 C AIRCFT - TABLE OF AIRCRAFT TYPES
 C ANoise - TABLE OF ENGINE NOISE CURVES
 C APTHD - TABLE OF A/C THROUST SETTINGS
 C INoise - TABLE OF WEL NOISE CURVES
 C CUTOFF -
 C DC - TABLE OF DISTANCE CRITERIA FOR NOISE CONTRIBUTION CUTOFF
 C DNAME - TABLE OF NAMES TO WHICH DC APPLY
 C EA - TABLE OF AIRCRAFT IDENTIFIED BY DIFFERENT A/C THAN 2TC
 C IDUM - DUMMY VARIABLE FLAG
 C IINDX1 - STARTING A/C
 C IINDX2 - STARTING A/C
 C IINDX3 - STARTING A/C
 C IINDX4 - STARTING A/C
 C IITL - ALPHANUMERIC OUTPUT TITLE
 C ITITLE - TABLE OF LOOKUPS FOR REFERENCES TO OTHER A/C TABLES
 C MATCH -
 C MATCHC -
 C NAC - NUMBER OF AIRCRAFT
 C NAMES - NAMES OF AIRCRAFT
 C NODC - NUMBER OF (DISTINCTLY) DEFINED AIRCRAFT
 C NDA - NUMBER OF RECORDS IN CURRENT ARRAY READ IN
 C MAXAC,MAXNO,MAXTA,MAXPE,MAXPP - COUNT NUMBER OF VARIOUSLY
 C FORMATTED DATA
 C RECORDS TO BE READ IN
 C PP -
 C PFILE - PERFORMANCE PROFILES
 C PARS - AIRCRAFT THRUST SETTINGS

05-30-79

03-26-79

03-26-79

Subroutine MESSAGE

SUBROUTINE MESSAGE (IGC,N,IND,IRET)

```

C *****
C
C   IGC - ERROR RETURN
C
C   IND - SET TO 999 IF IRET IS LESS THAN OR EQUALS ZERO
C   IRET - EXIT RETURN INDICATOR
C   MESSAGE - SUBROUTINE
C   THE PURPOSE OF THE SUBROUTINE MESSAGE IS TO OUTPUT INFORMATIVE
C   MESSAGES TO THE LINE PRINTER.
C   MESSAGE DOES NOT USE ANY EXTERNAL SUBROUTINES.
C   THE SUBROUTINE MESSAGE HAS ONLY ONE ENTRY POINT AND THE CALLING
C   SEQUENCE IS
C       CALL MESSAGE (*,N,IND,IRET)
C
C   WHERE
C       * - MEMORY LOCATION IN CALLING PROGRAM FOR ALTERNATE RETURN.
C       N - MESSAGE NUMBER TO BE PRINTED.
C   IND - SET TO 999 IF IRET IS LESS THAN OR EQUAL TO ZERO. OTHERWISE,
C         IND IS UNMODIFIED BY MESSAGE.
C   IRET - INDICATOR DICTATING THE EXIT RETURN TO USE AND WHETHER OF
C         NOT TO MODIFY IND.
C         IRET > 0, NO MODIFICATION TO IND AND USE ALTERNATE RETURN.
C         IRET = 0, MODIFY IND AND USE NORMAL RETURN.
C         IRET < 0, MODIFY IND AND USE ALTERNATE RETURN.
C   MESSAGE IS USED BY THE SUBROUTINES MERGRD, MIXRD, PROPRD, NOISRD,
C   GERDR, ACURD, ADPRD, ALPRD, READIN, SETRES, NEWMIX, WINDRD,
C   FENPRD, RHYRD, AND TRAKRD. THE SUBROUTINE MESSAGE MAY BE CALLED MANY
C   TIMES DURING EXECUTION, BUT IT USUALLY USED TO OUTPUT MESSAGES
C   REGARDING ERROR CONDITIONS WHICH WILL ULTIMATELY CAUSE EXECUTION TO
C   BE TERMINATED.
C   THERE ARE THREE EXIT RETURNS FROM MESSAGE LOCATED AT LINES
C   NUMBERED 44, 46 AND 47 OF THE SUBROUTINE LISTING IN SECTION 5. THE
C   RETURN AT LINE 44 IS AN ALTERNATE RETURN USED WHEN IND IS NOT TO BE
C   TO BE MODIFIED. THE RETURN AT LINE 46 IS AN ALTERNATE RETURN AND IS
C   MODIFIED. THE RETURN AT LINE 47 IS A NORMAL RETURN AND IS USED
C   AFTER IND IS MODIFIED.
C   THE OUTPUT FROM MESSAGE IS TO THE LINE PRINTER AND THE
C   MODIFICATION, IF INDICATED, OF THE CALLING VARIABLE IND.
C   NO PROCESSING IS PERFORMED BY MESSAGE.

```

Subroutine METFIX

SUBROUTINE METFIX (METFCT,IGC)

```

C *****
C
C   LOCAL VARIABLE DICTIONARY
C
C   METFCT - CORRECTION FACTOR (SUBTRACT) FOR EVENT EXPOSURE, ALTERNATES
C   ALTRN - EVENING WEIGHTING FACTOR, ALTERNATE METRICS
C   NTRN - NIGHT WEIGHTING FACTOR, ALTERNATE METRICS
C   IGC - USER COMMENT
C   IGC - ALTERNATE RETURN IN CALLING PROGRAM

```

```

C      ITPD - BLANK FILLED WORD
C      IX72 - DUMMY VAR FOR TRUNCATION OF METRIC NAME TO 2 CHARACTERS
C      METID - LIST OF METRIC NAMES (LITERALS)
C      METLEV - THRESHOLD LEVEL FOR NOISE MEASURE
C      METLIT - DUMMY VAR FOR METRIC NAME
C      MEFFT - DUMMY ARG FOR METFIX
C      MGNAL - NUMBERS OF ALTERNATE METRICS
C      MGNPR - NUMBER OF PRIMARY METRIC
C      PRMECT - CORRECTION FACTOR (SUBTRACT) FOR EVENT EXPOSURE, PRIMARY
C      PRMWE - EVENING WEIGHTING FACTOR, PRIMARY METRIC
C      PRMWN - NIGHT WEIGHTING FACTOR, PRIMARY METRIC
C      MECTES - METRIC WEIGHTING FACTORS (ENERGY)
C      METFIX - SUBROUTINE
C      INPUT DATA AND INITIALIZES A VARIETY OF VARIABLES AND INDICATORS FOR
C      THE METFIX SUBROUTINE READS THE METRIC SELECTION CARD FROM THE
C      USE IN OTHER SUBROUTINES.
C      THE SUBROUTINE METFIX CALLS THE SUBROUTINE HEADER.
C      METFIX HAS ONLY ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C      CALL METFIX (MEFFT,*)
C      WHERE
C      MEFFT - USED AS TEMPORARY STORAGE BY METFIX AND SET TO / BEFORE
C      RETURNING.
C      * - MEMORY LOCATION IN CALLING PROGRAM TO WHICH TO RETURN IF
C      ERRORS ARE ENCOUNTERED IN METFIX.
C      ONLY THE MAIN PROGRAM NOISE1 CALLS THE SUBROUTINE METFIX AT THE
C      BEGINNING OF EACH RUN TO INITIALIZE THE VARIABLES ASSOCIATED WITH
C      METRIC CHOICES AND CALCULATIONS AND TO INITIALIZE THE HEADER AND
C      DATA LINE FORMATS FOR THE UPCOMING CONTOUR CALCULATIONS.
C      THE SUBROUTINE METFIX OBTAINS ALL OF ITS DATA FROM THE
C      "METRIC CARD" IN THE INPUT DATA DECK.
C      THE SUBROUTINE METFIX HAS TWO EXIT RETURNS AT LINES NUMBERED 37
C      AND 61 IN THE PROGRAM LISTING IN SECTION 5. THE RETURN AT LINE 37
C      IS ERROR RETURN IF THE FIVE CHARACTERS IN THE PRIMARY METRIC
C      POSITION ARE INCORRECT AND HENCE, THE PRIMARY METRIC CANNOT BE
C      DETERMINED. THE RETURN AT LINE 61 IS USED OTHERWISE AND IS THE
C      NORMAL RETURN.
C      THE OUTPUT DATA FROM METFIX CONSISTS OF INITIALIZING VARIABLES
C      IN THE LABELED COMMON BLOCK /METRIC/. THE FOLLOWING DESCRIBES THE
C      VARIABLES:
C      VARIABLE      DESCRIPTION
C      PRMECT        THE VALUE TO SUBTRACT FROM THE FINAL SUMMATION OF
C                   SINGLE EVENT NOISE EXPOSURE AS FOLLOWS
C                   NEP - 89
C                   LDN - 49.4
C                   CNPT - 49.5
C                   LEQ - 49.4
C                   ASDS - 0
C                   DOSE - 0
C                   THE VARIABLE APPLIES TO THE PRIMARY METRIC.
C
C      ALTECT        SAME AS PRMECT EXCEPT FOR THE REQUESTED ALTERNATE
C                   METRICS.
C      PRMWE         EVENING WEIGHTING FACTOR FOR PRIMARY METRIC
C                   (SEE BELOW)
C      PRMWN         NIGHT WEIGHTING FACTOR FOR PRIMARY METRIC AS FOLLOWS
C                   NEP      PRMWE = 1.0      PRMWN = 16.7
C                   LDN      = 1.0          = 10.0

```

```

C          CNEL          = 3.0          = 10.0
C          IPO           = 1.0          = 1.0
C          ASDS          = 1.0          = 1.0
C          DCSE          = 1.0          = 1.0
C  ALTWE          SAME AS ABOVE EXCEPT FOR SELECTED
C  ALTRW          ALTERNATE METRICS.
C  NUMPP          NUMBER OF PRIMARY METRIC
C          REF V 1          LEQ = 4
C          IDN = 2          ASDS = 5
C          CNEL = 3          DCSE = 6
C  NUMAT          NUMBERS FOR ALTERNATE METRICS AS ABOVE.

```

Subroutine MIXRD

```

      SUBROUTINE MIXRD (IJOB,FAC,IDIMP)

```

```

      *****

```

```

      *LOCAL VARIABLE DICTIONARY*

```

```

      IJOB - TOTAL EQUIVALENT DAYTIME OPERATIONS

```

```

      OF - OFFER, CARD INPUT, LANDINGS

```

```

      FAC - COMBINED AIRCRAFT/TRAFFIC

```

```

      OF - OFFER, CARD INPUT, TAKEOFFS

```

```

      DUMMY - DUMMY AND USED TO CLEAR CONTENTS OF COMMON BLOCK RMYJL

```

```

      DUMMY - ANOTHER DUMMY AND

```

```

      DUMMY - EQUIVALENT DAYTIME OPERATIONS FOR

```

```

      SELECTED PROFILE

```

```

      DUMMY - EQUIVALENT DAYTIME OPERATIONS, ALL PROFILES

```

```

      FAC - INCLUDING ALL DATA ACTION INDICATOR (SEE BELOW)

```

```

      FLAG - BLANK FILLER WORD (DUMMY'S FILE)

```

```

      IJOB - USED TO CLEAR

```

```

      OF - USED FLAG (EVERY PROFILE)

```

```

      OF - USED FLAG ( )

```

```

      OF - USED FOR CURRENT TRACK

```

```

      IDIMP - PRINT CONTROL VARIABLE (SEE BELOW)

```

```

      OF - USED TO CLEAR

```

```

      OF - ALTERNATE PROFILE

```

```

      IJOB - NUMBER OF EQUIVALENT DAYTIME

```

```

      OF - FLAG, DISTINGUISHES BETWEEN CALLS BY USER AND VIEWED

```

```

      IJOB - TRACK GROUP NUMBER

```

```

      OF - NOISE ABOVE NUMBER ASSIGNED TO CURRENT A/C

```

```

      OF - FLIGHT DEFINITION TABLE

```

```

      OF - TABLE OF TRACK NUMBERS ASSIGNED TO EACH PROFILE

```

```

      OF - TABLE OF TRACK GROUP NUMBERS

```

```

      OF - TRACK NUMBER

```

```

      OF - ASSIGNED VARIABLE NAME

```

```

      OF - ASSIGNED VARIABLE NAME

```

```

      OF - ASSIGNED VARIABLE NAME

```

```

      OF - SECONDARY TRACK NUMBER

```

```

      OF - NUMBER OF FLIGHTS TOTAL

```

```

      OF - DECODES IJOB

```

```

      OF - CODE BINARY DECODING

```

```

      OF - SYLLABLE PROFILE NUMBER

```

```

      OF - PROFILE NUMBER

```

```

      OF - ANOTHER TRACK NUMBER

```

```

      OF - PROFILE NUMBER

```

```

      OF - TOTAL OPERATIONS

```

```

C      DEPT - TOTAL ARRIVALS/DEPART (HOURS)
C      DEPT - A/C PERFORMANCE PROFILES
C      DEPT OPERATIONS BROKEN DOWN BY RUNWAY
C      STMT - TOTAL FINDINGS
C      STMT - TOTAL TAKEOFFS
C      TOTS - TOTAL OPERATIONS MAJOR USFRS
C      TOTS - TOTAL OPERATIONS
C      TOTS - TOTAL DEPARTURES/DEPART (HOURS)
C      TOTS - SUBROUTINE
C      THE PURPOSE OF SUBROUTINE MIXRD IS TO READ DIRECTLY ASSIGNED
C      AIRCRAFT OPERATIONAL INPUT DATA. APPROPRIATE VARIABLES DESCRIBING
C      THE OPERATIONAL CHARACTERISTICS OF THE FLIGHTS ALONG WITH THE
C      NUMBER OF OPERATIONS ARE CONSTRUCTED.
C      MIXRD USES THE SUBROUTINES CRTAL, DEPTAL, EQOPS, NEWRED, SORT4
C      AND MESSAGE.
C      THERE ARE FOUR ENTRY POINTS TO MIXRD AND CALLING SEQUENCE FOR
C      THE FIRST ONE IS
C      CALL MIXRD (*, FAC, IDUMP)
C      WHERE
C      * - MEMORY LOCATION IN CALLING PROGRAM TO WHICH TO RETURN IF
C        ERROR ARE ENCOUNTERED IN MIXRD.
C      FAC - AN INDICATOR TELLING WHAT TO DO WITH THE INCOMING MIX
C        DATA.
C        IF FAC = 0, NEW MIX DATA IS COMING IN AND ANY OLD MIX
C        DATA IS DISCARDED. IF FAC > 0, THE NEW MIX DATA
C        OPERATIONS ARE MULTIPLIED BY FAC AND REPLACE THE OLD MIX
C        DATA. IF FAC < 0, THE NEW MIX DATA IS MULTIPLIED BY /FAC/
C        AND ADDED TO THE OLD MIX DATA.
C      IDUMP - PRINT CONTROL VARIABLE. IF IDUMP = 0, RAW DATA WILL BE
C        PRINTED AMONG OTHER OUTPUT. IF IDUMP = 1, THE RAW DATA
C        FROM THE INPUT CARDS WILL NOT BE PRINTED. IF IDUMP / 0
C        AND IDUMP / 1, A DETAILED SUMMARY OF THE FLIGHT DEFINITION
C        TABLE ITBAC AND THE OPERATIONS TABLE OPS WILL BE PRINTED
C        FOR ALL DEFINED FLIGHTS IN ADDITION TO THE NORMAL OUTPUT.
C      THE SUBROUTINE MIXRD IS CALLED ONLY BY THE SUBROUTINE READY.
C      IT IS CALLED WHEN "SUBJECT ASSIGNMENT" AIRCRAFT OPERATIONS DATA ARE
C      INPUT. IT MAY BE CALLED MANY TIMES.
C      IN ADDITION TO THE CALLING VARIABLE FAC, THE INPUT DATA FOR
C      MIXRD IS READ FROM DATA CARDS IN THE INPUT DATA DECK.
C      THERE ARE THREE END BETWEEN FROM MIXRD AT LINES NUMBERED 74,
C      75, AND 76 IN THE SUBROUTINE LISTING IN SECTION 2. THE RETURN AT
C      LINE 74 IS AN ERROR RETURN AND IS USED ONLY IF THE NUMBER OF DEFINED
C      FLIGHTS EXCEEDS 2000, THE PRESENT TABLE STORAGE SIZE. THE USE OF
C      OTHER RETURN WILL CAUSE EXECUTION TO BE TERMINATED. THE RETURN AT
C      LINE 75 IS ALSO AN ERROR RETURN RESULTING IN EXECUTION TERMINATION
C      AND IS USED IF ANY ERRORS ARE DETECTED IN THE INPUT DATA. THE
C      RETURN AT LINE 76 IS A NORMAL RETURN AND IS USED IF NO ERRORS ARE
C      DETECTED IN THE INPUT DATA.
C      THE OUTPUT FROM MIXRD CONSISTS OF INFORMATION PRINTED ON THE
C      LINE PRINTER AND DATA FILE INITIALIZATIONS. MIXRD CALLS NEWRED
C      WHICH PRINTS THE RAW INPUT MIX DATA FROM THE DATA DECK AND DEPTAL
C      WHICH PRINTS THE AIRCRAFT OPERATIONS AND PRETTY UTILIZATION TABLES
C      IN THE OUTPUT. IN ADDITION, MIXRD WILL OUTPUT THE CONTENTS OF THE
C      FLIGHT IDENTIFICATION TABLE ITBAC AND THE NUMBER OF OPERATIONS
C      TABLE OPS FOR EACH DEFINED FLIGHT IF REQUESTED TO DO SO BY THE
C      USER. THESE TABLES ARE LOCATED IN THE LABELED COMMON BLOCK
C      /MIXRD/.
C      INTERNAL VARIABLES IN THE LABELED COMMON BLOCK /MIXRD/ ARE
C      INITIALIZED IN MIXRD. THE VARIABLE NAMES AND THEIR DESCRIPTIONS
C      ARE:

```

VARIABLE DESCRIPTION
 NOPS TOTAL NUMBER OF DISTINCTLY DEFINED FLIGHTS
 ITPRAC A TABLE CONTAINING UP TO 2000 DISTINCT FLIGHT IDENTIFICATION CODES. THE CONTENTS OF EACH WORD IN THE TABLE ARE AS FOLLOWS, WHERE BINARY BIT POSITION 0 IS THE LEAST SIGNIFICANT BIT.

BIT POSITIONS	CONTENTS
0-4	NOISE CURVE SET NUMBER MINUS 1
5-10	PERFORMANCE PROFILE NUMBER
11-16	GROUND TRACK NUMBER
17-24	TRACK GROUP NUMBER

NOPS THE ASSIGNED NUMBER OF OPERATIONS FOR EACH OF THE DEFINED FLIGHTS IN ITPRAC AND FOR ALL POSSIBLE METRICS. WHERE K IS THE FLIGHT NUMBER, THE OPERATIONS/METRIC CORRESPONDENCE IS AS FOLLOWS
 NOPS (K,1) - WFF
 NOPS (K,2) - LON
 NOPS (K,3) - CHSL
 NOPS (K,4) - LED, ASDS, DOSE

IT SHOULD BE NOTED THAT THE WORDS CONTAINED IN THE TABLE ITPRAC ARE ACTUALLY GENERATED IN SUBROUTINE NEWRED, THEY ARE STORED IN THE TABLE BY SUBROUTINE MIXRD.

THE PROCESSING PERFORMED BY MIXRD CONSISTS OF SORTING THE FLIGHT DEFINITION TABLE ITPRAC AND THE OPERATIONS TABLE NOPS ONCE ALL OF THE FLIGHTS HAVE BEEN DEFINED. THE WORDS IN THE TABLE ITPRAC, EACH ASSIGNED TO BE A SINGLE INTEGER VALUE, ARE SORTED IN DESCENDING ORDER WHILE THE VALUES IN THE TABLE NOPS ARE SORTED SO THAT THE NUMBER OF OPERATIONS FOR A FLIGHT IS IN THE SAME RELATIVE POSITION IN NOPS AS THE FLIGHT IDENTIFICATION WORD IN ITPRAC.

THE SECOND ENTRY IN MIXRD IS AT PCNTRD AND THE CALLING SEQUENCE IS
 CALL PCNTRD (*, FAC, IDUMP)
 WHERE THE CALLING ARGUMENTS ARE AS PREVIOUSLY DEFINED IN THE MIXRD ENTRY.

THE SUBROUTINES CALLED BY PCNTRD ARE ZERO, NBETH, MESSAGE, AND, BY DEFAULT, NEWMIX. THE SUBROUTINE NEWMIX IS NOT ACTUALLY CALLED BUT IS ENTERED AS A NORMAL CONTINUATION OF PCNTRD AT THE NEWMIX ENTRY POINT.

PEADIN IS THE ONLY SUBROUTINE TO USE PCNTRD AND IT MAY BE CALLED SEVERAL TIMES DURING THE INPUT PHASE OF EXECUTION.

THE INPUT TO PCNTRD IS PROVIDED FROM CARDS IN THE INPUT DATA DECK.

THE ONLY EXIT FROM THE PCNTRD ENTRY IS DIRECTLY INTO THE NEWMIX ENTRY. THE EXIT RETURNING WILL BE EXECUTED FROM NEWMIX.

PCNTRD INITIALIZES THE TRACK TAKEOFF AND LANDING UTILIZATION TABLES TOPP AND PERL RESPECTIVELY AND COMPUTES AND PRINTS THE SUM OF THE UTILIZATION FOR THE ENTIRE SET OF TRACKS. THIS IS A DIAGNOSTIC OUTPUT WHICH IS USEFUL WHEN CHECKING THE INPUT DATA.

THE THIRD ENTRY IN MIXRD IS AT NEWMIX AND THE CALLING SEQUENCE IS
 CALL NEWMIX (*, FAC, IDUMP)
 WHERE THE CALLING ARGUMENTS ARE AS PREVIOUSLY DEFINED IN MIXRD.

NEWMIX USES THE EXTERNAL SUBROUTINES SORTA, MESSAGE, EQUOPS, IMPRAT, CRTAL, AND NEWRED.

NEWMIX IS CALLED BY SUBROUTINE PEADIN AND IS A NORMAL CONTINUATION FOR THE ENTRY AT PCNTRD AS DISCUSSED JUST PREVIOUSLY.

NEWMIX READS AIRCRAFT OPERATIONS DATA FROM THE INPUT DECK, THROUGH THE SUBROUTINE NEWRED, JUST AS IN MIXRD BUT, UNLIKE MIXRD,

```

C ASSIGNS THE OPERATIONS TO THE FLIGHT TRACKS IN THE PROPORTIONS
C INDICATED IN THE TRACK TAKEOFF AND LANDING UTILIZATION TABLES TPER
C AND LPER RESPECTIVELY. IN ADDITION, AND AGAIN UNLIKE MIXRD, THE
C LANDING PERFORMANCE PROFILE NUMBER WILL BE COMPUTED BY NEWMIX, IF
C NECESSARY, AND INSERTED INTO THE FLIGHT IDENTIFICATION STORED IN THE
C TABLE ITPRAC.
C OTHERWISE, NEWMIX PERFORMS THE SAME FUNCTION, HAS THE SAME EXIT
C RETURNS WHICH WILL BE USED FOR THE SAME REASONS AND PERFORMS THE
C SAME VARIABLE INITIALIZATIONS AS THE ENTRY AT MIXRD.
C THE FINAL ENTRY IN MIXRD IS AT MERGRD AND THE CALLING SEQUENCE
C IS
C CALL MERGRD (N, IDUMP)
C WHERE THE CALL ARGUMENTS ARE AS DEFINED IN THE MIXRD CALLING
C SEQUENCE.
C MERGRD CALLS THE SUBROUTINES NBETW, MESSAGE, AND SORT4.
C READIN IS THE ONLY USER OF MERGRD AND MAY CALL IT SEVERAL TIMES.
C MERGRD RECEIVES ITS INPUT DATA FROM THE DATA CARDS IN THE INPUT

```

```

C DECK AND USING THAT WILL PERFORM OPERATIONS ON THE TABLES ITPRAC
C AND WOPS.
C THERE ARE TWO EXIT RETURNS FROM MERGRD LOCATED AT LINES 254 AND
C 266 OF THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 254
C IS AN "ERROR" RETURN WHILE THE ONE AT LINE 266 IS THE "NORMAL" RETURN.
C THE PURPOSE OF MERGRD IS TO CHANGE THE NOISE CURVE SET NUMBER IN
C THE CONTENTS OF THE TABLE ITPRAC TO A DIFFERENT NUMBER IF IT IS
C DIFFERENT FROM THE GIVEN NUMBER WHERE BOTH VALUES ARE READ FROM A
C DATA CARD. THE RESULTANT FLIGHT IDENTIFICATION AND OPERATIONS FOR
C EACH FLIGHT ARE THEN COMBINED (OR MERGED) WITH ANY OTHER FLIGHTS
C WITH THE SAME IDENTIFICATION CODE SO THAT WHEN MERGRD IS DONE NO TWO
C FLIGHT IDENTIFICATION CODES IN THE TABLES ITPRAC ARE THE SAME.

```

Function NBETW

```

C LOGICAL FUNCTION NBETW (I,J,K)
C
C *****
C I - ARRAY OF TEST VALUES
C J - LOWER BOUND
C K - UPPER BOUND
C NBETW - TRUE OR FALSE
C THIS FUNCTION IS .TRUE. IF A IS NOT BETWEEN B AND C INCLUSIVE.
C
C 2.35 NBETW - LOGICAL FUNCTION SUBROUTINE
C NBETW DETERMINES LOGICALLY (I.E., TRUE OR FALSE) IF A
C GIVEN NUMBER IS NOT BETWEEN TWO OTHER GIVEN NUMBERS.
C NBETW DOES NOT USE ANY EXTERNAL SUBROUTINES.
C THERE IS ONLY ONE ENTRY IN NBETW AND THE CALLING SEQUENCE
C IS
C NBETW (I,J,K)

```

```

      *****
      I - THE INTEGER VALUE IN QUESTION
      J - THE INTEGER LOWER BOUND
      K - THE INTEGER UPPER BOUND
      NBETW IS CALLED BY THE SUBROUTINES MEPSRD, PROPRD,
      MEISRD, GEPED, ACURDT, ALTRRD, PCNTRD, NEWRED, TRAKRD, RMYRD AND
      MENDRD.
      THE INPUT TO NBETW IS ENTIRELY THROUGH THE CALLING ARGUMENTS.
      THERE IS ONLY ONE EXIT RETURN FROM NBETW AND IT IS USED UNDER
      ALL CONDITIONS.
      THE OUTPUT OF NBETW IS RETURNED TO THE CALLING PROGRAM THROUGH
      THE FUNCTION NAME AND CONSISTS OF A LOGICAL VALUE TRUE OR FALSE.
      THE PROCESSING PERFORMED BY NBETW CAN BE FORMULATED AS FOLLOWS
      NBETW = FALSE , IF J < I < K
      OR
      NBETW = TRUE , OTHERWISE
      WHERE I,J,K ARE THE CALLING ARGUMENTS.

