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U.S. Department of Transportation
Federal Aviation Administration

INM
Integrated Noise Model Version 3

- N27

User's Guide

(Includes Change 1, Change 2, and Appendix C)

FAA-EE-81-17

October 1982

Prepared by:
CACI, Inc.-Federal
For the Office of Environment and Energy

U.S. Department
of Transportation
Federal Aviation
Administration

800 Independence Ave., S.W.
Washington, D.C. 20591

INM
INTEGRATED NOISE MODEL
VERSION 3

FAA-EE-81-17 USER'S GUIDE

CHANGE 1 JANUARY 1983

This change transmits Appendix B, Cost Effective use of Version 3, and serves as an errata sheet.

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This change transmits changes to incorporate the PREVIEW module into the model.

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15. Supplementary Notes

16. Abstract

This document contains the instructions to execute the Integrated Noise Model (INM), Version 3. INM Version 3 is the state-of-the-art computer tool for determining the total impact of aircraft noise at and around airports. This manual contains a general description of elements of an airport study case and specific instructions for preparing the input for a case.

INM Version 3 supersedes Version 2 which was released in September 1979. This document replaces "INM, Integrated Noise Model, Version 2, User's Guide," (Report No. FAA-EE-79-09).

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1.0 INTRODUCTION

Version 1 of the Integrated Noise Model (INM) was released in January 1978 by the Federal Aviation Administration (FAA). The model was originally developed to provide aviation specialists and airport planners with an analysis tool to assist in assessing the impact of aircraft noise in the vicinity of airports. Since its first public release, the model has been used extensively in several major airport studies. It has, in fact, become the recommended tool to generate site analyses for Airport Noise Control and Land Use Compatibility Planning (ANCLUC) studies.

Version 2 of the INM, released in September 1979, included modifications to expand the actual modeling capabilities and to improve the overall ease of use of the INM. Some of these modifications were based on recommendations made by interested parties such as the Air Transport Association (ATA) and Airport Operation's Council International (AOCI). In particular, Version 2 of the model included:

- an expanded data base of aircraft noise and performance
- additional user selection for input data, e.g. noise curve data, takeoff profiles, approach parameters and additional aicraft types
- improved documentation
- additional modules, including an interactive conversational input module, an input data verifier and a data base printing program.

Version 3 of the INM is a state-of-the-art tool for determining the total impact of aircraft noise at and around airports. Although Version 3 uses much of the methodology of Version 2, it is essentially a new model in terms of actual program code. The new model is written in ANSI FORTRAN machine-independent, fully-documented code which is highly portable across major computer systems. Version 3 incorporates into one model a number of modules whose functions were performed by separate programs in Version 2.

Version 3 offers substantial improvements over Version 2. Most importantly, it contains a more proficient method of calculating noise contours with the replacement of the point search technique with grid mapping technique. This version also includes:

- an updated and expanded data base of aircraft noise and performance
- a new input processor which accepts keyword free format input and allows for numerous new options for organizing input data
- a verifier option to determine whether the input information is logically consistent with both the data base and the computational methods
- an option to preview flight information through the generation of a plot
- a revised algorithm for lateral attenuation
- a simple and straightforward method of simulating "touch-and-go" types of operations
- an improved and expanded report generating system.

The purpose of the User's Guide is to provide the information necessary to use the INM appropriately. The manual contains a general description of elements of an airport study case and specific instructions for preparing the input for a case. It also provides instructions for running the case and for interpreting the output.

1.1 BACKGROUND

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

The Integrated Noise Model represents the continuing effort of the FAA to provide the technical means to analyze aircraft noise abatement. As former

Administrator Langhorne Bond said in an interview given in early 1978, "One of the features of our strategy at National Airport is that, for the first time, we proposed the use of the FAA's integrated noise model, which is a very useful tool for airport operators all around the country to adopt."[1] The INM is the one tool which can meet both the cumulative noise measure for continuous contours and cumulative noise measures for discrete point requirements of Order 1050.1C, "Policies and Procedures for Considering Environmental Impacts," December 20, 1979. The INM is the recommended tool to generate Land Use Guidance Zones (LUG) and data for site analyses for Airport Noise Control and Land Use Compatibility Planning (ANCLUC) studies.[2] It is also the recommended tool to generate noise exposure contours for Airport Operator's Noise Compatibility Programs.[3]

Airport planners, airport operators and local governments are required to address the recurring problems of assessing noise impact. The significance of these problems is underscored by increasing public awareness of urgent environmental and safety concerns and development of technologically feasible and economically reasonable solutions. The INM constitutes the ongoing commitment of the FAA to provide the most sophisticated analytical approach.

1/<u>FAA World</u>, Vol. 8 No. 5, U. S. Department of Transportation, Federal Aviation Administration, Office of Public Affairs, Washington, D.C., May 1978.

2/Advisory Circular 150/5050-6, "Airport-Land Use Compatibility Planning," U. S. Department of Transportation, Federal Aviation Administration, December 30, 1977.

3/Federal Register Vol. 46, No. 16, "Development and Submission of Airport Operator's Noise Compatibility Planning Programs and the FAA's Administrative Process for Evaluating and Determining the Effects of those Programs and Proposed Amendment to Definition of 'Acoustical Change' in Aircraft Noise Certification Rules Relating to Turbojet Engine Powered Transport Category, Large Airplanes," U.S. Department of Transportation, Federal Aviation Administration, January 26, 1981.

1.2 INM CAPABILITIES

The INM contains computer modules for determining the impact of aircraft noise at or around airports. This noise impact can be given in terms of contours of equal noise exposure for any of the following noise measures:

1. Noise Exposure Forecast (NEF)

   Description: NEF was developed in 1967 and is based on effective perceived noise decibel (EPNdB) as the unit of aircraft noise. All aircraft operations during the period 10 p.m. to 7 a.m. are weighted by a factor of 16.7 per one operation.

2. Equivalant Sound Level (Leq)

   Description: Leq is an energy summation of the aggregate noise environment as measured in A-weighted decibel units (dBA).

3. Day-Night Average Sound Level (Ldn)

   Description: Ldn was developed in 1973-74 for the Environmental Protection Agency (EPA). Ldn is based upon Leq with the aircraft operations during the period 10 p.m. to 7 a.m. weighted by a 10 decibel penalty.

4. Time above a specified threshold of A-Weighted Sound (TA)

   Description: TA indicates the time in minutes that a dBA level is exceeded during a 24-hour period.

The contours are presented in the form of a printout of the contour coordinates and area impacted, and as a plot of the contours. In addition, a printout report of populations within the contour areas may be produced. The model also allows for the calculation of several noise measures at specific points (grid) in the airport vicinity. The output from this type of calculation is a printout report.

The model also produces a number of supporting reports. For example, the ECHO Report presents the User Input Data in tabular format, the Verify Report notifies the user of inconsistencies in the input data, and the Data Base Print Report presents selected portions on the INM Data Base in tabular format. In addition, without performing grid or contour analyses of the input data, the model can produce PREVIEW plots of the input scenario flights. All of these reports aid the user in developing an accurate scenario of input data.

1.3 INM DATA BASE

To lessen the analyst's information gathering burden, a standard data base of individual aircraft noise and performance has accompanied each of the model versions. Each new data base is more complete, consistent, and accurate than the previous data base. Version 3 is accompanied by the new Data Base No. 8, for which Bolt, Beranek and Newman, Inc. provided the data. References 1 and 2 describe these data, their derivations and sources.

The data base contains representatives of commercial, general aviation, and military aircraft which are powered by turbojet, turbofan, or propellor-driven engines. Each of these aircraft is associated with an aircraft category, a set of departure profiles for each applicable trip length, a set of approach parameters, Sound Exposure Level (SEL) vs. distance curves at several thrust settings, and Effective Perceived Noise Level (EPNL) vs. distance curves at several thrust settings. The measure SEL is essentially an A-weighted sound level corrected for time duration effects. The measure EPNL is essentially a perceived noise level corrected for time-duration and pure-tone effect.

Figure 1-1 gives the identification name of each aircraft in the data base and the name or number of each data set associated with that aircraft. Within the data base, approach parameter set names are comprised of the prefix "AP " and the number of the set. For example, AP2 is the name of the approach parameter set associated with aircraft type 747200. Similarly, takeoff profiles names are comprised of the prefix "TOP " and the profile number. In Figure 1-1 only the numbers are given for approach parameter sets and takeoff profiles, therefore the user must remember to add the appropriate prefix when referring to one of these data sets. Under takeoff profiles, a "0" means that no profile is defined for that trip length.

In many instances, several aircraft in the data base share the same data set or a particular departure profile data set is applicable to a wide range of trip lengths. These conditions are evidenced by the multiple appearances of some of the identification names in Figure 1-1. Figure 1-1 is a reference to use in the later sections which discuss the input options of alternative aircraft definitions, alternative takeoff profiles and alternative approach parameters. Each of these

AIRCRAFT NO	AIRCRAFT NAME	AIRCRAFT DESCRIPTION	CAT	NOISE CURVE NO	NOISE CURVE NAME	AP	TAKEOFF PROFILES BY TRIP LENGTH CATEGORY 1	2	3	4	5	6	7
1	747100	B747-100/JT9DBD	JCOM	5	JT9DBD	1	1	2	3	4	5	6	0
2	747200	B747-200/JT9DFL	JCOM	6	JT9DFL	2	7	8	9	10	11	12	13
3	74710Q	B747-100QN/JT9DFL	JCOM	6	JT9DFL	1	1	2	3	4	5	6	0
4	747SP	B747SP/JT9DFL	JCOM	6	JT9DFL	3	14	15	16	17	18	19	20
5	DC820	DC-8-20/JT4A	JCOM	1	JT4A	4	21	22	23	24	25	26	0
6	707	B707-120/JT3C	JCOM	1	JT4A	5	27	28	29	30	31	32	0
7	720	B720/JT3C	JCOM	1	JT4A	6	33	34	35	36	37	0	0
8	707320	B707-320B/JT3D-7	JCOM	2	JT3D	7	38	39	40	41	42	43	44
9	707120	B707-120B/JT3D-3	JCOM	2	JT3D	8	45	46	47	48	49	50	0
10	720B	B720B/JT3D-3	JCOM	2	JT3D	9	51	52	53	54	55	0	0
11	DC850	DC-8-50/JT3D-3	JCOM	2	JT3D	10	56	57	58	59	60	61	0
12	DC860	DC-8-60/JT3D-7	JCOM	2	JT3D	11	62	63	64	65	66	67	68
13	DC8CFM	DC-8-60/CFM-56	JCOM	4	CFM56	12	69	70	71	72	73	74	75
14	707CFM	B707-320B/CFM-56	JCOM	4	CFM56	13	76	77	78	79	80	81	82
15	707QN	B707-320B/JT3D-7QN	JCOM	3	JT3DQ	8	38	39	40	41	42	43	44
16	DC8QN	DC-8-60/JT3D-7QN	JCOM	3	JT3DQ	10	62	63	64	65	66	67	68
17	CONCRD	CONCORDE/OL593	JCOM	7	OL593	14	83	83	83	83	84	84	0
18	DC1010	DC-10-10/CF6-6D	JCOM	10	CF66D	15	85	86	87	88	89	90	0
19	DC1030	DC-10-30/CF6-6D	JCOM	10	CF66D	16	91	92	93	94	95	96	0
20	DC1040	DC-10-40/JT9D-20	JCOM	10	CF66D	17	97	98	99	100	101	102	103
21	L1011	L-1011/RB211-22B	JCOM	11	RB2112	18	104	105	106	107	108	109	0
22	L10115	L-1011-500/RB211-524	JCOM	11	RB2112	19	110	111	112	113	114	115	116
23	727200	B727-200/JT8D-7	JCOM	8	3JT8D	20	117	118	119	120	0	0	0
24	727100	B727-100/JT8D-7	JCOM	8	3JT8D	21	121	122	123	124	0	0	0
25	727D15	B727-200/JT8D-15	JCOM	8	3JT8D	22	125	126	127	128	129	0	0
26	727Q9	B727-200/JT8D-9QN	JCOM	9	3JT8DQ	23	130	131	132	133	0	0	0
27	727Q7	B727-100/JT8D-7QN	JCOM	9	3JT8DQ	21	121	122	123	124	0	0	0
28	727Q15	B727-200/JT8D-15QN	JCOM	9	3JT8DQ	22	125	126	127	128	129	0	0
29	727D17	B727-200/JT8D-17	JCOM	9	3JT8DQ	24	134	135	136	137	0	0	0
30	A300	A300/CF6-50C	JCOM	17	CF650	25	138	139	140	141	0	0	0
31	767	B767/CF6-80A	JCOM	18	CF680	26	142	143	144	145	0	0	0
32	A310	A310/CF6-80A	JCOM	17	CF650	27	146	147	148	149	0	0	0
33	BAC111	BAC111/SPEY512	JCOM	38	SP512	28	150	151	152	0	0	0	0
34	F28	F28/SPEY555	JCOM	14	SP555	29	153	154	0	0	0	0	0
35	DC930	DC-9-30/JT8D-9	JCOM	12	2JT8D	30	155	156	157	0	0	0	0

FIGURE 1-1. INM DATA BASE NO. 8 AIRCRAFT DEFINITIONS (PART 1 OF 2)

AIRCRAFT NO	NAME	DESCRIPTION	CAT	NOISE CURVE NO	NOISE CURVE NAME	AP	TAKEOFF PROFILES BY TRIP LENGTH CATEGORY 1	2	3	4	5	6	7
36	DC910	DC-9-10/JT8D-7	JCOM	12	2JT8D	31	158	159	160	0	0	0	0
37	737	B737/JT8D-9	JCOM	12	2JT8D	32	161	162	163	164	0	0	0
38	DC9Q9	DC-9-30/JT8D-9QN	JCOM	13	2JT8DQ	30	155	156	157	0	0	0	0
39	DC9Q7	DC-9-10/JT8D-7QN	JCOM	13	2JT8DQ	31	158	159	160	0	0	0	0
40	737QN	B737/JT8D-9QN	JCOM	13	2JT8DQ	32	161	162	163	164	0	0	0
41	DC950	DC-9-50/JT8D-17	JCOM	13	2JT8DQ	33	165	166	167	0	0	0	0
42	737D17	B737/JT8D-17	JCOM	13	2JT8DQ	34	168	169	170	171	0	0	0
43	DC980	DC-9-80/JT8D-209	JCOM	15	2JT8D2	35	172	173	174	175	0	0	0
44	757RB	B757/RB211-535C	JCOM	16	RB2115	36	176	177	178	179	0	0	0
45	757JT	B757/JT10D	JCOM	16	RB2115	36	176	177	178	179	0	0	0
46	COMJET	COMPOSITE GA JET	JGA	19	CGAJ	37	180	180	180	180	0	0	0
47	GALTF	I.E. LEAR 35/TFE-731	JGA	21	TF731	38	181	181	181	181	181	0	0
48	GALTJ	I.E. LEAR 25/CJ610	JGA	20	CJ610	39	182	182	182	182	0	0	0
49	GAMTF	I.E. SABRE 75/CF700	JGA	22	CF700	40	183	183	183	183	0	0	0
50	GALQTF	I.E. CITATION/JT15D	JGA	23	JT15D	41	184	184	184	184	184	0	0
51	L188	ELECTRA/T56-A-7	PCOM	24	T56A7	42	185	185	185	185	185	0	0
52	L100	HERCULES/T56-A-15	PCOM	25	T56A15	43	186	186	186	186	186	186	0
53	DHC7	DHC-7/PT6A-50	PCOM	26	PT650	44	187	187	187	0	0	0	0
54	CV580	CV580/AL501-D13	PCOM	27	501D13	45	188	188	188	188	0	0	0
55	HTETP	I.E. F27/RDA7	PCOM	28	RDA7	46	189	189	189	0	0	0	0
56	MTETP	I.E. SD3-30/PT6A-45A	PCOM	29	PT645	47	190	190	190	0	0	0	0
57	DHC6	DHC-6/PT6A-27	PCOM	30	PT627	48	191	191	0	0	0	0	0
58	4EP	I.E. DC-6,7/R2800	PCOM	31	R2800	49	192	192	192	192	192	192	192
59	TEP	I.E. DC-3/R1820	PCOM	32	R1820	50	193	193	193	193	0	0	0
60	COMTEP	COMP. GA TWIN ENG	PGA	33	CGATEP	51	194	194	194	0	0	0	0
61	COMSEP	COMP. GA SINGLE ENG	PGA	34	CGASEP	52	195	195	0	0	0	0	0
62	KC135	KC-135A/J57	JMIL	35	J57	53	196	196	196	196	196	196	196
63	C130	HERCULES/T56	PMIL	25	T56A15	43	186	186	186	186	186	186	186
64	F4	F-4/J79	JMIL	36	J79	54	197	197	197	197	0	0	0
65	A7D	A7D/TF41	JMIL	37	TF41	55	198	198	198	193	0	0	0
66	CL600	CL600/ALF502	JGA	39	ALF502	56	199	199	199	199	199	0	0

FIGURE 1-1. INM DATA BASE NO. 8 AIRCRAFT DEFINITIONS (PART 2 OF 2)

options allows the user to replace a data set which resides in the data base. The key to the replacement of a data set is its identification name which is indicated in Figure I - I.