```

Subroutine NEWPNT

```

      SUBROUTINE NEWPNT (IGC,NPTS)

```

```

      *****
      LOCAL VARIABLE DICTIONARY
      AINC - CONTOUR POINT SEARCH ANGULAR STEP
      ANGLE - ANGULAR DISPLACEMENT OF TEST POINT FROM PREVIOUS POINT
      D - STEP SIZE BETWEEN CONTOUR POINTS
      DCHK - STEP SIZE TOLERANCE FOR LINEAR SEARCH
      DD - LINEAR SEARCH STEP SIZE
      (TWO-THIRD CONTOUR POINT BETWEEN 2 TEST POINTS)
      DENG - MAXIMUM ALLOWABLE DISTANCE BETWEEN CONTOUR POINTS (FEET)
      DLY - CONTOUR SEGMENT PARALLELISM TOLERANCE
      E - TEST EXPOSURE AT POINT BY
      GRADU - LAST COMPUTED GRADIENT VECTOR COMPONENTS
      IGC - ERROR RETURN
      IJK - LOOP COUNTER
      KY - MULTIPLYING FACTOR FOR ITERATION LIMITS
      L - ITERATION LIMIT TIMES MULTIPLYING FACTOR
      NOY - NOISE VALUE AT POSITION OF NEXT CONTOUR POINT
      NOYC - TEST EXPOSURE AT C)
      NOYS - TEST EXPOSURES AT POINTS PO IN CURRENT SEARCH
      NOY7 - TEST EXPOSURE AT PO (BRANCHING PROBLEM IS REASON FOR THESE)
      NPTS - NUMBER OF POINTS IN CONTOUR
      NSCRN - NAME OF ITERATION LIMITS
      NYS - NUMBER OF TIMES EXPOSE HAS BEEN CALLED
      NPTS - NUMBER OF SEGMENTS IN CONTOUR
      CANGA - POINT SEARCH ANGLE STEP (RADIAN)
      DD - DOT PRODUCT TO CHECK PARALLELISM OF CONTOUR SEGMENTS
      DVAL2 - VECTOR MAGNITUDE OF DD
      DDP - DIFFERENCES BETWEEN X,Y COORDS OF ADJACENT CONTOUR POINTS
      DZ - RESULTANT VECTOR
      Q - QUOTIENT OF EXPOSURE DIFFERENCES
      PO - FIRST GUESS AT LOCATION OF NEXT POINT, CONTAINS NEXT POINT ON RETURN
      PJ - SCRATCH COPY OF NEXT CONTOUR POINT LOCATION

```

```

C      PP - AS PER, SIGN OF X COORD REVERSED, COORD ORDER Y,X,Z
C      PPTS - X,Y COORDINATES OF TEST POINTS IN CURRENT SEARCH
C      PO - COORDINATES OF TEST CONTOUR POINT (OFFSET FROM AX,YY
C           ACCORDING TO ANGLE, D)
C      RP - DIFFERENCE BETWEEN X,Y COORDS OF NEW POINT AND ARBITRARY EXISTING
C           CONTOUR POINT
C      RPK - WORKING COPY OF NEXT CONTOUR POINT (TENTATIVE)
C      RY - DIFFERENCE VECTOR BETWEEN STARTING AND TEST POINTS
C      TOL - CONTOUR ERROR TOLERANCE (SACROSANCT)
C      TOL - CONTOUR ERROR TOLERANCE (CHANGED BY NEWPNT)
C      TOLR - ERROR TOLERANCE
C      VAL - CONTOUR VALUE (LEVEL)
C      VAL1 - EXPOSURE AT PREVIOUS CONTOUR POINT
C      VAL2 - TEST EXPOSURE AT RPK
C      V - SIGN OF EXPOSURE DIFFERENCES
C      V - PREVIOUSLY COMPUTED COORDINATES
C      X2 - COORDINATE OF PO
C      XVAL - TEST EXPOSURE
C      YX - ALIAS PO(1)
C      YZ - ALIAS PO(2)
C      YZ2 - DIFFERENCE VECTOR BETWEEN PO AND PZ
C      Y - PREVIOUSLY COMPUTED COORDINATES
C      Y2 - COORDINATE OF PO
C      YZ - ALIAS PO(2)
C      Z - DIFFERENCE BETWEEN PRIOR AND TEST POINT EXPOSURES
C      NEWPNT - SUBROUTINE
C      THE PURPOSE OF SUBROUTINE NEWPNT IS TO FIND SUBSEQUENT POINTS ON
C      A CONTOUR ONCE THE FIRST POINT HAS BEEN FOUND. THIS SUBROUTINE IS
C      USED FOR NEP, LON, ONEY, AND LEO CONTOURS.
C      NEWPNT CALLS THE SUBROUTINES SGNP, VTPN, VSUB, VUNT, VMAG,
C      VDOT, DEND, AND EXPOS.
C      THE SUBROUTINE NEWPNT HAS ONE ENTRY POINT AND THE FOLLOWING IS
C      THE CALLING SEQUENCE:
C      CALL NEWPNT (*, NPTS)
C      WHERE
C      * - MEMORY LOCATION IN CALLING PROGRAM FOR ERROR RETURN.
C      NPTS - THE NUMBER OF CONTOUR POINTS THAT HAVE ALREADY BEEN
C            COMPUTED.
C      THE MAIN PROGRAM NOISE1 IS THE ONLY USER OF SUBROUTINE NEWPNT
C      AND WILL CALL IT MANY TIMES DURING EXECUTION TO FIND CONTOUR POINTS
C      ON NEP, LON, ONEY, OR LEO CONTOURS. IF ASOS OF DOSE CONTOURS ARE
C      BEING COMPUTED, THE SUBROUTINE NEWPNT WILL NOT BE USED AT ALL.
C      OTHER THAN THE NUMBER OF POINTS (NPTS) IN THE CALLING
C      ARGUMENTS, THE INPUT TO SUBROUTINE NEWPNT IS PROVIDED BY VARIABLES
C      IN LABELED COMMON BLOCKS. THE FOLLOWING DESCRIBES THAT DATA.
C      COMMON
C      BLOCK      VARIABLE DESCRIPTION
C      /BK/      TOL2 CONTOUR ERROR TOLERANCE (NEVER CHANGED).
C              TOL CONTOUR ERROR TOLERANCE (SOMETIMES CHANGED
C                   BY NEWPNT).
C              VAL CONTOUR VALUE (LEVEL).
C      /COPS/      PO FIRST GUESS AT POSITION OF NEXT POINT.
C                   WILL CONTAIN NEW POINT ON NORMAL RETURN.
C      /SCRACH/     X, Y PREVIOUSLY COMPUTED COORDINATES.
C      COMMON
C      BLOCK      VARIABLE DESCRIPTION
C      /PCTP/      DEVS MAXIMUM ALLOWABLE DISTANCE BETWEEN
C                   CONTOUR POINTS (FEET).
C      /GRADNT/     GRADN LAST COMPUTED UNIT GRADIENT VECTOR
C                   COMPONENTS.

```

THERE ARE SEVEN EXIT RETURNS FROM THE SUBROUTINE NEWPNT
 LOCATED AT LINES NUMBERED 58, 74, 89, 129, 134, 153, AND 217 IN THE
 SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 58 IS USED IF
 THE SEARCH PATTERN COMPLETELY FAILS TO FIND THE CONTOUR. IT IS AN
 ERROR RETURN HALTING FURTHER COMPUTATIONS ON THE CURRENT CONTOUR.
 THE RETURN AT LINE 74 IS ALSO AN ERROR RETURN HAVING THE SAME
 CONSEQUENCE AND IS USED IF THE NUMBER OF TRIAL POINTS HAS BECOME
 EXCESSIVE. THE RETURN AT LINE 89 IS, LIKEWISE, AN ERROR RETURN
 USED WHEN THE NUMBER OF INTERPOLATION TRIALS BETWEEN TWO POINTS
 BECOMES EXCESSIVE DUE TO A DISCONTINUITY IN THE NOISE FUNCTION. THE
 RETURN AT LINE 129 IS AN ERROR RETURN USED IF, IN GENERAL, THE

NUMBER OF TRIES AT FINDING A NEW POINT IS EXCESSIVE. THE RETURN AT
 LINE 134 IS A NORMAL RETURN AND IS USED IF A POINT ON THE CONTOUR
 HAS BEEN FOUND AND THE NUMBER OF PREVIOUSLY COMPUTED POINTS IS LESS
 THAN SIX. THE RETURN AT LINE 153 IS THE ONLY OTHER NORMAL RETURN
 AND IS USED WHEN A POINT ON THE CONTOUR HAS BEEN FOUND AND HAS
 PASSED THE LOOP CHECK SEQUENCE. THE RETURN AT LINE 217 IS AN ERROR
 RETURN AND IS USED WHEN THE PROGRAM FINDS ITSELF IN A LOOP AND
 CANNOT FIND ITS WAY OUT.

THE OUTPUT OF SUBROUTINE NEWPNT IS SIMPLY THE POSITION OF THE
 NEXT CONTOUR POINT WHICH IS PASSED TO THE CALLING PROGRAM THROUGH
 THE VARIABLE RC IN THE LABELED COMMON BLOCK /OOPS/ AND THE NOISE
 VALUE AT THAT POINT WHICH IS PASSED THROUGH THE REAL VARIABLE NEW1
 IN THE LABELED COMMON BLOCK /SCRATCH/.

THE PROCESSING PERFORMED BY SUBROUTINE NEWPNT IS DESCRIBED IN
 THE FOLLOWING PARAGRAPHS.

SINCE AT LEAST ONE POINT ON THE CONTOUR IS AVAILABLE, THE FIRST

STEP IS TO DETERMINE THE NOISE GRADIENT AT THE LAST POINT KNOWN TO
 BE GOOD. THE INITIAL GUESS IS THEN MADE IN A DIRECTION
 PERPENDICULAR TO THE GRADIENT AND AT A DISTANCE (THE "STEPSIZE")
 WHICH HAS BEEN SPECIFIED AS AN INPUT (SEE FIGURE). IF THIS FIRST
 GUESS IS NOT ON THE CONTOUR, SUBSEQUENT GUESSES ARE MADE BY ROTATING
 AROUND THE LAST GOOD POINT. THIS ROTATION IS DONE IN TWO STEPS OF
 10, IN A DIRECTION THAT, ACCORDING TO THE GRADIENT, SHOULD CAUSE
 THE NOISE EXPOSURE TO APPROACH THE CONTOUR VALUE. IF THIS FAILS,
 THE STEPSIZE IS HALVED, THE ANGLE STEP INCREASED TO 20, AND THE
 ROTATION REPEATED. IF THE SECOND ROTATION FAILS, THE STEPSIZE IS
 HALVED AGAIN, AND THE POINT ROTATED FOR FOUR STEPS OF 20. IF THE
 THIRD ROTATION FAILS, THE STEPSIZE IS HALVED AGAIN, AND THE POINT
 ROTATED IN 12 STEPS. IF THE CONTOUR POINT HAS STILL NOT BEEN
 FOUND, THE STEPSIZE IS HALVED AGAIN. IF THIS FAILS, THE CONTOUR IS DELETED.
 WHILE THE ABOVE SEARCH IS BEING PERFORMED, A CHECK IS MADE FOR
 CROSSING THE CONTOUR. IF IT IS CROSSED, THE CONTOUR POINT IS THEN
 FOUND BY DEGRADED LINEAR INTERPOLATION. AFTER A POTENTIAL POINT HAS
 BEEN FOUND, CHECKS ARE MADE TO VERIFY THAT THIS POINT IS NOT ACROSS
 A FENCE OR INLET OF THE CONTOUR FROM THE LAST CONTOUR POINT. IF IT
 IS, THE STEPSIZE IS HALVED AND THE SEARCH PROCEDURE IS REPEATED.
 THIS INSURES A FAITHFUL TRACKING OF THE ACTUAL CONTOUR.

UNDER CERTAIN CIRCUMSTANCES, IT IS POSSIBLE FOR THE CONTOUR
 SEARCH PROGRAM TO BECOME CAUGHT IN A LOOP IN A DISTANT PART OF THE
 CONTOUR AND NEVER RETURN TO THE START POINT (SEE FIGURE FOLLOWING
 FOR AN EXAMPLE OF SUCH A SITUATION). A LOOPING SITUATION IS DETECTED
 BY COMPARING A POTENTIAL NEW CONTOUR POINT WITH PAIRS OF POINTS
 ALREADY DETERMINED TO BE ON THE CONTOUR. IF THE NEW POINT IS WITHIN
 ONE-TENTH OF THE INPUT STEPSIZE OF A STRAIGHT LINE JOINING A PAIR
 OF CONSECUTIVE CONTOUR POINTS, THEN THE PROGRAM IS LOOPING. TO
 CORRECT THE SITUATION, THE PROGRAM RETURNS TO THE LAST GOOD CONTOUR

C FIND AND COMPUTES THE NOISE EXPOSURE AT A FULL CIRCLE OF 24 POINTS.
 C THE RADIUS OF THE CIRCLE IS 1.5 TIMES THE CURRENTLY UPDATED
 C STEPSIZE. THE SEARCH IS BEGUN WITH THE POINT IN THE SAME DIRECTION
 C AS THE PREVIOUS CONTOUR POINT (SEE FOLLOWING FIGURES). AFTER ALL
 C POINTS ON THE CIRCLE HAVE BEEN COMPUTED, THEY ARE EXAMINED TO
 C DETERMINE ALL PLACES WHERE THE CONTOUR CROSSES THE CIRCLE OF POINTS.
 C ALL SUCH CONTOUR CROSSING ARE THEN EXAMINED IN REVERSE ORDER TO
 C DETERMINE IF THEY ARE ON A PREVIOUSLY-FOUND PORTION OF THE CONTOUR.
 C THE FIRST NEW CONTOUR POINT FOUND IS CHOSEN AS THE NEXT CONTOUR
 C POINT. IF NO POINT IS FOUND AND IF THE RADIUS OF THE CIRCLE IS LESS
 C THAN THE INPUT STEP SIZE, THE SEARCH IS REPEATED WITH A RADIUS EQUAL
 C TO THE INPUT STEP SIZE. IF A NEW POINT IS STILL CANNOT BE FOUND,
 C THE RUN IS ABORTED.

C THE FOLLOWING PARAGRAPHS WILL DELINEATE THE SECTIONS OF THE
 C SUBROUTINE NEWRED THAT PERFORM THE PROCESSES JUST DESCRIBED (REFER
 C TO THE SUBROUTINE LISTING IN SECTION 5).

C LINES 17 THE NOISE EXPOSURE VALUE AT RC IS COMPUTED (SIGNIFANT
 C FLIGHTS ONLY).
 C LINES 28 TO 50 THE NORMAL SEARCH PATTERN IS EXECUTED (SEE
 C PREVIOUS FIGURE).
 C LINES 62 TO 77 CHECKS ARE MADE TO SEE IF A POTENTIAL CONTOUR
 C POINT IS ACROSS A FINGER OR INLET IN THE CONTOUR.
 C LINES 84 TO 102 REPEATED INTERPOLATIONS BETWEEN TWO POINTS
 C WHICH STRADDLE THE CONTOUR.

C LINES 105 TO 120 ADDITIONAL FINGER AND INLET CROSSING CHECKS AND
 C TOLERANCE CHECKS USING ALL DEFINED FLIGHTS AT A
 C POTENTIAL CONTOUR POINT.
 C LINES 134 TO 153 CHECK POTENTIAL CONTOUR POINT FOR LOOPING
 C CONDITIONS. THE PROCEDURE USED IS NEARLY
 C IDENTICAL TO THE METHOD DESCRIBED IN SUBROUTINE
 C CKLOOP.
 C LINES 159 TO 217 ALTERED SEARCH PATTERN EXECUTED AFTER
 C DETERMINING EXISTENCE OF LOOPING CONDITIONS
 C (SEE FIGURE).
 C LINES 219 TO 237 DISPOSITION OF POTENTIAL CONTOUR POINT FOUND
 C BY ALTERED SEARCH PATTERN.

Subroutine NEWRED

SUBROUTINE NEWRED (ISOL, IBCF, HCC, IV, CPS, FAC, IOC, IDUMP, WE, WN,
 ILLIQU)

C *****
 C READ MY DATA
 C TOT - TOTAL COMBINED OPERATIONS (EVERYTHING)
 C TOTC - TOTAL NUMBER OF RESTRICTED OPERATIONS (DAY/ EVE/ NIGHT)
 C TOTTC - TOTAL NUMBER OF RESTRICTED TAKEOFFS
 C TOTTD - TOTAL NUMBER OF RESTRICTED LANDINGS
 C OPERATC - DUMMY ARRAY, NUMBER OF OPERATIONS
 C IPRSTY - LOOKUP ARG> DEPARTURE_Rwy TO ARRIVAL_Rwy NUMBERS
 C IV - TRACK GROUP NUMBER < 32*PROFILE NUMBER
 C CPS - NUMBER OF OPERATIONS

03-29-79

```

C      EQOPS - EQUIVALENT DAYTIME OPERATIONS
C      DEN - LABEL APRAY (DAY, EVENING, NIGHT)
C      NAME - AIRCRAFT NAME
C      NPROPS - NUMBER OF PROFILES
C      ITAC - NUMBER OF AIRCRAFT (DEFAULT)
C      MAC - NUMBER OF DEFINED AIRCRAFT) LOOP COUNTER(
C      MAC -
C      ITAC - AIRCRAFT TYPE
C      ITPK - TRACK NUMBER
C      NPROF - PROFILE I.D. (CARDINAL)
C      IPRF - PROFILE NUMBER
C      IED - ERROR FLAG, APRAY SUBSCRIPTS BOUNDS
C      NOC - NOISE CURVE NUMBER
C      ITG - TRACK GROUP NUMBER
C      FAC - FUDGES AIRCRAFT NUMBER OF OPERATIONS
C      T - SUBTOTAL OPERATIONS
C      IP - RUNWAY NUMBER
C      NP - PROFILE NUMBER
C      YTOT - TOTAL ANNUAL OPERATIONS
C      NEWRED - SUBROUTINE
C      THE SUBROUTINE NEWRED READS THE AIRCRAFT OPERATIONS DATA FROM
C      THE INPUT DATA. IT ASSOCIATES THE AIRCRAFT NUMBER WITH THE NOISE
C      CURVE NUMBER AND FLIGHT PERFORMANCE DATA WITH STAGE LENGTH
C      INFORMATION. NEWRED HAS ALTERNATE ENTRY POINTS AT EQOPS, CLRTAL,
C      DMPY, AND ACUDPT.
C      NEWRED USES THE SUBROUTINES MESSAGE AND FBETW.
C      THE SUBROUTINE NEWRED HAS THE FOLLOWING CALLING SEQUENCE:
C      CALL NEWRED (*,*,NC,IV,CPS,FAC,LOC,IDUMP)
C      WHERE
C      * - MEMORY LOCATION IN CALLING PROGRAM FOR RETURN IF ERRORS
C      ARE ENCOUNTERED.
C      INPUT DATA.
C      * - MEMORY LOCATION IN CALLING PROGRAM FOR RETURN AT END OF
C      NC - NOISE CURVE SET NUMBER RETURNED TO CALLING PROGRAM BY
C      NEWRED.
C      IV - VARIABLE OF DIMENSION 8 WHICH CONTAINS THE FLIGHT
C      IDENTIFICATION CODES CONSTRUCTED BY NEWRED. (SEE
C      SUBROUTINES MIXPD AND NEWMIX WITH RESPECT TO VARIABLE
C      ITPK.)
C      CPS - VARIABLE OF DIMENSION 24 CONTAINING UP TO 8 SETS OF DAY/
C      EVENING/NIGHT OPERATIONS MULTIPLIED BY THE CALL
C      ARGUMENT FAC (BELOW).
C      FAC - OPERATIONS MULTIPLIER. (SEE CPS ABOVE.)
C      LOC - IF = 1, CALLING PROGRAM IS NEWMIX. OTHERWISE, CALLING
C      PROGRAM IS MIXPD AND LANDING PROFILE NUMBER MUST
C      ACCOMPANY LANDING OPERATIONS.
C      IDUMP - IF = 0, RAW INPUT DATA NOT PRINTED. OTHERWISE, IT IS
C      PRINTED.
C      THE SUBROUTINE NEWRED IS USED BY THE SUBROUTINES MIXPD AND
C      NEWMIX. SINCE NEWRED ONLY READS ONE INPUT DATA CARD PER CALL, IS
C      WILL BE CALLED AS MANY TIMES AS THERE ARE MIX DATA CARDS IN THE
C      DECK.
C      IN ADDITION TO THE CALLING ARGUMENTS, NEWRED GETS ITS INPUT
C      DATA FROM THE RUN DECK AND FROM DATA TABLES IN LABELED COMMON. THE
C      FOLLOWING DISCUSSES THOSE TABLES.
C      COMMON
C      BLOCK      VARIABLE DESCRIPTION

```

C /MIXDATA/ IA(8,70) NUMBERS INDICATING NOISE CURVE SETS AND
 C PERFORMANCE PROFILES FOR UP TO 50 AIRCRAFT
 C TYPES AS FOLLOWS ASSUMING AIRCRAFT TYPE I.
 C IA(1,I) NOISE CURVE SET NUMBER
 C (2,I) PROFILE FOR 0-500 NAUTICAL MILES
 C (3,I) PROFILE FOR 500-1000 NAUTICAL
 C MILES
 C (4,I) PROFILE FOR 1000-1500 NAUTICAL
 C MILES
 C (5,I) PROFILE FOR 1500-2500 NAUTICAL
 C MILES
 C (6,I) PROFILE FOR 2500-3500 NAUTICAL
 C MILES
 C (7,I) PROFILE FOR 3500-4500 NAUTICAL
 C MILES
 C (8,I) PROFILE FOR 4500 + NAUTICAL
 C MILES
 C MAC LARGEST AIRCRAFT DEFINITION NUMBER WHICH
 C HAS BEEN DEFINED
 C TALLY CUMULATIVE OPERATIONS FOR DAY/EVENING/
 C (8,2,70) NIGHT, LANDING AND 7 TAKEOFF STAGE LENGTHS
 C FOR UP TO 50 DEFINED AIRCRAFT TYPES.
 C
 C COMMON BLOCK VARIABLE DESCRIPTION
 C /TRACK/ ITR(80) DEFINED TRACKS HAVE A RUNWAY NUMBER IN THIS TABLE
 C IN THE SAME POSITION AS THE TRACK NUMBER. OTHER WISE, THE VALUE IN A
 C POSITION IS EQUAL TO 7491. NEWRED USED THIS VARIABLE TO CHECK THAT
 C A USER-REQUESTED TRACK HAS BEEN DEFINED.
 C /RUNWAY/ RL(15) CONTAINS THE LENGTHS OF THE RUNWAYS. USED BY NEWRED
 C TO ASSURE THAT TAKEOFFS HAVE ENOUGH ROOM.
 C /PERFNT/ PROF(8,10,15) AIRCRAFT PERFORMANCE PROFILES USED IN
 C CONSTRUCTION WITH THE RUNWAY LENGTHS AS DESCRIBED ABOVE.
 C /RWYWT/ RWSE(2,2,5) THE RUNWAY LENGTHS AS DESCRIBED ABOVE.
 C NEWRED/ RWSE(2,2,5) CUMULATIVE DAY/EVENING/NIGHT OPERATIONS FOR
 C TAKEOFF =1 AND LANDING =2 FOR EACH DEFINED RUNWAY. RUNWAY
 C UTILIZATION PERCENTAGES WILL BE COMPUTED FROM THIS TABLE.
 C THERE ARE THREE EXIT RETURNS IN SUBROUTINE NEWRED, LOCATED AT LINES
 C NUMBERED 21, 23 AND 99 IN THE SUBROUTINE LISTING IN SECTION 5. THE
 C RETURN AT LINE 21 IS AN ALTERNATE RETURN USED WHEN THE END-OF-DATA
 C CARD (A BRAND CARD) IS READ BY NEWRED. THE RETURN AT LINE 99 IS AN
 C ERROR RETURN AND IS USED IF ANY ERRORS WERE ENCOUNTERED. THE RETURN
 C AT LINE 23 IS AN ERROR RETURN AND IS USED IF ANY ERRORS WERE
 C ENCOUNTERED. THE RETURN AT LINE 21 IS THE NORMAL RETURN AFTER
 C PROCESSING AN AIRCRAFT OPERATIONS CARD.
 C IN ADDITION TO THE ABOVE EXIT RETURNS, THERE IS ONE EXIT
 C TERMINATION AT LINE NUMBER 25. THIS EXIT IS USED IF NEWRED
 C DETERMINES THAT THERE ARE NO PROPERLY DEFINED AIRCRAFT AT ALL IN THE
 C TABLE PREVIOUSLY DISCUSSED. EXECUTION OF THE PROGRAM IS
 C TERMINATED WITH THIS EXIT.
 C THE OUTPUT OF NEWRED IS THROUGH THE CALLING ARGUMENTS AND LABELED
 C COMMON BLOCKS PREVIOUSLY DISCUSSED.
 C THE PROCESSING PERFORMED BY NEWRED IS PRIMARILY HOUSEKEEPING IN
 C NATURE IN ADDITION TO A VARIETY OF CHECKS ON THE DATA. INFORMATIVE
 C MESSAGES REGARDING USUAL OR ERROR CONDITIONS ARE PRINTED FOR THE
 C USER.
 C THE FIRST ALTERNATE ENTRY POINT IN NEWRED IS AT EQUOPS AND THE
 C CALLING SEQUENCE IS:
 C CALL EQUOPS (GPS,ROOPS,WE,WH)
 C WHERE
 C GPS - SAME IS DEFINED IN NEWRED.
 C ROOPS - EQUIVALENT OPERATIONS COMPUTED BY EQUOPS.
 C WE - EVENING OPERATIONS WEIGHTING FACTOR.

C - NIGHT OPERATION WEIGHTING FACTOR.
 C EQUOPS DOES NOT USE ANY EXTERNAL SUBROUTINES.
 C EQUOPS IS CALLED BY THE SUBROUTINES MIXRD AND NEWMIX. IT WILL BE
 C CALLED MANY TIMES DURING EXECUTION.
 C THE INPUT DATA TO EQUOPS IS PROVIDED ENTIRELY BY THE CALLING
 C ARGUMENTS.
 C THERE IS ONLY ONE EXIT RETURN FROM EQUOPS AND IT IS USED UNDER ALL
 C CONDITIONS. THE OUTPUT FROM EQUOPS IS PASSED TO THE CALLING PROGRAM
 C THROUGH THE CALLING ARGUMENT EQUOPS.
 C THE PROCESSING PERFORMED BY EQUOPS IS FORMULATED AS FOLLOWS FOR
 C EQUIVALENT OPERATIONS:
 C $EQUOPS(I) = D(I) * W * F(I * W * F(I))$
 C WHERE D(I), F(I), E(I) ARE THE DAY/EVENING/NIGHT OPERATIONS FROM OPS
 C PROG, W, W, W ARE CALLING ARGUMENTS
 C THE SECOND ALTERNATE ENTRY IN MIXRD IS CLRTAL AND CALLING SEQUENCE
 C IS:
 C CALL CLRTAL
 C CLRTAL USES THE EXTERNAL SUBROUTINE ZERO.
 C CLRTAL IS CALLED BY ROUTINE MIXRD AND NEWMIX.
 C THERE IS NO INPUT DATA TO CLRTAL.
 C THERE IS ONE EXIT RETURN IN CLRTAL AND IT IS ALWAYS USED.
 C THERE IS NO OUTPUT FROM CLRTAL.
 C THE PROCESSING PERFORMED BY CLRTAL CONSISTS OF SETTING THE VALUES IN
 C THE TABLES WUSE AND FALLY IN LABEL COMMON BLOCK/RWYUTL/ TO ZERO.
 C THE THIRD ENTRY TO MIXRD IS AT DMPTAL AND IS CALLING SEQUENCE IS:
 C CALL DMPTAL
 C DMPTAL USES THE EXTERNAL SUBROUTINE ZERO.
 C THE SUBROUTINES MIXRD AND NEWMIX CALL DMPTAL. DMPTAL MAY BE CALLED
 C MANY TIMES DURING EXECUTION.
 C THE INPUT DATA TO DMPTAL IS PROVIDED THROUGH LABELED COMMON BLOCKS
 C /RWYUTL/ AND /MIXOTA/.
 C THERE IS ONE EXIT RETURN FROM DMPTAL LOCATED AT LINE NUMBER 214 IN
 C THE SUBROUTINE LISTING IN SECTION 5. THIS RETURN IS USED UNDER ALL
 C CONDITIONS.
 C THE OUTPUT FROM DMPTAL IS, FOR THE MOST PART, PRINTED ON THE LINE
 C PRINTER.
 C HOWEVER, VARIABLES DEFCT IN LABELED COMMON BLOCK /DEFAULT/ AND IRBIG
 C IN LABELED COMMON BLOCK /RWYUTL/ ARE ASSIGNED VALUES.
 C THE PROCESSING PERFORMED BY DMPTAL CONSISTS OF PRINTING THE TABLE
 C WUSE IN AN APPROPRIATE FORMAT AND COMPUTING AND PRINTING THE RUNWAY
 C UTILIZATION NUMBERS. ALSO, THE TOTAL OPERATIONS ARE COMPUTED AND THE
 C BUSIEST TAKEOFF RUNWAY IS DETERMINED.

Subroutine NOISRD

C SUBROUTINE NOISRD(IGO,ICNT) C THIS SUBROUTINE TOTALLY REWRITTEN FOR VERSION 2 C C LOCAL VARIABLE DICTIONARY C C IGF - ARRAY FOR TEMPORARY STORAGE OF NOISE TABLE C IGD - POINTS 1 IF CURRENT NOISE CURVE IS NOT USED C IZ - COUNTER INCREMENTED EACH TIME A NEW THRUST LEVEL IS READ C IT - POINTS 1 IF 1ST TABLE IS BEING READ C IJ - POINTS 2 IF 2ND TABLE IS BEING READ C K - NOISE CURVE I.D. (ORDINATE)	02-26-79 03-29-79 03-23-79 03-29-79 03-29-79 03-29-79 03-29-79 03-29-79 03-29-79
--	--

C	MM	- HOIDS CHARACTERS TO BE PRINTED	03-29-79
C	Y	- CURRENT NOISE CURVE I.D. (AS READ IN)	03-29-79
C	MY	- NOISE MEASURE OF THE TABLE BEING PROCESSED	03-29-79
C	PMAX	- NEW MAXIMUM REFERENCE THRUST	03-29-79
C	PMIN	- NEW MINIMUM REFERENCE THRUST	03-29-79

Subroutine NWASDS

```

SUBROUTINE NWASDS (IIC,NOTS)

*****

      I = COS(PI/3.14159)

C  UNLOC - SEARCH ANGLE STEP SIZE
C  ANGLE - CURRENT ANGLE FOR POINT CONTOUR SEARCH
C  AVALS - TABLE OF AREA EXPONENTIALS
C  A = SIN (ANGLE)
C  A = 1/8192 OF THE ALLOWABLE DISTANCE BETWEEN CONTOUR POINTS
C  DOT5 - THE ALLOWABLE DISTANCE BETWEEN CONTOUR POINTS
C  SWAL - ENDING EXPOSURE VALUE
C  SEARCH UNIT TANGENT VECTOR, POINTS TOWARDS GREATEST EXPOSURE INCREASE
C  IIC - ERROR RETURN
C  IIR - VARIABLE INDEX - SHOWS SOME IMAGINATION IN CHOICE OF NAME
C  IRT - AREA...
C  I = POINTS CALLER, STATUS OF CANDIDATE POINT, NONZERO MEANS NO GOOD
C  MY = 15 * I, PASSED TO EXPOTW
C  N = LOOP ARGUMENT IMMEDIATELY INCREMENTED
C  MY1 - NOISE EXPOSURE AT P0
C  NORD - NUMBER OF OBSERVES
C  NOTS - NUMBER OF CONTOUR POINTS
C  NUNIT - NUMBER OF INTERMEDIATE METRIC
C  NUNIT - NUMBER OF PRIMARY METRIC
C  P0 - PREVIOUS CONTOUR POINT
C  P0 - FIRST POINT AT POSITION OF NEXT CONTOUR POINT
C  PIR - X AND Y COORDS OF NEXT CANDIDATE CONTOUR POINT
C  PCH - P0 "MY"
C  START - STARTING ANGLE FOR CIRCULAR POINT SEARCH
C  SWAL - STARTING EXPOSURE VALUE
C  SEARCH FOR VALUE IN RANGE OF LAST POINT(
C  ANGLE - ROTATION INCREMENT BETWEEN PREVIOUS TWO CENTER POINTS ) CURVED SEG
C  TOL - CONTOUR TOLERANCE
C  TOL - SPARE COPY OF TOL, NEVER CLOBBERS
C  TOLLOP - PROXIMITY TO CONTOUR FACTOR FOR LOOP CHECK COMPUTATION
C  VAL - CONTOUR VALUE (LEVEL)
C  VVAL - VAL PLUS TOL
C  VVAL - VAL MINUS TOL
C  V0 - TABLE OF PREPARED POINT SEARCH LOCATIONS (TRIAL POINTS)
C  X - PREVIOUSLY COMPUTED CONTOUR X COORDS
C  Y - Y COORDS OF PREVIOUSLY COMPUTED CONTOUR POINTS
C  XX - OLDY - INCREMENT BETWEEN PREVIOUS TWO POINTS ON CONTOUR
C  YY - OLDY - INCREMENT BETWEEN PREVIOUS TWO POINTS ON CONTOUR
C  NWASDS-SUBROUTINE
C  NWASDS PERFORMS THE SAME FUNCTION AS NEWPNT BUT FOR ASDS AND DOSE
C  CONTOURS.
C  NWASDS CALLS THE SUBROUTINES CKICOP, EXPOSE, VADD, VTPN, VSCL, VSTB

```

```

C AND WMSG.
C THERE IS ONLY ONE ENTRY TO WMSDS AND THE CALLING SEQUENCE IS:
C CALL WMSDS(*,NPTS)
C WHERE
C * - MEMORY LOCATION IN CALLING PROGRAM FOR ERROR RETURN.
C NPTS - THE NUMBER OF CONTOUR POINTS THAT HAVE ALREADY BEEN COMPUTED.
C THE MAIN PROGRAM, NCISI, IS THE ONLY USER OF WMSDS.
C THE INPUT DATA FOR WMSDS IS IDENTICAL TO THAT FOR NEWPNT.
C THERE ARE TWO EXIT RETURNS FROM WMSDS, LOCATED AT LINES NUMBERED
C 60 AND 143 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT
C LINE 60 IS A NORMAL RETURN USED WHEN A POINT ON THE CONTOUR HAS BEEN
C FOUND. THE RETURN AT LINE 143 IS AN ERROR RETURN AND IS USED WHEN A
C VALID POINT CANNOT BE FOUND AND WILL CAUSE COMPUTATIONS ON THE
C CONTOUR TO BE TERMINATED.
C THE OUTPUT FROM WMSDS IS IDENTICAL TO THE SUBROUTINE NEWPNT.
C WHILE THE PROCESSING PERFORMED BY WMSDS IS CONCEPTUALLY THE
C SAME AS NEWPNT, THERE IS A SUBTLE DIFFERENCE IN THE HANDLING OF THE
C ZERO-TIME, PARTICULARLY THE ZERO-TIME CONTOUR FOR ANY GIVEN
C THRESHOLD. THE INHERENT DISCONTINUITY OF THE NOISE EXPOSURE
C (I.E., TIME ABOVE THRESHOLD) ALONG THIS BORDER IS THE REASON
C THAT WMSDS WAS WRITTEN. THE SUBROUTINE NEWPNT IS INCAPABLE OF
C PROCESSING THIS SPECIFIC CASE.
C IN THE ACTUAL PROCESSING, THE IDENTICAL POINT SEARCH PATTERNS,
C BOTH NORMAL AND ALTERED (IN CASE OF LOOPING CONDITIONS) ARE
C REQUESTED, AS WELL AS INLET AND FINGER CROSSING CRITERIA CHECKS,
C LOOPING CHECKS AND TOLERANCE CHECKS AS THOSE IN NEWPNT WITH THE
C EXCEPTION OF THE SPECIAL HANDLING OF THE ZERO-TIME CONTOUR.
C THE SPECIAL HANDLING OF THE ZERO-TIME CONTOUR CONSISTS OF
C DEPRIVING A ONE-SIDED TOLERANCE CHECK RATHER THAN TWO-SIDED AS IN
C NEWPNT. ALSO, A COMPUTED VALUE OF ZERO TIME FOR A TRIAL POINT
C INDICATES NOTHING ABOUT HOW CLOSE IT IS TO THE CONTOUR UNLESS
C ANOTHER POINT HAS BEEN CALCULATED WITH A NONZERO VALUE AND THEN IT
C CAN BE ASSUMED THAT THE CONTOUR IS BETWEEN THE TWO POINTS.
C SINCE THE BASIC CONCEPTS HAVE ALREADY BEEN DISCUSSED FOR
C SUBROUTINE NEWPNT, THE FOLLOWING WILL RELATE THE PROCESSING
C DEPICTED TO THE VARIOUS SECTIONS OF THE PROGRAM (REFER TO THE
C SUBROUTINE LISTING IN SECTION 5.).
C LINES 11 TO 29 NORMAL SEARCH PATTERN POINT SET-UP. THE PATTERN IS
C ONE-SIDED BUT ONLY ONE SIDE WILL BE USED.
C LINE 32 ONE-SIDED TOLERANCE SET-UP FOR ZERO-TIME CONTOUR.
C LINE 44 NOISE EXPOSURE COMPUTATION AT FIRST TRIAL POINT.
C LINES 52 TO 60 EXIT SEQUENCE WHEN A POINT ON THE CONTOUR HAS BEEN
C FOUND.
C LINES 61 TO 105 NORMAL SEARCH PATTERN EXECUTION.
C LINES 107 TO 142 ALTERED SEARCH PATTERN EXECUTION.
C LINES 144 TO 157 INTERPOLATION BETWEEN TWO POINTS STRADDLING THE
C CONTOUR.

```

Subroutine OVRLAY

```

SUBROUTINE OVRLAY (I10,KTRAK,NTSS,WPSS,DD,KFS,WPCAS,WW)
C
C *****
C LOCAL VARIABLE DICTIONARY
C ASPPCF - ASDS PERFORMANCE PROFILE
C DANG - TURN ANGLE
C D1 - DISTANCE MEASURED ALONG GROUND TRACK FROM RUNWAY THRESHOLD
C TO THE POINT WHERE THE AIRCRAFT TRACKING BEGINS (USUALLY THE

```

C POINT ON THE GROUND CLOSEST TO THE FIRST OBSERVER).
 C DW - DIFFERENCE BETWEEN REMAINING GROUND TRACK SEGMENT AND
 C REMAINING PROFILE SEGMENT
 C FLTPTR - FLIGHT PATH INFO (SEE BEI(W...))
 C IGO - ERROR RETURN
 C ITSEG - CONTAINS THE NUMBER OF TRACK SEGMENTS FOR A GIVEN TRACK
 C IN THE LOW ORDER 5 BITS OF THE WORD (CF SUBR HDT)
 C KPS: NUMBER OF FLIGHTPATH SEGMENTS AS ASSEMBLED BY CVRLAY
 C (CALCULATED BY CVRLAY)
 C KPS - PROFILE SEGMENT COUNTER
 C KTRAK: INDICATES THE TRACK NUMBER FOR USE IN ARRAY PARA IN
 C COMMON BLOCK TRACK.
 C KTS - TRACK COUNTER
 C LDR - HAS A BEEN FOUND
 C LEXT - IS THIS AN EXTENSION OF THE PREVIOUS SEGMENT
 C LINT - IS THIS THE VERY FIRST SEGMENT
 C LPS - SHOULD PROFILE SEGMENT COUNTER BE INCREMENTED
 C LRS - SHOULD TRACK SEGMENT COUNTER BE INCREMENTED
 C LZ - IS THERE ZERO REMAINING LENGTH IN CURRENT SEGMENT
 C MAGK - DECODES ADDS IN ITAC
 C *NFSP* - MAX NUMBER OF SEGMENTS IN PROFILE
 C NPS - MAX NUMBER OF PROFILE SEGMENTS ALLOWED BY ARRAY DIMENSIONING
 C NTS - MAX NUMBER OF TRACK SEGMENTS ALLOWED BY ARRAY DIMENSIONING
 C N - LOOP COUNTER, SOMETIMES EQUALS *NFSP*
 C TRACKING BEGINS. (CALCULATED BY CVPLAY)
 C NPCAS: THE NUMBER OF THE SEGMENT IN ARRAY FLTPTR WHERE AIRCRAFT
 C TRACKING BEGINS
 C NPSS: NUMBER OF PROFILE SEGMENTS
 C NTSS: NUMBER OF TRACK SEGMENTS
 C P - SCRATCHPAD PROFILE SEGMENT
 C PARA - ALIAS PARA IN OTHER ROUTINES (A/C INFO)
 C R - REMAINING LENGTH OF LAST PROFILE SEGMENT
 C RPS - REMAINING PROFILE SEGMENT LENGTH
 C RE - GROUND TRACK RADIUS
 C RPI - RD OF PREVIOUS SEGMENT
 C RTS - LENGTH OF CURRENT SEGMENT
 C RW - THE DISTANCE MEASURED IN THE GROUND TRACK, FROM THE BEGINNING
 C OF THE NPCAS-TH SEGMENT TO THE POINT WHERE TRACKING BEGINS
 C (CALCULATED BY CVPLAY).
 C CVRLAY - SUBROUTINE
 C SUBROUTINE CVRLAY CONSTRUCTS THE FLIGHT PATH GEOMETRY VARIABLES FROM
 C FLIGHT TRACK DEFINITIONS AND ALTITUDE PROFILES FOR THE POSITIONAL
 C CALCULATIONS RELATING OBSERVED AND AIRCRAFT USED FOR ADDS AND DCS
 C CONTAINS COMPUTATIONS.
 C THE SUBROUTINE CVRLAY DOES NOT USE EXTERNAL SUBROUTINES.
 C CVRLAY HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
 C CALL CVRLAY (*, RTIME, NTS, NPS, P, KPS, NPCAS, NO
 C THERE
 C * - MEMORY LOCATION IN CALLING PROGRAM FOR ERROR RETURN.
 C KTRAK - GROUND TRACK NUMBER.
 C KTS - TOTAL NUMBER OF SEGMENTS IN THE TRACK.
 C NPS - TOTAL NUMBER OF PERFORMANCE PROFILE SEGMENTS.
 C P - DISTANCE ALONG THE GROUND TRACK, FROM THE BEGINNING, TO WHERE
 C AIRCRAFT TRACKING IS TO START. USUALLY, THIS AT THE POINT OF
 C CLOSEST APPROACH.
 C KPS - NUMBER OF "FLIGHT PATH" SEGMENTS ASSEMBLED BY OVERLAY.
 C NPCAS - THE NUMBER OF THE "FLIGHT PATH" SEGMENT TO START AIRCRAFT
 C TRACKING.

C 4 - THE DISTANCE FROM THE BEGINNING OF SEGMENT NUMBER NPCAS TO
 C THE POINT WHERE AIRCRAFT TRACKING BEGINS.
 C THE SUBROUTINE TIMIST IS THE ONLY USER OF OVRLAY. THE SUBROUTINE
 C WILL BE CALLED ONCE PER FLIGHT AND HENCE, MANY TIMES DURING THE
 C EXECUTION INVOLVING ASDX OR DDPF CALCULATIONS.
 C THE INPUT DATA TO OVRLAY IS PROVIDED BY BOTH THE CALLING
 C ARGUMENTS AND LABELED COMMON BLOCK /TPACK/. SEE THE DISCUSSION FOR
 C SUBROUTINE HTP FOR A DESCRIPTION OF THE CONTENTS OF THIS BLOCK,
 C SPECIFICALLY THE GROUND TRACK DEFINITIONS CONTAINED IN THE VARIABLE
 C DAPAM. NOTE THAT THE VARIABLE IS REFERRED TO AS PAPA IN OVRLAY.
 C THERE ARE TWO EXIT RETURNS FROM OVRLAY LOCATED AT LINES NUMBERED
 C 201 AND 209 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT
 C LINE NUMBER 201 IS THE NORMAL RETURN USED IF NO ERRORS ARE
 C ENCOUNTERED. THE RETURN AT LINE 209 IS AN ERROR RETURN AND IS USED
 C WHEN A VALID GROUND POINT CANNOT BE FOUND AND WILL CAUSE
 C COMPUTATIONS IN THE CURRENT CONTEXT TO BE TERMINATED.
 C RETURN AT LINE 201 IS THE NORMAL RETURN USED IF NO ERRORS ARE
 C ENCOUNTERED. THE RETURN AT LINE 209 IS AN ERROR RETURN AND IS USED
 C AFTER AN ERROR HAS BEEN ENCOUNTERED AND AN ERROR MESSAGE PRINTED ON
 C THE LINE PRINTER (SEE LINES 204 TO 220). THIS RETURN WILL CAUSE THE
 C EXECUTION TO BE TERMINATED.
 C IN ADDITION TO THE CALLING ARGUMENTS, THE OUTPUT FROM OVRLAY
 C CONSISTS OF THE CONTENTS OF THE VARIABLE FILTER IN LABELED COMMON
 C BLOCK /FILT/. FOR A DETAILED DESCRIPTION OF THE CONTENTS OF FILTER
 C REFER TO LINES 11 THROUGH 19 IN THE SUBROUTINE LISTING IN SECTION 5.
 C THE PROCESSING PERFORMED BY OVRLAY CONSISTS OF MERGING THE
 C GROUND TRACK DEFINITIONS WITH THE AIRCRAFT PERFORMANCE PROFILE
 C DEFINITIONS TO CONSTITUTE A SINGLE DEFINITION FOR THE AIRCRAFT FLIGHT
 C PATH. OTHER AIRCRAFT CHARACTERISTICS SUCH AS VELOCITY AND POWER
 C SETTINGS ARE CORRELATED WITH ALTITUDE AND DISTANCE ALONG THE PATH.
 C THIS DEFINITION WILL BECOME THE ONE USED BY TIMIST AND OTHER RELATED
 C SUBROUTINES TO SIMULATE THE AIRCRAFT FLIGHT IN THE REGION WHERE THE
 C MINIMUM SOUNDING NOISE LEVEL IS EXCEEDED.
 C
 C 1: GROUND TRACK TYPE OR ARGUMENT, USED FOR ERROR RETURN.
 C 2: TRACK NUMBER FOR USE IN DISPLAY DATA IN
 C COMMON BLOCK /TPACK/.
 C 3: NUMBER OF TRACK SEGMENTS
 C 4: NUMBER OF PROFILE SEGMENTS
 C 5: DISTANCE MEASURED ALONG GROUND TRACK FROM RUNWAY THRESHOLD
 C TO THE POINT WHERE THE AIRCRAFT TRACKING BEGINS (USUALLY THE
 C POINT ON THE GROUND CLOSEST TO THE FIRST OBSERVED).
 C 6: NUMBER OF FLIGHTPATH SEGMENTS AS ASSEMBLED BY OVRLAY
 C (CALCULATED BY OVRLAY)
 C 7: NPCAS: THE NUMBER OF THE SEGMENT IN PAPA FILTER WHERE AIRCRAFT
 C TRACKING BEGINS. (CALCULATED BY OVRLAY)
 C 8: THE DISTANCE MEASURED ALONG THE GROUND TRACK, FROM THE BEGINNING
 C OF THE NPCAS-TH SEGMENT TO THE POINT WHERE TRACKING BEGINS
 C (CALCULATED BY OVRLAY).
 C THE STRUCTURE OF GROUND TRACK IS EXACTLY AS FOUND IN
 C VOL 2, 23 AIRPORT REPORT.
 C DIMENSION DAPA(5,17,80)
 C DIMENSION DAPAM(5,17,80)
 C DIMENSION D(5,17)
 C AIRCRAFT CONTAINS THE PROFILE INFORMATION IN A FORMAT ALMOST
 C THE SAME AS DESCRIBED IN VOL 2, 23 AIRPORT REPORT.
 C ONLY DIFFERENCE - DISTANCES ARE MEASURED FROM THE FAP END
 C RUNWAY THRESHOLD, IRRESPECTIVE OF WHETHER IT IS A TAKEOFF OR
 C LANDING. OVRLAY DOESN'T EVEN KNOW WHETHER A T/O OR LANDING IS
 C BEING TREATED.

```

C   PRIMARY TASK IS TO FILL CORRECTLY ARRAY FLITER WITH INFORMATION
C   FOR EACH SEGMENT ON - BRODND TRACK GEOMETRY, ALTITUDE, SPEED,
C   AND THRUST.
C   IF THE FIRST INDEX IS
C
C   1
C
C   0. FOR STRAIGHT SEGMENT
C   1. FOR CIRCULAR SEGMENT
C   STRAIGHT - Y-COORD. OF SEGMENT
C   STARTING POINT
C   CIRCULAR - Y-COORD. OF TURN
C   CENTER
C   STRAIGHT - Y-COORD OF SEGMENT
C   START POINT
C   CIRCULAR - Y-COORD OF TURN
C   CENTER
C   STRAIGHT - LENGTH OF SEGMENT
C   CIRCULAR - RADII. POSITIVE IF
C   TURNING LEFT, NEGATIVE IF
C   TURNING RIGHT (LOOKING
C   IN A DIRECTION AWAY FROM
C   THE RUNWAY, I.E. AS IF
C   IT WERE A T/O)
C   STRAIGHT - X-COMPONENT OF
C   UNIT VECTOR IN DIRECTION
C   OF SEGMENT
C   CIRCULAR - TURN ANGLE
C   STRAIGHT - Y-COORD. OF UNIT
C   VECTOR IN DIRECTION OF
C   SEGMENT
C   CIRCULAR - ANGLE BETWEEN LINE
C   FROM TURN CENTER TO
C   SEGMENT START, WITH
C   POSITIVE Y-AXIS
C   ALTITUDE AT SEGMENT START
C   SPEED IN KNOTS AT SEGMENT START
C   THRUST OVER SEGMENT IN LBS/
C   ENGINE
C
C   NOTE - ALL DISTANCES IN FEET, ALL ANGLES IN RADIALS

```

Subroutine POSCOO

```

C   SUBROUTINE POSCOO (N1, N2, N3, N4, N5, N6, N7, N8, N9, N10, N11, N12, N13, N14, N15, N16, N17, N18, N19, N20, N21, N22, N23, N24, N25, N26, N27, N28, N29, N30, N31, N32, N33, N34, N35, N36, N37, N38, N39, N40, N41, N42, N43, N44, N45, N46, N47, N48, N49, N50, N51, N52, N53, N54, N55, N56, N57, N58, N59, N60, N61, N62, N63, N64, N65, N66, N67, N68, N69, N70, N71, N72, N73, N74, N75, N76, N77, N78, N79, N80, N81, N82, N83, N84, N85, N86, N87, N88, N89, N90, N91, N92, N93, N94, N95, N96, N97, N98, N99, N100)
C
C   *****
C   C - Y-COORD INCREASE DURING SEGMENT (AIRPORT FRAME)
C   C - LENGTH OF SEGMENT ALONG X-DIRECTION (FROM XI - WHICH COORD FRAME)
C   FLITER- AIRCRAFT FLIGHT PATH DEFINITION
C   NSEG - SEGMENT NUMBER
C   NSEGP- NUMBER OF PREVIOUSLY EXAMINED TRACK SEGMENTS
C   NSEF- LOGICAL VARIABLE
C   N1 - FLAG TO TEST IF SAME SEGMENT
C   N2 - MAXIMUM NUMBER OF SEARCH POINTS (AS KEASDS)
C   N3 - MAXIMUM NUMBER OF SEARCH POINTS, FIRST PASS) NOT USED (
C   N4 - FRACTION OF TURN ANGLE TRAVERSED
C   N5 - LENGTH OF SEGMENT (STORED IN FLITER)
C   N6 - ABSOLUTE VALUE OF SEGMENT LENGTH
C   N7 - Y-COORD INCREASE ETC
C   N8 - DISTANCE FROM ORIGIN OF VA
C   N9 - ANGLE OF TURN ANGLE TRAVERSED
C   N10 - THE XY2-COORDINATE POSITION OF THE AIRCRAFT
C   N11 - END POINT OF SEGMENT RELATIVE TO STARTPOINT (WHOSE REFERENCE FRAME
C   (
C   N12 - UNIT VECTOR COMPONENTS FOR ALPHA IN THE AIRCRAFT
C   REFERENCE FRAME