Data Base No. 8 also contains three default approach profiles which the user may select in defining his aircraft operations. Subsection 2.1.7 describes these profiles in detail.

One important aspect of developing a new data base is the validation of its contents. This function is being carried out under the INM Validation Project, the purpose of which is to determine the accuracy of both the computational methods and the data base of the model by comparing the model's noise exposure calculations with measured levels. The first phase of validation was an analysis of air carrier flights over the monitoring system at Washington National and Dulles International Airport (Reference 3). The results of the first phase became the criteria by which the sound exposure level (SEL) noise-thrust-distance curves of the data base were modified (Figure I-2). The modification of the SEL values primarily reflects the change of function of relative signal duration with distance from 10 dB per decade to 6 dB per decade. An offshoot of the first phase served as a guide to the revision of the model's definition of the commercial jet departure procedure to represent current practices.

Future phases of the validation project will investigate the methods of computation. However, what may be more imperative, in the light of the Aviation Safety and Noise Abatement Act, are standards for the computational methods. The FAA will continue to adhere to the guidance of the A-21 Committee of the Society of Automotive Engineers (SAE) as they explore this area. Already, as a result of the proposal by the subcommittee on ground reflection measurement, a revised algorithm for lateral attenuation has been used in Version 3. This new functional definition depicts a change of varying magnitude to the definition utilized in Version 1 and 2 (Figure I-3).

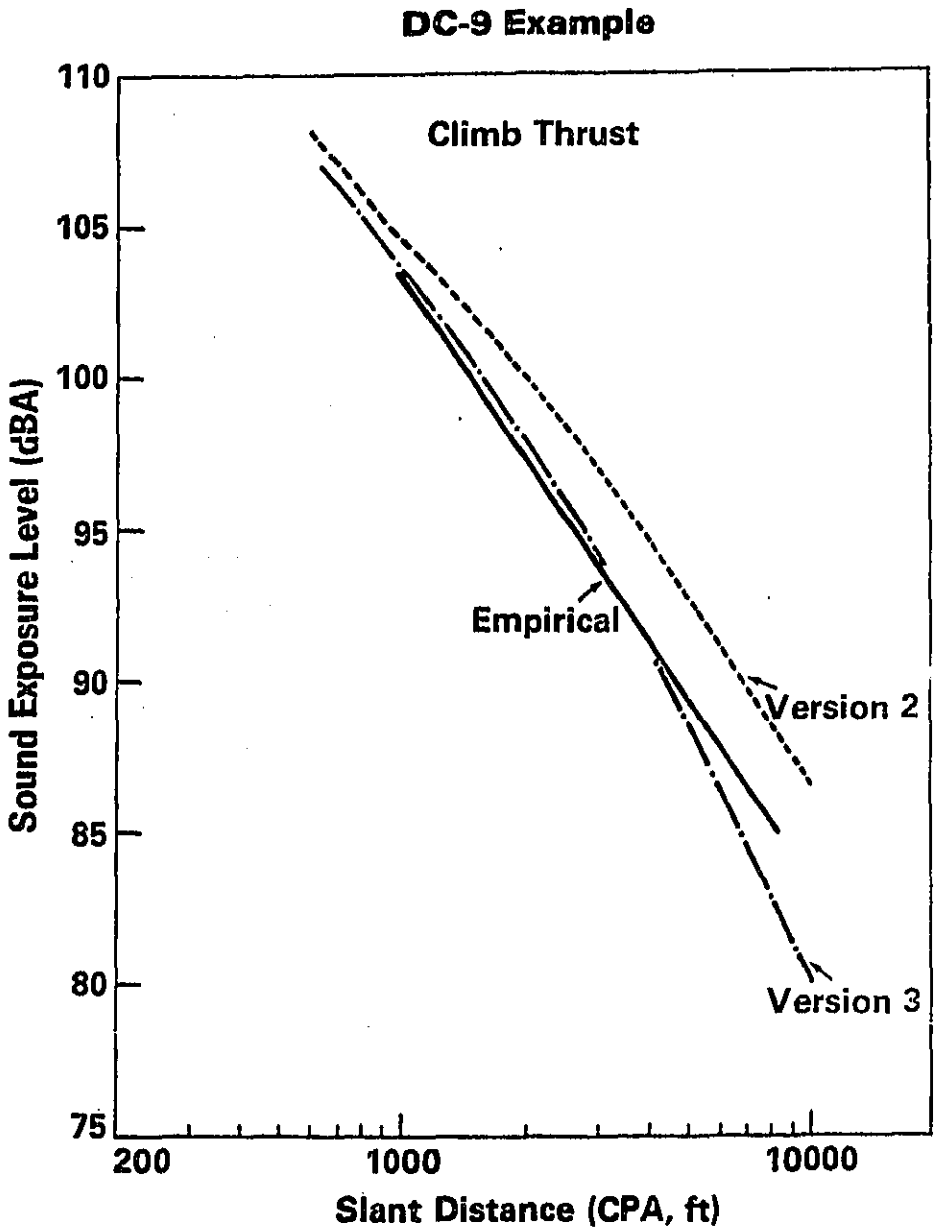


Figure 1-2. INM DATA BASE: SEL-DISTANCE-THRUST RELATIONSHIP

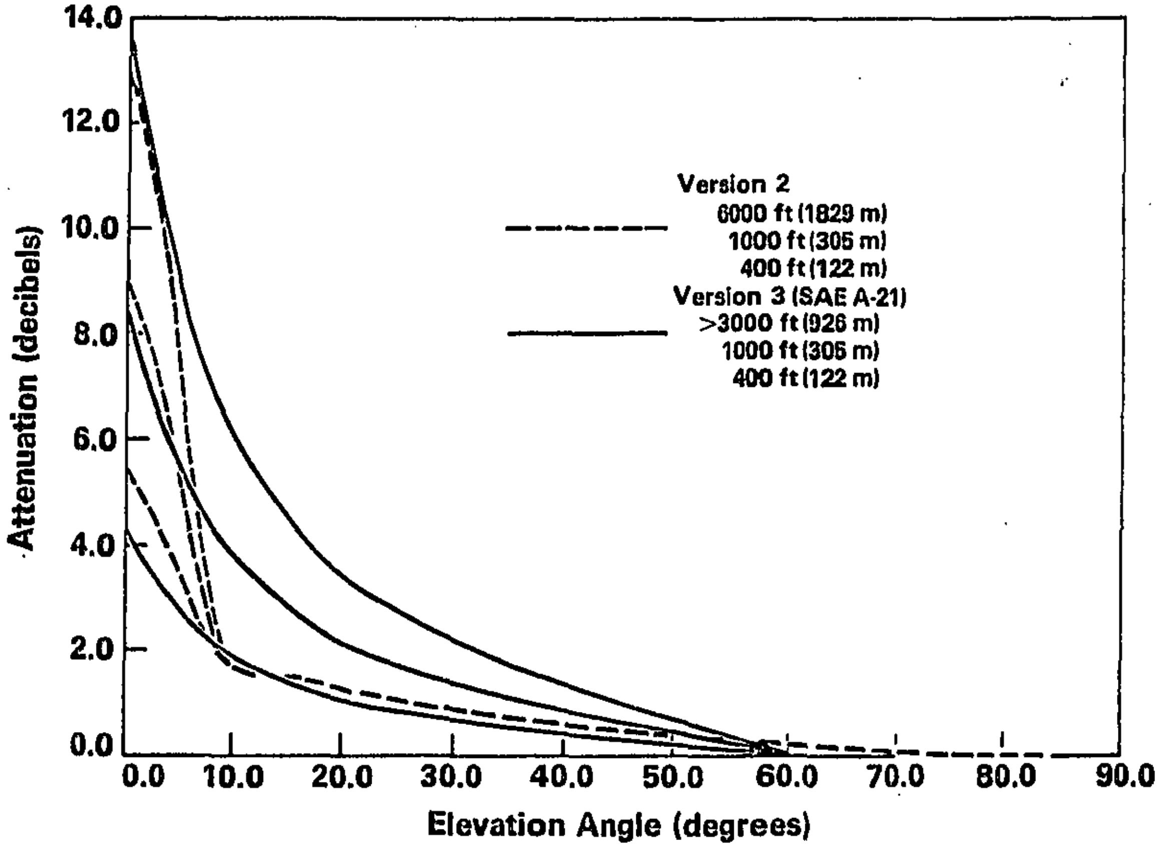


Figure 1-3. INM ALGORITHMS: LATERAL ATTENUATION OF AIRCRAFT NOISE

1.4 NOTE TO PREVIOUS USERS OF INM

Version 3 of the INM is a new model whose input and output differ substantially from earlier versions. Threfore, previous users are advised to set aside their knowledge of the earlier versions and approach the use of Version 3 as they would any new model. The documentation for Version 3 fully describes the new model and where appropriate points out differences in the results between Version 3 and earlier versions.

1.5 INM DOCUMENTATION

The INM documentation includes a number of manuals for the model itself and several reports on activities which support the INM. A bibliography of these documents, each of which may be obtained from the FAA, is given below:

1. Bishop, D. E. and Beckmann, J. M., Bolt Beranek and Newman, Inc., "Civil Aircraft Noise Data for Computation of Aircraft Noise Contours," Report No. 4440, Project No. 09611, submitted to the U.S. Department of Transportation, November 1980 (Draft).

2. Potter, R. C. and Mills, J. F., Bolt Beranek and Newman, Inc., "Aircraft Flight Profiles for Use in Aircraft Noise Prediction Models," Report No. 4594, Project No. 09612, submitted to the U.S. Department of Transportation, January 1981 (Draft).

3. Gados, R. G. and Aldred, J. M., "FAA Integrated Noise Model Validation, Phase I: Analysis of Integrated Noise Model Calculations for Air Carrier Flyovers," FAA-EE-80-04, December 1979.

4. Federal Aviation Administration, "INM, Integrated Noise Model, Version 3 - Installation Instructions," October 1982.

5. Federal Aviation Administration, "INM, Integrated Noise Model, Version 3 - Programmer's Maintenance Manual," planned document for 1982.

6. Federal Aviation Administration, "INM, Integrated Noise Model, Version 3 - Data Base Manual," planned document for 1982.

7. Flathers II, G. W., "A Comparison of FAA Integrated Noise Model Flight Profiles with Profiles Observed at Seattle-Tacoma Airport," DOT/FAA/EE-82/10, December 1981.

8. Flathers II, G. W., "FAA Integrated Noise Model Validation: Analysis of Air Carrier Flyovers at Seattle-Tacoma Airport," planned document for 1982.

2.0 ELEMENTS OF AN AIRPORT CASE STUDY

INM Version 3 requires that the user input data be entered via punched cards or via an input data file. The interactive conversation INPUT Module available with Version 2 has been eliminated.

This section describes the data required to produce a case study. Section 3 provides instructions for creating the input data file.

2.1 GENERAL DESCRIPTION OF AIRPORT CASE STUDY ELEMENTS

In order to run the model, the user is required to provide at least four and up to twelve types of data describing the airport and its associated activity, i.e.;

a. Airport Altitude and Temperature
b. Runway Configuration
c. Names of the Selected Aircraft
d. Alternate Aircraft Definitions (optional)
e. Alternate Noise Curve Data (optional)
f. Alternate Approach Parameters (optional)
g. Alternate Approach Profiles (optional)
h. Alternate Takeoff Profiles (optional)
i. Takeoff Profile Modifications (optaional)
j. Takeoff Tracks and Operations
k. Landing Tracks and Operations
l. Touch-and-Go Tracks and Operations

Data types a, b, and c are required along with at least one of types j, k, and l.

2.1.1 ALTITUDE AND TEMPERATURE

The altitude and temperature data consists of the airport altitude above sea level in feet and the average daily airport temperature (in the user-specified units) for the period under consideration. The temperature may be in Fahrenheit, Celsius, or Rankine. If the scenario reflects a typical hot day, then the average summer temperature is entered. Most scenarios will require the average annual temperature.

2.1.2 RUNWAY DEFINITION

The runway definitions establish the airport geometry and its relationship to the surrounding area. First, the user must define a cartesian coordinate system with which to describe the airport. The units for distances are user-specified as feet, meters, or international nautical miles (equivalent to 6,076.1155 feet). The positive X- and Y-axes must run east and north, respectively, as on a typical map. The placment of the origin point (0,0) is arbitrary; however, for computational precision the distances from the origin to the runways should be small. The user determines X-, Y-coordinates of each runway endpoint giving the INM the information it needs to reconstruct the user's coordinate system.

It may be desirable to locate the origin so that all runways are in the first quadrant and thus have positive coordinates. If the origin is located at the start or end of a runway, the required calculations of runway starts and ends will be simplified. After selection of the origin, the user may employ simple trigonometric techniques or a graph paper overlay to determine the X-Y values of the points on the runway. Figure 2-1 illustrates the coordinate system for the 09L/27R with the Y-axis pointing north. Any X-coordinate of a point to the west of the origin and any Y-coordinate to the south of the origin must be a negative number.

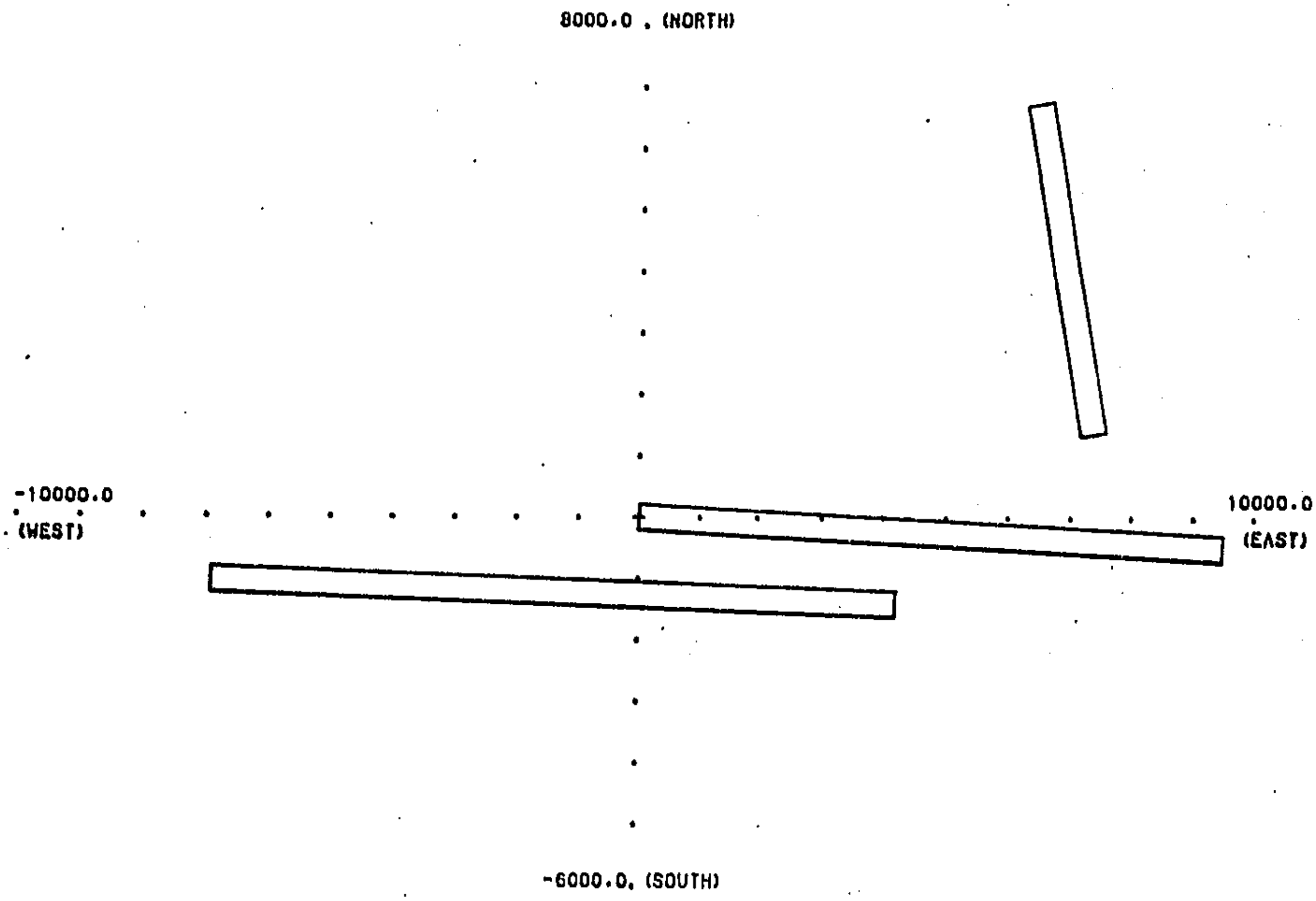


FIGURE 2-1. COORDINATE SYSTEM FOR THE EXAMPLE AIRPORT

Two pairs of X-, Y-coordinates, each corresponding to a runway endpoint, define a runway. Each coordinate pair, or runway end, has two definitions, one corresponding to departures and one to arrivals. The first pair locates the end of the runway where a departing aircraft begins its takeoff roll or a landing aircraft could first touch down. The latter description is called the threshold point for a landing aircraft and is defined as the beginning of that portion of the runway useable for landing. The second pair locates the end of the runway where an aircraft departing from the opposite direction would begin its takeoff roll or an aircraft landing from the opposite direction could first touch down. The implication is that both endpoints are the physical runway ends. Figure 2-2 displays the relationship of the pairs of coordinates to the type of aircraft operation.