```

C "VBETA- UNIT VECTOR COMPONENTS FOR BETA IN THE AIRCRAFT
 C REFERENCE FRAME
 C VC - STRAIGHT SEGMENT START POINT> CURVED SEGMENT TURN CENTER
 C VP- POSITION OF SEGMENT END POINT) FROM FLITER ()
 C WV - DISTANCE FROM SEGMENT STARTING POINT
 C VX - ELEVATION ANGLE OF SEGMENT
 C TO UNDERSTAND WHAT POSCOO IS DOING, AN EXAMINATION OF THE
 C DISCUSSION IN THE WYLE BOOK WITH THE ACCOMPANYING
 C DIAGRAM IS VERY NECESSARY FOR A VERY GOOD
 C UNDERSTANDING OF COORDINATE TRANSFORMATIONS
 C BETWEEN REFERENCE FRAMES MOVING RELATIVE TO EACH OTHER,
 C BUT ELEMENTARY CELESTIAL MECH()
 C PCSCOO - SUBROUTINE
 C SUBROUTINE POSCOO COMPUTES THE POSITION VECTOR OF AN OBSERVER
 C RELATIVE TO THE AIRCRAFT IN THE AIRCRAFT REFERENCE COORDINATE
 C SYSTEM.
 C PCSCOO HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
 C CALL POSCOO (LXISI,TI,W,KSEG)
 C WHERE
 C LXISI - A LOGICAL VARIABLE WHICH IS TRUE FOR THE FIRST CALL TO
 C PCSCOO FOR A FLIGHT AND FALSE OTHERWISE.
 C TI = +1.0 FOR TAKEOFF, -1.0 FOR LANDING.
 C W - HORIZONTAL DISTANCE ALONG CURRENT SEGMENT, IN FEET, FROM THE
 C BEGINNING OF THE SEGMENT TO THE ANALYSIS POSITION.
 C KSEG - THE NUMBER OF THE SEGMENT BEING ANALYZED IN THE FLIGHT PATH
 C DEFINITION.
 C THE SUBROUTINE TITISI IS THE ONLY USER OF SUBROUTINE POSCOO AND
 C CALLS IT DURING THE FLYBY SIMULATION TO DETERMINE THE POSITION
 C COORDINATES OF THE AIRCRAFT AND UNIT VECTORS IN THE AIRCRAFT
 C REFERENCE FRAME. THESE QUALITIES ARE NEEDED FREQUENTLY WHICH
 C NECESSITATES MANY CALLS TO POSCOO.
 C THE INPUT DATA TO POSCOO IS PROVIDED BY THE CALLING ARGUMENTS AS
 C WELL AS BY LABELED COMMON BLOCK /BLK2/. THE INFORMATION IN /BLK2/
 C IS THE FLIGHT PATH DEFINITION WHICH WAS CONSTRUCTED BY THE
 C SUBROUTINE CVRLAY.
 C PCSCOO HAS THREE EXIT RETURNS LOCATED AT LINES NUMBERED 26, 31
 C AND 37 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE
 C 26 IS USED FOR ALL BUT THE FIRST CALL FOR A SINGLE STRAIGHT FLIGHT
 C PATH SEGMENT. THE RETURN AT LINE 31 IS USED AFTER POSCOO HAS
 C PROCESSED A STRAIGHT SEGMENT. THE RETURN AT LINE 37 IS USED AFTER
 C PROCESSING A CIRCULAR (HELICAL) SEGMENT.
 C THE OUTPUT FROM POSCOO IS CONTAINED IN THE LABELED COMMON BLOCK
 C /PCOBY/. THE FOLLOWING DESCRIBES THE CONTENTS OF THAT BLOCK.
 C VARIABLE DESCRIPTION
 C V1 THE XYZ-COORDINATE POSITION OF THE AIRCRAFT.
 C VBETA UNIT VECTOR COMPONENTS FOR (A) IN THE AIRCRAFT
 C REFERENCE FRAME.
 C VBTETA UNIT VECTOR COMPONENTS FOR (B) IN THE AIRCRAFT
 C REFERENCE FRAME.
 C NOTE THAT BOTH (A) AND (B) ARE EXPRESSED IN TERMS OF (I) AND (J) IN
 C THE AIRCRAFT FIXED COORDINATE SYSTEM.
 C THE VERSION OF POSCOO PRESENTLY INCLUDED IN THIS MODEL IS A
 C SIMPLIFIED APPROACH TO A MORE COMPLEX VERSION WHICH IS IN A STAGE OF
 C DEVELOPMENT. SPECIFICALLY, THE FUNCTIONS PERFORMED BY THE MOPE COMPLEX

C VERSION THAT ARE NOT PERFORMED BY THE PRESENT VERSION ARE THE
 C COMPUTATION OF BANKING AND FUSelage ANGLES. THE PRESENT VERSION
 C ASSUMES THAT THE AIRCRAFT IS HORIZONTAL AT ALL TIMES. THE
 C MAGNITUDE OF THE ERROR, IF ANY, CAUSED BY THIS ASSUMPTION, HAS NOT
 C BEEN DETERMINED.
 C THE PROCESSING PERFORMED BY POSCCC CONSISTS OF DEFINING THE
 C POSITION COORDINATES (XYZ IN THE CARTESIAN SYSTEM) OF THE AIRCRAFT AS
 C THE BASIS VECTORS FOR THE AIRCRAFT MOVING REFERENCE FRAME.
 C X, Y ARE THE COORDINATES OF THE PROJECTION OF THE HELIX CENTERLINE
 C ON THE GROUND PLANE.
 C Z IS THE ALTITUDE AT THE BEGINNING OF THE TURN.
 C ALPHA IS THE ANGLE OF THE POSITIVE X-DIRECTION AND A LINE THROUGH
 C THE PROJECTION OF THE SEGMENT STARTING POINT AND THE COORDINATES
 C X, Y ABOVE.
 C PHI IS THE ANGLE INTO THE TURN FOR THE CURRENT AIRCRAFT POSITION.
 C R IS THE RADIUS OF THE TURN, POSITIVE FOR LEFT TURNS, NEGATIVE FOR
 C RIGHT WHEN ASSUMING A TAKEOFF OPERATION.
 C THE FOLLOWING IS A DESCRIPTION OF THE CODE.
 C LINES 14 TO 25 - COMPUTATION OF AIRCRAFT POSITION COORDINATES FOR
 C STRAIGHT SEGMENT.
 C LINES 27 TO 30 - COMPUTATION OF (A) AND (B) FOR A STRAIGHT SEGMENT.
 C LINES 32 TO 42 - COMPUTATION OF AIRCRAFT POSITION COORDINATES FOR A
 C HELICAL SEGMENT.
 C LINES 44 TO 55 - COMPUTATION OF (A) AND (B) FOR A HELICAL SEGMENT.

Subroutine POSIT

C SUBROUTINE POSIT (LUNIT)
 C
 C TAPE POSITIONING SUBROUTINE
 C *****
 C POSIT - SUBROUTINE
 C SUBROUTINE POSIT POSITIONS A MAGNETIC DATA TAPE A BEGIN WRITING
 C BETWEEN THE FIRST DOUBLE-END-OF-FILE MARKS FOUND.
 C THE SUBROUTINE POSIT CALLS THE SUBROUTINE SKFIL.
 C POSIT HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
 C CALL POSIT (LUNIT)
 C WHERE
 C LUNIT - THE LOGICAL UNIT NUMBER FOR THE MAGNETIC TAPE.
 C THE MAIN PROGRAM NCISE1 IS THE ONLY USER OF POSIT AND IT IS
 C CALLED ONLY ONCE PER EXECUTION RUN.
 C THE ONLY INPUT DATA FOR POSIT IS PROVIDED BY THE CALLING
 C ARGUMENT.
 C THERE IS ONE EXIT RETURN FROM POSIT AND IS USED UNDER ALL
 C CONDITIONS.
 C THE OUTPUT FROM POSIT IS THE NUMBER OF FILE MARKS PASSED ON THE
 C TAPE BEFORE TWO BACK-TO-BACK FILE MARKS WERE ENCOUNTERED. THE
 C COUNT INCLUDES THOSE TWO FILE MARKS. THE NUMBER IS STORED IN
 C LABELED COMMON BLOCK /DEFLT/ IN THE VARIABLE IFLDEF.

Subroutine POSMUT

C FUNCTION POSMUT (PWR1,PWR2,DISTS,DISTE,DISTA)
 C *****

```

C
C      THIS FUNCTION SMOOTHS THRUST CHANGES OVER THE FIRST
C      1000 FEET OF THE NEW PROFILE SEGMENT
C
C      POSMUT - VALUE FOR THRUST AT THE ANALYSIS POINT
C      PWR1 IS THE OLD THRUST
C      PWR2 IS THE NEW THRUST
C      DISTS IS THE START OF THE NEW SEGMENT
C      DISTE IS THE END OF THE NEW SEGMENT
C      DISTA IS THE POINT AT WHICH THE THRUST IS DESIRED
C
C      ABOVE STATEMENTS APPLY TO TAKEOFFS ONLY
C      FOR LANDINGS REVERSE INPUT START-END DISTANCES AND POWER SETTING
C      IS (ABS(DISTS-DIST)*.GE.1000.) GO TO 10
C      POSMUT - FUNCTION SUBROUTINE
C      THE PURPOSE OF THE FUNCTION POSMUT IS TO SMOOTH THRUST
C      TRANSITIONS WHEN THEY ARE ENCOUNTERED IN THE AIRCRAFT PERFORMANCE
C      PROFILE.
C      POSMUT HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
C      CALL POSMUT (PWR1,PWR2,DISTS,DISTE,DISTA)
C
C      WHERE
C      PWR1 THE ORIGINAL THRUST (POUNDS PER ENGINE).
C      PWR2 THE FINAL THRUST (POUNDS PER ENGINE).
C      DISTS THE GROUND DISTANCE FROM THRESHOLD TO THE START OF THE
C      SEGMENT AS THE AIRCRAFT FLIES IT (I.E., ONE END OF THE SEGMENT FOR A
C      TAKEOFF, THE OTHER END FOR A LANDING).
C      DISTE THE GROUND DISTANCE FROM THRESHOLD TO THE END OF THE
C      SEGMENT AS THE AIRCRAFT FLIES IT. (SEE COMMENT ABOVE.)
C      DISTA THE GROUND DISTANCE FROM THRESHOLD TO THE POINT BEING
C      ANALYZED.
C      POSMUT IS THE ONLY USER OF POSMUT AND IT MAY BE CALLED MANY
C      TIMES DURING THE COMPUTATION OF ENERGY METRIC COURSES.
C      THE INPUT DATA FOR POSMUT IS PROVIDED BY THE CALLING ARGUMENTS.
C      THERE ARE TWO EXIT RETURNS FROM POSMUT LOCATED AT LINES NUMBERED
C      10 AND 23 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT
C      LINE 10 IS USED WHEN THE SMOOTHING FUNCTION IS USED WHILE THE RETURN
C      AT LINE 23 IS USED WHEN THE ANALYSIS POINT IS BEYOND THE SMOOTHING
C      AREA.
C      THE OUTPUT FROM POSMUT IS A VALUE FOR THE THRUST AT THE ANALYSIS
C      POINT AND IS PASSED TO THE CALLING PROGRAM THROUGH THE FUNCTION
C      THE FUNCTION POSMUT SMOOTHS THRUST TRANSITIONS OVER 1000 FEET
C      GROUND DISTANCE. WHEN AIRCRAFT THRUST CHANGES ARE DEFINED, IS
C      THEREAR WITH GROUND DISTANCE AND THAT THE NEW THRUST WILL BE
C      REALIZED AT 1000 FEET GROUND DISTANCE AFTER THE CHANGE IS INITIATED.

```

Subroutine PPGRM

```

C      SUBROUTINE PPGRM (XX,YY,NPTS,FAST,MORE,NPIT,NRW,IGO)
C
C      *****
C      LOCAL VARIABLE DICTIONARY
C      A - TOTAL EQUIVALENT T/C OPERATIONS 24 HPS
C      ANIT - OUTPUT TITLE
C      AP - ANOTHER OUTPUT TITLE
C      P - TOTAL T/C OPERATIONS IN OPPOSITE DIRECTION TO A
C      BARNER - STILL ANOTHER OUTPUT TITLE
C      DATEP - DUMMY ARG TO CONTAIN DATE, FOR ALPHA OUTPUT
C      I - EVER POPULAR ALL PURPOSE LOOP COUNTER
C      IC - I COUNT

```

C IFLDEF - CURRENT FILE NUMBER (UPDATED)
 C IGC - ERROR RETURN
 C IIN - NUMBER OF POINTS IN CONTOUR
 C INCOR - NOT EQUAL ZERO INDICATES RUNWAY INSIDE
 C IPSIZ - MULTIPLE CONTOUR FLAG, ZERO MEANS SINGLE CLOSED CONTOUR
 C IF - LOOP COUNTER
 C IFBIG - NUMBER OF RUNWAY WITH MOST WEIGHTED T/O OPERATIONS
 C ITIT - CONTOUR TITLE
 C IXR - COUNTS NUMBER OF DISTINCT CONTOUR THRESHOLDS
 C K - CURRENT RUNWAY NUMBER
 C L - NUMBER OF RUNWAY IN OPPOSITE DIRECTION TO K
 C LSTAT - RETURNING FILE STATUS (CONTOURS FROM TAPE)
 C METLEV - TABLE OF THRESHOLDS FOR THE SEVERAL METRICS IN USE
 C METLIT - ALPHANUMERIC LITERAL OF CURRENT PRIMARY METRIC
 C MORE - INDICATES WHEN THE LAST POINT OF A PLOT HAS BEEN DONE
 C NAME - ARRAY OF RUNWAY NAMES (SO CALLED)
 C NPLOT - FLAG INDICATES ANOTHER PLOT REMAINS
 C NPIT - NUMBER OF PLOT PRESENTLY BEING PROCESSED
 C NPTS - NUMBER OF POINTS CALCULATED THIS FAR
 C NRW - NUMBER OF DEFINED RUNWAYS
 C RPNWY - NUMBER OF DEFINED RUNWAYS (PASSED IN COMMON)
 C TIT - ANOTHER OUTPUT TITLE
 C TUSE - TABLE OF OPERATIONS PER RUNWAY
 C TPD - MORE TITLE PUBLISH
 C VAL - CONTOUR VALUE
 C X - X COORDINATES OF CONTOUR
 C XA - RUNWAY COORDS, ARRIVAL
 C XAR - CONTOUR AREA
 C XD - RUNWAY COORDINATES, DEPARTURE
 C XLG - MAXIMUM VALUE OF X IN PRESENT CONTOUR
 C XSM - MINIMUM VALUE OF X IN PRESENT CONTOUR
 C XY - CURRENT X COORDINATE
 C Y - Y COORDINATES OF CONTOUR
 C YLG - MAXIMUM VALUE OF Y IN PRESENT CONTOUR
 C YSM - MINIMUM VALUE OF Y IN PRESENT CONTOUR
 C YY - CURRENT Y COORDINATE
 C PPRM - SUBROUTINE
 C THE SUBROUTINE PPRM TABULATES THE CONTOUR POINT COORDINATES AS
 C THEY ARE COMPUTED AND OUTPUTS THEM, ALONG WITH APPROPRIATE
 C IDENTIFICATION INFORMATION, TO MAGNETIC TAPE UNLESS REQUESTED NOT TO
 C BY THE USER. ADDITIONALLY, PPRM CAN REDIRECT IN-LINE PROCESSING AS
 C AN OPTIONAL USER REQUEST.
 C PPRM CALLS THE SUBROUTINE INSIDE AND SKIPP.
 C PPRM HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
 C CALL PPRM (XX,YY,NPTS,LAST,MORE,NPIT,NRW,*)
 C WHERE
 C XX - THE X-COORDINATE OF THE CONTOUR POINT
 C YY - THE Y-COORDINATE OF THE CONTOUR POINT
 C NPTS - THE NUMBER OF POINTS IN THE CONTOUR
 C LAST - IF NOT = 0, THIS IS THE LAST POINT ON THE CONTOUR
 C
 C MORE - IF NOT = 0, THIS IS THE LAST CONTOUR IN THE FILE
 C
 C NPIT - CURRENT CONTOUR NUMBER IN THIS FILE
 C
 C NRW - NUMBER OF DEFINED RUNWAYS
 C
 C * - MEMORY LOCATION IN CALLING PROGRAM FOR ALTERNATE RETURN
 C WHICH WILL REDIRECT IN-LINE PROCESSING
 C THE MAIN PROGRAM USER IS THE ONLY USER OF PPRM AND IT WILL BE
 C CALLED AFTER EVERY POINT ON A CONTOUR HAS BEEN DETERMINED.

C THE INPUT DATA FOR PPRGM IS PROVIDED THROUGH THE CALLING
 C ARGUMENTS AND THE LABELED COMMON BLOCKS /RUNWAY/, FOR RUNWAY
 C COORDINATES, /TITLE/, FOR CONTOUR TITLES, /PLCTR/, FOR OPTICANL
 C RESTRICTION REQUEST (VARIABLE IPSIZ) AND THE CONTOUR AREA (VARIABLE
 C VAP), /DE/, FOR THE CONTOUR VALUE, /PWYUTL/, RUNWAY USE AND BUSIEST
 C TAKEOFF RUNWAY.

Subroutine PREPR

SUBROUTINE PREPR (NP,DQ,RL,H,PWR,V,ITAC,NTRKK,MAXSEG,IAPP)

03-15-79

C *****
 C LOCAL VARIABLE DICTIONARY
 C ANG - ROTATION ANGLE, CURVED SEG
 C APA - AIRPORT ALTITUDE) CORRECTED ()
 C APPTRP - TABLE OF THRUST SETTINGS (INPUT DATA)
 C ASDPRF - ASDS PERFORMANCE PROFILE
 C AVEALT - AVERAGE ALTITUDE OVER SEGMENT AFTER RESTRICTION
 C RY1 - RADIUS OF SEGMENT
 C CUTYPE1 - CUTBACK TYPE 1 INDICATOR
 C CUTYPE2 - CUTBACK TYPE 2 INDICATOR
 C DALT - ALTITUDE LOSS FROM RESTRICTION
 C DD - DISTANCE ALONG PROFILE TO CURRENT POINT
 C DDIST - DISTANCE OVER WHICH RESTRICTION APPLIES
 C DEL - DELTA CORRECTION FOR THRUST VALUES
 C DIR - WIND DIRECTION RELATIVE TO PCS X AXIS
 C DS - SEGMENT LENGTH
 C EDALT - HEIGHT ABOVE GROUND AT END OF CUTBACK PROCEDURE
 C EDOR - DISTANCE ALONG TRACK TO END OF CUTBACK PROCEDURE
 C GAMMA - VALUE OF RESTRICTION
 C GRAD - CLIMB GRADIENT DURING CUTBACK PROCEDURE
 C H - TRACK ELEVATION
 C IAPP - APPROACH PARAMETER I.D. (ORDINATE)
 C IFORMD - CUTBACK MODE
 C ICNCCC - INTEGER CUTBACK NUMBER CUTBACK OVERPLANE
 C ITAC - AIRCRAFT TYPE
 C ITR - FIRST 20 X COORDS OF CURRENT CONTOUR
 C ITR1 - TRACK GROUP NUMBER
 C ITRSEG - NUMBER OF TRACK SEGMENTS PER TRACK IN LOW 7 BITS
 C JOINP - UPPER BOUND
 C MATCH - MAPS A/C TYPES TO PROFILES
 C MASK - DECODES INTO FROM ITRSEG
 C MAXSEG - LARGEST NUMBER OF SEGMENTS/TRACK
 C NKS - TRACK WITH NEXT GREATEST NUMBER OF SEGS) MAXSEG-1(
 C N1 - TRACK GROUP NUMBER
 C N2 - PROFILE NUMBER
 C NPS - NUMBER OF PROFILE SEGMENTS
 C NPT - RESTRICTION NUMBER
 C NPT - RESTRICTION TYPE
 C NTRK - TABLE OF TRACK NUMBERS
 C NTRKK - TRACK NUMBER
 C PARAN - SEGMENT INFO FOR EACH TRACK (SEE NTRK)
 C PI - CONSTANT EQUALS THREE SOMETHING
 C PRPF - TABLE OF PERFORMANCE PROFILES
 C PWR - THRUST SETTING
 C PWR1 - POWER SETTING TO CONFORM TO RESTRICTION
 C R - RUNWAY LENGTH
 C RY1L - TABLE OF RUNWAY LENGTHS

03-23-79

```

C   RUNWAY - RUNWAY LENGTH
C   HIGH - INDICATES HANDLEDNESS OF TRAIL
C   STATE - FINAL SEGMENT ACTION AFTER RESTRICTION APPLIED
C   STOP - RESTRICTION STOP HERE
C   STOP - START OF RESTRICTION
C   TD - TABLE OF INCREMENTAL TRACK LENGTHS TO END OF SUCCESSIVE SEGS
C         (EXCLUDES LAST SEG)
C   TL - TRACK LENGTH
C   U - COMPONENT OF WIND VELOCITY IN DIRECTION OF TRACK SEGMENT
C   V1 - X-VELOCITY ALONG TRACK
C   V2 - Y-VELOCITY ALONG TRACK
C   W - AIRPLANE SPEED
C   W1 - WIND VELOCITY (KNOTS)
C   W2 - INTERPOLATED VELOCITY
C
C   W3 - WIND COMPONENT IN AIRCRAFT'S DIRECTION OF TRAVEL
C
C   X - X-COORD, TRACK DIRECTION
C
C   Y - Y-COORD, TRACK DIRECTION
C   SUBROUTINE
C   PREPR DETERMINES THE VALUES OF OPERATIONAL PERFORMANCE PARAMETERS
C   (WIND, ALTITUDE, VELOCITY AND THRUST) OF A GIVEN FLIGHT AT A GIVEN
C   POINT. WIND AND ALTITUDE EFFECTS ON AIRCRAFT PERFORMANCE ARE
C   CONSIDERED.
C   THE SUBROUTINE PREPR CALLS THE SUBROUTINES DELTA, GENFNI AND PROCPA.
C   PREPR HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
C   CALL PREPR (N2,D,B,H,PRP,V,ITAC,NTRK,MAXSEG,IAPP)
C   WHERE:
C   N2 - PROFILE NUMBER FOR CURRENT FLIGHT
C   D - DISTANCE ALONG GROUND TRACK TO TRACK'S POINT OF CLOSEST APPROACH
C   B - POINT ON SECONDARY SEGMENT WHICH IS CLOSEST TO THE ANALYSIS
C   H - RUNWAY LENGTH
C   PRP - AIRCRAFT ALTITUDE ABOVE GROUND LEVEL (COMPUTED BY PREPR)
C   V - AIRCRAFT THRUST SETTING (COMPUTED BY PREPR)
C   ITAC - NOISE CURVE SET NUMBER ASSIGNED TO AIRCRAFT
C   NTRK - TRACK NUMBER
C   MAXSEG - TRACK SEGMENT NUMBER BEING CONSIDERED
C   THE SUBROUTINE EXPOSE IS THE ONLY USER OF PREPR AND WILL CALL IT
C   MANY TIMES DURING EXECUTION.
C   THE INPUT DATA TO PREPR IS PROVIDED BY THE CALLING ARGUMENTS AS WELL
C   AS LABELED COMMON BLOCKS WHOSE DESCRIPTORS FOLLOW.
C   COMMON BLOCK VARIABLE DESCRIPTION
C   /RUNWAY/    APA    AIRPORT ALTITUDE ABOVE MEAN SEA LEVEL.
C               TWY1   RUNWAY LENGTHS.
C   /TRACK/     ITSEG   JEE
C               MASK    DISCUSSION
C               PAPER    IN
C               TD       SUBROUTINE HBT.
C   /GROUP/     DCTM    COMMON DISTANCE FOR INDIVIDUAL GROUPS.
C               ITBG    GROUP ASSIGNMENTS FOR EACH TRACK.
C   /WIND/      V1      WIND VELOCITY (KNOTS) FOR EACH GROUP.
C               V2      WIND DIRECTION RELATIVE TO POSITIVE X-AXIS
C   /PROFILE/   PRCP    AIRCRAFT PERFORMANCE PROFILES.
C   /RESULT/    VAC     NOISE ABATEMENT ALTERNATIVE FOR EACH TRACK
C               STP     DISTANCE ALONG TRACK TO START OF PROCEDURE
C               ENDR     DISTANCE ALONG TRACK TO END OF PROCEDURE.
C               TCBNC    ABATEMENT OVERRIDE COMMANDS.

```

03-13-79

C DEFAULT ALTITUDE ABOVE GROUND LEVEL AT END OF
 C PROCEDURE.
 C THERE ARE TWO EXIT RETURNS FROM PREPR LOCATED AT LINES NUMBERED
 C 82 AND 92 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT
 C LINE 82 IS USED IF THE FLIGHT IS A TAKEOFF OR NO WIND CONDITIONS
 C EXIST FOR THE FLIGHT. THE RETURN AT LINE 92 IS USED WHEN THE FLIGHT
 C BEING EXAMINED IS A LANDING AND WIND CONDITIONS ARE PRESENT.
 C THE OUTPUT FROM PREPR IS PROVIDED BY THE CALLING ARGUMENTS AS
 C WELL AS THE VARIABLE ASPROF IN LABELED COMMON BLOCK /PROFNI/ WHICH
 C IS A TEMPORARY STORAGE FOR THE EXPLICIT DEFINITION OF THE CURRENT
 C PERFORMANCE PROFILE AND WILL BE USED BY SUBROUTINE OVRLAY FOR ASDS
 C AND DOSE CALCULATIONS. THE FOLLOWING PARAGRAPHS DISCUSS THE
 C PROCESSING PERFORMED BY PREPR.
 C BASICALLY, THE ALTITUDE IS FOUND BY LINEAR INTERPOLATION ON THE
 C DISTANCE ALONG THE TRACK IN THE PROFILE TABLES. HOWEVER, THERE ARE
 C SOME MODIFICATIONS THAT CAN BE APPLIED TO TAKEOFFS. FIRST, IF
 C THERE IS A WIND, THE AIRCRAFT PERFORMANCE RELATIVE TO THE GROUND
 C WILL CHANGE. THIS MODIFICATION IS PERFORMED BY MULTIPLYING THE
 C DISTANCE FLOWN ALONG STRAIGHT TRACK SEGMENTS BY THE FACTOR
 C $\Delta D = VA / (VA - V)$
 C WHERE VA IS THE AIRCRAFT SPEED AND V IS THE COMPONENT OF THE WIND
 C SPEED ALONG TRACK SEGMENT. NOTE THAT IF $V > 0$, THEN IT IS TAIL
 C WIND. ALSO, IF THERE IS AN ABATEMENT ALTERNATIVE APPLICABLE TO THE
 C TRACK IN QUESTION, THIS MUST BE ACCOUNTED FOR AS THE FOLLOWING
 C PARAGRAPHS DESCRIBE.
 C WHEN A NOISE ABATEMENT ALTERNATIVE IS SPECIFIED, THE STANDARD
 C TAKEOFF PROCEDURES ARE MODIFIED BY INSERTING A PROFILE SEGMENT WHERE
 C THE THRUST AND CLIMB GRADIENT ARE AS SPECIFIED BY THE ABATEMENT
 C DEFINITION. THE START AND ENDPOINTS OF THE ABATEMENT SEGMENT MUST
 C BE SPECIFIED BY THE USER AND MAY BE GIVEN AS EITHER AN ALTITUDE, IN
 C FEET, OR A DISTANCE ALONG THE TRACK FROM BRAKE RELEASE, IN NAUTICAL
 C MILES. THE ONLY EXCEPTION TO THIS IS THAT IF THE ABATEMENT CLIMB
 C GRADIENT IS ZERO, THE ENDPOINT MUST BE SPECIFIED AS A DISTANCE FROM
 C BRAKE RELEASE.
 C THERE ARE FIVE DIFFERENT TYPES OF NOISE ABATEMENT ALTERNATIVES
 C ALLOWED FOR IN THE PROGRAM:
 C 1. ALTITUDE RESTRICTION (GAMMA = 0)
 C 2. TAKEOFF POWER
 C 3. MAXIMUM CLIMB POWER
 C 4. ENGINE OUT LEVEL FLIGHT POWER
 C 5. MAINTAIN SPECIFIED CLIMB GRADIENT (GAMMA)
 C WHERE THE "ENGINE OUT LEVEL FLIGHT" CUTBACK IS DEFINED BY:
 C $T = \text{THRUST REQUIRED FOR LEVEL FLIGHT WITH ONE ENGINE OUT,}$
 C AND
 C $\text{GAMMA} = \text{GRADIENT AT WHICH SPEED WILL BE CONSTANT WITH THE ABOVE}$
 C THRUST.
 C ABATEMENT TYPES 1 THROUGH 4 HAVE THE CLIMB GRADIENTS AND POWER
 C SETTINGS STATED IN THE AIRCRAFT TAKEOFF PROFILE. THE TYPE 5 CUTBACK
 C REQUIRES SOME SPECIAL COMPUTATION. SINCE THE GRADIENT IS INPUT AND
 C IS THE SAME FOR ALL AIRCRAFT TYPES, THE THRUST MUST BE COMPUTED.
 C THIS IS DONE BY:
 C $T = (\text{GAMMA} * W / \text{TEC} * (N - 1)) / X$
 C WHERE
 C W IS THE GROSS WEIGHT
 C W IS THE GROSS WEIGHT OF THE AIRCRAFT
 C TEC IS THE THRUST FOR ENGINE OUT LEVEL FLIGHT
 C CUTBACK, AND
 C N IS THE NUMBER OF ENGINES
 C TWO METHODS ARE USED TO INSERT THE ABATEMENT SEGMENT INTO THE
 C STANDARD PROFILE. IF THE ABATEMENT PROCEDURE STARTS BEFORE THE
 C START OF THE FIFTH PROFILE SEGMENT, THEN, AFTER THE ABATEMENT
 C SEGMENT ENDS, THE AIRCRAFT RESUMES THE STANDARD PROFILE AT THE
 C START OF THE FIFTH SEGMENT. NOTE THAT SINCE THIS PART OF THE
 C PROFILE IS DEFINED BASED ON AN ALTITUDE OF 1500 FEET AT THE START OF
 C THE FIFTH SEGMENT, PERFORMANCE FOR THE REMINDER OF THE PROFILE

C MUST AGAIN BE CORRECTED BY DELTA.
 C IF THE ABATEMENT PROCEDURE BEGINS DURING OR AFTER THE FIFTH
 C SEGMENT, THEN, AT THE END OF THE SEGMENT, THE AIRCRAFT RETURNS TO
 C THE STANDARD PROFILE AT THE POINT WHERE THE ABATEMENT PROCEDURE
 C STARTED. ALSO, IT IS POSSIBLE TO SPECIFY OVERRIDE MODES FOR
 C SPECIFIC AIRCRAFT TYPES. THESE ARE:
 C 0 - ACCEPT ANY ABATEMENT ALTERNATIVE.
 C 1 - NO ALTERNATIVE OF ANY TYPE.
 C 2 - ENGINE OUT LEVEL FLIGHT ABATEMENT ONLY.
 C 3 - TAKEOFF AND CLIMB ONLY.
 C GIVE THE ALTITUDE, THE THRUST IS DETERMINED BY INTERPOLATION IN
 C THE PROFILE TABLES, WITH THRUST TRANSITIONS SMOOTHED OVER 1000 FEET
 C OF GROUND TRACK DISTANCE. SINCE NOISE IS CONSIDERED TO BE A
 C FUNCTION OF CORRECTED NET THRUST, A CORRECTION FOR PRESSURE ALTITUDE
 C FUNCTION OF CORRECTED NET THRUST, A CORRECTION FOR PRESSURE ALTITUDE
 C MUST BE MADE WHENEVER UNCORRECTED NET THRUST IS STORED IN OR
 C COMPUTED BY THE PROGRAM. THIS IS THE CASE FOR THRUSTS STORED IN THE
 C APPROACH PROFILES AND FOR THE LEVEL FLIGHT AND NOISE ABATEMENT
 C THRUSTS STORED IN THE STANDARD TAKEOFF PROFILES. (SEE DELTA
 C SUBROUTINE.) AN ADDITIONAL MODIFICATION IS MADE TO SIMULATE THRUST
 C CHANGES FOR AN APPROACH WITH A WIND VECTOR.
 C 1 - AIRCRAFT WEIGHT
 C TANVA - CLIMB GRADIENT (NEGATIVE FOR DESCENT)
 C VW - WIND SPEED COMPONENT IN THE DIRECTION OF FLIGHT
 C VA - AIRCRAFT AIR SPEED
 C DELTA - PRESSURE ALTITUDE CORRECTION
 C N - NUMBER OF ENGINES
 C THE VELOCITY, LIKE THE THRUST, IS INTERPOLATED FROM THE PROFILE
 C TABLES, BUT WITH TWO POSSIBLE CORRECTIONS. A WIND CORRECTION IS
 C APPLIED TO STRAIGHT TRACK SEGMENTS BY ADDING THE AIRCRAFT SPEED
 C AND THE COMPONENT OF THE WIND SPEED IN THE DIRECTION OF THE TRACK.
 C FOR CURVED SEGMENTS, IT IS APPLIED BY INTERPOLATING BETWEEN THE
 C CORRECTED VELOCITIES ON THE SURROUNDING TRACK SEGMENTS. FOR
 C ABATEMENT ALTERNATIVES, THE VELOCITY IS ASSUMED TO BE CONSTANT
 C DURING THE PROCEDURE AND IS SET EQUAL TO THE VELOCITY AT THE START
 C OF THE ABATEMENT SEGMENT. IN ORDER TO PREVENT AN EXCESSIVE
 C CORRECTION, THE VELOCITY IS NEVER PERMITTED TO BE LESS THAN 32
 C KNOTS.

Subroutine PROFDA

SUBROUTINE PROFDA (NP,DD,R/L,H,PWR,V,ITAC,I,IAPP) 03-13-79
 C GIVEN DISTANCE ALONG FLIGHT TRACK, PROFDA COMPUTES THE
 C AIRCRAFT HEIGHT, THRUST SETTING AND VELOCITY.
 C *****
 C LOCAL VARIABLE DICTIONARY
 C APPTHR - APPROACH THRUSTS (INPUT DATA FOR INTERPOLATION)
 C AV1 - THRUST SETTING AT START OF SEG
 C AV1 - THRUST SETTING AT END OF SEG
 C D - DISTANCE ALONG FLIGHT TRACK, CLOSEST POINT TO RUNWAY END
 C DD - DISTANCE ALONG TRACK
 C DT - DISTANCE ALONG TRACK
 C GTD - GROUND TRACK DISTANCE
 C GTDX - X COORD OF GROUND TRACK DISTANCE
 C H - HEIGHT ABOVE RUNWAY (INTERPOLATED)
 C I - ARRAY INDEX OF LARGEST ENTRY IN PROF LESS THAN DT
 C IAPP - APPROACH PARAMETER I.D. (ORDINATE)
 C ITAC - A/C TYPE
 C JKRC - CONSTANT 03-28-79

C JOINT - NUMBER OF SEGMENT DATA POINTS
 C KK - CONSTANT
 C I - LOOK ARG FOR APPTHR KEYED TO ITAC
 C MATCH - TABLE OF INDEX ARGS TO APPTHR BY A/C TYPE
 C NP - PROFILE INDICATOR
 C NP - PROFILE NUMBER
 C PROF - PROFILE DATA (IN COMMON PROFIL)
 C PWR - RETURNS POWER SETTING
 C RL - RUNWAY LENGTH
 C RY - RUNWAY LENGTH
 C V - VELOCITY
 C 2.47 PROFDA - SUBROUTINE
 C PROFDA IS USED BY SUBROUTINE PREPR TO DETERMINE THE ALTITUDE,
 C VELOCITY, AND THRUST FOR A GIVEN FLIGHT AT A GIVEN POINT.
 C PROFDA CALLS THE SUBROUTINES DELTA, POSHUT, PROCSET, AND GENFNI.
 C PROFDA HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
 C CALL PROFDA (NP,D,BY,H,PWR,V,ITAC,I,IAPP)
 C 03-13-79
 C WHERE
 C NP - PERFORMANCE PROFILE NUMBER
 C D - DISTANCE ALONG PROFILE TO ANALYSIS POINT
 C RY - RUN WAY LENGTH
 C H - ALTITUDE ABOVE GROUND LEVEL (RETURNED)
 C PWR - THRUST SETTING (RETURNED)
 C V - AIRCRAFT VELOCITY (RETURNED)
 C ITAC - AIRCRAFT ASSIGNED NOISE CURVE SET
 C I - NUMBER OF SEGMENTS IN PROFILE UP TO ANALYSIS POINT.
 C PREPR IS THE ONLY SUBROUTINE TO CALL PROFDA AND IT WILL DO SO
 C MANY TIMES DURING EXECUTION.
 C THE INPUT DATA TO PROFDA IS SUPPLIED BY THE CALLING ARGUMENTS AND
 C THE VARIABLES PROF, MATCH AND APPTHR IN LABELED COMMON BLOCK
 C /PROFIL/.
 C THERE ARE FOUR EXIT RETURNS FROM PROFDA, LOCATED AT LINES NUMBERED
 C 52, 57, 59 AND 64 IN THE SUBROUTINE LISTING IN SECTION 5. THE
 C RETURN AT LINE 52 IS USED WHEN THE ANALYSIS POINT IS BEYOND THE
 C STOPPING POINT FOR A LANDING. THE RETURN AT LINE 57 IS USED AFTER
 C SMOOTHING THE THRUST FOR A TAKEOFF. THE RETURN AT LINE 59 IS USED
 C IF NO SMOOTHING IS NECESSARY. THE RETURN AT LINE 64 IS USED AFTER
 C SMOOTHING THE THRUST FOR A LANDING AND APPLYING ALTITUDE
 C CORRECTIONS.
 C THE OUTPUT FROM PROFDA IS CONTAINED IN THE CALLING ARGUMENTS.
 C
 C GIVEN DISTANCE ALONG FLIGHT TRACK, PROFDA COMPUTES THE
 C
 C AIRCRAFT HEIGHT, THRUST SETTING AND VELOCITY.
 C
 C NP - PROFILE INDICATOR
 C D - DISTANCE ALONG FLIGHT TRACK FROM CLOSEST POINT TO
 C THE FAR END OF THE RUNWAY.
 C RL - RUNWAY LENGTH

Subroutine PROFRD

05-30-79

```

SUBROUTINE PROFRD (IGC1,ICNT,IDTMP,MCDPRF)
*****
LOCAL VARIABLE DICTIONARY
A - DEFAULT AIRPORT ALTITUDE (0 FEET)
APALT - AIRPORT PRESSURE ALTITUDE
APTEMP - AIRPORT TEMP DEGREES KELVIN
CI - ALPHANUMERIC OUTPUT LABEL
CT - DUMMY VARIABLE FOR OUTPUT LABEL
DUM - OUTPUT LABEL (/N.Z./)
ET - OUTPUT LABEL (/FEET/)
I - LOOP COUNTER
ICNT - PROFILE DATA (YES, REALLY!)
IDTMP - DUMMY ARG
IDTMP - PASSED TO SETRES AS AN OUTPUT INDICATOR
        SETRES AS ERROR INDICATOR
ISNY - MORE OUTPUT LABELS
ISMP - MORE FORMAT INFO
ISMT - ARRAY CONTAINING FORMAT INFORMATION
ISC - ALTERNATE RETURN ADDRESS IN CALLING PROGRAM
IGC1 - ERROR RET RN ADDRESS IN CALLING PROGRAM
II - UNITS INDICATOR FOR PROFILE DATA
IDAR - OUTPUT LABEL ARRAY
IVAR - OUTPUT LABEL OF CURRENT LINE
J - LOOP COUNTER
K - PROFILE NUMBER
N - UPPER BOUND
PROF - A/C PERF PROFILES (SEE COMMON PROFILE)
T - DEFAULT AIRPORT TEMPERATURE (2) DEGREES KELVIN(
PROFRD - ROUTINE
PROFRD RE. AIRCRAFT PERFORMANCE PROFILE INFORMATION FROM THE
INPUT DATA.
PROFRD CALLS THE SUBROUTINES MESSAGE, NBETW, SETRES AND TPROP.
PROFRD HAS ONLY ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
CALL PROFRD (*,ICNT,IDTMP)
WHERE
* - MEMORY LOCATION IN CALLING PROGRAM FOR ERROR RETURN.
ICNT - USED AS TEMPORARY STORAGE BY PROFRD.
IDTMP - PASSED TO SETRES AS AN OUTPUT INDICATOR AND PASSED
BACK FROM SETRES AS AN ERROR INDICATOR.
READING IS THE ONLY SUBROUTINE TO CALL PROFRD AND IT MAY BE
CALLED SEVERAL TIMES DURING THE INPUT PHASE OF EXECUTION.
THE INPUT DATA TO PROFRD IS PROVIDED BY INPT DATA CARDS FROM
THE 0TH DECK.
THERE ARE TWO EXIT RETURNS FROM PROFRD, LOCATED AT LINES
NUMBERED 77 AND 78 IN THE SUBROUTINE LISTING IN SECTION 5. THE
RETURN AT LINE 77 IS AN ERROR RETURN WHILE THE ONE AT LINE 78 IS
USED UNDER NORMAL CONDITIONS.
THE OUTPUT FROM PROFRD CONSIST OF INFORMATION STORED IN THE
AIRCRAFT PERFORMANCE PROFILE TABLE PROF IN LABELED COMMON BLOCK
/PROFIL/.
THE PROCESSING PERFORMED BY PROFRD IS TO READ AND STORE
PERFORMANCE PROFILES FROM THE PUT DATA. THE INPUT DISTANCES ARE
CONVERTED TO FEET FROM NAUTICAL MILES IF NECESSARY. EXTENSIVE
ERROR CHECKS ARE MADE ON THE INPUT DATA.

```

Subroutine PROSET

SUBROUTINE PROSET (NP,ITAC,KK,IAPP)

03-15-79

C

C

C

SUBSTITUTES PROFILE PARAMETERS INTO APPROACH PROFILES
AS INDICATED BY NEGATIVE NUMBERS STORED IN PROF

C

C

PARAMETERS WILL BE PLACED INTO PROFILE 100

C

LOCAL VARIABLE DICTIONARY

C

APPTH - A/C POWER SETTINGS

C

ASPROF - ASPP PROFILE INFO - VELOCITY AND THRUSTS

C

IAPP - APPROACH PARAMETER I.D. (ORDINAL)

03-29-79

C

ITAC - NOISE CURVE NUMBER ASSIGNED TO CURRENT A/C

C

ITYPE - APPROACH PROFILE LOOKUP ARG (AIRCRAFT TYPE)

C

KK - ONE GREATER THAN THE NUMBER OF PROFILE SEGMENTS

C

NTACH - TABLE OF ITYPE

C

NSEGS - NUMBER OF SEGMENTS

C

PR - PROFILE RESTRICTIONS (ASPROF)

C

PROF - A/C PERFORMANCE PROFILES

C

SIR - SLANT RANGE

C

TORL - TRACK LENGTH INCLUDING RUNWAY

C

PROSET - SUBROUTINE

C

PROSET IS USED BY SUBROUTINE PROFDA TO INITIALIZE LANDING

C

PERFORMANCE DATA WHEN "INDICATORS" ARE USED IN THE DEFINITIONS.

C

PROSET DOES NOT USE ANY EXTERNAL SUBROUTINES.

C

PROSET HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:

C

CALL PROSET (NP,ITAC,KK,IAPP)

03-13-79

C

WHERE

C

NP - PROFILE NUMBER.

C

ITAC - NOISE CURVE SET NUMBER ASSIGNED TO THE CURRENT AIRCRAFT.

C

KK - THE NUMBER OF PROFILE SEGMENTS +1.

C

PROFDA IS THE ONLY SUBROUTINE TO CALL PROSET.

C

THE INPUT TO PROSET IS PROVIDED BY THE CALLING ARGUMENTS AND

C

THE TABLES PROF AND APPTH IN THE LABELED COMMON BLOCK/PROFIL/.

C

THERE IS ONE EXIT RETURN FROM PROSET, LOCATED AT LINE NUMBER

C

21 IN THE SUBROUTINE LISTING IN SECTION 5 AND IT IS USED UNDER

C

ALL CONDITIONS.

C

THE OUTPUT FROM PROSET CONSISTS OF THE CONTENTS OF THE VELOCITY

C

AND THRUST VALUES IN PERFORMANCE PROFILE NUMBER 100 IN THE VARIABLE

C

PROF AS WELL AS THE SAME VALUE FOR THE VARIABLE ASPROF IN LABELED

C

COMMON BLOCK/PROFIL/.

C

THE PROCESSING PERFORMED BY PROSET CONSISTS OF RETRIEVING

C

VARIABLES FROM THE ARRAY APPTH AS INDICATED BY THE PROFILE

C

INDEX ANALYSIS AND STORING THOSE VARIABLES APPROPRIATELY INTO

C

WORKING LOCATIONS.

C

C

SUBSTITUTES PROFILE PARAMETERS INTO APPROACH PROFILES

C

AS INDICATED BY NEGATIVE NUMBERS STORED IN PROF

C

PARAMETERS WILL BE PLACED INTO PROFILE 100

Function PWR4ME

FUNCTION PWR4ME (AX,AY,AZ)

```

C
C *****
C THE FUNCTION PWR4ME RETURNS AS ITS VALUE THE CORRECT QUOTE APPROXIMATION
C THROUGHT TO A PRODUCT REQUIRED BY AL (SEE BELOW)
C

```

Subroutine READIN

SUBROUTINE READIN (NRW)

```

C *****
C LOCAL VARIABLE DICTIONARY
C
C PAC - FLAG TO CLEAR RUNWAY UTILIZATION TABLES
C I - LOOP COUNTER
C ICHT - USER COMMENT
C ICST - NUMBER OF ERRORS
C ICODE - DATA INPUT CONTROL CODE (SEE BELOW)
C IDUMP - ERROR FLAG
C IGO - ALTERNATE RETURN ADDRESS IF CALLING PROGRAM
C READIN - SUBROUTINE
C THE SUBROUTINE READIN CONTROLS THE READING OF INPUT DATA FROM
C CARDS.
C READIN CALLS THE FOLLOWING SUBROUTINES:
C ACTPDT ASDCON REPRD NEWMIK RWYRD
C ATRPD ASDTTH MESSAGE NOISRD TOYRD
C APTRD ASDTTH WYRD PCYRD TRAKRD
C ASDANC SPYRD WRETG PROPPD WINDRD
C READIN HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
C CALL READIN (NRW)
C WHERE
C NRW - NUMBER OF RUNWAYS DEFINED AT THIS TIME. ERROR RETURN IF
C NRW = 0 AFTER CALL IN CALLING PROGRAM.
C THE MAIN PROGRAM NOISEI IS THE ONLY PROGRAM TO CALL READIN.
C THE INPUT TO READIN CONSISTS ENTIRELY OF DATA CONTROL CARDS READ
C FROM THE INPUT DECK.
C THERE ARE TWO EXIT RETURNS FROM READIN, LOCATED AT LINES 29 AND
C 110 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 29
C IS THE NORMAL RETURN WHILE THE ONE AT LINE 110 IS USED IF ERRORS
C ARE ENCOUNTERED.
C THE OUTPUT FROM READING CONSISTS ONLY OF PRINTED ERROR MESSAGES.
C THE OUTPUT FROM READIN CONSISTS ONLY OF PRINTED ERROR MESSAGES.
C
C EXTERNAL STATE
C
C CODE 000 RETURN TO NOISEI
C CODE 100-1 READ RUNWAYS AND TRACKS
C CODE 100-2 READ TRACKS ONLY (MUST FOLLOW RUNWAY DATA)

```

```

CODE 100-3    READ MIX DATA
CODE 100-4    READ TRACK PERCENTAGES (THEN MIX DATA)
CODE 100-5    READ MIX DATA - FIXED PROPORTION FORMAT
CODE 101      READ PROFILES
CODE 102      READ NOISE CURVES
CODE 103      READ TRACK ALTITUDE RESTRICTIONS
CODE 104      READ NOISE CURVE MERGE DATA (MUST FOLLOW MIX DATA)
CODE 105      READ TRACK GROUP DATA (MUST PRECEED MIX DATA)
CODE 106      READ WIND DATA
CODE 107      READ NEW AIRCRAFT DEFINITIONS
CODE 108      READ APPROACH PARAMETERS
CODE 109      READ TOLERANCES
CODE 110      READ ASDS 2 THRESHOLD.
CODE 111      READ ASDS 3 THRESHOLDS AND TIMES.
CODE 112      READ AIRCRAFT NOISE CONSTANTS FOR ASDS.
CODE 113      READ OPERATIONAL CONSTANTS FOR ASDS.

```

Subroutine RWYRD

```

SUBROUTINE RWYRD (ISOL, 'RW, FAC, IDUMP)
C
C *****
C LOCAL VARIABLE DICTIONARY
C 1 - RADIUS, CURVED SEGMENT
C 2 - ORIGINAL AIRPORT ALTITUDE ) FROM APALT (
C 3 - TABLE OF RUNWAY NAMES_1 - DEPARTURE, 2 - ARRIVAL
C APALT - AIRPORT ALTITUDE ABOVE MEAN SEA LEVEL
C APTMP - AVERAGE AMBIENT AIRPORT TEMPERATURE DEGREES KELVIN
C BPF - ACTUAL RUNWAY DATA (NUMBER, BRAKE RELEASE, END, ETC)
C CTHETA - CUMULATIVE TURN ANGLE (MUST BE LESS THAN 270 DEGREES)
C DMTN - LENGTH OF SHORTEST STRAIGHT SEG OR ONE HALF RADIUS OF
C MIN TURN, WHICHEVER SMALLEST
C DUM - DUMMY VARIABLE, SILENCE
C FAC - DUMMY ARG FOR RWYRD (NOT USED, PERIOD)
C IDUMP - DIAGNOSTIC OUTPUT INDICATOR
C ITC - ERROR RETURN
C ISOL - HERE ANOTHER ERROR RETURN INDICATOR
C IORTG - NUMBER OF BUSIEST RUNWAY
C IRWY - RUNWAY NUMBER
C ITR - RUNWAY NUMBER ASSIGNED TO EACH TRACK
C ITSEG - NUMBER OF SEGMENTS IN A GIVEN TRACK IN LOW 5 BITS
C ITOTIDX -
C 1 - SEGMENT NUMBER PASSED IN SUBROUTINE CALLS
C MASK - DECODING CONSTANTS FOR ITSEG
C MRW - RUNWAY ERROR FLAG ) RUNWAY = OUT OF BOUNDS - DEPARTURE (
C MRP - RUNWAY ERROR FLAG ) RUNWAY = OUT OF BOUNDS - ARRIVAL (
C NAME - TABLE OF RUNWAY NAMES, AS AMR
C NRW - NUMBER OF DEFINED RUNWAYS (RETURNED)
C RWY - RUNWAY NUMBER
C RS - NUMBER OF SEGMENTS
C RT - TRACK NUMBER
C RTWY - RUNWAY NUMBER FOR GIVEN TRACK
C NR - NUMBER OF RUNWAYS
C PARAM - TRACK SEGMENT INFORMATION (SEE HBT)
C PL - RUNWAY LENGTHS (FEET)
C RM - 1/100
C RPS - NUMBER OF RESTRICTED OPERATIONS ) DEPARTURES, ARRIVALS (
C RPR - RUNWAY PER DAY/EVENING/ NIGHT