In addition to the runway endpoints, the user may wish to enter data defining the runway heading. The heading is in degrees of direction and, if not readily available, can be determined from the runway coordinates using simple trigonometric techniques.

2.1.3 AIRCRAFT SELECTION

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

Table 2-1 lists the aircraft contained in the INM Data Base No. 8. An aircraft is selected by referencing its name as described in this table. The following subsection describes alternate aircraft definitions.

2.1.4 ALTERNATE AIRCRAFT DEFINITIONS

The user may add new aircraft to an airport data file so that the operation of aircraft not currently included in the INM data base can be part of a case. It is also possible to alter the properties of aircraft which are already included in the INM data base.

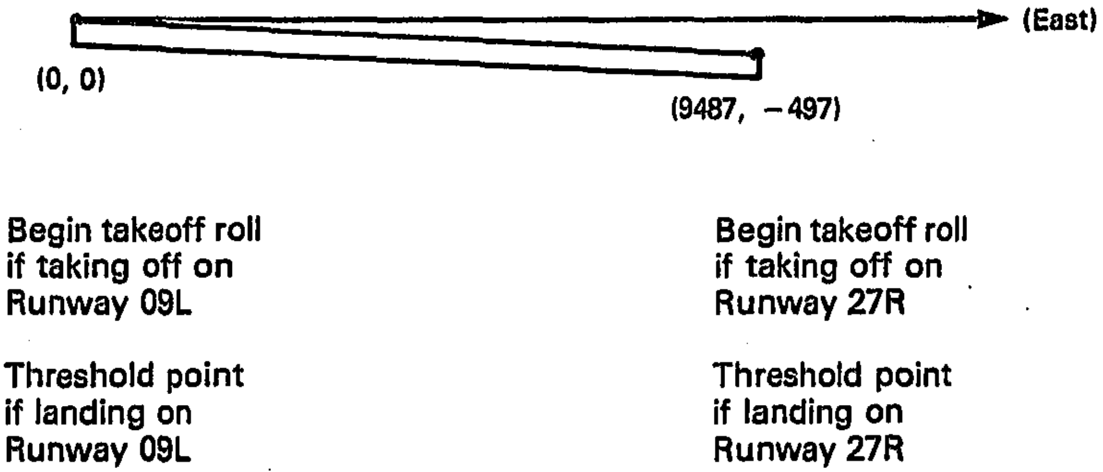


FIGURE 2-2. THE RUNWAY ENDPOINTS

TABLE 2-1
(Part 1 of 2)
AIRCRAFT STORED IN THE INM DATA BASE NO. 8

Order of Storage	Name	Description
1	747100	B747-100/JT9BD
2	747200	B747/200/JT9DFL
3	74710Q	B747-100QN/JT9DFL
4	747SP	B747SP/JT9DFL
5	DC820	DC-8-20/JT4A
6	707	B707-120/JT3C
7	720	B720/JT3C
8	707320	B707-320B/JT3D-7
9	707120	B707-120B/JT3D-3
10	720B	B720B/JT3D-3
11	DC850	DC-8-50/JT3D-3
12	DC860	DC-8-60/JT3D-7
13	DC8CFM	DC-8-60/CFM-56
14	707CFM	B707-320B/CFM-56
15	707QN	B707-320B/JT3D-7QN
16	DC8QN	DC-8-60/JT3D-7QN
17	CONCRD	CONCORDE/OL593
18	DC1010	DC-10-10/CF6-6D
19	DC1030	DC-10-30/CF6-6D
20	DC1040	DC-10-40/JT9D-20
21	L1011	L-1011/RB211-22B
22	L10115	L-1011-500/RB211-524
23	727200	B727-200/JT8D-7
24	727100	B727-100/JT8D-7
25	727D15	B727-200/JT8D-15
26	727Q9	B727-200/JT8D-9QN
27	727Q7	B727-100/JT8D-7QN
28	727Q15	B727-200/JT8D-15QN
29	727D17	B727-200/JT8D-17
30	A300	A300/CF6-50C
31	767	B767/CF6-80A

TABLE 2-1
(Part 2 of 2)

Order of Storage	Name	Descriptions
32	A310	A310/CF6-80A
33	BAC111	BAC111/SPEY512
34	F28	F28/SPEY555
35	DC930	DC-9-30/JT8D-9
36	DC910	DC-9-10/JT8D-7
37	737	B737/JT8D-9
38	DC9Q9	DC-9-30/JT8D-9QN
39	DC9Q7	DC-9-10/JT8D-7QN
40	737QN	B737/JT8D-9QN
41	DC950	DC-9-50/JT8D-17
42	737D17	B737/JT8D-17
43	DC980	DC-9-80/JT8D-209
44	757RB	B757/RB211-535C
45	757JT	B757/JT10D
46	COMJET	COMPOSITE GA JET
47	GALTF	I.E. LEAR 35/TFE-731
48	GALTJ	I.E. LEAR 25/CJ610
49	GAMTF	I.E. SABRE 75/CF700
50	GALQTF	I.E. CITATION/JT15D
51	L188	ELECTRA/AL501-D13
52	L100	HERCULES/AL501-D13
53	DHC7	DHC-7/PT6A-50
54	CV580	CV580/AL501-D13
55	HTETP	I.E F27/RDA7
56	MTETP	I.E. SD3-30/PT6A-45A
57	DHC6	DHC-6/PT6A-27
58	4EP	I.E. DC-6,7/R2800
59	TEP	I.E. DC-3/R1820
60	COMTEP	COMP. GA TWIN ENG
61	COMSEP	COMP. GA SINGLE ENG
62	KC135	KC-135A/J57
63	C130	HERCULES/T56
64	F4	F-4/J79
65	A7D	A7D/TF41
66	CL600	CHALLENGER

An airplane definition includes the following information:

- An aircraft name
- A noise curve name which identifies the noise vs. slant-distance tables associated with the aircraft
- An approach parameter name which associates the aircraft type with a set of approach parameter values
- A takeoff profile name for each possible trip length category
- An aircraft category which indicates whether an aircraft is propeller or jet and whether it is a commercial, general aviation or military aircraft.

For new aircraft types, these must all be provided. In most cases, the user will need to create a new set of approach parameters. However, the noise curve and takeoff profiles may be selected from those already in the INM data base, or new ones may be created.

When changing an aircraft type that is already part of the INM, it is not necessary to change all of its properties. For example, if a new noise curve is not specified the INM will retrieve and use the noise curve from the INM data base.

2.1.5. ALTERNATE NOISE CURVE DATA

The INM data base contains sets of EPNL vs. distance tables and a like number of SEL vs. distance tables. Each set consists of up to six noise curves, each noise curve corresponding to a different power setting. A noise curve is defined by a table of ten noise levels at the ten slant range distances of 200, 400, 630, 1000, 2000, 4000, 6300, 10,000, 16,000 and 25,000 feet. The power setting is usually thrust in pounds per engine and given in units of pounds per engine. However, any power unit may be used as long as it is consistent for all noise curves, takeoff profiles, and approach parameters used by a particular aircraft type. Each noise vs. distance data set is assigned to at least one aircraft in the data base by associating with each aircraft identification name a noise curve identification name. An aircraft's EPNL noise curve and SEL noise curves are grouped together under the same identification name. A noise data set must be defined by noise curves for anywhere from two to six power settings. Table 2-2 lists the names of the noise curves in the data base.

TABLE 2-2
(Part 1 of 2)

NOISE CURVES IN THE INM DATA BASE NO. 8

Order of Storage	Name
1	JT4A
2	JT3D
3	JT3DQ
4	CFM56
5	JT9DBD
6	JT9DFL
7	OL593
8	3JT8D
9	3JT8DQ
10	CF66D
11	RB2112
12	2JT8D
13	2JT8DQ
14	SP555
15	2JT8D2
16	RB2115
17	CF650
18	CF680
19	CGAJ
20	CJ610
21	TF731
22	CF700
23	JT15D
24	T56A7
25	T56A15
26	PT650
27	501D13
28	RDA7
29	PT645

TABLE 2-2
(Part 2 of 2)

Order of Storage	Name
30	PT627
31	R2800
32	R1820
33	CGASEP
34	CGATEP
35	J57
36	J79
37	TF41
38	ALF502

This input section allows the user to enter noise vs. distance tables not available in the current INM data base. The new noise data must follow the conventions of the standard data base described above except that up to 22 distances and up to 10 thrust levels may be specified in the noise curves. Any new noise curve entered by the user should be referenced in at lease one of the aircraft definitions. In defining a new noise curve, the user must include the four kinds of data required by this section: noise curve identification data, thrust setting data, distance data, and noise curve levels.

Usually, a user-defined noise curve is a new noise curve and not a replacement for one in the data base. However, the user may replace a data base noise curve by using the data base noise curve name to identify the user-defined noise curve. Care must be taken in doing replacements though because several aircraft in the data base may use the same noise curve and replacement of the noise curve will affect each of these aircraft.

2.1.6 ALTERNATE APPROACH PARAMETERS

An approach parameter set defines various performance characteristics for the aircraft associated with it. Each parameter set must contain the landing weight of the aircraft and the number of engines on the aircraft. In addition, the parameter set may also include values for the stop distance from touchdown, the taxi speed, the final speed, the terminal speed, and up to eight thrust settings. A parameter set may be defined in the data base or be user-defined. Table 2-3 describes the parameters contained in the data base parameter sets. Within user-defined parameter sets the thrust parameter names used may be determined by the user but the other parameter names must be the same as those in the data base.

The distance, speed, and thrust parameters are used in the approach profile to make the profile more general and therefore applicable to numerous aircraft types. (See Section 2.1.7). Whenever the INM encounters a parameter name within an approach profile, it knows to go to the parameter set associated with the aircraft using the profile to find the values of the various performance characteristics for that aircraft. Approach parameters are stored for each

TABLE 2-3

APPROACH PARAMETERS IN THE INM DATA BASE NO. 8

PARAMETER NAME	DESCRIPTION OF THE ASSOCIATED DATA
WEIGHT	Landing weight of the aircraft (lb)
ENGINE	Number of engines on the aircraft
STOP	Stop Distance (ft.), i.e., distance from the touchdown point to the point where the aircraft stops
TAXI	Taxi Speed (kt.), i.e., aircraft taxiing speed
FINSP	Final Speed (kt.), i.e., speed aircraft flies to maintain its final approach course
TERMSP	Terminal Speed (kt.), i.e., speed at which aircraft enters the terminal control area
3DLND	Thrust for 3° glide slope, Landing Flap, Final Speed (lb/eng or any other appropriate unit)
3DAPFS	Thrust for 3° glide slope, Approach Flap, Final Speed (lb/eng or any other appropriate unit)
3DAPTS	Thrust for 3° glide slope, Approach Flap, Terminal Speed (lb/eng or any other appropriate unit)
LEVAPP	Thrust for Level Flight, Approach Flap, Terminal Speed (lb/eng or any other appropriate unit)
LEVMAN	Thrust for Level Flight, Maneuver Flap, Terminal Speed (lb/eng or any other appropriate unit)
500FMS	Thrust for 500ft/n.mi descent, Maneuver Flap, Terminal Speed (lb/eng or any other appropriate unit)
IDLE	Idle Thrust, Taxi Speed (lb/eng or any other appropriate unit)
REV	Reverse Thrust, Final Speed (lb/eng or any other appropriate unit)

aircraft in the data base under an identification name of AP1 through AP56. (See Figure 1-1). The user may replace a data base approach parameter set by entering one in this section under the same name which the data base uses. Notice, however, that several aircraft may use the same approach parameter set. If this is the case, other aircraft will be affected, therefore if the user wishes to change only those parameters which pertain to a single aircraft, he must change the aircraft's definition (see Section 2.1.4) and enter the approach parameters under a new identification name.

2.1.7 ALTERNATE APPROACH PROFILES

In the INM an aircraft's profile is a table of altitude, speed, and thrust represented as functions of ground distance from a reference point. The program interpolates from these tables to find an aircraft's performance characteristics at any point in its flight path. Profiles fall into one of two categories: approach profiles and takeoff profiles. Approach profiles are discussed in this subsection and takeoff profiles in the next subsection.

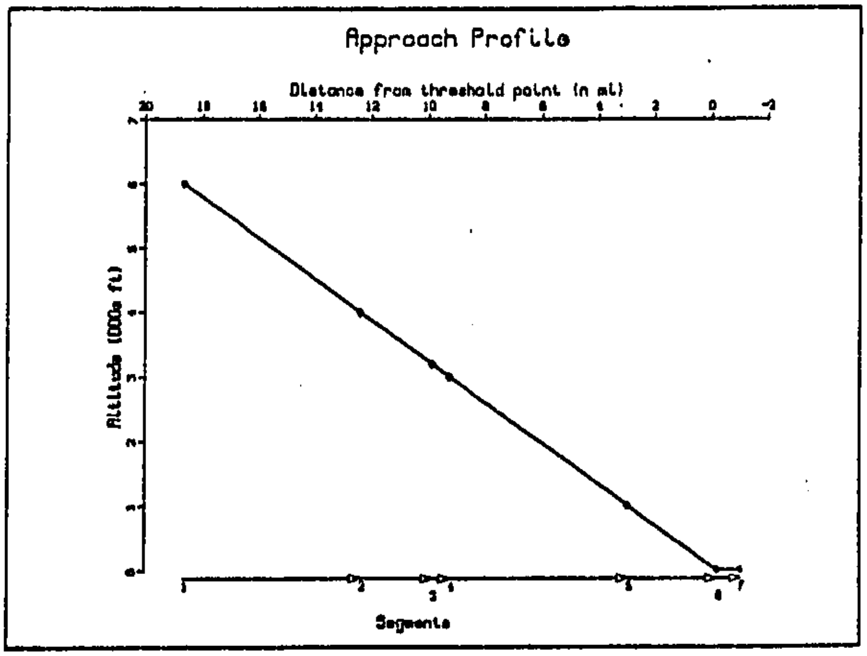
Three default approach profiles are contained in Data Base No. 8, one profile each for commercial, general aviation, and military aircraft. These profiles are presented in Table 2-4. The user may also enter alternate approach profiles.

Each approach profile is modeled with a set of four values, which provide the INM with a set of ground distances from the threshold point on the runway, reference values of altitude and speed at each of these distances, and an indication of the power settings between them. (See Figure 2-3). The distances are in the user-specified units but altitudes are in feet and the speeds in knots. The units for thrust are relative but must match that used in the noise curves associated with the aircraft which use the profile. The ground distances divide the approach profile into a set of discrete connected segments. There must be at least three ground distances and at most fourteen. The data must be entered in the order in which the profile would be flown on landing. Note that this is the reverse order from that used in Version 2. Certain values of stop distance, speeds, and approach thrusts may be entered indirectly via parameter names. These parameter names

TABLE 2-4

APPROACH PROFILES
IN THE INM DATA BASE NO. 8

NAME	SEGMENT	DISTANCE FROM RUNWAY END FT	M	NMI	ALTITUDE(FT)	SPEED(KNTS)	THRUST
STD3D	1	STOP			0.00	TAXI	REV
	2	-1002.56	-305.58	-.17	0.00	FINSP	3DLND
	3	18076.40	5509.70	2.97	1000.00	FINSP	3DAPFS
	4	56234.50	17140.31	9.26	3000.00	FINSP	3DAPFS
	5	60050.30	18303.37	9.88	3200.00	FINSP	3DAPFS
	6	75313.50	22955.60	12.40	4000.00	TERMSP	3DAPTS
	7	113471.00	34586.03	18.67	6000.00	TERMSP	0.00
GA3D	1	STOP			0.00	32.00	3DLND
	2	-1002.56	-305.58	-.17	0.00	FINSP	3DLND
	3	18076.40	5509.70	2.97	1000.00	FINSP	3DLND
	4	56234.50	17140.31	9.26	3000.00	FINSP	3DLND
	5	60050.30	18303.37	9.68	3200.00	FINSP	3DLND
	6	75313.50	22955.60	12.40	4000.00	FINSP	3DLND
	7	113471.00	34586.03	18.67	6000.00	FINSP	0.00
MIL3D	1	STOP			0.00	32.00	3DLND
	2	-1002.56	-305.58	-.17	0.00	FINSP	3DLND
	3	18076.40	5509.70	2.97	1000.00	FINSP	3DLND
	4	56234.50	17140.31	9.26	3000.00	FINSP	3DLND
	5	60050.30	18303.37	9.88	3200.00	FINSP	3DLND
	6	75313.50	22955.60	12.40	4000.00	FINSP	3DLND
	7	113471.00	34586.03	18.67	6000.00	FINSP	0.00



POINT	DISTANCE from threshold point (n.mi)	HEIGHT above airport ground level (ft)	AIR SPEED	THRUSTS*
1	18.67	6,000	TERMSP	3DAPTS
2	12.40	4,000	TERMSP	3DAPFS
3	9.88	3,200	FINSP	3DAPFS
4	9.26	3,000	FINSP	3DAPFS
5	2.97	1,000	FINSP	3DLND
6	-.17	0	FINSP	REV
7	STOP	0	TAXI	

*Thrust refers to the segment between the lower segment point and the next higher numbered point.

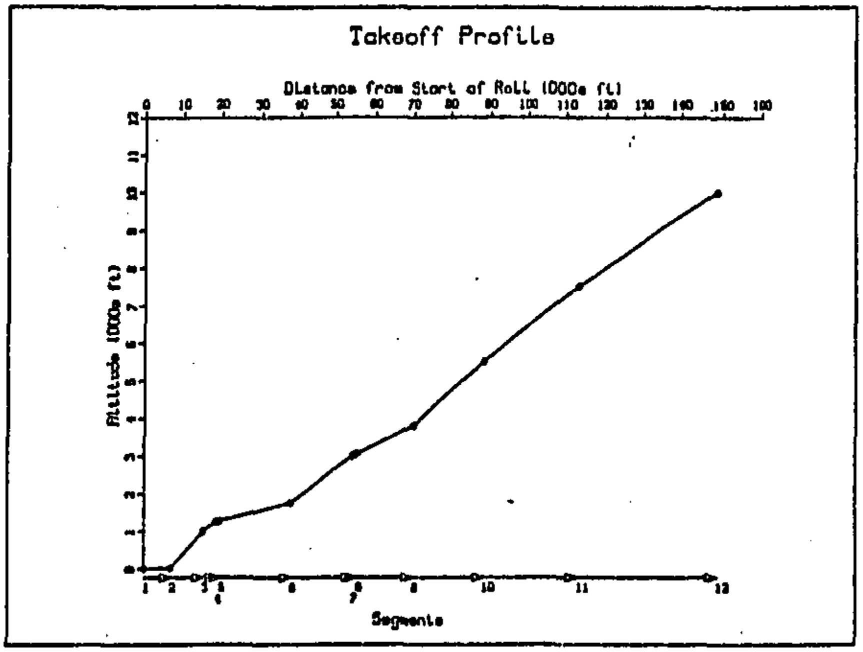
FIGURE 2-3. EXAMPLE OF AN APPROACH PROFILE refer the INM to the appropriate parameter sets in the data base or to those provided by the user. (See Subsection 2.1.6) This scheme enables the user to model approaches for many aircraft types with only one approach profile.

2.1.8 ALTERNATE TAKEOFF PROFILES

Inclusion of takeoff profiles in the input data is optional. The user should only include them if the profiles stored in the data base do not suit his needs. If the user wishes to replace a stored takeoff procedure and preserve the process by which the profile is referenced in the data base, the user need only enter the new profile under the identification name of the data base profile it replaces. Under these circumstances he need not enter an alternate aircraft definition as described in Subsection 2.1.4. Alternatively, the user may wish to include a profile which has no counterpart in the data base. This may occur either in the case of a new, user-created aircraft or a redefined data base aircraft.

Notice that in the data base, several aircraft use the same profiles. Replacement of such profiles as described above will affect all aircraft using them. One may avoid this side effect by including new aircraft-specific profiles.

Takeoff profiles are defined in a manner similar to approach profiles. Each takeoff profile is modeled with a set of four values, which provide the INM with a set of ground distances from the start of takeoff roll, reference values of altitude and speed at each of these distances, and an indication of the power settings between them. (See Figure 2-4.) The distances are in the user-specified units but altitudes are in feet and speeds are in knots. The units for thrusts are relative but must match those used in the noise curves associated with the aircraft which use the profile. The ground distances divide the takeoff profile into a set of discrete connected segments. There must be at least three ground distances and at most fourteen. The data must be entered in the order in which the profile would be flown on takeoff. In addition, a takeoff profile also requires that the number of engines being used and the aircraft's gross takeoff weight be specified.



POINT	DISTANCE from start of roll (ft)	ALTITUDE (ft)	AIR SPEED (kts)	THRUSTS* (lbs/eng)
1	0	0	16	11,895
2	6,863	0	157	11,895
3	15,215	1,000	157	11,895
4	18,621	1,250	167	11,895
5	19,621	1,276	169	8,611
6	37,898	1,755	210	8,611
7	54,573	3,000	210	8,611
8	55,573	3,052	213	10,712
9	70,097	3,801	250	10,712
10	88,502	5,500	250	10,712
11	112,931	7,500	250	10,712
12	148,639	10,000	250	--

*Thrust refers to the segment between the lower segment point and the next higher numbered point.

FIGURE 2-4. EXAMPLE OF A TAKEOFF PROFILE

In contrast to approach profiles, takeoff profiles do not use any parameter names. Thus each takeoff profile is very specific.

2.1.9 TAKEOFF PROFILE MODIFICATIONS (AVAILABLE IN NEAR FUTURE)

Occasionally the user may desire to modify a set of standard takeoff profiles without the benefit of the substantial performance information required in Section 2.1.8. In this section the user can modify any portion of the standard profile using one of six types of modification: altitude restriction, takeoff power, climb power, engine-out level flight power, specified climb gradient or acceleration to clean-up. This section does not apply to either the military or general aviation aircraft in the INM data base. The INM checks the aircraft category and applies modifications only to commercial jet aircraft.

The modification definition identifies the type of modification and specifies the segment of the profiles to be modified.

The following types of modifications are possible:

1. Altitude restriction (the aircraft cannot exceed the assigned altitude).
2. Takeoff power (the aircraft uses full power).
3. Climb power (the aircraft uses maximum continuous climb power).
4. Engine-out level flight power (the aircraft uses that power per engine which would maintain level flight if one engine were lost).
5. Specified climb gradient (the aircraft will alter power to maintain the climb gradient).
6. Acceleration to clean-up (the aircraft accelerates to the 0° flap minimum safe manuevering speed while retracting flaps on schedule).

All modifications except type 6 require that the profile start point and endpoint, respectively, of the modification be entered. Modification type 6 requires only a start point. These points are either altitudes, in feet, above the runway, or distances, in the user-specified units, from the start of the takeoff roll.

Modification type 5 also requries that the user enter the climb gradient. Climb gradient is the ratio of the change in altitude to the change in ground distance in feet of climb over feet of distance.

2.1.10 DESCRIPTION OF TAKEOFF TRACKS AND OPERATIONS

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

A track is made up of up to sixteen segments which are either curved or straight. For a straight segment, only a length in the user-specified units is necessary to describe it. The user models a curved segment with a trio of entries. The first number is the turn angle in degrees or a new heading in degrees. The second number is the radius of the turn in the user-specified units. Then, the direction of the turn is indicated by "LEFT" or "RIGHT".

Takeoff tracks are described as a departing aircraft would fly, with the first segment beginning at the start of takeoff roll. (Note that this differs from Version 2 in which the track was appended to the end of the runway.) Therefore, the first segment must be straight. Figure 2-5 presents a sample takeoff track.

Operations describe the type, magnitude, and arrangement of activity at an airport. The input consists of the average number of day, evening, and night departures or arrivals per day on each track. Day is the period betwen 7 a.m. and 7 p.m., evening is the period between 7 p.m. and 10 p.m., and night is between 10 p.m. and 7 a.m. The specification of time of day is an important factor in the calculation of two of the measures of airport noise which are available in the INM: NEF and Ldn. The contribution of each night operation to total exposure

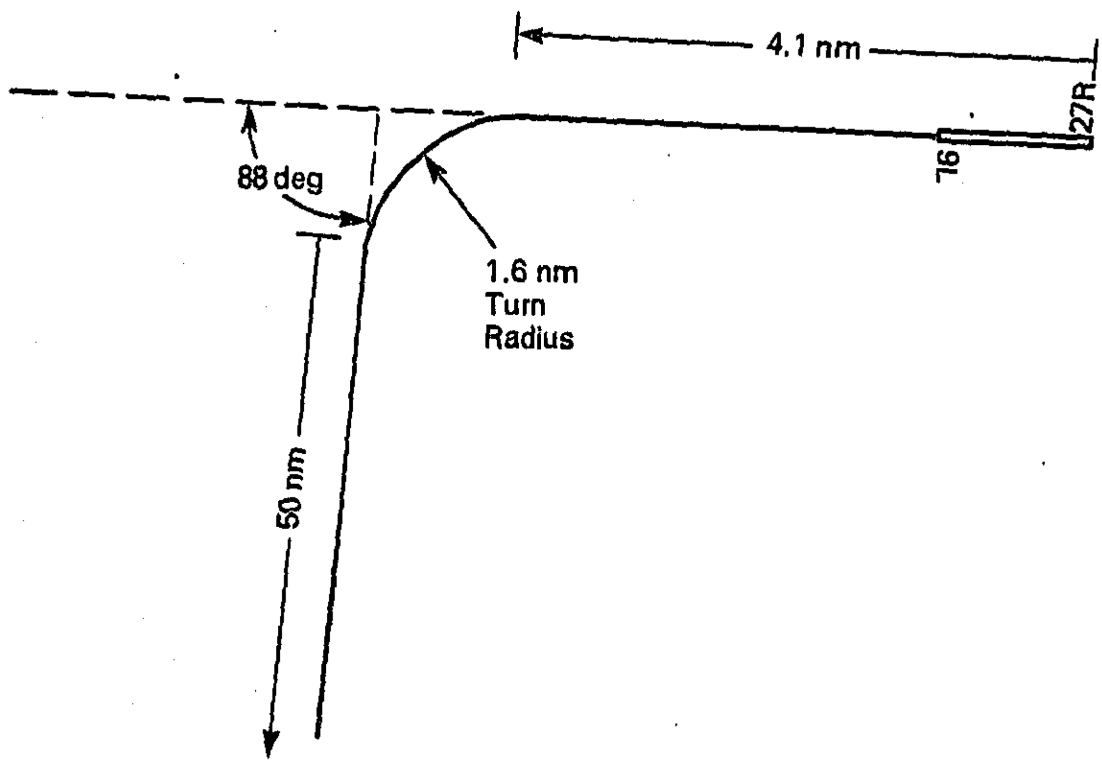


FIGURE 2-5. TAKEOFF TRACK TR2 FOR THE EXAMPLE AIRPORT

is more heavily weighted than the contribution of each day operation for each of these measures. The preparation of operations data is based on knowledge of schedule, demand, runway utilization, and air traffic control procedures in addition to the runway and track layout.

Departures are further divided into 7 stage-length categories which correspond to the approximate flight distances. Each stage length is associated with a takeoff weight which represents a typical passenger load factor and fuel required for such a trip.

0 - 500	nautical miles
500 - 1000	nautical miles
1000 - 1500	nautical miles
1500 - 2500	nautical miles
2500 - 3500	nautical miles
3500 - 4500	nautical miles
4500 and greater	nautical miles

Not all aircraft can fly all of these stage lengths (e.g., a GASEP's range is less than 500 miles). the INM will not accept a departure beyond an aircraft's maximum possible stange length. Figure 1-1 in Section 1 shows the maximum stage length for each aircraft type.

Operations may be described for the INM by one of two methods, by frequency or by percentage. All operations of a given type must be described by the same user-selected method. Note, however, that different types of operations may be entered by different methods. For example, takeoffs may be entered by frequency and landings by percentage.

With the first method, each takeoff track description is followed by the operations on that track. Each operation description gives the aircraft type name and the number of day, evening, and night departures for up to seven stage-length categories for that aircraft on that particular track. With the second method, each of the takeoff operations are described first, giving the number of day, evening and night departures for the operations for all tracks. Then each of the tracks are described, along with the percentage of commercial, general aviation and military operations that are to take place on that particular track. All of the aircraft operations must be distributed across the tracks, e.g., the sum over all tracks of the percentage of commercial aircraft distributed to the track must equal 100. Table 2-5 presents takeoff operations by percentage and Table 2-6 presents the same takeoff operations by frequency.

Takeoff modifications may be applied to specific takeoff tracks. For operations input in frequencies, the modification may be applied to some commercial jet aircraft on the specific track and not to others on that track. For operations input by percentage, the modifications will be applied to all commercial jet aircraft on the specific track. Note that takeoff modifications may be applied only to data base takeoff profiles for commercial jet aircraft. However, the model checks that a modification is applicable before it uses it on a profile.

2.1.11 DESCRIPTIONS OF APPROACH TRACKS AND OPERATIONS

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

A track is made up of up to sixteen segments which are either curved or straight. For a straight segment, only the length in the user-specified units is necessary to describe it. The user models a curved segment with a trio of entries. The first number is the turn angle in degrees or a new heading in degrees. The second number is the radius of the turn in the user-specified units. Then, the direction of the turn is indicated by "LEFT" or "RIGHT".

TABLE 2-5

TAKEOFFS BY PERCENTAGE

AIRCRAFT	CLASS	STAGE	DAY	OPERATIONS EVENING	NIGHT
727100	COM	1	6	4	2
727100	COM	2	4	2	2
LTJ	GA	1	10	5	0
TYPE-Y	GA	1	5	0	0
TYPE-Z	MIL	2	8	4	4

PERCENTAGES

TRACK	COM	GA	MIL
TR1	50	60	0
TR2	50	0	25
TR3	0	40	75
	100	100	100

TABLE 2-6

TAKEOFFS BY FREQUENCY

TRACK	AIRCRAFT	CLASS	STAGE	DAY	OPERATIONS EVENING	NIGHT
TR1	727100	COM	1	3	2	1
TR1	727100	COM	2	2	1	1
TR1	LTJ	GA	1	6	3	0
TR1	TYPE-Y	GA	1	3	0	0
TR2	727100	COM	1	3	2	1
TR2	727100	COM	2	2	1	1
TR2	TYPE-Z	MIL	2	2	1	1
TR3	LTJ	GA	1	4	2	0
TR3	TYPE-Y	GA	1	2	0	0
TR3	TYPE-Z	MIL	2	6	3	3

Approach tracks are described as a landing aircraft would fly, with the last segment ending at the threshold point. (Note that this differs from earlier versions in which an approach track was defined in the same manner as a takeoff track.) If turns are described as new headings, the initial approach heading must also be supplied. Figure 2-6 presents a sample approach track.

Operations describe the type, magnitude, and arrangement of activity at an airport. The input consists of the average number of day, evening, and night departures or arrivals per day on each track. Day is the period betwen 7 a.m. and 7 p.m., evening is the period between 7 p.m. and 10 p.m., and night is between 10 p.m. and 7 a.m. The specification of time of day is an important factor in the calculation of two of the measures of airport noise which are available in the INM: NEF and Ldn. The contribution of each night operation to total exposure is more heavily weighted than the contribution of each day operation for each of these measures. The preparation of operations data is based on knowledge of schedule, demand, runway utilization, and air traffic control procedures in addition to the runway and track layout.

Operations may be described for the INM by one of two methods, by frequency or by percentage. All operations of a given type must be described by the same user-selected method. Note, however, that different types of operations may be entered by different methods. For example, takeoffs may be entered by frequency and landings by percentage.

With the first method, each approach track description is followed by the operations on that track. Each operation description gives the aircraft type name, the approach profile name, and the number of day, evening, and night arrivals for that aircraft on that particular track. With the second method, each of the landing operations are described first, giving the number of day, evening, and night arrivals for the operations for all tracks. Then each of the tracks are described, along with the percentage of commercial, general aviation, and military operations that are to take place on that particular track. All of the aircraft operations must be distributed across the tracks, e.g., the sum over all tracks of the percentage of commercial aircraft distributed to the track must equal 100. In

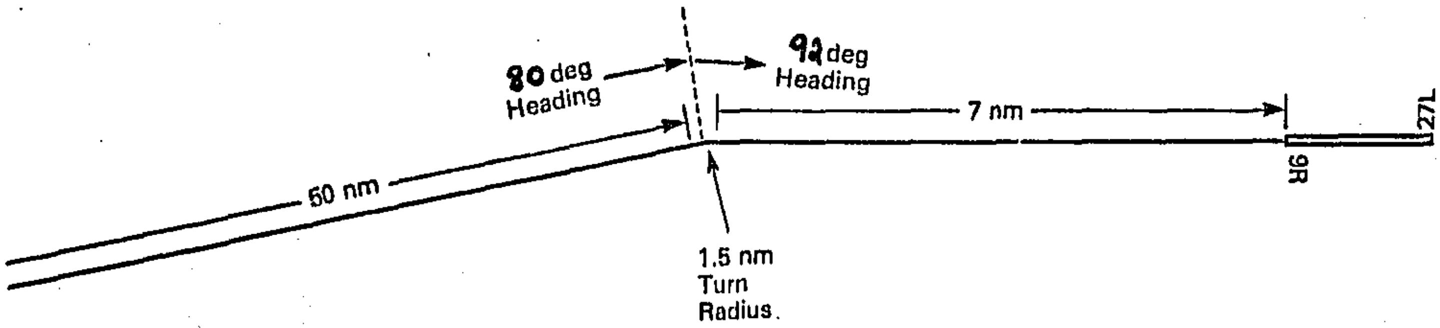


FIGURE 2-6. APPROACH TRACK TR9 FOR THE EXAMPLE AIRPORT

subsection 2.1.10, Table 2-5 presented takeoff operations by percentage and Table 2-6 presented the same operations by frequency.