```

```

C      SI - SIGN (SO CALLED) OF TURN (RIGHT OR LEFT HAND)
C      TEMP - ORIGINAL AIRPORT TEMPERATURE ) FROM APTEMP (
C      BOTH ALT AND TEMP ARE AS BEFORE MODIFIED BY THIS ROUTINE
C      THETA - TURN ANGLE, CURVED SEGMENT
C      TTD - TRACK DISTANCES FROM START OF RUNWAY TO END OF SUCCESSIVE SEGMENTS
C      FOR ALL EXCEPT LAST SEGMENT (GUESS WHY)
C      UNIT - UNIT VECTOR, DIRECTION OF RUNWAY
C      V1 - VECTOR BRAKE RELEASE POINT TO RUNWAY END ) DEPARTURE (
C      V2 - VECTOR BRAKE RELEASE POINT TO RUNWAY END ) ARRIVAL (
C      YA - RUNWAY START COORDS
C      XD - RUNWAY END COORDS
C      YL - DISTANCE TO BEGINNING OF TRACK SEGMENT
C      XLONG - LENGTH OF TAKEOFF SEGMENT
C      XR - VECTOR, ORIGIN TO RUNWAY END
C      RWYRD - SUBROUTINE
C      SUBROUTINE RWYRD READS THE AIRPORT ALTITUDE AND MEAN AMBIENT
C      TEMPERATURE AS WELL AS RUNWAY DEFINITIONS FROM THE INPT DATA.
C      RWYRD CALLS THE SUBROUTINES TRAKRD (ALTERNATE ENTRY IN RWYRD),
C      SETRES, MESSAGE, NBETW, TPROP, VSUB AND VMAG.
C      RWYRD HAS TWO ENTRY POINTS, RWYRD AND TRAKRD. THE CALLING
C      SEQUENCE FOR RWYRD IS AS FOLLOWS:
C      CALL RWYRD(*,NPV,FAC,IDUMP)
C      WHERE
C
C      * - MEMORY LOCATION IN CALLING PROGRAM FOR ERROR RETURN.
C
C      NRW - NUMBER OF DEFINED RUNWAYS (RETURNED)
C
C      FAC - NOT USED.
C
C      IDUMP - DIAGNOSTIC OUTPUT INDICATOR PASSED TO SUBROUTINES
C      TRAKRD AND SETRES.
C      READIN IS THE ONLY SUBROUTINE TO CALL RWYRD AND IT WILL NORMALLY
C      ONLY BE CALLED ONCE PER RUN.
C      THE INPUT TO RWYRD IS SUPPLIED ENTIRELY FROM DATA CARDS IN THE
C      INPUT RUN DECK.
C      THERE ARE NO EXIT RETURNS FROM RWYRD AND ALL RETURNS ARE EXECUTED
C      IN TRAKRD.
C      TRAKRD IS THE NATURAL CONTINUATION WHEN RWYRD IS COMPLETE SINCE IT IS
C      ASSUMED THAT IF A RUNWAY IS DEFINED, THERE ARE TRACKS TO GO WITH IT
C      AND THEY CAN BE EFFICIENTLY DEFINED NOW.
C      THE OUTPUT FROM RWYRD CONSISTS OF THE NUMBER OF DEFINED RUNWAYS,
C      NRW, OF COURSE, AS WELL AS THE INITIALIZATION OF VARIABLES IN THE
C      LABELED COMMON BLOCKS /RUNWAY/ AND /RWYUTL/. THE VARIABLES IN THOSE
C      BLOCKS ARE DESCRIBED AS FOLLOWS:
C      COMMON
C      BLOCK VARIABLE DESCRIPTION
C      /RUNWAY/ APALT AIRPORT ALTITUDE ABOVE MEAN SEA LEVEL.
C      /RUNWAY/ APALT AIRPORT ALTITUDE ABOVE MEAN SEA LEVEL.
C      APTEMP AVERAGE AMBIENT TEMPERATURE AT AIRPORT (K)
C      YA RUNWAY START COORDINATES.
C      XD RUNWAY END COORDINATES.
C      RL RUNWAY LENGTHS (FEET).
C      /RWYUTL/ AMR RUNWAY NAMES, THREE CHARACTERS EACH.
C      INRWY NUMBER OF DEFINED RUNWAYS.
C      RWYRD PERFORMS NO FURTHER PROCESSING AFTER INITIALIZING THE
C      ABOVE TABLES BUT PROCEEDS IMMEDIATELY TO TRAKRD TO READ GROUND
C      TRACK INFORMATION.
C      TRAKRD IS AN ALTERNATE ENTRY IN RWYRD.
C      TRAKRD CALLS THE SUBROUTINES MESSAGE, NBETW, DGTRD, HELG, VUNT AND
C      XLINE.
C      THE CALLING SEQUENCE FOR TRAKRD IS:
C      CALL TRAKRD(*,IDUMP)
C      WHERE
C      * - MEMORY LOCATION IN CALLING PROGRAM FOR ERROR RETURN.
C      IDUMP - DIAGNOSTIC OUTPUT INDICATOR WHICH, IF NOT EQUAL TO ZERO,

```

C CAUSES THE CONTENTS OF THE VARIABLE PARAM IN LABELED COMMON BLOCK
 C /TRACK/ TO BE OUTPUT TO THE PRINTER FOR ALL DEFINED GROUND TRACKS.
 C (SEE SUBROUTINE HBT FOR A DISCUSSION OF PARAM.)
 C TRAKRD IS CALLED FROM READIN AND, BY DEFAULT, FROM RWYRD.
 C THE INPUT FOR TRAKRD COMES FROM INPUT DATA CARDS, THE VARIABLES
 C R, YA AND XD IN COMMON BLOCK /RUNWAY/ AND THE VARIABLE MASK IN
 C LABELED COMMON BLOCK /TRACK/.
 C THERE ARE TWO EXIT RETURNS FROM TRAKRD (AND RWYRD) LOCATED AT
 C LINES NUMBERED 163 AND 164 IN THE SUBROUTINE LISTING IN SECTION 5.
 C THE RETURN AT LINE 163 IS AN ERROR RETURN WHILE THE ONE AT LINE 164
 C IS USED IF NO ERRORS ARE ENCOUNTERED.
 C THE OUTPUT FROM TRAKRD CONSISTS OF INITIALIZED VARIABLES IN THE
 C LABELED COMMON BLOCK /TRACK/ DEFINED AS FOLLOWS.
 C VARIABLE DESCRIPTION
 C ITR - RUNWAY NUMBER ASSIGNED TO EACH TRACK.
 C ITSEG - (SEE SUBROUTINE HBT FOR DESCRIPTION.)
 C PARAM - (SEE SUBROUTINE HBT FOR DESCRIPTION.)

C ITTD - TOTAL TRACK DISTANCE, RUNWAY INCLUDED, TO THE END
 C OF ALL BUT THE LAST SEGMENT FOR EACH DEFINED TRACK. DISTANCE IS IN
 C FEET.
 C DMIN - FOR EACH TRACK, THE LENGTH OF THE SHORTEST STRAIGHT
 C SEGMENT OR ONE-HALF THE MINIMUM TURN RADIUS, WHICHEVER IS SMALLEST.
 C THE PROCESSING PERFORMED BY TRAKRD CONSISTS OF THE COMPUTATION OF
 C THE VALUES FOR THE INITIALIZED VARIABLES, EXCEPT PARAM. TRAKRD WILL
 C CALL XLINE TO PROCESS STRAIGHT SEGMENTS AND HELG FOR TURN SEGMENTS
 C AND THESE TWO SUBROUTINES PERFORM THE INITIALIZATION IN PARAM.

Subroutine SETRES

SUBROUTINE SETRES (NP, NP, IDUMP)

 C LOCAL VARIABLE DICTIONARY
 C APALT - PRESSURE ALTITUDE CORRECTION FROM DELTA
 C AX - PROFILE TABLE FOR GENFI INTERPOLATION
 C YX - START OF RESTRICTION ZONE FOR PARTICULAR RUNWAY + PROFILE
 C BY - PROFILE TABLE FOR GENFI INTERPOLATION
 C DELT - RATIO OF POWER SETTING TO THAT REQUIRED FOR FINAL
 C PROFILE ALTITUDE
 C END - END OF RESTRICTION ZONE
 C ENDALT - ALTITUDE AT END OF PROCEDURE FOR EACH PROF AND RESTR NUMBER
 C ENDR - RESTRICTION END
 C GCON - INPUT TAKEOFF GRADIENT FOR EACH RESTRICTION NUMBER.
 C ICR - TYPE OF ABATEMENT PROCEDURE FOR EACH RESTRICTION NUMBER.
 C ICBACO - PROCEDURE OVERRIDE CODES FOR EACH NOISE CURVE SET.
 C IDUMP - FLAG TO DUMP VARIABLES TO IPT IF SETRES FAILS
 C IGO - ERROR RETURN
 C II - CONTAINS POSITION IN TABLE OF LAST VALUE NOT GREATER THAN XX
 C INT - LOOP COUNTER NUMBER OF VALUES IF AX, BX
 C IAR - NOISE ABATEMENT PROCEDURE NUMBER FOR EACH TRACK.
 C PROFILE AND RESTRICTION NUMBER.

```

C      NP - NUMBER OF PROFILES TOWHICH RESTRICTIONS APPLY
C      NR - RUNWAY NUMBER TO WHICH RESTRICTIONS APPLY
C      NRT - RESTRICTION TYPE
C      ORGEND - INPUT PROCEDURE END DEFINITION.
C      ORGSTR - INPUT PROCEDURE START DEFINITION.
C      PROF - TABLE OF PROFILE INFORMATION
C      PWR - POWER SETTING TO MAINTAIN SPECIFIED GRADIENT
C      STALT - ALTITUDE AT START OF RESTRICTION
C      STR* - DISTANCE FROM THRESHOLD TO START OF PROCEDURE FOR EACH
C      PROFILE AND RESTRICTION NUMBER.
C      STPT - START OF RESTRICTION ZONE
C      Z - ALTITUDE AT WHICH PM1 EXCEEDS CLIMB POWER
C      SETRES - SUBROUTINE
C      SUBROUTINE SETRES INITIALIZES APPROPRIATE VARIABLES WHEN THE
C      OPTIONAL TAKEOFF PROCEDURES ARE REQUESTED.
C      THE SUBROUTINE SETRES CALLS THE SUBROUTINE MESSAGE IF AN ERROR IS
C      ENCOUNTERED AND GENFNI TO DO INTERPOLATIONS.
C      THERE IS ONE ENTRY IN SETRES AND THE CALLING SEQUENCE IS:
C      CALL SETRES (NP, NR, IDIMP)
C      WHEN
C      NP PERFORMANCE PROFILE NUMBER.
C      NR RESTRICTION NUMBER INDEFINITION TABLES.
C      IDIMP DIAGNOSTIC OUTPUT INDICATOR WHICH IF NOT EQUAL TO ZERO
C      CAUSES THE RESULTS TO BE PRINTED. ON RETURN INDICATES ERROR IF = -1
C      SETRES IS CALLED BY THE SUBROUTINES ALTRRD, PROFRD AND RWYRD.
C      THE INPUT DATA FOR SETRES IS PROVIDED BY THE CALLING ARGUMENTS AND
C      THE LABELED COMMON BLOCK /PESALT/. THE FOLLOWING IS A DESCRIPTION
C      OF THE VARIABLES IN /PESALT/.
C      VARIABLE DESCRIPTION
C      VAR - NOISE ABATEMENT PROCEDURE NUMBER FOR EACH TRACK.
C      ENDR* - DISTANCE FROM THRESHOLD TO END OF PROCEDURE FOR EACH
C      PROFILE AND RESTRICTION NUMBER.
C      STR* - DISTANCE FROM THRESHOLD TO START OF PROCEDURE FOR EACH
C      PROFILE AND RESTRICTION NUMBER.
C      ICDT - TYPE OF ABATEMENT PROCEDURE FOR EACH RESTRICTION NUMBER.
C      GRN - INPUT TAKEOFF GRADIENT FOR EACH RESTRICTION NUMBER.
C      ICRNCO - PROCEDURE OVERPIDE CODES FOR EACH NOISE CURVE SET.
C      ENDAIT* - ALTITUDE AT END OF PROCEDURE FOR EACH PROFILE AND
C      RESTRICTION NUMBER.
C      ORGSTR - INPUT PROCEDURE START DEFINITION.
C      ORGEND - INPUT PROCEDURE END DEFINITION.
C      *THESE VARIABLES ARE INITIALIZED BY SETRES.
C      THERE ARE SIX EXIT RETURNS FROM SETRES, LOCATED AT LINES NUMBERED
C      11, 14, 22, 65 AND 70 IN THE SUBROUTINE LISTING IN SECTION 5.
C      THE RETURN AT LINE 11 IS USED IF THE PROFILE NUMBER IS GREATER THAN
C      25. THIS IS NOT AN ERROR. THE RETURN AT LINE 14 IS USED IF THE
C      PROFILE HAS NOT BEEN DEFINED. THE RETURN AT LINE 14 IS USED IF NO
C      PROCEDURE HAS BEEN ASSIGNED TO THE RESTRICTION NUMBER NR. THE
C      RETURN AT LINE 22 IS AN ERROR RETURN AND IS USED IF THE PERFORMANCE
C      PROFILE IS NOT IN STANDARD FORM. THE RETURN AT LINE 65 IS THE
C      NORMAL RETURN USED AFTER PROCESSING IS COMPLETE. THE RETURN AT LINE
C      70 IS USED AFTER COMPLETION OF PROCESSING AND PRINTING DIAGNOSTIC
C      OUTPUT.
C      THE OUTPUT FROM SETRES IS AS INDICATED BY THE ASTERISKS IN THE
C      PREVIOUS DISCUSSION OF THE VARIABLES IN THE LABELED COMMON BLOCK
C      /PESALT/.

```

Function SGNI (I)

This function returns the value ± 1 according to the following:

```

SGNI = 1      for I ≥ 0
SGNI = -1     for I < 0

```

Function SGNR

```

C      FUNCTION SGNR (R)
C
C      *****
C
C      SGNR - FUNCTION SUBROUTINE
C      SGNR RETURNS THE VALUE S1. ACCORDING TO THE FOLLOWING:
C
C      SGNR = X/ABS(X) FOR X≠0
C      SGNR = +1. FOR X=0
C      SGNR DOES NOT USE ANY SUBROUTINES.
C      THERE IS ONE ENTRY TO SGNR AND THE CALLING SEQUENCE IS:
C      SGNR (R)
C
C      WHERE
C      R - ANY REAL NUMBER.
C
C      SGNR IS CALLED BY THE SUBROUTINES NEWPNT AND CTRVE.
C      THE INPUT TO SGNR IS THE CALLING ARGUMENT.
C      THERE IS ONE EXIT RETURN FROM SGNR AND IS ALWAYS USED.
C      THE OUTPUT FROM SGNR IS + 1 OR - 1 AS PREVIOUSLY DESCRIBED.

```

Subroutine SIFT

```

C      SUBROUTINE SIFT (TABN,NP,NSP,TN,SN,TOLL)
C
C      *****
C      LOCAL VARIABLE DICTIONARY
C      ITPRAC - A TABLE CONTAINING UP TO 2000 DISTINCT FLIGHT IDENTIF
C              CATION CODES (SEE MIXRD)
C      IVX - DUMMY UNIT NUMBER
C      J - COUNTER
C      MSK1 - ENCODING MASK FOR ITPRAC
C      MSK2 - ENCODING MASK FOR ITPRAC
C      NF - TOTAL = OF FLIGHTS
C      NCPS - TOTAL OPERATIONS BY ETC
C      NSP1 = OF SIGNIFICANT FLIGHTS
C      SIGM - SIGNIFICANCE MEASURE )10**2.5/(TOI
C      SN1 NOISE FROM SIGNIFICANT FLIGHTS ONLY
C      SUM - TOTAL NOISE FROM SIGNIFICANT FLIGHTS )63G VALUE(
C      TABN CONTAINS NOISE DATA
C      TN1 TOTAL NOISE
C      TOL1 - TOLERANCE APPLIED TO EXPOSURE SUM TO DETERMINE
C              SIGNIFICANT FLIGHTS
C      TOT - TOTAL SIGNIFICANT NOISE
C      X111 - TOLERANCE APPLIED TO EACH ENTRY IN TABN
C
C      SIFT - SUBROUTINE
C
C      SIFT DETERMINES WHICH FLIGHTS ARE TO BE USED WHEN SEARCHING FOR
C      THE NEXT POINT ON THE CONTOUR. THE NOISE FROM FLIGHT OPERATIONS IS
C      SORTED IN ORDER OF SIGNIFICANCE UNTIL THE SUM IS WITHIN A TOLERANCE
C      OF THE TOTAL FOR ALL FLIGHTS AND ONLY THE FLIGHTS WHOSE NOISE VALUES
C      WERE INCLUDED IN THE SUM (I.E., THE MOST SIGNIFICANT FLIGHTS) ARE
C      USED.
C
C      THE SUBROUTINE SIFT DOES NOT USE EXTERNAL SUBROUTINES.
C      SIFT HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS :
C      CALL SIFT (TABN,NP,NSP,TN,SN,TOL)
C
C      WHERE
C      TABN - TABLE OF NOISE VALUES WHICH WERE COMPUTED FOR EACH DEFINED

```

C FLIGHT THE LAST TIME THE NOISE AT A POINT WAS COMPUTED.
 C NF - TOTAL NUMBER OF DEFINED FLIGHTS.
 C NSF - NUMBER OF SIGNIFICANT FLIGHTS (RETURNED).
 C TN - SUMMATION OF NOISE VALUES INCLUDING THE CONTRIBUTIONS
 C FROM ALL DEFINED FLIGHTS (I.E., SUMMATION OF VALUES IN TABLE TABN).
 C SN - SUMMATION OF NOISE VALUES FROM SIGNIFICANT FLIGHTS
 C (RETURNED).
 C TOT - ALLOWABLE TOLERANCE IN CONTOUR LEVEL.
 C EXPOSE IS THE ONLY SUBROUTINE TO CALL SIFT AND IT WILL DO SO MANY
 C TIMES DURING EXECUTION.
 C THE INPUT DATA TO SIFT IS PROVIDED THROUGH THE CALLING ARGUMENTS.
 C THERE ARE TWO EXIT RETURNS FROM SIFT, LOCATED AT LINES NUMBERED
 C 22 AND 41 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT
 C LINE 22 IS USED AFTER THE PROCESSING FOR SIGNIFICANT FLIGHTS HAS
 C BEEN COMPLETED. THE RETURN AT LINE 41 IS USED WHEN THE NUMBER
 C OF DEFINED FLIGHTS IS 50 OR LESS, IN WHICH CASE ALL FLIGHTS WILL BE
 C USED ALL THE TIME.
 C THE OUTPUT OF SIFT CONSISTS OF THE MODIFICATION OF THE TABLE
 C ITPRAC IN LABELED COMMON BLOCK/TRAFFIC/ (SEE SUBROUTINE MIXRD FOR
 C DESCRIPTION OF THE CONTENTS OF ITPRAC). SPECIFICALLY, FOR EACH
 C SIGNIFICANT FLIGHT DEFINED IN ITPRAC, THE MOST SIGNIFICANT BINARY
 C BIT IN THE DEFINITION WORD WILL BE A 1 AND FOR THE INSIGNIFICANT
 C FLIGHTS IT WILL BE A 0.
 C ALL ADDITIONAL OUTPUT IS PASSED THROUGH THE CALLING ARGUMENTS AS
 C PREVIOUSLY DEFINED.
 C THE PROCESSING PERFORMED BY SIFT CONSISTS OF DETERMINING WHICH
 C FLIGHTS OF THE TOTAL CREATE A SIGNIFICANT ENOUGH CONTRIBUTION TO
 C THE OVERALL NOISE EXPOSURE AND SHOULD BE INCLUDED IN THE SEARCH FOR
 C THE NEXT POINT. SINCE THE COMPUTATION OF NOISE FROM ANY FLIGHT,
 C SIGNIFICANT OR NOT, TAKES THE SAME AMOUNT OF TIME AND EFFORT, THE
 C ELIMINATION OF AS MANY FLIGHTS AS POSSIBLE FROM THE COMPUTATIONS
 C WILL SIGNIFICANTLY REDUCE THE RUN TIME OF THE PROGRAM.
 C THE NOISE DATA FOR THE FLIGHT CONTRIBUTIONS AND SUMMATIONS
 C IS COMPUTED AND STORED IN ANTILOG FORM AND CONVERTED TO DECIBELS
 C ONLY WHEN NECESSARY TO LIMIT CALLS TO MATHEMATICAL FUNCTION ALOG10
 C AND RAISING 10 TO A REAL POWER. THIS ALSO SAVES TIME.
 C A FLIGHT IS DETERMINED SIGNIFICANT IF THE FOLLOWING CONDITION
 C HOLDS:
 C $TABN(I) \cdot GE \cdot TOT / SIGM$
 C WHERE
 C $TABN(I)$ IS THE NOISE CONTRIBUTION OF FLIGHT I IN ANTILOG FORM
 C $TOT = 10^{((TN - TOT) / 10)}$
 C $SIGM = 10^{(2.5 - LOG(TOT))}$
 C TN = SUMMATION OF NOISE FROM ALL FLIGHTS (DECIBELS).
 C TOT = ALLOWABLE CONTOUR LEVEL ERROR TOLERANCE (DECIBELS).
 C IF THE SUM OF ALL SIGNIFICANT FLIGHTS' NOISE CONTRIBUTIONS IS LESS
 C THAN TOT,
 C THEN SIGM IS MULTIPLIED BY 2.0 AND THE PROCESS IS REPEATED.
 C REPETITION CONTINUES UNTIL THE ABOVE IS NOT TRUE.
 C IF ANY REPETITION(S) IS NECESSARY, THE CHARACTERS SFTXX WILL BE
 C PRINTED ON THE CONTOUR OUTPUT AT THE FAR RIGHT SIDE, WHERE XX IS THE
 C NUMBER OF REPETITIONS.

Subroutine SKFIL

 SUBROUTINE SKFIL (IU,N,ISTAT)

C SKIPPER-SUBROUTINE

C THE SUBROUTINE SKIPPER IS USED TO SKIP FILES (ENTRY SKFIL) OR

C RECORDS (ENTRY SKREC) ON MAGNETIC TAPE.

C SKIPPER HAS TWO ENTRY POINTS AT SKFIL AND SKREC. THE CALLING

C SEQUENCE FOR SKFIL IS:

C CALL SKFIL (IU,N,ISTAT)

C WHERE

C IU FORTRAN LOGICAL UNIT NUMBER

C N NUMBER OF FILES TO BE SKIPPED

C +N = SKIP FORWARD,

C -N = SKIP BACKWARD,

C 0 = SKIP TO BEGINNING OF CURRENT FILE.

C ISTAT STATUS OF COMPLETED OPERATION

C 0 = NORMAL COMPLETION

C 1 = BAD OR INAPPROPRIATE UNIT

C 2 = NOT USED

C 3 = UNRECOVERABLE ERROR

C SKFIL IS CALLED BY THE SUBROUTINES POSIT AND PPGRM.

C THE INPUT TO SKFIL IS THROUGH THE CALLING ARGUMENTS.

C THE OUTPUT FROM SKFIL IS, LIKEWISE, PASSED THROUGH THE CALLING

C ARGUMENTS.

C THE SECOND ENTRY SKREC HAS THE CALLING SEQUENCE:

C CALL SKREC (IU,N,ISTAT)

C WHERE

C IU FORTRAN LOGICAL UNIT NUMBER

C N NUMBER OF PHYSICAL RECORDS TO SKIP

C +N = SKIP FORWARD

C -N = SKIP BACKWARD

C 0 = NO OPERATION

C ISTAT STATUS OF COMPLETED OPERATION

C 0 = NORMAL COMPLETION

C 1 = BAD OR INAPPROPRIATE UNIT

C 2 = END -OF -FILE OR LOAD POINT PASSED

C 3 = UNRECOVERABLE ERROR

C SKREC IS NOT USED BY THE CONTOUR ANALYSIS MODEL BUT IS USED BY THE

C CONTOUR PLOTTING PACKAGE.

Subroutine SKREC (IU, N, ISTAT)

 Subroutine SKREC forward/backward skips logical records. See
Subroutine SKFIL for a complete description:

Subroutine SORTI (AIRCRAFT, N)

Subroutine SORTI is a general purpose subroutine used to sort one dimensional ARRAYS. This subroutine examines the input ARRAY, AIRCRAFT, removes zero and duplicate entries, and sorts the table in ascending order. Input variable, N, is the number of entries in ARRAY AIRCRAFT. This subroutine is used primarily by subroutine LOAD.

Subroutine SORT2

```
SUBROUTINE SORT2 (IT,Z,Y,IK)
C
C *****
C
C SORTS IT IN ASCENDING ORDER
C SORTS Z AND Y ACCORDING TO IT
C ENTRY SORT2 DOES NOT BOTHER TO SORT Y
C IK - NUMBER OF ELEMENTS IN ARRAYS
C IT - LOGICAL FLAG (TRUE OR FALSE)
C Y - TEMPORARY STORAGE FOR VALUES MOVED
```

Subroutine SORT4

```
1 SUBROUTINE SORT4 (IT,A,B,C,D,IK,N)
C
C *****
C IK - LENGTH OF ARRAYS
C IT, A,B,C,D - APPROPRIATE ARRAYS
C THIS ROUTINE SORTS THEM IN ASCENDING ORDER
C ACCORDING TO IT
C - - EXTRA ARGUMENT (NOT USED!)
C SORT4 - SUBROUTINE
C SORT4 IS A NUMERICAL SORTING ROUTINE THAT ARRANGES THE VALUES IN A
C GIVEN TABLE IN DESCENDING ORDER. CORRESPONDING VALUES IN FOUR
C ASSOCIATED TABLES ARE REARRANGED IN THE SAME FASHION AS THE GIVEN
C TABLE WITHOUT REGARD TO THEIR QUANTITATIVE ORDER. THIS ROUTINE IS
C USED TO ASSEMBLE THE FLIGHT IDENTIFICATION TABLE AND THE ASSOCIATED
C EQUIVALENT OPERATIONS FOR REF, IDN, CNEJ, AND LFQ INTO LOGICAL
C ORDER. NOTE THAT THE OPERATIONS FOR ASDS AND DCSE ARE THE SAME AS
C FOR REF.
```

```

C SORTN DOES NOT USE ANY EXTERNAL SUBROUTINES.
C SORTN HAS ONLY ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C CALL SORTN (IT,A,B,C,D,IK,N)
C WHERE
C IT - THE TABLE TO BE SORTED
C A,B,C,D - THE FOUR TABLES TO SORT THE SAME WAY AS IT
C IK - NUMBER OF VALUES IN THE TABLES
C N - NOT PRESENTLY USED BY SORTN
C SORTN IS CALLED BY THE SUBROUTINES MIXRD, MERGRD, AND NEWMIX.
C THE INPUT DATA FOR SORTN IS PROVIDED BY THE CALLING ARGUMENTS.
C THERE ARE TWO EXIT RETURNS FROM SORTN, LOCATED AT LINES NUMBERED 4
C AND 6 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 4
C IS USED IF THERE ARE LESS THAN THREE VALUES IN THE TABLES AND THE
C RETURN AT LINE 6 IS USED OTHERWISE.
C THE OUTPUT OF SORTN IS THROUGH THE CALLING VARIABLES. THE TABLE IT
C WILL BE SORTED SO THAT THE VALUES ARE IN DESCENDING ORDER. THE
C TABLES A,B,C,D WILL BE SORTED IN THE SAME ORDER AS TABLE IT WITHOUT
C REGARD TO NUMERICAL ORDER.