2.1.12 DESCRIPTION OF TOUCH-AND-GO TRACKS AND OPERATIONS

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

A track is made up of up to sixteen segments which are either curved or straight. For a straight segment, only a length in the user-specified units is necessary to describe it. The user models a curved segment with a trio of entries. The first number is the turn angle in degrees or a new heading in degrees. The second number is the radius of the turn in the user-specified units. Then, the direction of the turn is indicated by "LEFT" or "RIGHT".

Touch-and-go tracks are described as a touch-and-go aircraft would fly, with the first segment beginning at the start of takeoff roll and the last segment ending at the threshold point. Therefore, the first segment must be straight. Figure 2-7 presents a sample touch-and-go track. (Note that the ability to specify touch-and-go operations did not exist in earlier versions of the INM.)

Operations describe the type, magnitude, and arrangement of activity at an airport. The input consists of the average number of day, evening, and night departures or arrivals per day on each track. Day is the period betwen 7 a.m. and 7 p.m., evening is the period between 7 p.m. and 10 p.m., and night is between 10p.m. and 7 a.m. The specification of time of day is an important factor in the calculation of two of the measures of airport noise which are available in the INM: NEF and Ldn. The contribution of each night operation to total exposure is more heavily weighted than the contribution of each day operation for

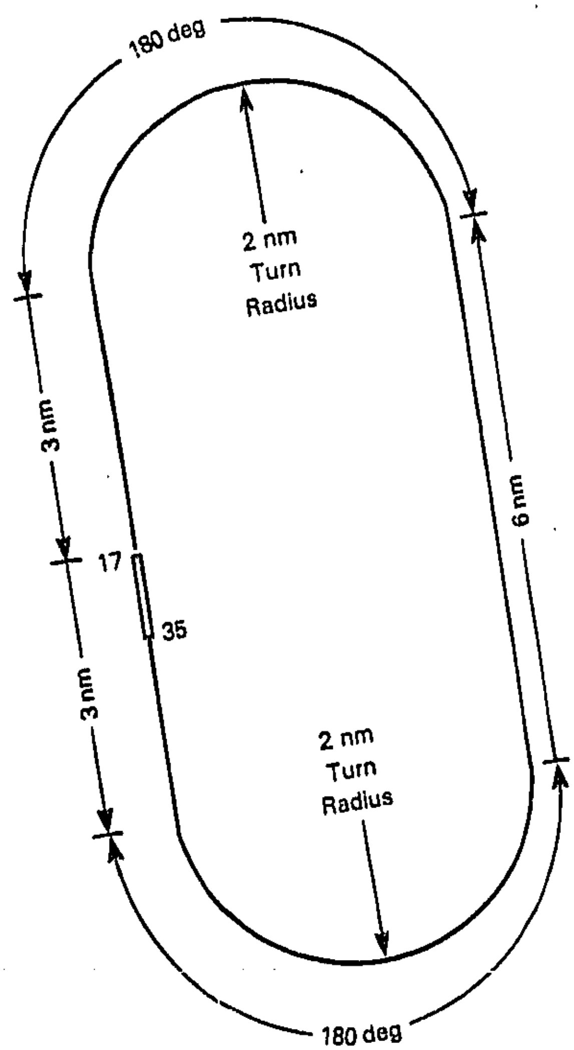


FIGURE 2-7. TOUCH-AND-GO TRACK TR14 FOR THE EXAMPLE AIRPORT

each of these measures. The preparation of operations data is based on knowledge of schedule, demand, runway utilization, and air traffic control procedures in addition to the runway and track layout.

Operations may be described for the INM by one of two methods, by frequency or by percentage. All operations of a given type must be described by the same user-selected method. Note, however, that different types of operations may be entered by different methods. For example, touch-and-go's may be entered by frequency and landings by percentage.

With the first method, each touch-and-go track description is followed by the operations on that track. Each operation description gives the aircraft type name, the approach profile name, and the number of day, evening, and night departures for one stage-length category for that aircraft on that particular track. With the second method, each of the touch-and-go operations are described first, giving the number of day, evening, and night arrivals for the operations for all tracks. Then each of the tracks are described, along with the percentage of commercial, general aviation, and military operations that are to take place on that particular track. All of the aircraft operations must be distributed across the tracks; e.g., the sum over all tracks of the percentage of commercial aircraft distributed to the track must equal 100. In subsection 2.1.10, Table 2-5 presented takeoff operations by percentage and Table 2-6 presented the same takeoff operations by frequency.

2.2 EXAMPLE AIRPORT DESCRIPTION

A hypothetical airport system has been constructed to assist the user in preparing a case for the INM and in assessing the impact of aircraft noise. The example airport, illustrated in Figure 2-8, is the basis of the sample input data file used through this manual.

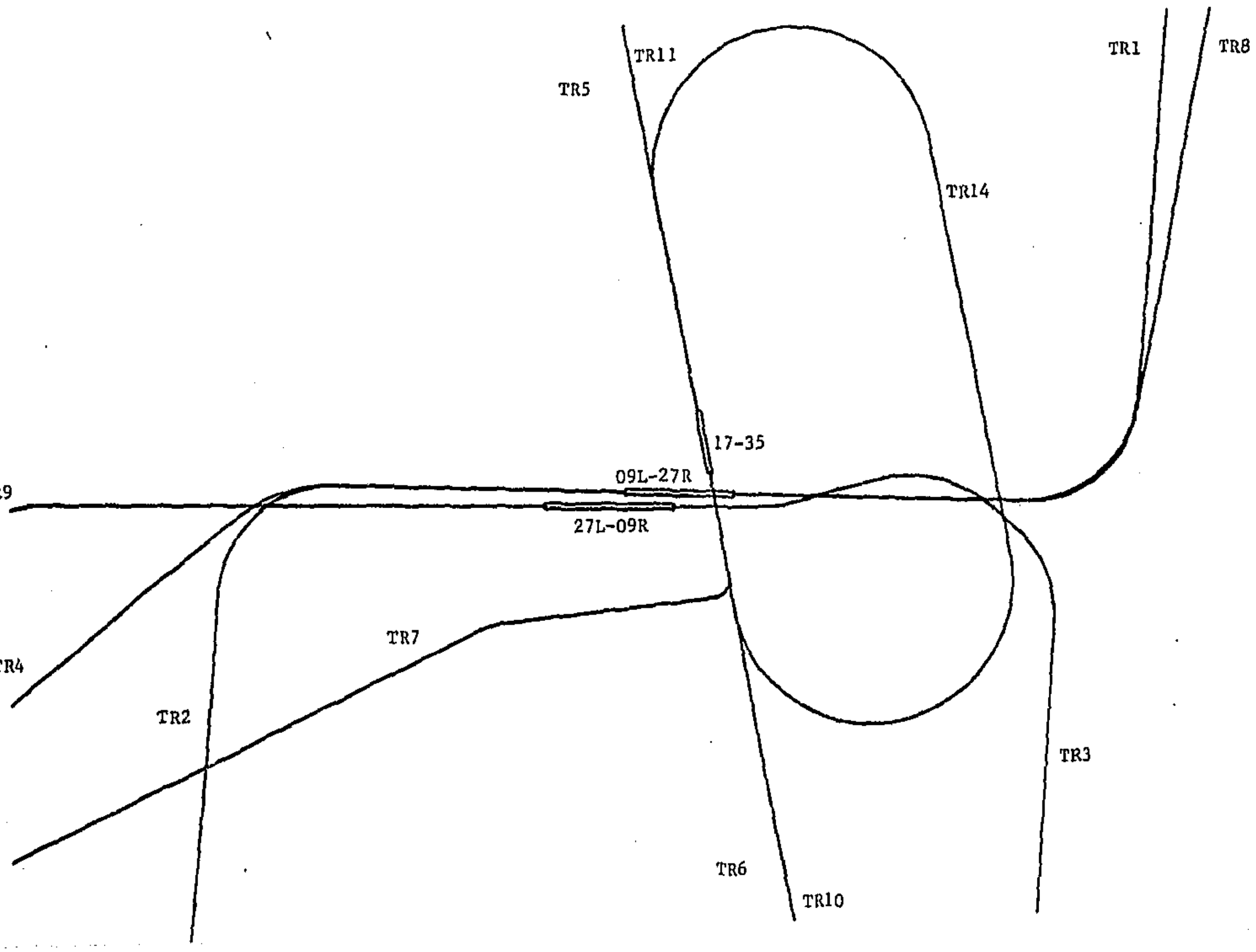


FIGURE 2-8. EXAMPLE AIRPORT

The airport system described below is given only as an example. The airport's operating characteristics are entirely fictitious and should not be construed as representative of FAA standards.

Assume the following definitions at the example airport:

- Airport elevation is at 23 feet above sea level.
- Ambient temperature near the surface is 12.66° C.
- Runways 09L/27R, 27L/09R, and 35/17 (9,500 feet, 11,129 feet, and 5,459 feet in length, respectively) are utilized at the example airport.
- There are seven takeoff tracks, four landing tracks, and one touch-and-go track.
- Eight aircraft types, B747-200, DC-10-30, B707-320B, A300, B727-200, DC-9-30, I.E. SABRE 75, and one composite general aviation single engine aircraft, are retrieved from the data base in standard form. One new aircraft type S-76 is user-defined.
- One noise curve, one approach parameter set, two approach profiles, one takeoff profile, and one takeoff modification are user-defined.
- The magnitude and mix of traffic is typical for a small to medium airport.
- The takeoff profiles of all commerical jet aircraft using track TR1 are modified to begin acceleration to clean-up at an altitude of 700 feet.

3.0 PREPARING CASE INPUTS

The input data for the INM Version 3 consists of the following six major sections:

SETUP	containing airport and runway data
AIRCRAFT	containing aircraft types, noise curves, approach parameters, profiles for approach and takeoff, and takeoff modifications
TAKEOFFS	containing takeoff tracks and operations
LANDINGS	containing landing tracks and operations
TOUCHGOS	containing touch-and-go tracks and operations
PROCESS	containing the process commands

All sections are required with the exception that only one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) is required. Section 3 describes the procedure for arranging the input data into these data sections.

The input data file structure is free format with keywords used to identify the data sections, data elements and control steps. This type of format provides the user with a readable and naturally ordered input format which is both flexible and easy to use.

The keywords have a hierarchical structure which aids the INPUT Module in processing the user input. The major keywords, called level 1 keywords, begin and end the input file or start one of the major sections of input data described above. Within each major section, there are level 2 keywords which may start subsections of data or label data elements. Table 3-1 shows the ordering of level 1 and level 2 keywords in the INM. Within each subsection successively lower level keywords are used until a keyword is associated with a data element or group of elements.

TABLE 3-1

ORDER OF LEVEL 1 AND LEVEL 2 KEYWORDS

Level 1 Keyword	Level 2 Keyword
BEGIN.	
SETUP:	
	TITLE
	AIRPORT
	ALTITUDE
	TEMPERATURE
AIRCRAFT:	
	TYPES
	NOISE CURVES
	APPROACH PARAMETERS
	PROFILES APPROACH
	PROFILES TAKEOFF
	MODIFICATIONS TAKEOFF
TAKEOFFS BY FREQUENCY: or TAKEOFFS BY PERCENTAGE:	
	OPER
	TRACK
	MOD.
	NOMOD.
LANDINGS BY FREQUENCY: or LANDINGS BY PERCENTAGE:	
	OPER
	TRACK
TOUCHGOS BY FREQUENCY: or TOUCHGOS BY PERCENTAGE:	
	OPER
	TRACK
PROCESS:	
	EXECUTE
	NOEXECUTE
	VERIFY
	NOVERIFY
	WARN
	NOWARN
	DATA BASE
	PREVIEW
	CONTOUR
	RETRIEVE
	GRID
END.	

In order to allow for processing of the free format keyword input data in an effective and efficient manner, a number of assumptions have been made about the input data. In addition, the programming logic of the model puts certain restrictions on how the input data can be formatted. From these assumptions and restrictions a set of general rules for creating an input data file has been developed. These rules are presented in Table 3-2. In addition, Table 3-3 presents limitations on the number of items of specific types which may be present in a given scenario.

Table 3-4 contains a summary of pertinent information about the keywords and data which must or may be present in a user input file. Figure 3-1 presents a sample input file to illustrate the format. Within Table 3-4 the keywords are ordered as they might appear in a user input file and are indented to show their heirarchical structure. Any data item or group of items associated with the keyword is listed in the second column. The third column indicates whether a keyword or a keyword with its data item are required or optional. "R" indicates that an entry is required in every input data file. "O" indicates that it is optional. "R2" indicates that it is required if the user selected its higher order optional entry. For example, the keyword "NC" and a noise curve name is required if the user elected to input user-defined noise curves under the subsection "NOISE CURVES ". The format column indicates the type and number of data items to be entered. The format specifications in parentheses indicates the fixed format used to store the data on internal model files. The format also includes the units in which the ground distances are stored on the internal files. Error messages are produced if the significant digits of the data cannot be stored with this format. (See Section 4.3.) The fifth column indicates the appropriate units for the data. For ground distances, all three units options are listed indicating that it is the user's responsibility to use the flag keywords to indicate the units for the data. The value ranges provide the user a guide to selecting input and the defaults inform him of the values which will be used if he does not enter any values for these items. The last column provides miscellaneous information which is helpful in preparing the input for the particular data item.

TABLE 3-2
(Part 1 of 3)
GENERAL RULES FOR CREATING A USER INPUT DATA FILE

Keywords

1. Each keyword begins with an alpha character (A through Z) and contains no special characters other than " : ", " . " or " - ".

2. A keyword must be followed by a blank, " = ", " (", ") " or end in column 80.

3. A keyword comprised of several words must appear on one line, e.g., "NOISE CURVES".

4. Any level 1 keyword and any level 2 keyword within the "AIRCRAFT: " section must appear on a line by itself.

5. Any flag keyword must immediately precede a level 1 or level 2 keyword. If a flag keyword is embedded at a lower level, it will kick the keyword search process back up to level 2 checking and the rest of the data at the lower level will not be recognized.

Data

1. Numbers must be followed by a blank or end in column 80. The only exception is the index of a takeoff modification which may be followed immediately by ") ".

2. Names for such items as aircraft, noise curves, parameters, etc. may contain any character except a blank, " = ", " (", or ") ". It is strongly suggested that special characters be limited to " . " and " - ". Parameter names used in the approach parameter sets may begin with a number, but must contain at least one alpha character (A through Z). For example, 500FMS is an acceptable thrust parameter name. Other names are not required to contain an alpha character. For example, 727100 is a legal aircraft name.

TABLE 3-2
(Part 2 of 3)

3. A runway definition must be contained entirely on one card. A runway definition consists of the keyword "RW", a runway name, starting runway coordinates in the first direction, the keyword "TO", and the ending runway coordinates. Optionally, the definition may include the keyword "HEADING" and the heading value.

4. The delimiter "=" is required within the APPROACH PARAMETERS subsection to separate parameter names and their values. A parameter name and its associated value must appear on the same line. Use of "=" is optional in other sections of the data but the delimiter has been used in the examples to make the data more readable.

5. Whenever the user defines a new aricraft type (i.e., one not in the data base), the definition must specify an aircraft name, its category, noise curve, approach parameter set, and at least one stage number and takeoff profile.

6. New user-defined noise curves, approach parameter sets, and profiles should be labelled with unique names not used in the data base. If a user-defined item has the same name as a data base item of that type all references to that name will point to the user-defined item and not to the data base item. For example, if a data base aircraft is selected and its data base definition refers to a data base noise curve which has the same name as a user-defined noise curve, the wrong noise curve will be selected for the aircraft. However, if the user wishes to replace an item in the data base he must use the same name.

TABLE 3-2
(Part 3 of 3)

7. Within each input data set there must be at least one runway defined in the SETUP section, one aircraft selected or defined in the AIRCRAFT section and one track and operation defined under each of the selected operations sections (TAKEOFFS, LANDINGS and TOUCHGOS). At least one of the operations sections must be present in the input data.

TABLE 3-3
SPECIFIC PROGRAM LIMITS*

Item Type	No. of Items
RUNWAYS	50
AIRCRAFT TYPES	100
NOISE CURVES	100
APPROACH PARAMETER SETS	100
APPROACH PROFILES	50
TAKEOFF PROFILES	300
TAKEOFF MODIFICATIONS	30
TRACKS	200
AIRCRAFT IN THE INM DATA BASE	75

*The limits are used only for the cross reference arrays in the model and can be easily modified by the maintenance programmer. A limit applies to the sum of the number of an item which the user defines and those which he retrieves from the data base. Note that APPROACH PROFILES always include all data base approach profiles whether or not they are referenced by the user.

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 1 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
BEGIN.		R					Level 1 keyword to start the user input data.
NOECHO.		O				ECHO.	Flag keyword to suppress printing of ECHO Reports.
ECHO.		O					Requests printing of ECHO Reports. The two commands NOECHO. and ECHO. can be used to selectively print ECHO Reports.
FT.		O				Feet	Flag keyword which indicates that in the following data ground distances are in feet. The three units keywords may be used to change units in the data file.
METRIC.		O				Feet	Flag keyword which indicates that in the following data ground distances are in meters.
INT.NM.		O				Feet	Flag keyword which indicates that in the following data ground distances are in international nautical miles.
SETUP:		R					Level 1 keyword to begin airport description section.
TITLE	Case title	O	≤ 80 characters (20A4)		Blanks		Title must be contained between the two delimiters < > , with < on the same line as the keyword and > on the same line as the last non blank character of the title.
AIRPORT	Airport name	O	≤ 36 characters (9A4)		Blanks		Name must be contained between the two delimiters < > , with < on the same line as the keyword and > on the same line as the last non blank character of the name.
ALTITUDE	Altitude of airport	O	One numeric value (F8.0)	Feet above sea level	-1296 to 29028 ft	Sea level, 0 ft.	
TEMPERATURE	Average daily airport temperature	O	One numeric value followed by a blank and a unit designator F, C or R (F6.1, 1x, A1)	Degrees F, C or R	-126° to 136° F	59° F	

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 2 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
RUNWAYS		R					Keyword to begin runway description subsection. Subsection must include at least one runway.
RW	Runway name in both directions	R	nnA-mmB or nn-mm. e.g. 09L-27R or 13-31 (A3 for each name)				See the text for a discussion of naming conventions.
	Starting coordinates (X,Y)	R	2 numeric values (F8.0 ft.)	Feet, meters or nm distances from a reference point	Length of the runway must be between 0 and 25,000 feet		
TO	Ending coordinates (X,Y)	R	2 numeric values (F8.0 ft)	Feet, meters or nm distances from a reference point	See above		
HEADING	Heading of runway in the first direction	O	1 integer value (I3)	Degrees direction	0 to 360 degrees	10Xnn where nn is the first 2 digits of the runway name for the first direction	If the heading is specified it must be within 10 degrees of 10 times the first two digits of the runway name, e.g. heading 287 for runway 29.
AIRCRAFT:		R					Level 1 keyword to begin aircraft section. Section must include at least one aircraft.
TYPES		R					Level 2 keyword to begin aircraft definition subsection.
AC	Aircraft type name	R	≤6 characters (A4,A2)				The name may be an aircraft type from the data base or one to be defined by the user. User-defined names must be unique from the data base names and other user-defined names.

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
PARAM	Approach parameter set name	O	≤ 6 characters (A4,A2)			Data base approach parameter for this A/C	The name may be for an approach parameter set from the data base or one to be defined by the user.
CURVE	Noise curve name	O	≤ 6 characters (A4,A2)			Data base noise curve for this A/C	The name may be for a noise curve from the data base or one to be defined by the user.
STAGE	Stage number and the takeoff profile name for that stage	O	One integer and one name of ≤ 6 characters (I1,1X, A4, A2)		1 to 7 for the stage number	Data base takeoff profile for this A/C and stage number	The name may be for a takeoff profile from the data base or one to be defined by the user.
CATEGORY	Category of the A/C	O	≤ 4 characters (A4)			Data base category for this A/C	Category must be J (jet) or P (propeller) combined with COM (commercial) or GA (general aviation) or MIL (military). Examples JCOM or PGA.
NOISE CURVES		O					Level 2 keyword to begin noise curve definition subsection.
NC	Noise curve name	R2	≤ 6 characters (A4,A2)				If the name is for a new user-defined noise curve it must be unique from any data base noise curve name or other user-defined noise curve name.
	Number of EPNL thrusts	R2	One integer value (I2)		2 to 10		
BY	Number of EPNL distances	R2	One integer value (I2)		2 to 22		
	Number of SEL thrusts	R2	One integer value (I2)		2 to 10		
BY	Number of SEL distances	R2	One integer value (I2)		2 to 22		
EPNL		R2					Keyword indicating beginning of EPNL noise curve data.

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
THRUSTS	EPNL thrust values	R2	One numeric value for each thrust (F7.1)	User's choice	> 0		Values must be monotonically increasing or decreasing.
							Data at this point is presented as a distance followed by the noise curve data for that distance and all thrusts. This is repeated for each distance, usually one line for each distance.
	EPNL distance value	R2	One numeric value (F6.0 ft)	Feet, meters or nm	0		Distance values must be monotonically increasing.
	EPNL noise level data	R2	One numeric value for each thrust (F6.2)	dB	> 0 to < 200		Levels decrease with decreasing thrusts. Levels decrease with increasing distances.
SEL		R2					Keyword indicating beginning of SEL noise curve data.
THRUSTS	SEL thrust values	R2	One numeric value for each thrust (F7.1)	User's choice	> 0		Values must be monotonically increasing or decreasing.
							Data at this point is presented as a distance followed by the noise level data for that distance and all thrusts. This is repeated for each distance, usually one line for each distance.
	SEL distance value	R2	One numeric value (F6.0 ft.)	Feet, meters or nm	> 0		Distance values must be monotonically increasing.
	SEL noise level data	R2	One numeric value for each thrust (F6.2)	dB	>0 to <200		Levels decrease with decreasing thrusts. Levels decrease with increasing distances.
APPROACH PARAMETERS		O					Level 2 keyword to begin approach parameters subsection.
AP	Approach parameter set name	R2	≤ 6 characters (A4,A2)				If the name is for a new user-defined approach parameter set it must be unique from any data base approach parameter set name or other user-defined set name.
WEIGHT=	Weight of aircraft	R2	One numeric value (F7.0)	lbs	> 0 to 1,000,000		
ENGINE=	Number of engines	R2	One numeric value (F2.0)		1 to 8		

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 5 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
STOP=	Stopping distance	O	One numeric value (F8.0ft)	Feet, meters or nm	Distance may not exceed length of runway		Value may be input as a positive or negative value but it will be converted to a negative value to indicate a stopping point beyond the landing threshold point.
	Speed parameters	O	Parameter name of ≤ 6 characters, "=" and a numeric value (A4,A2, "=",F6.2)	Knots	>0 to 250 for GA or COM aircraft >0 to 500 for MIL		Valid speed parameter names are TAXI, FINSP and TERMSP and the values must be such that taxi ≤ final ≤ terminal.
	Thrust parameters	O	Parameter name of ≤ 6 characters, "=", and a numeric value (A4,A2, "=", F7.1)	User's choice but must match units in noise curve	> 0		A maximum of 8 thrust parameter names may be used. Any name is acceptable except STOP, TAXI, FINSP and TERMSP. Example 3OLND=2000.
PROFILES APPROACH		O					Level 2 keyword to begin approach profiles subsection.
PF	Approach profile name	R2	≤ 6 characters (A4,A2)				If the name is for a new user-defined approach profile, it must be unique from any data base profile name or other user-defined profile name.
SEGMENTS	Number of segment points in the profile	R2	One integer value (I2)		3 to 14		Segment points are numbered from 1 to n in the order the aircraft lands.
DISTANCES	Distances from the runway end, one for each segment	R2	One numeric value or parameter name for each segment point (F10.2 ft.)	Feet, meters or nm	Value may not be -12 to -1 ft or equivalent		Last segment must have a negative value or be the parameter "STOP". If "STOP" is used it must be defined in the appropriate parameter set for any aircraft which uses this profile. Distances must be monotonically decreasing.
ALTITUDES	Altitudes above runway	R2	One numeric value for each segment point (F10.2)	Feet	≥ 0		If an altitude is 0 then the distance for that segment point must be < 0. For most cases, the altitudes should be non ascending and the glideslope should be between 2.75 and 3.0 degrees.
SPEEDS	Aircraft air speeds	R2	One numeric value or parameter name for each segment point (F10.2)	Knots	1) 0 to 250 if COM or GA and if altitude ≤ 3000ft 2) 0 to 350 if MIL and if altitude ≤ 3000 ft 3) 0 to 660 knots if altitude > 3000 ft		The only valid parameter names are TAXI, FINSP and TERMSP. Any name used must be defined in the approach parameter set for any aircraft which uses this profile. For most cases, the speeds should be non-increasing.

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 6 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
THRUSTS	Aircraft thrusts	R2	One numeric value or parameter name for each segment point except the last one. (F10.2)	User's choice but must match units in noise curve	> 0		Any parameter name used must be defined in the approach parameter set for any aircraft which uses this profile. A maximum of 8 unique thrust names can be used.
PROFILES TAKEOFF		O					Level 2 keyword to begin takeoff profiles subsection.
PF	Takeoff profile name	R2	≤ 6 characters (A4,A2)				If the name is for a new user-defined takeoff profile it must be unique from any data base profile name or other user-defined profile name.
SEGMENTS	Number of segment points in the profile	R2	One integer value (I2)		3 to 14		Segment points are numbered 1 to n in the order the aircraft takes off.
WEIGHT	Weight of aircraft	R2	One numeric value (F7.0)	lbs	> 0 to 1,000,000		
ENGINE	Number of engines	R2	One integer value (I1)		1 to 8		
DISTANCES	Distances from the runway end	R2	One numeric value for each segment point (F10.2 ft)	Feet, meters or nm	≥ 0		Distances must be monotonically increasing. For most cases, the starting distance should be 0, indicating that brake release occurs at the runway start.
ALTITUDES	Altitude above runway	R2	One numeric value for each segment point (F10.2)	Feet	≥ 0		For most cases, the altitude should be non-descending and the first two values should be 0.
SPEEDS	Aircraft air speeds	R2	One numeric value for each segment point (F10.2)	Knots	1) 0 to 250 if COM or GA and if altitude ≤ 3000 ft 2) 0 to 350 if MIL and altitude ≤ 3000 ft 3) 0 to 660 if altitude > 3000 ft		For most cases, the values should be non-decreasing.
THRUSTS	Aircraft thrusts	R2	One numeric value for each segment point except the last one (F10.2)	User's choice but must match units in noise curve	>0		The first thrust must be ≥ all other thrusts. The climb gradient must be 0 or ≥ .04.

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 7 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
MODIFICATIONS TAKEOFF		O					Level 2 keyword to begin takeoff modifications subsection.
	Takeoff modification type and index	R2	6 characters followed by integer index value in parentheses (A4,A2,"(",I2,")")		Index from 1 to 99		Valid modification types are ALTRST, TKOPOW, CLMPOW, OUTLVL, CLMGRD and ACCVZF and apply only to commercial jet aircraft. Indices are used to distinguish between modifications of the same type and are usually numbered sequentially from 1 to n.
START	Starting point of the modification	R2	Characters A= or D= followed by one numeric value (A1, "=", F8.2 ft)	Feet if altitude; feet, meters or nm if distance	> 0		The starting point is indicated as an altitude (A) or a distance (D). A start point is required for all modification types. If the modification is type CLMPOW or OUTLVL and the start is A then the value must be ≥ 400 ft.
END	Ending point of the modification	R2	Characters A= or D= followed by one numeric value (A1, "=", F8.2 ft)	feet if altitude; feet, meters or nm if distance	> 0		The ending point is indicated as an altitude (A) or a distance (D). An end point is required for all modification types except ACCVZF. The end value must be a point in the profile which is later than the start point. For type ALTRST, the end point must be a distance (D).
GRADIENT=	Climb gradient	R2	One numeric value (F5.2)		> 0 to 1.0		Only modification type CLMGRD requires a gradient value.
TAKEOFFS BY FREQUENCY:		O					Level 1 keywords to begin the takeoff operations section. If a TAKEOFFS BY FREQUENCY: is present a TAKEOFFS BY PERCENTAGE: section may not also be present in a given scenario. In this section, operations are given by describing the track and then the operations on that track.
TRACK	Track name	R2	≤ 4 characters (A4)				Track names must be unique for a given runway. It may be easier to give each track a unique name.
RWY	Runway name	R2	≤ 3 characters (A3)				Runway name must be one defined under the RUNWAYS subsection within SETUP. The runway name is followed by a description of the track which may have up to 16 segments, either straight, or left or right turns. The track is described in the order the aircraft operation uses it.
STRAIGHT	Length of a straight track segment	R2	One numeric value (F6.2 nm)	nm, feet or meters	> 0		

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 8 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
LEFT or RIGHT	Turn angle in degrees or heading, and the turn radius	R2	One integer value, designator D or H, one numeric value (I3,1X,A1,1X, F6.2 nm)	Angle in degrees; radius in nm, feet, meters	Angle 0 to 360 radius > 0		The turn angle may be described in degrees of turn (e.g. 30D) or as a resulting degree heading (e.g. 100H). The angle and its designator must appear on the same line of input. The keywords LEFT and RIGHT indicate the direction of the turn.
OPER	Aircraft type for the operations on this track	R2	≤ 6 characters (A4,A2)				The aircraft name must be one selected or defined in the TYPES subsection of the AIRCRAFT section.
STAGE	Stage number for the operation	R2	One integer value (I1)		1 to 7		A takeoff operation description (which begins with the keyword OPER) may contain values for several stages. Example OPER 727100 STAGE 1 D=3 STAGE 3 N=2. The takeoff profile for this stage must have been defined by the user or the data base.
D or E or N	Number of operations on this track for this aircraft for this time period (D, E or N)	R2	One numeric value (F7.2)		≥0		For each stage at least one non-zero D, E or N value must be given.
MOD.	Takeoff modification type and index	O	6 character name followed by index in parantheses (A4,A2,"(",I2,")")			NOMOD.	The modification type and index must have been defined under the MODIFICATIONS TAKEOFF subsection of the AIRCRAFT section. The modification, which must immediately precede a track or operation definition, applies to all tracks and commercial jet aircraft operations which follow until another modification is specified or until the NOMOD. command is used. The modification affects only data base takeoff profiles.
NOMOD.		O					Command used to turn off a previously used takeoff modification.
TAKEOFFS BY PERCENTAGE:		O					Level 1 keyword to begin the takeoff operations section. If a TAKEOFFS BY PERCENTAGE: is present, a TAKEOFFS BY FREQUENCY: section may not be present in a given scenario. In this section all operations are described first and then each of the tracks is given together with its percentages for the distribution of MIL, GA and COM aircraft operations.
OPER	Aircraft type for the operations	R2	≤ 6 characters (A4,A2)				The aircraft name must be one selected or defined in the TYPES subsection of the AIRCRAFT section.