```

Subroutine STRAIT

```

SUBROUTINE STRAIT (IGO,RO,P,D,X,IE)
C
C *****
C COMPUTES DISTANCE FROM A POINT (RO TO D
C IF MAXSEG IS KNOWN
C P(1),P(2) ARE COORDINATES OF THE SEGMENT START
C P(3) IS THE SEGMENT LENGTH
C P(4),P(5) IS A UNIT VECTOR ALONG THE SEGMENT
C D - VECTOR MAGNITUDE
C S - DIFFERENCE VECTOR BETWEEN PO AND SEGMENT START POINT
C X - PROJECTION OF DIFFERENCE VECTOR ONTO TRACK SEGMENT
C PO - COORDINATES OF POINT IN QUESTION
C IGO - ERROR RETURN
C STRAIT - SUBROUTINE
C SUBROUTINE STRAIT COMPUTES THE DISTANCE FROM A GIVEN POINT TO A
C STRAIGHT LINE SEGMENT OF A TRACK.
C STRAIT CALLS THE SUBROUTINES VADD, VSCI, VDOT, VMAG, AND VSUB.
C STRAIT HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C CALL STRAIT (*,RO,P,D,X,IE)
C WHERE
C * - MEMORY LOCATION IN THE CALLING PROGRAM FOR RETURN WHEN POINT IS
C NOT IN THE RANGE OF THE LINE SEGMENT.
C RO - THE COORDINATES OF THE POINT IN QUESTION
C P - VARIABLE OF DIMENSION 5 OR MORE WHICH CONTAINS THE FOLLOWING THE
C FIRST FIVE POSITIONS
C P(1)=X-COORDINATE OF SEGMENT START
C P(2)=Y-COORDINATE OF SEGMENT START
C P(3)=SEGMENT LENGTH (FEET)
C P(4)=X-COMPONENT OF UNIT VECTOR ALONG SEGMENT
C P(5)=Y-COMPONENT OF UNIT VECTOR ALONG SEGMENT
C D - DISTANCE TO SEGMENT (RETURNED)
C X - DISTANCE ALONG SEGMENT (RETURNED)
C IE - INDICATOR WHICH IF NOT EQUAL TO ZERO MEANS THAT IT IS KNOWN
C THAT THE POINT IS IN THE SEGMENT RANGE
C HRT IS THE ONLY SUBROUTINE TO CALL STRAIT.

```

C THE INPUT TO STRAIT IS PROVIDED BY THE CALLING ARGUMENTS.
 C THERE ARE TWO EXIT RETURNS FROM STRAIT AT LINES NUMBERED 11 AND 16
 C IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 11 IS AN
 C APPROPRIATE RETURN USED WHEN THE POINT NO IS OUTSIDE THE RANGE OF THE
 C LINE SEGMENT. THE RETURN AT LINE 16 IS USED WHEN THE POINT IS
 C WITHIN THE RANGE OF THE LINE SEGMENT.
 C THE OUTPUT FROM STRAIT IS THROUGH THE CALLING ARGUMENTS AS
 C PREVIOUSLY DEFINED.

Subroutine SWITCH

SUBROUTINE SWITCH (A,B)

 THIS ROUTINE EXCHANGES THE VALUES OF TWO VARIABLES
 BY A SIMPLE CIRCULAR SUBSTITUTION

Subroutine TIHISI

SUBROUTINE TIHISI(IG, DIST1, DIST2, SCENEO)

 LOCAL VARIABLE DECLARATION
 A - CURRENTLY SELECTED EXPOSURE THRESHOLD
 ADL - ABSOLUTE VALUE OF THE LAST NOISE LEVEL DIFFERENCE
 ADT - ABSOLUTE VALUE OF DT
 ALA - A LEVEL EXPOSURE FOR PREVIOUS TIME STEP (ALOB50)
 ALB - A LEVEL EXPOSURE FOR CURRENT TIME STEP (ALOB5)
 ALB - DUMMY VAR FOR INTERNAL FUNCTION DECLARATION (LINE 42)
 ALORS - TABLE OF A LEVEL (EXPOSURES AT NTH) OBSERVERS (MOMENTARY)
 ALOB51 - KEEPS TRACK OF UNCORRECTED VALUE OF ALCHS FOR CURRENT
 TIME STEP
 ALOB50 - ALOB51 OF PREVIOUS TIME STEP (C FOR OLD)
 NTH - ARRAY OF UP TO 20 THRESHOLD LEVELS IN DB FOR WHICH
 EXCEEDENCE TIMES WILL BE CALCULATED
 ALX - DUMMY VAR FOR INTERNAL FUNCTION DECLARATION (LINE 42)
 ALY - DUMMY VAR FOR INTERNAL FUNCTION DECLARATION (LINE 42)
 ASDST - ARRAY FOR UP TO 20 THRESHOLD LEVELS AND UP TO 20 OBSERVERS
 CONTAINING THE THRESHOLD LEVEL EXCEEDENCE TIMES FOR EACH OBSERVER
 IN SECONDS
 AVD - MAGNITUDE OF VECTOR V COMPUTED BY A1
 AVDMIN - SMALLEST AVD (VECTOR MAGNITUDE) YET ENCOUNTERED
 B - ACCELERATION THROUGH THE CURRENT SEGMENT
 BACKGR - BACKGROUND NOISE LEVEL IN ENERGY EQUIVALENT UNITS
 TO WHERE AIRCRAFT TRACKING IS TO START
 CDT - TIME STEP TOLERANCE (DCL/TSSC**2 OR DCL/2, WHICHEVER IS LARGER)
 CHDT - CDT/10, A TENTH OF CDT
 CHDT2 - CHDT/TSSC, IE DCL/10*TSSC**3 OR DCL/20*TSSC
 D - DISTANCE ALONG THE GROUND TRACK, FROM THE BEGINNING,
 DATRK - DISTANCE IN FEET OF CLOSEST APPROACH TO THE FIRST OBSERVER
 MEASURED ALONG THE GROUND TRACK STARTING AT THE THRESHOLD OF THE RUNWAY
 WHICH WOULD BE USED IF IT WERE A TAKEOFF TRACK. NEGATIVE DATRK
 INDICATES THE POINT OF CLOSEST APPROACH TO THE FIRST OBSERVER IS THE START

POINT OF THE TRACK.
 DMAX - LOWEST THRESHOLD LEVEL (LINE 45)
 DCL - USED IN DETERMINING THE NEXT TIME INCREMENT, BASED ON THE
 CURRENT TIME INCREMENT AND THE CHANGE IN NOISE LEVEL OVER THE
 LAST STEP. $DT \cdot DT \cdot DCL / AD$
 DPTH - DIFFERENCE BETWEEN INITIAL THPST (PTH) AND THE THRUST OF
 PRECEDING SEGMENT (FLITEP (0, KSEG-1)).
 DPTHX - MAXIMUM ALLOWABLE THRUST CHANGE OVER THE NEXT TIME STEP.
 DMINT - INITIAL TIME INCREMENT IN SECONDS. DMINT.LE.DMINT.LE.DMAX
 DIST1 - DISTANCES IN FEET FROM RUNWAY THRESHOLD ALONG GROUND TRACK
 INDICATING FROM WHERE TO WHERE THE AIRCRAFT WAS TRACKED
 DIST11 - DIST1 OF PREVIOUS SEGMENT
 DIST2 - DISTANCES IN FEET FROM RUNWAY THRESHOLD ALONG GROUND TRACK
 INDICATING FROM WHERE TO WHERE THE AIRCRAFT WAS TRACKED.
 DIST21 - DIST2 OF PREVIOUS SEGMENT
 D1 - LAST NOISE LEVEL DIFFERENCE (PREVIOUS TIME STEP)
 D12 - NOISE LEVEL DIFFERENCE TWO STEPS PREVIOUS (STEP BEFORE D1)
 DMAX - THE LARGEST ALLOWABLE TIME STEP SIZE IN SECONDS
 DMINT - THE SMALLEST ALLOWABLE TIME STEP SIZE IN SECONDS
 DT - THE NEXT TIME INCREMENT
 DTIC - LAST CALCULATED DT
 DUR - TIME NECESSARY TO FLY THROUGH THE CURRENT SEGMENT
 DV - DUMMY FOR OVERLAY (W) AND POSCOO (W) HORIZONTAL DISTANCE ALONG
 CURRENT SEGMENT, IN FEET, FROM THE BEGINNING OF THE SEGMENT TO THE
 ANALYSIS POSITION
 DVIS - MAXIMUM ALLOWABLE ANGLE CHANGE (DECK AND BANKING)
 ENERGY - CONTAINS ACCUMULATED ENERGY NOISE LEVELS FOR EACH OBSERVER
 FOR THIS ONE FLYBY, AFTER THE THIST CALL.
 FLITEP - CONTAINS THE SEGMENTED SPECIFICATION OF THE FLIGHT PATH.
 FP - THRUST
 FSIKX - CONVERSION FACTOR, KNOTS TO FEET PER SECOND
 PTH - DUMMY FOR AL (P), THRUST SETTING OF THE AIRCRAFT
 PTHOLD - OLD PTH, PREVIOUS TIME STEP
 I - INDEX VARIABLE
 IGO - PROCP BRANCH IN CASE OF A RETURN FROM THIST
 IGO - MEMORY LOCATION IN CALLING PROGRAM FOR ERROR RETURN
 I - AIRCRAFT NUMBER
 JF - TIME DIRECTION IN RELATION TO PCA SEGMENT
 JP - AIRCRAFT NUMBER
 K - STEP COUNTER FOR CURRENT SEGMENT
 KK - NUMBER OF POINTS IN THE TIME HISTORY
 KSEG - THE NUMBER OF THE SEGMENT BEING ANALYZED IN THE FLIGHT PATH
 DEFINITION
 KSTEP - COUNTS NUMBER OF TIME STEPS
 KTRAY - GROUND TRACK NUMBER
 L - IMPLICIT LOGICAL - ALL VARIABLES BEGINNING WITH L CONTAIN LOGICAL
 ASSIGNMENTS
 L1 - IS ALA GT A
 L2 - IS A B GT A
 L3 - AT LEAST ONE OBSERVER NOISE LEVEL ABOVE LOWEST THRESHOLD
 L4 - HAVE THIST CHECK ARGS IN CALLING SEQ AND ASDSB1
 L5 - PROVIDE DETAILED DIAGNOSTIC OUTPUT
 L6 - IS DT LESS THAN OR EQUAL DMINT
 L7 - CALCULATE ACCUMULATED ENERGY NOISE LEVELS
 L8 - HAS DT BEEN HALVED IN THE PRECEDING TIME STEP
 L9 - ARE WE AT THE FIRST POINT IN A SEGMENT OF THE FLIGHTPATH
 L10 - DO WE NEED SEGMENTS FOLLOWING THE POINT OF CLOSEST APPROACH SEGMENT
 L11 - MUST WE TROUBLE OURSELVES WITH SEGMENTS PRECEDING THE PCA SEG
 L12 - ARE WE FINISHED (FOR NOW) WITH THE TIME PROGRESSION IN THIS DIR
 L13 - IF WE HAVE REMAINING EXCEEDANCE TIMES, THEY ARE ALL BELOW THRESHOLD

C ITM - THE TIME LIMIT HADN'T BEEN REACHED YET
 C IXXSI - IS THIS THE FIRST CALL TO POSCCC FOR THIS FLIGHT
 C M- INDEX VARIABLE> ERROR INDICATOR NUMBER
 C MNPLP-USED FOR DUMPING IN CASE AN ERROR IS DETECTED
 C MNPS- USED FOR DUMPING IN CASE AN ERROR IS DETECTED
 C MPTS- USED FOR DUMPING IN CASE AN ERROR IS DETECTED
 C M- INDEX VARIABLE
 C MAC- USED FOR DUMPING IN CASE AN ERROR IS DETECTED
 C MZIN- USED FOR DUMPING IN CASE AN ERROR IS DETECTED
 C MFS- CUMMY FOR OVRAY(MPS),NUMBER OF FLIGHT PATH SEGMENTS ASSEMBLED BY
 C OVRAY
 C MCRS- NUMBER OF OBSERVERS
 C MOCAS- NUMBER OF THE FLIGHT PATH SEGMENT TO START AIRCRAFT TRACKING
 C MOP- THE NUMBER OF TIME STEPS UP TO WHICH THE RESULTS OF EACH STEP
 C ARE STORED IN APRAYS TGPL, ALPL, AND CCCR.
 C MPS- NUMBER OF PROFILE SEGMENTS
 C MPM- USED FOR DUMPING IN CASE AN ERROR IS DETECTED
 C MSTEP- MAXIMUM ALLOWABLE NUMBER OF TIME STEPS IN ANY ONE SEGMENT
 C MTH- NUMBER OF THRESHOLD LEVELS
 C MTS- NUMBER OF TRACK SEGMENTS
 C MEGA- ANGULAR VELOCITY IN RADIANS PER SECONDS WITH WHICH THE
 C AIRPLANE IS ALLOWED TO CHANGE ITS NOSEUP AND BANKING ANGLES
 C O - SWAPPING ARRAY TO SIMPLIFY SWITCHING OF VARS AT PROGRESSION REVERSAL
 C (SEE LINE 19 AND PREVIOUS LINES)
 C OI - O FROM PREVIOUS STEP, ETC
 C SOMEWC- A GIVEN DISTANCE IN FEET WHICH , IF EXCEEDED AT ANY TIME
 C BY THE AIRCRAFT TO OBSERVER DISTANCE, CAUSES THE TRACKING PROCESS
 C TO TERMINATE
 C STWC- SPEED WHEN CROSSING A SEGMENT BOUNDARY
 C T- TIME WHEN THE AIRCRAFT IS EXACTLY AT THE SEGMENT BOUNDARY
 C TL- <1. FOR TAKEOFF, -1. FOR LANDING
 C TLMAX - MOST SUBSEQUENT TIME STEP TO BE CONSIDERED IN CURRENT SEG
 C TLMIN - MOST PREVIOUS TIME STEP TO BE CONSIDERED IN CURRENT SEG
 C TMAX- THE LARGEST ALLOWABLE REAL-TIME IN SECONDS
 C TMIN- THE SMALLEST ALLOWABLE REAL-TIME IN SECONDS
 C TOTALT- ARRAY FOR UP TO 20 OBSERVERS CONTAINING THE TOTAL TIMES
 C OVER WHICH CALCULATIONS HAVE BEEN PERFORMED BY TIHISI.
 C TPTOT - CURRENT TIME STEP (QUESTION MARK)
 C TSDI - TIME STEP TOLERANCE (DCL*TSSC)
 C TSDL - A LARGER TIME STEP TOLERANCE (DCL*TSSC**4)
 C TSSC- USED TO CONTROL THE TIME STEP BY CHECKING THAT ADL IS SMALLER
 C THAN DCL*TSSC. THE LARGER TSSC, THE GREATER JUMPS IN NOISE LEVEL
 C ARE ALLOWED, THE POORER THE RESOLUTION
 C " - SCRATCH VAR USED TO COMPUTE VARIOUS DIFFERENCES, AS LINE 312
 C VA- VECTOR FROM THE FIXED COORDINATE ORIGIN TO THE AIRPLANE
 C VALPHA, VBETA, VGAMMA ARE UNIT VECTORS POINTING IN THE DIRECTIONS
 C OF THE THREE AXES OF THE COORDINATE SYSTEM FIXED WITH THE AIRPLANE
 C VD- AN ARRAY OF VECTORS, EACH VECTOR POINTING FROM THE AIRPLANE TO ONE
 C OBSERVER, WITH RESPECT TO THE AIRPORT FIXED COORDINATE SYSTEM
 C VOO- SAME AS VD, EXCEPT VECTOR COMPONENTS ARE WITH RESPECT TO
 C AIRPLANE FIXED COORDINATE SYSTEM
 C VO- ARRAY OF UP TO 20 VECTORS EACH POINTING TO ONE OBSERVER
 C W- LENGTH OF THE SEGMENT (MEASURED IN THE GROUND PLANE)
 C
 C TIHISI - SUBROUTINE
 C SUBROUTINE TIHISI IS CALLED DURING ASDS OR DOSE CALCULATIONS TO
 C PROVIDE THE TIMES THAT SELECTED THRESHOLD NOISE LEVELS ARE EXCEEDED
 C BY ONE FLIGHT. TO THIS END, A TIME HISTORY SIMULATION (HENCE, THE
 C NAME OF THE SUBROUTINE) IS PERFORMED BY TRACKING THE AIRCRAFT ON ITS
 C USING GROUND TRACK GEOMETRY AND AIRCRAFT PERFORMANCE INFORMATION.
 C THE TRACKING IS DONE IN DISCRETE TIME STEPS OF VARYING LENGTH.
 C TIHISI CALL SEVERAL EXTERNAL SUBROUTINES:

C CURVAY - OVERLAYS THE PERFORMANCE PROFILE OVER THE GROUND TRACK,
 C DETERMINES FLIGHT PATH SEGMENTS. CALLED IN LINE 57 (SEE LISTINGS,
 C SECTION 5).
 C POSCOO - DETERMINES THE POSITION COORDINATES OF THE AIRCRAFT AND THE
 C AIRPLANE FIXED COORDINATE SYSTEM, BOTH WITH RESPECT TO THE AIRPORT
 C FIXED COORDINATE SYSTEM. CALLED IN LINE 190.
 C EGA - CALCULATES EXTRA GROUND ATTENUATION (LINE 220).
 C AL - CALCULATES THE NOISE LEVEL AT THE ANALYSIS POINT FOR THE
 C CURRENT AIRCRAFT POSITION AND ORIENTATION (LINE 223).
 C TINISI HAS ONE ENTRY POINT ONLY AND THE CALLING SEQUENCE IS:
 C CALL TINISI (*,DIST1,DIST2,SCHEM0)
 C WHERE
 C * - TO BE REPLACED IN AN ACTUAL CALL BY A STATEMENT LABEL TO WHICH
 C TO BRANCH IN CASE OF A RETURN 1 FROM TINISI. THIS FEATURE IS USED
 C IN CASE TINISI DETECTS AN ERROR.
 C DIST1,DIST2 - CALCULATED BY TINISI: DISTANCES IN FEET FROM RUNWAY
 C THRESHOLD ALONG GROUND TRACK INDICATING FROM WHERE TO WHERE THE
 C AIRCRAFT WAS TRACKED.
 C SCHEM0 - VALUE TO BE SUPPLIED WHEN CALLING TINISI. IT IS A GIVEN
 C DISTANCE IN FEET WHICH, IF EXCEEDED AT ANY TIME BY THE AIRCRAFT TO
 C OBSERVER DISTANCE, CAUSES THE TRACKING PROCESS TO TERMINATE.
 C PRESUMABLY, SCHEM0 IS CHOSEN SUCH THAT THE RESULTING NOISE LEVEL
 C WOULD BE LOWER THAN ANY REASONABLE LOWEST THRESHOLD LEVEL. SCHEM0
 C DEPENDS ON AIRCRAFT TYPE. USED ONLY ONCE IN LINE 232.
 C TINISI IS CALLED BY SUBROUTINES ASDS2 AND ASDS3. IN ADDITION TO THE
 C CALLING SEQUENCE, TINISI COMMUNICATES VIA MANY COMMON BLOCKS:
 C /TRIPLOK/ - CONTAINS A CONGLOMERATE OF VARIABLES WHICH MUST ALL HAVE
 C SPECIFIED VALUES WHEN TINISI IS CALLED:
 C KTRAK: THE TRACK NUMBER
 C NTS: THE NUMBER OF TRACK SEGMENTS
 C NPS: THE NUMBER OF PROFILE SEGMENTS
 C NOBS: THE NUMBER OF OBSERVERS
 C J: AIRCRAFT NUMBER (SEE ARGUMENT J IN FUNCTION SUBROUTINE AL)
 C NSTEP: MAXIMUM ALLOWABLE NUMBER OF TIME STEPS IN ANY ONE SEGMENT
 C NTH: NUMBER THRESHOLD LEVELS
 C DATRK: DISTANCE IN FEET OF POINT OF CLOSEST APPROACH TO THE FIRST
 C OBSERVER, MEASURED ALONG THE GROUND TRACK STARTING AT THE THRESHOLD
 C OF THE RUNWAY WHICH WOULD BE USED IF IT WERE A TAKEOFF TRACK. DATRK
 C MUST NOT BE LONGER THAN THE TRACK ITSELF. A NEGATIVE DATRK
 C INDICATES THAT THE POINT OF CLOSEST APPROACH TO THE FIRST OBSERVER
 C IS THE START POINT OF THE TRACK. IF DATRK IS NEGATIVE, IT NEED NOT
 C BE THE ACTUAL DISTANCE TO THE START POINT.
 C TL: +1. FOR TAKEOFF. -1. FOR LANDING.
 C CHECK: TRUE IF YOU WISH TINISI TO CHECK ON THE REASONABLENESS OF
 C THE ARGUMENTS IN THE CALLING SEQUENCE AND SOME OF THE PARAMETERS IN
 C COMMON BLOCK ASDS3. FALSE OTHERWISE.
 C DET: TRUE, IF YOU WISH DETAILED DIAGNOSTIC OUTPUT FOR EACH TIME
 C STEP. FALSE, OTHERWISE.
 C VO: VO(3,20) IS AN ARRAY OF UP TO 20 VECTORS EACH POINTING TO ONE
 C OBSERVER. IF N IS THE OBSERVER NUMBER, THEN VO(1,N) IS THE X-COORD-
 C INATE, VO(2,N) THE Y-COORDINATE, AND VO(3,N), THE ALTITUDE, ALL IN
 C FEET. YOU MUST, OF COURSE, PROVIDE NON-0 VECTORS. NOTE THAT IF THE
 C ALTITUDE IS GREATER THAN 10 FEET, NO EXTRA GROUND ATTENUATION IS
 C SUBTRACTED FROM THE AIRCRAFT NOISE LEVEL FOR THAT OBSERVER.
 C NPLP: THE NUMBER OF TIME STEPS UP TO WHICH THE RESULTS OF EACH STEP
 C ARE STORED IN ARRAYS TGPL, ALPL, AND COORD, I.E., THE ACTUAL NOISE
 C LEVEL TIME HISTORY AND AIRCRAFT POSITION AND DIRECTION ARE DEPOSITED
 C THERE. THIS HAS BEEN BUILT PRIMARILY FOR THE PURPOSE OF PLOTTING
 C THE TIME HISTORIES FOR EACH OBSERVER, BUT MAY BE USED OTHERWISE. IF
 C NPLP IS LESS THAN OR EQUAL TO ZERO, ARRAYS TGPL AND ALPL ARE NOT
 C FILLED. NPLP MUST NOT BE GREATER THAN 400. IF THE ACTUAL NUMBER OF
 C TIME STEPS EXCEEDS NPLP, TINISI CONSIDERS THIS AN ERROR. THE
 C ARRAYS TGPL, ALPL, AND COORD ARE ON COMMON BLOCK /PIOTRI/ (SEE
 C BELOW).
 C ENERGY: IF ACCUMULATED ENERGY NOISE LEVELS ARE TO BE CALCULATED,
 C THIS IS TRUE. FALSE OTHERWISE.

C BACKGR: THE BACKGROUND NOISE LEVEL IN ENERGY EQUIVALENT UNITS.
 C NOISE LEVEL NEVER DROPS BELOW IT. EXAMPLE: IF BACKGROUND LEVEL IS
 C 15 DB, THEN BACKGR=10.**(.02/10)=3.162280
 C /ASDST/ - CONTAINS VARIABLES AND ARRAYS RELATING TO THE TRACKING
 C ALGORITHM AND ASDS CALCULATIONS. AT BUT THE LAST THREE MUST HAVE
 C SPECIFIED VALUES WHEN TINI1 IS CALLED. THE LAST THREE ARE
 C CALCULATED BY TINI1 (TOTAL, ASDST, ENERGY). ALL VARIABLES ARE
 C REAL.
 C ASDST: THIS PROFILE IS GENERATED IF SUBROUTINE PREPS AND IS THE
 C PERFORMANCE PROFILE FOR THE AIRCRAFT TYPE IN THE CURRENT FLIGHT
 C BEING ANALYZED. TINI1 MODIFIES ASDST. WHETHER IT IS A LANDING OR
 C A TAKEOFF PROFILE, DISTANCES ARE ALWAYS MEASURED IN FEET FROM THE
 C RUNWAY THRESHOLD WHICH WOULD BE THE THRESHOLD IF IT WERE A TAKEOFF
 C TRACK.
 C DCL: USED IN DETERMINING THE SIZE OF THE NEXT TIME INCREMENT, BASED
 C ON THE CURRENT TIME INCREMENT AND THE CHANGE IN NOISE LEVEL OVER THE
 C LAST STEP: $DT = DCL/ADJ$
 C WHERE ADJ IS THE ABSOLUTE VALUE OF THE LAST NOISE LEVEL DIFFERENCE.
 C DCL IS USUALLY CHOSEN BETWEEN 1 AND 5 DB. THE SMALLER DCL, THE MORE
 C ACCURATE THE RESOLUTION, THE LARGER THE COMPUTING TIME.
 C TSSC: USED TO CONTROL THE TIME STEP BY CHECKING THAT ADJ IS SMALLER
 C THAN $DCL * TSSC$. SHOULD ADJ BE GREATER, THEN THE TIME STEP IS HALVED.
 C TSSC IS USUALLY CHOSEN BETWEEN 1.2 AND 3. IT MUST NOT BE LESS OR
 C GREATER THAN 1. THE LARGER TSSC, THE GREATER JUMPS IN NOISE LEVEL ARE
 C ALLOWED, THE POORER THE RESOLUTION. NOTE THAT IT WORKS IN
 C CONNECTION WITH DCL.
 C DINT: THE INITIAL TIME INCREMENT IN SECONDS.
 C NOTES:
 C SINT,LE,DINT,LE,DHAYT
 C DINT: THE SMALLEST ALLOWABLE TIME STEP SIZE, SECONDS.
 C DHAYT: THE LARGEST ALLOWABLE TIME STEP SIZE, SECONDS.
 C TINT: THE SMALLEST ALLOWABLE REAL-TIME, SECONDS.
 C THAYT: THE LARGEST ALLOWABLE REAL-TIME, SECONDS.
 C ANGVS: THE ANGULAR VELOCITY IN RADIANS PER SECOND WITH WHICH THE
 C AIRPLANE IS ALLOWED TO CHANGE IT NOSE-UP AND BANKING ANGLES.
 C ALTH: ARRAY OF UP TO 20 THRESHOLD LEVELS IN DB FOR WHICH EXCEEDENCE
 C TIMES WILL BE CALCULATED. THE ACTUAL NUMBER OF LEVELS USED IS
 C INDICATED BY NTH IN COMMON BLOCK/THBLV/.
 C TOTAL: FOR EACH OF UP TO 20 OBSERVERS, THE TOTAL TIMES OVER WHICH
 C CALCULATIONS HAVE BEEN PERFORMED BY TINI1 ARE ACCUMULATED IN THIS
 C ARRAY. THESE TIMES WILL BE LONGER THAN THE EXCEEDENCE TIME ABOVE
 C THE LOWEST THRESHOLD LEVEL BECAUSE TINI1 CALCULATES AN EXTRA 5
 C POINTS BELOW THE LOWEST THRESHOLD LEVEL IN AN ATTEMPT TO MAKE SURE
 C THAT THE NOISE LEVEL DOES NOT COME UP AGAIN.
 C ASDST: ARRAY FOR UP TO 20 THRESHOLD LEVELS AND UP TO 20 OBSERVERS,
 C CONTAINING THE THRESHOLD LEVEL EXCEEDENCE TIMES FOR EACH OBSERVER IN
 C SECONDS.
 C ENERGY: AN ARRAY FOR UP TO 20 OBSERVERS IN WHICH THE NOISE ENERGY
 C ABOVE THE LOWEST THRESHOLD LEVEL IS ACCUMULATED IF LENRGY IS .TRUE.
 C (SEE THBLV ABOVE). THE RESULT IN ENERGY AFTER THE TINI1 CALL ARE
 C THE ACCUMULATED ENERGY NOISELEVELS FOR EACH OBSERVER FOR THIS ONE
 C CALL. NOTE THAT ENERGY IS SET TO ZERO AT THE START OF EACH TINI1
 C CALL.
 C /PLOTB/ - TINI1 FILLS THIS ARRAY IF NPLP IS POSITIVE (SEE/THBLV/)
 C KK: NUMBER OF POINTS IN THE TIME HISTORY:
 C 0,LE,FK,LE,NPLP