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 9 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
STAGE	Stage number for the operation	R2	One integer value (I1)		1 to 7		A takeoff operation description (which begins with the keyword OPER) may contain values for several stages. Example OPER 727100 STAGE 1 D=3 STAGE 3 N=2. The takeoff profile for this stage must have been defined by the user or the data base.
D or E or N	Number of operations on all tracks for this aircraft type for this time period (D, E, or N)	R2	One numeric value (F7.2)		≥ 0		For each stage at least one non-zero D, E or N value must be given.
TRACK	Track name	R2	≤ 4 characters (A4)				Track names must be unique for a given runway. It may be easier to give each track a unique name.
RWY	Runway name	R2	≤ 3 characters (A3)				Runway name must be one defined under the RUNWAYS subsection within SETUP. The runway name is followed by a description of the track which may have up to 16 segments, either straight, or left or right turns. The track is described in the order the aircraft operation uses it.
STRAIGHT	Length of a straight track segment	R2	One numeric value (F6.2 nm)	Nm, feet or meters	> 0		
LEFT or RIGHT	Turn angle in degrees or heading, and the turn radius	R2	One integer value, designator D or H, one numeric value (I3,1X,A1,1X, F6.2 nm)	Angle in degrees; radius in nm, feet, or meters	Angle 0 to 360 radius > 0		The turn angle may be described in degrees of turn (e.g. 30D) or as a resulting degree heading (e.g. 100H). The angle and its designator must appear on the same line of input. The keywords LEFT and RIGHT indicate the direction of the turn.
PERCENT		R2					Keyword to indicate that the percent distribution of operations for the tracks are to follow. At least one COM, GA or MIL must be non-zero for each track. For each category, the sum of percentages over all tracks must equal 100.
COM	Percent of the commercial aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		
GA	Percent of general aviation aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 10 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
MIL	Percent of military aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		
MOD.	Takeoff modification type and index	O	6 character name followed by index in parentheses (A4,A2,"(",I2,")")			NOMOD.	The modification type and index must have been defined under the MODIFICATIONS TAKEOFF subsection of the AIRCRAFT section. The modification, which must immediately precede a track definition, applies to all tracks which follow (and consequently to all commercial jet operations on those tracks) until another modification is specified or until the NOMOD. command is used. The modification affects only data base takeoff profiles.
NOMOD.		O					Command used to turn off a previously used takeoff modification.
LANDINGS BY FREQUENCY:		O					Level 1 keywords to begin the landing operations section. If a LANDINGS BY FREQUENCY: section is present, a LANDINGS BY PERCENTAGE: may not be present in the same scenario. In this section operations are given by describing the track and then the operations on that track.
TRACK	Track name	R2	≤ 4 characters (A4)				Track names must be unique for a given runway. It may be easier to give each track a unique name.
RWY	Runway name	R2	≤ 3 characters (A3)				Runway name must be one defined under the RUNWAYS subsection within SETUP. The runway name is followed by a description of the track which may have up to 16 segments, either straight, or left or right turns. The track is described in the order the aircraft operation uses it.
HEADING	Initial approach heading of the aircraft on approach	O	One integer value (I3)	Degree of heading	0 to 360		The initial heading is required if the H designator is used to describe the track turns (see LEFT or RIGHT below).
STRAIGHT	Length of a straight track segment	R2	One numeric value (F6.2 nm)	Nm, feet or meters	> 0		

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
LEFT or RIGHT	Turn angle in degrees or heading, and the turn radius	R2	One integer value, designator D or H, one numeric value (I3,1X,A1,1X, F6.2 nm)	Angle in degrees; radius in nm, feet, or meters	Angle 0 to 360 radius > 0		The turn angle may be described in degrees of turn (e.g. 30D) or as a resulting degree heading (e.g. 100H). The angle and its designator must appear on the same line of input. The keywords LEFT and RIGHT indicate the direction of the turn.
OPER	Aircraft type for the operations on this track	R2	≤ 6 characters (A4,A2)				The aircraft name must be one selected or defined in the TYPES subsection of the AIRCRAFT section.
PROF	Approach profile name	R2	≤ 6 characters (A4,A2)				The approach profile name must be one from the data base or one previously defined.
D or E or N	Number of operations on this track for this aircraft for this time period (D, E or N)	R2	One numeric value (F7.2)		≥ 0		At least one non-zero D, E or N value must be given.
LANDINGS BY PERCENTAGE:		O					Level 1 keywords to begin the landing operations section. If a LANDINGS BY PERCENTAGE: is present, LANDINGS BY FREQUENCY: may not be present in a given scenario. In this section all operations are described first and then each of the tracks is given together with its percentages for the distribution of MIL, GA, and COM aircraft operations.
OPER	Aircraft type for the operations on this track	R2	≤ 6 characters (A4,A2)				The aircraft name must be one selected or defined in the TYPES subsection of the AIRCRAFT section.
PROF	Approach profile name	R2	≤ 6 characters (A4,A2)				The approach profile name must be one from the data base or one previously defined.
D or E or N	Number of operations on all tracks for this aircraft type for this time period (D, E or N)	R2	One numeric value (F7.2)		≥ 0		At least one non-zero D, E or N value must be given.
TRACK	Track name	R2	≤ 4 characters (A4)				Track names must be unique for a given runway. It may be easier to give each track a unique name.
RWY	Runway name	R2	≤ 3 characters (A3)				Runway name must be one defined under the RUNWAYS subsection within SETUP. The runway name is followed by a description of the track which may have up to 16 segments, either straight, or left or right turns. The track is described in the order the aircraft operation uses it.

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 12 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
HEADING	Initial approach heading of the aircraft on approach	O	One integer value (I3)	Degree of heading	0 to 360		The initial heading is required if the H designator is used to describe the track turns (see LEFT or RIGHT below).
STRAIGHT	Length of a straight track segment	R2	One numeric value (F6.2 nm)	Nm, feet or meters	> 0		
LEFT or RIGHT	Turn angle in degrees or heading, and the turn radius	R2	One integer value, designator D or H, one numeric value (I3,1X,A1,1X, F6.2 nm)	Angle in degrees; radius in nm, feet, or meters	Angle 0 to 360 radius > 0		The turn angle may be described in degrees of turn (e.g. 30D) or as a resulting degree heading (e.g. 100H). The angle and its designator must appear on the same line of input. The keywords LEFT and RIGHT indicate the direction of the turn.
PERCENT		R2					Keyword to indicate that the percent distribution of operations for the tracks are to follow. At least one COM, GA or MIL must be non-zero for each track. For each category the sum of percentages over all tracks must equal 100.
COM	Percent of the commercial aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		
GA	Percent of general aviation aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		
MIL	Percent of military aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		
TOUCHGOS BY FREQUENCY:		O					Level 1 keywords to begin the touch-and-go operations section. If a TOUCHGOS BY FREQUENCY: is present, a TOUCHGOS BY PERCENTAGE: section may not be present in a given scenario. In this section, operations are given by describing the track and then the operations on that track.
TRACK	Track name	R2	≤ 4 characters (A4)				Track names must be unique for a given runway. It may be easier to give each track a unique name.

TABLE 3-4. DESCRIPTION OF THE USER INPUT

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
RWY	Runway name	R2	≤ 3 characters (A3)				Runway name must be one defined under the RUNWAYS subsection within SETUP. The runway name is followed by a description of the track which may have up to 16 segments, either straight, or left or right turns. The track is described in the order the aircraft operation uses it.
STRAIGHT	Length of a straight track segment	R2	One numeric value (F6.2 nm)	nm, feet or meters	> 0		
LEFT or RIGHT	Turn angle in degrees or heading, and the turn radius	R2	One integer value, designator D or H, one numeric value (I3,1X,A1,1X, F6.2 nm)	angle in degrees; radius in nm, feet or meters	angle 0 to 360 radius > 0		The turn angle may be described in degrees of turn (e.g. 30D) or as a resulting degree heading (e.g. 100H). The angle and its designator must appear on the same line of input. The keywords LEFT and RIGHT indicate the direction of the turn.
OPER	Aircraft type for the operations on this track	R2	≤ 6 characters (A4,A2)				The aircraft name must be one selected or defined in the TYPES subsection of the AIRCRAFT section.
STAGE	Stage number for the operation	R2	one integer value (I1)		1 to 7		A touch-and-go operation description (which begins with the keyword OPER) may contain a value for only one stage. Example OPER 727100 STAGE 1 D=3. The takeoff profile for this stage must have been defined by the user or the data base.
PROF	Approach profile name	R2	≤ 6 characters (A4,A2)				The approach profile name must be one from the data base or one previously defined.
D or E or N	Number of operations on this track for this aircraft for this time period (D, E or N)	R2	one numeric value (F7.2)		≥ 0		At least one non-zero D, E or N value must be given.
TOUCHGOS BY PERCENTAGE:		O					Level 1 keywords to begin the touch-and-go operations section. If a TOUCHGOS BY PERCENTAGE: is present, a TOUCHGOS BY FREQUENCY: may not be present in a given scenario. In this section, all operations are described first and then each of the tracks is given together with its percentages for the distribution of MIL, GA, and COM aircraft operations.
OPER	Aircraft type for the operations	R2	≤ 6 characters (A4,A2)				The aircraft name must be one selected or defined in the TYPES subsection of the AIRCRAFT section.

TABLE 3-4. DESCRIPTION OF THE USER INPUT

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
STAGE	Stage number for the operation	R2	One integer value (I1)		1 to 7		A touch-and-go operation description (which begins with the keyword OPER) may contain a value for only one stage. Example OPER 727100 STAGE 1 D=3. The takeoff profile for this stage must have been defined by the user or the data base.
PROF	Approach profile name	R2	≤ 6 characters (A4,A2)				The approach profile name must be one from the data base or one previously defined.
D or E or N	Number of operations on all tracks for this aircraft type for this time period (D, E or N)	R2	One numeric value (F7.2)		≥ 0		At least one non-zero D, E or N value must be given.
TRACK	Track name	R2	≤ 4 characters (A4)				Track names must be unique for a given runway. It may be easier to give each track a unique name.
RWY	Runway name	R2	≤ 3 characters (A3)				Runway name must be one defined under the RUNWAYS subsection within SETUP.
							The runway name is followed by a description of the track which may have up to 16 segments, either straight, or left or right turns. The track is described in the order the aircraft operation uses it.
STRAIGHT	Length of a straight track segment	R2	One numeric value (F6.2 nm)	Nm, feet or meters	> 0		
LEFT or RIGHT	Turn angle in degrees or heading, and the turn radius	R2	One integer value, designator D or H, one numeric value (I3,1X,A1,1X, F6.2 nm)	Angle in degrees; radius in nm, feet, or meters	Angle 0 to 360 radius > 0		The turn angle may be described in degrees of turn (e.g. 30D) or as a resulting degree heading (e.g. 100H). The angle and its designator must appear on the same line of input. The keywords LEFT and RIGHT indicate the direction of the turn.
PERCENT		R2					Keyword to indicate that the percent distribution of operations for the tracks are to follow. At least one COM, GA or MIL must be non-zero for each track. For each category the sum of percentages over all tracks must equal 100.
COM	Percent of the commercial aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		
GA	Percent of general aviation aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 15 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
MIL	Percent of military aircraft operations which occur on this track	O	One numeric value (F5.1)		0 to 100		
PROCESS:		R					Level 1 keyword to begin the process commands section.
NOVERIFY.		O				VERIFY.	Supresses verification of the input data. NOVERIFY. must occur before any GRID, CONTOUR or RETRIEVE commands.
VERIFY.		O				VERIFY.	Elects option to verify. Not needed unless NOVERIFY. previously used.
NOEXECUTE.		O				EXECUTE.	Supresses execution of the model. NOEXECUTE. must occur before any GRID, CONTOUR or PREVIEW commands.
EXECUTE.		O				EXECUTE.	Elects option to execute. Not needed unless NOEXECUTE. previously used.
NOWARN.		O				WARN.	Suppresses warning messages from the modules until the WARN. command is given.
WARN.		O				WARN.	Requests the printing of warning messages from the modules.
DATA BASE		O					Level 2 keyword to indicate that commands follow to print information from the data base.
PLOT		O					Creates a plot of each of the data sets requested for print. Must immediately follow DATA BASE keyword.
*AIR	Aircraft name	O	≤ 6 characters (A4,A2)				Prints the full description of a data base aircraft, including noise curve, approach parameter set, and all takeoff profiles.
*NOI	Noise curve name	O	≤ 6 characters (A4,A2)				Prints data base noise curve data.
*APP	Approach parameter set name	O	≤ 6 characters (A4,A2)				Prints data base approach parameter set definition.
*PRO	Takeoff profile name	O	≤ 6 characters (A4,A2)				Prints data base takeoff profile description.
*END		R2					Indicates the end of the DATA BASE PRINT Module input data.
PREVIEW		O					Level 2 keyword to indicate that commands follow for the PREVIEW Module which plots tracks and operations on the track. The tracks and operations must be ones defined previously.

TABLE 3-4. D[illegible]PTION OF THE USER INPUT (PART 16 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
*NOI	Noise curve name	0	≤ 6 characters (A4,A2)				Plots data base and input file noise curve tables as noise vs. distance.
*PRO	Takeoff profile name	0	≤ 6 characters (A4,A2)				Plots data base and input file takeoff profile descriptions.
*TRACK		0					Plots all tracks in the input file.
SIZE	Paper X axis and Y axis lengths	0	2 numeric values (F8.1)	inches	>0	8.5 by 11	
SCALE	Plot scale	0	1 numeric value (F8.0)	ft/in	>0	8000	
ORIGIN	Plot origin position (X,Y) in inches relative to the lower left corner of the paper	0	2 numeric values (F8.1)	inches	≥0	Automatic centering	
*END		R2					Indicates the end of the PREVIEW Module input data.
GRID	Metrics for which grid calculations are to be made	0	≤ 4 characters for each metric (A4)			LDN	Metrics are LDN, NEF, TA, and LEQ. From one to four metrics may be selected.
DBA	TA threshold	0	One numeric value (F5.1)	dB	55 to 115 dBA	85	
START	Starting X and Y coordinates of the grid	R2	2 numeric values (F8.0 ft)	feet, meters or nm			Coordinates are in relationship to the runway (0,0) point.
STEP	X and Y increments	0	2 numeric values (F8.0 ft)	feet, meters or nm	≥0	0	If the X(Y) increment > 0, then the number of X(Y) values must be > 1.
SIZE	Number of X grid values	0	One integer value (I5)		>0	1	If the number of X values >1 then the X increment must be > 0.
BY	Number of Y grid values	0	One integer value (I5)		>0	1	If the number of Y values >1 then the Y increment must be >0.
DETAIL		0					Keyword to indicate that a Detailed Grid report is desired in addition to the Standard Grid report. A maximum of 20 points may be in the grid if a detailed report is requested.
CONTOUR	Metric for which contour calculations are to be made	0	≤ 4 characters (A4)			LDN 65,75	Only one of the metrics LDN, NEF, TA, and LEQ may be chosen. If no metric is selected, the metric and levels revert to LDN 65 and 75.
AT	Levels at which the contour is to be calculated	0	One numeric value for each level (F6.2)	dB	20 to 50 if NEF, 55 to 85 if LEQ or LDN, 0.1 to 360 if TA	LDN 65,75	A maximum of 10 levels may be selected. If no levels are selected, the metric and levels revert to LDN 65 and 75.
WITH		0					Indicates that selected CONTOUR options follow.

*** REVIEW APPENDIX B BEFORE RUNNING CONTOUR PROCESS

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 17 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
NAME	Contour name under which the contour is to be saved	O	≤ 6 characters (A4,A2)		Any unique name; a maximum of 20 can be saved in any one scenario	Blanks	Whenever a name is given, the contour data is saved for retrieval during a later execution of the model. Otherwise, the data is written to a scratch file. Data can be retrieved during the current run from either of these files.
TOLERANCE	Contour value tolerance	O	One numeric value (F4.2)	dB	≥.1	1.0	
XSTART	Window lower left X coordinate	O	One numeric value (F8.0 ft)	feet, meters or nm		-50000	All four window coordinates must be specified, otherwise the default is used, i.e., the whole window required to encompass the lowest level contour.
YSTART	Window lower left Y coordinate	O	One numeric value (F8.0 ft)	feet, meters or nm		-50000	
XSTOP	Window upper right X coordinate	O	One numeric value (F8.0 ft)	feet, meters or nm		50000	
YSTOP	Window upper right Y coordinate	O	One numeric value (F8.0 ft)	feet, meters or nm		50000	
REPORT		O				REPORT	Selects printing of the CONTOUR report. Unless NOREPORT is used, REPORT is automatic.
NOREPORT		O				REPORT	Suppresses printing of the CONTOUR report.
PLOT		O					Requests plot of the contour.
SIZE	Paper X axis and Y axis lengths	O	2 numeric values (F8.1)	inches	>0	8.5 by 11	
SCALE	Plot scale	O	1 numeric value (F8.0)	ft/in	>0	8000	
ORIGIN	Plot origin position (X,Y) in inches relative to the lower left corner of the paper	O	2 numeric values (F8.1)	inches	≥0	Automatic centering	
IMPACT		O					Requests IMPACT report for the contour
CARTESIAN	Cartesian coordinates of three non-colinear points (X,Y)	R2	6 numeric values (F8.0 ft)	feet, meters or nm			Points are required to extract census data (which is stored by geographic coordinates) for this airport (which is described in cartesian coordinates).

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
GEOGRAPHIC	Geographic coordinates of the same three non-colinear points (longitude, latitude)	R2	3 numeric values for each of 6 coordinates (F5.0, F3.0, F4.1)	degrees, minutes and seconds	longitude -180 to 180 latitude -90 to 90		Directions N and E are positive and S and W are negative. The three points must be input in the same order as the three cartesian coordinate points.
RETRIEVE		O					Requests retrieval of contour which is (1) saved in an old grid file, (2) has been saved on the new grid file or (3) has just been written to the scratch grid file. In the first two cases the NAME must be specified in order to retrieve it. In the third case, no NAME is required but the RETRIEVE command must directly follow the CONTOUR command which created the contour on the scratch grid file.
AT	Contour levels to be retrieved	O	One numeric value for each level (F6.2)	dB	20 to 50 if NEF, 55 to 85 if LEQ or LDN, 0.1 to 360 if TA	All levels used to create the contour	A maximum of 10 levels may be selected and they must be levels used to create the contour.
WITH		O					Indicates that selected RETRIEVE options follow.
NAME	Name of the contour to be retrieved	O	≤ 6 characters (A4,A2)			Blanks	If no name is specified, data is retrieved from the scratch grid file.
XSTART	Window lower left X coordinate	O	One numeric value (F8.0 ft)	ft, meters or nm		CONTOUR Window	All four window coordinates must be specified, otherwise the default is used, i.e., the window used to create the contour. The retrieved window should lie within the CONTOUR window.
YSTART	Window lower left Y coordinate	O	One numeric value (F8.0 ft)	ft, meters or nm		CONTOUR Window	
XSTOP	Window upper right X coordinate	O	One numeric value (F8.0 ft)	ft, meters, or nm		CONTOUR Window	
YSTOP	Window upper right Y coordinate	O	One numeric value (F8.0 ft)	ft, meters, or nm		CONTOUR Window	
REPORT						REPORT	Selects printing of the CONTOUR report. Unless NOREPORT is used, REPORT is automatic. At least one type of report (REPORT, PLOT or IMPACT) must be selected under a RETRIEVE command.
NOREPORT		O				REPORT	Suppresses printing of the CONTOUR report.
PLOT		O					Requests plot of the contour.