C TGPI: TGPI(402,20) CONTAINS FOR UP TO 400 POINTS AND UP TO 20
 C OBSERVERS THE SOUND ARRIVAL TIMES IN SECONDS. THE EXTRA TWO WORDS
 C ABOVE 400 ARE PROVIDED FOR PLOT SCALING PARAMETERS.
 C ALPL: ALPL(402,20) CONTAINS FOR UP TO 400 POINTS AND UP TO 20
 C OBSERVERS THE A-WEIGHTED NOISE LEVELS IN DB, CORRESPONDING TO THE
 C SOUND ARRIVAL TIMES IN TGPI.
 C COORD: COORD(102,3) CONTAINS FOR UP TO 400 POINTS THE AIRCRAFT
 C POSITION AND ORIENTATION ASSOCIATED WITH THE CORRESPONDING VALUES IN
 C TGPI AND ALPL. THE MEANINGS OF THE SECOND INDEX OF THIS ARRAY ARE:
 C 1-X-COORDINATE IN FEET
 C 2-Y-COORDINATE IN FEET
 C 3-ANGLE IN RADIANS OF AIRCRAFT LONGITUDINAL AXIS WITH POSITIVE
 C X-AXIS.
 C TIHISI COMMUNICATES WITH OTHER SUBROUTINES VIA THESE COMMON BLOCKS:
 C /AJINIT/ - SEE FUNCTION SUBROUTINE AL.
 C /BJK2/ - CONTAINS THE DEGENERATED SPECIFICATION OF THE FLIGHT PATH.
 C ARRAY FLITEP IS FILLED BY SUBROUTINE OVRAY
 C /VECRK/ - CONTAINS VARIOUS VECTORS.
 C VA POINTS FROM THE FIXED COORDINATE ORIGIN TO THE AIRPLANE.
 C VALPHA, VBETA, VGAMMA ARE UNIT VECTORS POINTING IN THE DIRECTIONS OF
 C THE THREE AXES OF THE COORDINATE SYSTEM FIXED WITH THE AIRPLANE.
 C VD IS AN ARRAY OF VECTORS, EACH VECTOR POINTING FROM THE AIRPLANE TO
 C ONE OBSERVER. VECTOR COMPONENTS ARE WITH RESPECT TO THE AIRPORT
 C FIXED COORDINATE SYSTEM.
 C VD2 IS THE SAME AS VD, BUT VECTOR COMPONENTS ARE WITH RESPECT TO THE
 C AIRPLANE FIXED COORDINATE SYSTEM.
 C THERE ARE THREE RETURNS POSSIBLE FROM TIHISI. THE NORMAL RETURNS
 C OCCUR IN LINES 498 AND 503. THE RETURN 1 IN LINE 554 IS TAKEN IN
 C CASE TIHISI DETECTS AN ERROR. THE FOLLOWING IS A LIST OF TIHISI
 C ERROR MESSAGES:
 C TIHISI ERROR MESSAGES:
 C ERROR MESSAGES ARE IN THE FORMAT
 C ERROR IN TIHISI: INDICATOR=XXX
 C WHERE XXX IS A SIGNED INTEGER NUMBER INDICATING THE KIND OF ERROR.
 C IF XXX IS: THE ERROR IS:
 C -1 ONE OF THE TIME LIMITS TMIN OR TMAX HAS BEEN REACHED.
 C 0 AN ERROR IN THE SUBROUTINE OVRAY WHICH WILL PRINT A MORE
 C EXPLICIT ERROR MESSAGE.
 C 1 THE MAXIMUM NUMBER OF STEPS IN ONE SEGMENT (NSTEP) HAS BEEN
 C EXCEEDED.
 C 2 NP/P BEING GREATER THAN 0, THE NUMBER OF TIME STEPS EXCEEDS
 C NP/P.
 C 3 DURING THE EGA CALCULATION, IT IS DETERMINED THAT THE AIRCRAFT
 C ATTEMPTS TO FLY AT A NEGATIVE ALTITUDE.
 C 4 NTH OUT OF RANGE.
 C 5 VTS OUT OF RANGE.
 C 6 NOBS OUT OF RANGE.
 C 7 J OUT OF RANGE.
 C 8 NSTEP IS LESS THAN 2.0 OR GREATER THAN 1000,000.
 C 9 THE VALUES IN ARRAY ALTH ARE NOT MONOTONICALLY INCREASING.
 C 10 DINT<0.001 OR DINT> DMAXT.
 C 11 DMINT<0.001 OR DMINT> DMAXT.
 C 12 TMAX<TMIN.
 C 13 DCL<0.000.
 C 14 TSSC<1.001
 C 15 CMEGA<0.001 OR CMEGA>3.
 C 16 KTRAK<0 OR KTRAK>80.
 C 17 NP/P>400.
 C 18 ATTEMPT TO FLY PAST THE END OF THE DEFINED GROUND TRACK.
 C 19 TL IS NOT EQUAL TO +1. OR -1.

C 20 NPS IS OUT OF RANGE
 C 21 BACKGE (IF CONVERTED TO DB) IS GREATER THAN ALTH(1)-1 IT
 C SHOULD BE NOTED THAT EXTENSIVE ERROR CHECKING IS DONE ONLY IF LCHECK
 C IS SET TO .TRUE. (SEE/THROCK/).
 C THIS PROGRAM STRUCTURE AND PROCESSING PERFORMED:
 C LINES 1 THROUGH 28 (SEE LISTINGS, SECTION 5) ARE CONTAIN
 C SPECIFICATION STATEMENTS. LINES 30 THROUGH 52 CHECK FOR
 C REASONABLENESS OF DATA SUPPLIED TO THIS. IN LINE 57, THE PROFILE
 C AND THE GROUND TRACK ARE COMBINED ("OVERLAPPED"), AND A SEGMENTED
 C FLIGHT PATH IS DEFINED. LINES 63 THROUGH 175 PERFORM VARIOUS
 C INITIALIZATIONS AND ANCILLARY CALCULATIONS. LINE 98 CONTAINS LABEL
 C 801 WHICH IS A POINT TO WHICH CONTROL RETURNS AFTER EACH TIME STEP
 C (LINES 281, 497). LABEL 812 (LINE 179) INCREASES THE REAL TIME,
 C I.E., PERFORMS THE DISCRETE TIME STEP, USING AN INTERNAL SUBROUTINE
 C DEFINED IN LINES 600 THROUGH 670. IN LINE 190, THE AIRCRAFT
 C POSITION AND THE AIRCRAFT FIXED COORDINATE SYSTEM ARE DETERMINED.
 C IN LINES 208 THROUGH 231, THE MOMENTARY NOISE LEVEL AT EACH OF THE
 C OBSERVERS IS CALCULATED MAKING USE OF SUBROUTINES A1 AND RGA.
 C NOTE THAT THE AIRCRAFT FIXED COORDINATE SYSTEM MUST BE USED WHEN
 C CALLING A1 (LINE 223). IN LINE 231, THE SOUND ARRIVAL TIME IS
 C CALCULATED USING A CONSTANT SPEED OF SOUND OF 1125 FEET PER SECOND.
 C VARIABLE TIME INCREMENT ALGORITHM
 C FOR AN AIRCRAFT NOISE TIME HISTORY IT IS DESIRABLE TO SPACE THE
 C POINTS ON THE TIME AXIS CLOSELY WHEN THE NOISE LEVEL CHANGES RAPIDLY
 C ,AND CONVERSELY, TO SPACE THE POINTS SPARSLEY WHEN THE NOISE LEVEL
 C CHANGES SLOWLY. THIS IS DONE IN AN EFFORT TO OBTAIN SUFFICIENT TIME
 C RESOLUTION WITHOUT REDUNDANT CALCULATIONS WHEN SUCH ACCURACY IS NOT
 C REQUIRED. THE FOLLOWING OPERATIONAL PRINCIPLES ARE FOLLOWED IN
 C DETERMINING THE "NEXT" TIME INCREMENT DT:
 C ORDINARILY, DT IS INCREASED OR DECREASED FOR THE NEXT TIME STEP IN
 C INVERSE PROPORTION TO THE LAST NOISE LEVEL DIFFERENCE DL (SEE ALSO
 C DT IN /ASDSB1/).
 C IF TWO SUCCESSIVE NOISE LEVEL DIFFERENCES ARE VERY SMALL, DT IS
 C DOWNSIZED.
 C IN ORDER TO INCREASE THE RESOLUTION, AN EXTRA POINT IS CALCULATED
 C HALF WAY BETWEEN THE PREVIOUS AND THE CURRENT TIME IF ONE OF TWO
 C CONDITIONS OCCURS: (1) DT IS EXCEPTIONALLY LARGE, AND (2) AN
 C EXTREMUM IS SUSPECTED, I.E., IF THE CURRENT AND THE PREVIOUS DL ARE
 C OF OPPOSITE SIGNS. IF ONE OF THESE CONDITIONS OCCURS, THE LAST
 C CALCULATED RESULTS ARE DISCARDED AND THE PROCEDURE IS REPEATED USING
 C HALF THE STEP SIZE.
 C DT CAN NEVER BE LESS THAN DMINT OR GREATER THAN DMXT.
 C THIS DETERMINATION OF THE "NEXT" TIME INCREMENT DT HAPPENS IN LINES
 C 230 THROUGH 325.
 C MAKING USE OF AN INTERNAL SUBROUTINE (ASDT, LINES 550 THROUGH 591),
 C ASO CALCULATES NOISE LEVEL EXCEEDENCE TIMES OVER THRESHOLD LEVELS
 C USING SOUND ARRIVAL TIMES CALCULATED IN LINE 231.
 C IN LINES 358 THROUGH 497, VARIOUS CONDITIONS ARE CHECKED AND
 C DECISIONS ARE MADE REGARDING THE DIRECTION OF TIME PROGRESSION,
 C ADJUSTMENTS TO THE VARIABLE TIME INCREMENT, AND VALUES TO REMEMBER
 C FOR LATER CALCULATIONS.
 C TRACKING BEGINS AT THE POINT OF CLOSEST APPROACH TO THE FIRST
 C OBSERVER (PCA). THE SEGMENT CONTAINING THIS POINT IS CALLED THE PCA
 C SEGMENT. INITIALLY, A VARIABLE, JF, IS SET TO 3, INDICATING THAT,
 C STARTING AT TIME $t=0$ AT PCA, THE AIRCRAFT IS TRACKED IN A POSITIVE
 C TIME DIRECTION UNTIL THE END OF THE SEGMENT IS REACHED (POINT A).
 C RELEVANT PARAMETERS AT THIS POINT ARE STORED AND TRACKING CONTINUES

C DT- THE NEXT TIME INCREMENT
 C IGO - ERROR RETURN
 C JF - INDICATES TIME DIRECTION OF PROGRESSION
 C IDEINT - IS ADT LESS THAN OR EQUAL DMINT
 C LTM - THE TIME LIMIT HASNT BEEN REACHED YET
 C STHC- SPEED WHEN CROSSING A SEGMENT BOUNDARY
 C T- TIME WHEN THE AIRCRAFT IS EXACTLY AT THE SEGMENT BOUNDARY
 C TLAMAX - MOST SUBSEQUENT TIME STEP TO BE CONSIDERED IN CURRENT SEG
 C TLAMIN - MOST PREVIOUS TIME STEP TO BE CONSIDERED IN CURRENT SEG
 C TMAX- THE LARGEST ALLOWABLE REAL-TIME IN SECONDS
 C TMIN- THE SMALLEST ALLOWABLE REAL-TIME IN SECONDS
 C TPLDT - CURRENT TIME STEP (QUESTION MARK)
 C

Subroutine TPROF

SUBROUTINE TPROF (A2,A1,T2,T1,NP)

 C DELT - RATIO PRESSURE ALTITUDE CHANGE
 C DH - DIFFERENCE IN HEIGHT ABOVE RUNWAY FOR LIPTOFF- GEARUP SEGS
 C DIP - CHANGE IN PRESSURE ALTITUDE INCREASE IN CLIMB GRADIENT
 C DS - DIFFERENCE IN PRESSURE ALTITUDE FOR LIPTOFF ETC
 C EV - AIRCRAFT POWER TO WEIGHT RATIO
 C GAMMA - CLIMB GRADIENT
 C JNT - INDICATES FORM OF PROFILE
 C NP - PROFILE NUMBER
 C PD1 - PRESSURE DIFFERENCE ACROSS FIRST PROFILE SEGMENT
 C PD2 - RDI CORRECTED FOR TEMP + PRESSURE ALT CHANGES
 C THETA - RATIO TEMPERATURE CHANGE
 C WT - AIRCRAFT WEIGHT
 C TPROF - SUBROUTINE
 C TPROF CORRECTS THE STORED AIRCRAFT TAKEOFF PERFORMANCE CHARACTER-
 C ISTICS FOR EFFECTS OF AIRPORT ALTITUDE (ABOVE MEAN SEA LEVEL) AND
 C AMBIENT TEMPERATURE.
 C TPROF CALLS THE SUBROUTINE DEITA.
 C TPROF HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
 C CALL TPROF (A2,A1,T2,T1,NP)
 C WHERE
 C A2 - AIRPORT PRESSURE ALTITUDE
 C A1 - REFERENCE PRESSURE ALTITUDE
 C T2 - AMBIENT TEMPERATURE (K)
 C T1 - REFERENCE TEMPERATURE (K)
 C NP - PERFORMANCE PROFILE NUMBER
 C TPROF IS CALLED BY THE SUBROUTINES PROPRD AND RMYRD AND MAY BE
 C CALLED MANY TIMES DURING THE INPUT PHASE OF EXECUTION.
 C THE INPUT TO TPROF IS PROVIDED BY THE CALLING ARGUMENTS AND THE
 C VARIABLE PROF IN THE LABELED COMMON BLOCK/PROFII/.
 C THERE ARE FOUR EXIT RETURNS FROM TPROF, LOCATED AT LINES NUMBERED 15
 C 16, 31, AND 73 IN THE SUBROUTINE LISTING IN SECTION 5. THE RETURN
 C AT LINE 15 IS USED IF THE PROFILE NUMBER IS GREATER THAN 99 AND THE
 C RETURN AT LINE 16 IS USED IF THE PROFILE HAS NOT BEEN DEFINED. THE
 C RETURN AT LINE 31 IS USED IF THE PROFILE IS NOT IN THE PROPER FORM.
 C THE RETURN AT LINE 73 IS USED AFTER PROFILE NP HAS BEEN MODIFIED.
 C THE OUTPUT FROM TPROF CONSISTS OF THE MODIFIED VALUES FOR THE NPTH
 C PROFILE VARIABLE PROF.

Subroutine VADD

SUBROUTINE VADD (C,A,B)

```

C
C *****
C
C VADD - SUBROUTINE
C VADD IS A VECTOR ADDITION SUBROUTINE. TWO GIVEN VECTORS ARE ADDED
C FORMING A THIRD VECTOR.
C VADD DOES NOT USE ANY EXTERNAL SUBROUTINES.
C VADD HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C CALL VADD(C,A,B)
C WHERE
C C - VARIABLE OF DIMENSION2 OR MORE TO RECEIVE THE SUM OF VALUES IN A
C AND B
C A - VARIABLE OF DIMENSION2 OR MORE CONTAINING VALUES TO BE ADDED TO
C B
C B - VARIABLE OF DIMENSION2 OR MORE CONTAINING VALUES TO BE ADDED TO
C A
C VADD IS CALLED BY THE SUBROUTINES NWASDS, STRAIT, XLINE AND THE MAIN
C PROGRAM NCISE1. VADD WILL BE CALLED MANY TIMES DURING EXECUTION.
C THE INPUT DATA FOR VADD IS PASSED THROUGH THE CALLING ARGUMENTS.
C THERE IS ONE EXIT RETURN FROM VADD AND IS ALWAYS USED.
C THE OUTPUT FROM VADD IS PASSED THROUGH THE CALLING ARGUMENTS.
C

```

Subroutine VDOT

FUNCTION VDOT (A,B)

```

C *****
C
C VDOT - FUNCTION SUBROUTINE
C VDOT RETURNS THE "DOT PRODUCT" OF TWO GIVEN VECTORS.
C VDOT DOES NOT USE EXTERNAL SUBROUTINES.
C VDOT HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C VDOT(A,B)
C WHERE
C A,B - VARIABLES OF DIMENSION2 OR MORE
C VDOT IS CALLED BY THE SUBROUTINES VMAG, STRAIT, NEQPNT AND CKLOOP.
C IT WILL BE CALLED MANY TIMES DURING EXECUTION.
C THE INPUT TO VDOT IS THROUGH THE CALLING ARGUMENTS.
C THERE IS ONE EXIT RETURN FROM VDOT AND IT IS ALWAYS USED.
C THE OUTPUT FROM VDOT IS PASSED TO THE CALLING PROGRAM BY THE
C FUNCTION NAME.
C

```

Subroutine VMAG

FUNCTION VMAG (A)

```

C *****
C
C 2.58 VMAG - FUNCTION SUBROUTINE
C VMAG RETURNS THE MAGNITUDE OF A GIVEN VECTOR.
C
C VMAG CALLS THE SUBROUTINE VDOT.
C

```

```

C VMAG HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C VMAG(A)
C WHERE
C A - VARIABLE OF DIMENSION2 OR MORE
C VMAG IS CALLED BY THE SUBROUTINES STRAIT, HBT, TWYRD, VUNT, FIRST,
C NEWPNT, GRADIR, CKLOOP, NWASDS, CURVE, AND THE MAIN PROGRAM NOISE1.
C THE INPUT TO VMAG IS THE CALLING ARGUMENT.
C THERE IS ONE EXIT RETURN FROM VMAG AND IT IS ALWAYS USED.
C THE OUTPUT OF VMAG IS PASSED TO THE CALLING PROGRAM BY THE FUNCTION
C NAME.
C

```

Subroutine VSCL

```

      SUBROUTINE VSCL (C,F,A)
C
C *****
C 2.65 VSCL - SUBROUTINE
C VSCL MULTIPLIES A GIVEN VECTOR BY A GIVEN SCALAR.
C VSCL DOES NOT USE ANY EXTERNAL SUBROUTINE.
C VSCL HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C CALL VSCL(C,F,A)
C WHERE
C C,A - VARIABLES OF DIMENSION2 OR MORE
C F - MULTIPLIER
C VSCL IS CALLED BY THE SUBROUTINES NWASDS, STRAIT, XLINE AND THE MAIN
C PROGRAM NOISE1.
C THE INPUT TO VSCL IS PROVIDED BY THE CALLING ARGUMENTS.
C THERE IS ONE EXIT RETURN FROM VSCL AND IT IS ALWAYS USED.
C THE OUTPUT FROM VSCL IS PASSED THROUGH THE CALLING ARGUMENTS.
C

```

Subroutine VSUB

```

      SUBROUTINE VSUB (C,A,B)
C
C *****
C 2.65 VSUB - SUBROUTINE
C VSUB SUBTRACTS ONE VECTOR FROM ANOTHER.
C VSUB DOES NOT USE ANY EXTERNAL SUBROUTINES.
C VSUB HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
C CALL VSUB(C,A,B)
C WHERE
C C,A,B - VARIABLES OF DIMENSION2 OR MORE
C VSUB IS CALLED BY THE SUBROUTINES CURVE, FIRST, HBT, NEWPNT, NWASDS,
C TWYRD, STRAIT AND THE MAIN PROGRAM NOISE1.
C THE INPUT TO VSUB IS THROUGH THE CALLING ARGUMENTS.
C THERE IS ONE EXIT RETURN FROM VSUB AND IT IS ALWAYS USED.
C THE OUTPUT FROM VSUB IS PASSED THROUGH THE CALLING ARGUMENTS.
C

```

Subroutine VTRN

```

SUBROUTINE VTRN (C,A)
*****
VTRN - SUBROUTINE
VTRN TRANSFERS A GIVEN VECTOR DEFINITION TO A SPECIFIED ALTERNATE
DEFINITION.
VTRN DOES NOT USE ANY EXTERNAL SUBROUTINES
THERE IS ONE ENTRY TO VTRN AND THE CALLING SEQUENCE IS
CALL VTRN(C,A)
WHERE C,A - VARIABLES OF DIMENSION? OR MORE
VTRN IS CALLED BY THE SUBROUTINES FIRST, GRADLE, NEWPNT, NNASDS,
XLINE AND THE MAIN PROGRAM MCISE1.
THE INPUT TO VTRN IS THROUGH THE CALLING ARGUMENTS.
THERE IS ONE EXIT POINT FROM VTRN AND IT IS ALWAYS USED.
THE OUTPUT FROM VTRN IS PASSED THROUGH THE CALLING ARGUMENTS.

```

Subroutine VUNT

```

SUBROUTINE VUNT (C,A)
*****
VUNT - SUBROUTINE
VUNT COMPUTES THE UNIT VECTOR CORRESPONDING TO A GIVEN VECTOR.
VUNT USES THE SUBROUTINE VMAG.
VUNT HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS
CALL VUNT(C,A)
WHERE
C,A - VARIABLES OF DIMENSION? OR MORE
VUNT IS CALLED BY THE SUBROUTINES FIRST, NEWPNT, TRAKRD AND XLINE.
THE INPUT TO VUNT IS THROUGH THE CALLING ARGUMENTS.
THERE ARE TWO EXIT RETURNS FROM VUNT, LOCATED AT LINES 9 AND 12 IN
THE SUBROUTINE LISTING IN SECTION 5. THE RETURN AT LINE 9 IS THE
NORMAL RETURN WHILE THE RETURN AT LINE 12 IS USED IF ALL VALUES OF A
ARE EQUAL TO ZERO.
THE OUTPUT FROM VUNT IS PASSED THROUGH THE CALLING ARGUMENTS.

```

Subroutine XLINE

```

SUBROUTINE XLINE (KXX,NSX,XX,UNIT,XP1)
*****
LOCAL VARIABLE DICTIONARY
KXX - PARAM ARG
NSX - PARAM ARG
PARAM - (SEE DISCUSSION IN HBT) TRACE SEGMENT INFORMATION
UNIT - UNIT VECTOR IN DIRECTION OF SEGMENT
V - SEEMS IDENTICAL TO UNIT ITS CONVERTED TO UNIT
XX - SEGMENT LENGTH
XP1 - UNIT VECTOR IN DIRECTION OF TRACK

```

```

C     VECTOR ANYWAY AS ERROR PREVENTION(
C     XLINE - SUBROUTINE
C     XLINE COMPUTES THE VARIABLES FOR THE STRAIGHT LINE SEGMENTS IN TRACK
C     DEFINITION DATA. (SEE SUBROUTINE HRT, VARIABLE PARAM.)
C     XLINE USES THE SUBROUTINES VADD, VSCI, VTRN AND VUNT.
C     XLINE HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
C     CALL XLINE(KXX,NSX,XLX,UNIT,XR1)
C     WHERE
C     KXX - THE TRACK NUMBER
C     NSX - THE NUMBER OF THIS SEGMENT
C     XLX - THE LENGTH OF THE SEGMENT IN FEET
C     UNIT - A UNIT VECTOR TANGENT TO THE END POINT (NOT THE START POINT)
C     OF THE LAST SEGMENT. UNIT IS OF DIMENSION3 OR MORE, THE FIRST TWO
C     POSITIONS OF WHICH CONTAIN THE VALUES OF THE X- AND Y-COMPONENTS OF
C     THE UNIT VECTOR.
C     XR1 - A VARIABLE OF DIMENSION2 OR MORE, THE FIRST TWO POSITIONS OF
C     WHICH CONTAIN THE X- AND Y-COORDINATES OF THE END POINT OF THE LAST
C     SEGMENT.
C     THE ONLY SUBROUTINE TO USE XLINE IS TRAKRD. XLINE IS USED IN
C     CONJUNCTION WITH HELG TO DEFINE GROUND TRACK GEOMETRY AND MAY BE
C     USED MANY TIMES DURING THE INPUT PHASE OF EXECUTION.
C     THERE IS ONE EXIT RETURN FROM XLINE, LOCATED AT LINE NUMBER 15 IN
C     THE LISTING OF THE SUBROUTINE IN SECTION 5. THIS RETURN IS ALWAYS
C     USPD.
C     THE OUTPUT FROM XLINE IS PASSED THROUGH THE CALLING ARGUMENTS. IN
C     ADDITION, THE APPROPRIATE LOCATIONS IN THE VARIABLE PARAM IN LABELED
C     COMMON BLOCK/TRACK/ ARE INITIALIZED.
C     THE ONLY PROCESSING PERFORMED BY XLINE IS THE COMPUTATION OF THE END
C     POINT OF THE SEGMENT SINCE THE START POINT IS IDENTICAL TO THE END
C     POINT OF THE LAST SEGMENT.
C     XS,YS - SEGMENT START COORDINATES
C     XU,YU - COMPONENTS OF UNIT VECTOR ALONG THE SEGMENT
C     VIX - SEGMENT LENGTH
C

```

Subroutine ZERO

```

C     SUBROUTINE ZERO (A,N)
C
C     *****
C     A - VECTOR TO BE CLEARED
C     N - NUMBER OF ELEMENTS IN VECTOR A
C     ZERO - SUBROUTINE
C     ZERO SETS SPECIFIED MEMORY LOCATIONS TO THE NUMERIC VALUE ZERO.
C     ZERO DOES NOT USE ANY EXTERNAL SUBROUTINES.
C     ZERO HAS ONE ENTRY POINT AND THE CALLING SEQUENCE IS:
C     CALL ZERO(A,N)
C     WHERE
C     A - VARIABLE OF ANY DIMENSION
C     N - NUMBER OF POSITIONS IN A TO BE SET TO ZERO.
C     ZERO IS CALLED BY THE SUBROUTINES CLRTAL, DMPTAL, EXPOSE, PCNTRD AND
C     THE MAIN PROGRAM NOISE1.
C     THE INPUT TO ZERO IS THROUGH THE CALLING ARGUMENTS.
C     THERE IS ONE EXIT RETURN FROM ZERO AND IT IS ALWAYS USED.
C     THE OUTPUT FROM ZERO IS THROUGH THE CALLING ARGUMENTS.
C

```