TABLE 3-4. DESCRIPTION OF THE USER INPUT (PART 19 of 19)

KEYWORD	DATA ITEM	REQ.	FORMAT	UNITS	VALUE RANGE	DEFAULT	COMMENTS
SIZE	Paper X axis and Y axis lengths	O	2 numeric values (F8.1)	inches	>0	8.5 by 11	
SCALE	Plot scale	O	1 numeric value (F8.0)	ft/in	>0	8000	
ORIGIN	Plot origin position (X,Y) in inches relative to the lower left corner of the paper	O	2 numeric values (F8.1)	inches	≥0	Automatic centering	
IMPACT		O					Requests IMPACT report for the contour.
CARTESIAN	Cartesian coordinates of three non-colinear points (X,Y)	R2	6 numeric values (F8.0 ft)	feet, meters or nm			Points are required to extract census data (which is stored by geographic coordinates) for this airport (which is described in cartesian coordinates).
GEOGRAPHIC	Geographic coordinates of the same three non-colinear points (longitude, latitude)	R2	3 numeric values for each of 6 coordinates (F5.0, F3.0, F4.1)	degrees, minutes and seconds	longitude -180 to 180 latitude -90 to 90		Directions N and E are positive and S and W are negative. The three points must be input in the same order as the three cartesian coordinate points.
END.							Level 1 keyword to indicate the end of the user input data.

```
BEGIN.

SETUP:
  TITLE <ANNUAL AVERAGE EXPOSURE AT AN EXAMPLE OF A MEDIUM HUB AIRPORT>
  AIRPORT <EXAMPLE (MHA)>
  ALTITUDE 23 TEMPERATURE 12.66 C

  RUNWAYS
    RW 09L-27R      0       0 TO  9487    -497      HEADING=93
    RW 27L-09R   4203   -1410 TO -6920   -1044      HEADING=272
    RW  35-17    7355    1366 TO  6407    6742
```

FIGURE 3-1. SAMPLE INPUT FILE (PART 1 OF 7)

```
AIRCRAFT:

  TYPES
    AC 747200
    AC DC1030
    AC 707320
    AC A300
    AC 727200
    AC DC930
    AC GAMTF
    AC COMSEP
    AC S-76     CURVE=250C30 PARAM=HELI STAGE 1=HORFLT
                CATEGORY=PGA

  NOISE CURVES
    NC 250C30       3 BY 8    3 BY 8
      EPNL
      THRUSTS       1         2         3
          200     90.2      91.2      97.2
          400     85.8      87.2      93.1
          600     83.1      84.5      90.6
         1000     79.4      80.7      87.4
         2000     73.7      75.1      82.6
         4000     67.6      68.2      77.2
         6000     63.1      63.8      73.7
        10000     56.8      57.4      68.7
      SEL
      THRUSTS       1         2         3
          200     88.6      90.0      95.6
          400     84.2      85.6      91.5
          600     81.5      82.9      89.0
         1000     77.8      79.1      85.8
         2000     72.1      73.5      81.0
         4000     66.0      66.6      75.6
         6000     61.5      62.2      72.1
        10000     55.2      55.8      67.1
```

FIGURE 3-1. SAMPLE INPUT FILE (PART 2 OF 7)

```
NOECHO.
  APPROACH PARAMETERS
    AP HELI     WEIGHT=10000   ENGINE=2  STOP=1
                TERMSP=160     FINSP=160 TAXI=160
                LEVAPP=3       3DLND=3

INT.NM.

  PROFILES APPROACH
    PF ALT3D SEGMENTS=7
              DISTANCES    10.     8.      5.      3.      1.    -.164    STOP
              ALTITUDES    3236   2600    1644    1007    370      0        0
                 SPEEDS TERMSP  TERMSP  TERMSP  FINSP   FINSP   FINSP    TAXI
                THRUSTS 3DAPTS  3DAPTS  3DAPTS  3DLND   3DLND    REV

    PF COPTR SEGMENTS=7
             DISTANCES    3.9    3.1    2.4    1.6    0.8     0       0
             ALTITUDES   2500   2000   1500   1000    500     0       0
                SPEEDS FINSP  FINSP  FINSP  FINSP  FINSP  FINSP    TAXI
               THRUSTS 3DLND  3DLND  3DLND  3DLND  3DLND  3DLND

ECHO.
FT.

  PROFILES TAKEOFF
    PF HORFLT SEGMENTS=8 WEIGHT=10000 ENGINES=2
                DISTANCES       0    1376    4126    6876    6877    9626   10000   15000
                ALTITUDES       0       0     500    1000    1000    1500    1500    1500
                SPEEDS         32     160     160     160     160     160     160     160
                THRUSTS         2       2       2       2       1       1       1

INT.NM.

  MODIFICATIONS TAKEOFF
    ACCVZF(1) START A=700
```

FIGURE 3-1. SAMPLE INPUT FILE (PART 3 OF 7)

```
TAKEOFFS BY FREQUENCY:
  MOD. ACCVZF(1)
  TRACK TR1 RWY 09L STRAIGHT 4.1 LEFT 5 H 1.6 STRAIGHT 50
    OPER 747200 STAGE 1 D=1.1 STAGE 2 D=1.1 STAGE 3 D=1.1
    OPER DC1030 STAGE 1 D=1.5 STAGE 2 D=2.5 STAGE 4 D=2
    OPER 727200 STAGE 1 D=3 N=.5 STAGE 2 D=2.6 N=.6
                STAGE 3 D=1.2 N=.1
    OPER DC930 STAGE 1 D=26.5 N=.5 STAGE 2 D=8 N=.5
               STAGE 3 D=1.5
  NOMOD.
  TRACK TR2 RWY 27R STRAIGHT 4.1 LEFT 88 D 1.6 STRAIGHT 50
    OPER DC1030 STAGE 1 D=1.5 STAGE 2 D=3 STAGE 3 D=1
                STAGE 4 D=1 STAGE 5 D=.5 STAGE 6 D=.5
    OPER 707320 STAGE 1 D=2 N=.5 STAGE 2 D=3.5 N=1
                STAGE 3 D=1 STAGE 4 D=2.5 STAGE 5 D=1
                STAGE 6 D=.5
    OPER A300  STAGE 2 D=2 STAGE 3 D=1
    OPER 727200 STAGE 1 D=6 N=1 STAGE 2 D=4.4 N=1.4 STAGE 3 D=1.8
                N=.4
  TRACK TR3 RWY 09R STRAIGHT 1.3 LEFT 15 D 1.0 STRAIGHT 1.4
                    RIGHT 57 D 1.8 STRAIGHT .5 RIGHT 50 D 1.6
                    STRAIGHT 50
    OPER 707320 STAGE 1 D=2 N=.5 STAGE 2 D=3.5 N=1 STAGE 3 D=1
                STAGE 4 D=1.5 STAGE 5 D=.5
    OPER 727200 STAGE 1 D=21 N=2.5 STAGE 2 D=16.5 N=4
                STAGE 3 D=8 N=.5
    OPER DC930  STAGE 1 D=26.5 N=.5 STAGE 2 D=8 N=.5 STAGE 3 D=1.5
  TRACK TR4 RWY 27R STRAIGHT 4.1 LEFT 230 H 2.2 STRAIGHT 50
    OPER GAMTF STAGE 1 D=3 N=.1
  TRACK TR5 RWY 35 STRA GHT 50
    OPER GAMTF STAGE 1 D=18 N=1.5 STAGE 2 D=12.5 N=1
    OPER COMSEP STAGE 1 D=13 N=1
  TRACK TR6 RWY 17 STRAIGHT 50
    OPER GAMTF STAGE 1 D=6 N=.5 STAGE 2 D=6.5
    OPER COMSEP STAGE 1 D=30 N=3
  TRACK TR7 RWY 17 STRAIGHT 1.5 RIGHT 265 H .25 STRAIGHT 3
                   LEFT 245 H 1.0 STRAIGHT 50
    OPER S-76  STAGE 1 D=5
```

FIGURE 3-1. SAMPLE INPUT FILE (PART 4 OF 7)

```
LANDINGS BY PERCENTAGE:
    OPER 747200 PROF=STD3D D=3  N=0
    OPER DC1030 PROF=STD3D D=22 N=2
    OPER 707320 PROF=ALT3D D=22 N=2
    OPER A300   PROF=STD3D D=2 N=1
    OPER 727200 PROF=ALT3D D=70 N=10
    OPER DC930 PROF=ALT3D D=70 N=4
    OPER GAMTF PROF=GA3D D=25 N=2
    OPER COMSEP PROF=GA3D D=42 N=5
    OPER S-76 PROF=COPTR D=5
  TRACK TR8 RWY 27R STRAIGHT 50 RIGHT 82 D 1.5 STRAIGHT 4.2
                    PERCENT COM=72 GA=0
  TRACK TR9 RWY 09R HEADING 260 STRAIGHT 50 RIGHT 272 H 1.5 STRAIGHT 7
                   PERCENT COM=28 GA=0
  TRACK TR10 RWY 35 STRAIGHT 50 PERCENT COM=0 GA=30
  TRACK TR11 RWY 17 STRAIGHT 50 PERCENT COM=0 GA=70
```

FIGURE 3-1. SAMPLE INPUT FILE (PART 5 OF 7)

```
TOUCHGOS BY FREQUENCY:
  TRACK TR14 RWY 17 STRAIGHT 3 LEFT 180 D 2.0 STRAIGHT 6
                    LEFT 180 D 2.0 STRAIGHT 3
    OPER COMSEP STAGE 1 PROF=GA3D D=23
```

FIGURE 3-1. SAMPLE INPUT FILE (PART 6 OF 7)

```
PROCESS:
FT.
NOWARN.
     DATA BASE
        *AIR A300
        *NOI CGASEP
        *END

     PREVIEW
        *TRACK TR14 RUNWAY 17 AIRCRAFT COMSEP STAGE 1 PROFILE GA3D
        *END
WARN.
     GRID NEF LDN TA START=-3000 1500 STEP=1000 700 SIZE= 2 BY 3

     GRID LEQ TA DBA=75 START=11000 3000 STEP=0 0 SIZE= 1 BY 1  DETAIL

     CONTOUR LDN AT 65 75
             WITH NAME=CASE1

     CONTOUR NEF AT 30 40
             WITH TOLERANCE=2.5
             XSTART=-10000 YSTART=-3000
             XSTOP=15000  YSTOP=5000
             NOREPORT
             PLOT

     RETRIEVE AT 65 75
             WITH NAME=CASE1
             NOREPORT
             PLOT SIZE=11 8.5 SCALE=8000

END.
```

FIGURE 3-1. SAMPLE INPUT FILE (PART 7 OF 7)

Each user input file must start with the keyword "BEGIN." and terminate with the keyword "END.". The following subsections describe the keywords and data to be contained in a user input file. The first subsection discusses the ECHO and units options, the second subsection discusses the data for the first five major data sections and the third subsection discusses the sixth major data section.

3.1 SELECTING THE ECHO AND UNITS OPTIONS

The INM produces twelve reports to ECHO portions of the input data. The user may elect to print or not print any of the first eleven reports by using the flag keywords "ECHO." and "NOECHO." in the appropriate places in the input file. Table 3-5 lists the twelve ECHO reports and indicates the keyword in the input file before which the "ECHO." and "NOECHO." keywords must be inserted. In using these options, the user should take advantage of the facts that an option stays in effect until it is changed by the other option and that the initial default option is "ECHO.". For example, if the user elects to print reports 1, 2, 3, 8, 9, 10 and 11 he would insert "NOECHO." immediately before "NOISE CURVES" and "ECHO." immediately before "MODIFICATION TAKEOFFS". The first three reports would be printed because the default option is "ECHO.". The "NOECHO." command would suppress printing of reports 4, 5, 6 and 7. The "ECHO." command would elect printing of reports 8, 9, 10 and 11, and report 12 would automatically be printed.

The INM also allows the user the option of selecting the units in which to enter his ground distances. He may elect feet, meters or international nautical miles by using the keywords "FT.", "METRIC.", or "INT.NM.", respectively. An international nautical mile is equivalent to 6076.1155 feet. The keyword must be inserted before a level 1 or level 2 keyword which precedes the ground distances. The units selected apply to all ground distances which follow until another units keyword is encountered. The default units option is feet and is in effect until the user selects other units. Table 3-4 indicates which values are affected by the units option. The user may change units for various parts of the input file. For example, in Figure 3 - 1 distances in the approach profiles are in nautical miles but in the takeoff profiles are in feet. Therefore, "INT.NM." has been inserted before " PROFILES APPROACH " and "FT." before " PROFILES TAKEOFF ".

TABLE 3-5
SELECTING ECHO REPORTS

Report Number	Report Title		Keyword Before Which to Select Option
1	SETUP		SETUP
2	RUNWAYS		RUNWAYS
3	AIRCRAFT		TYPES
4	NOISE CURVE		NOISE CURVES
5	APPROACH PARAMETERS		APPROACH PARAMETERS
6	APPROACH PROFILES		PROFILES APPROACH
7	TAKEOFF PROFILES		PROFILES TAKEOFF
8	TAKEOFF MODIFICATIONS		MODIFICATIONS TAKEOFF
9	TAKEOFF TRACKS, OPERATIONS, DISTRIBUTION	or	TAKEOFFS BY FREQUENCY TAKEOFFS BY PERCENTAGE
10	LANDING TRACKS, OPERATIONS, DISTRIBUTION	or	LANDINGS BY FREQUENCY LANDINGS BY PERCENTAGE
11	TOUCH-AND-GO TRACKS, OPERATIONS, DISTRIBUTION	or	TOUCHGOS BY FREQUENCY TOUCHGOS BY PERCENTAGE
12	PROCESSES		Automatically printed

Note that the default option "FT." was used for the runway data, noise curves and approach parameters.

3.2 PREPARING THE BASIC AIRPORT SCENARIO

The basic airport scenario consists of the first five major data sections. The following subsections describe each of these data sections.

3.2.1 SETUP SECTION

This section of the input data contains two major groups of data: airport characteristics and runway definitions. A sample SETUP section is shown in Figure 3-1, part 1.

3.2.1.1 Airport Characteristics

All of the airport characteristics data are optional and each data item has a default as shown in Table 3-4. These data include an 80-character title for the scenario, a 36-character name for airport, the airport altitude, and the temperature in one of three units. The temperature value must be followed by a unit designator F (Fahrenheit),
C (Celsius), or R (Rankine).

3.2.1.2 Runways

Each runway description must be contained on one card. A description begins with the keyword "RW" and includes the runway names, coordinates, and optional heading.

The number of runways in a given scenario is limited to 50, i.e., 25 pairs. The input format requires that runways are input in pairs such that the runways have the same surface but different directions.

A runway name consists of a two-digit number with the property that ten times the number is within ten degrees of the runway heading. For example, if a runway has a heading of 272° it could be named 27, and its associated runway which has a heading of 88° would be named 09. If a second runway has a heading of 267° and is also named 27, the two runways can be distinguished by using the letters R (right) and L (left), i.e., the names would be 27R and 27L. A third runway lying between these two can be distinguished by using the letter C (center), i.e., the name would be 27C.

In the user input data file the keyword "RW" must be followed by the runway name in both directions. The combination is of the format nn-mm or nnA-mmB with no imbedded blanks. The nn and mm are two-digit designators as discussed above, e.g.,27 or 09 and the A and B are the proper combination of L (left), and R (right) and C (center). For example, 13-31, 27L-09R, 27R-09L and 27C-09C are all valid combinations of runway names.

The runway name is followed by the X-,Y- coordinates of the beginning and end of the runway in the first direction. The beginning of a runway is that point where a departing plane would start its takeoff roll or a landing plane could first touch down. The latter description is called the threshold point for a landing aircraft and is defined as the beginning of that portion of the runway useable for landing. The end of the runway would be the start of the takeoff roll or the threshold point for aircraft using the runway in the opposite direction. Thus, the endpoints of the runway have dual definitions in terms of their useage, and the implication is that both points are the physical runway ends. The two pairs of coordinates are separated in the input by the keyword "TO ".

The actual heading for the runway in the first direction may also be entered by preceding the value with the keyword "HEADING". This option would normally be used when the heading is not divisible by 10, e.g.,272°. If no heading is given for a runway, it is assumed that the heading is 10 times the two-digit name. Therefore, if runway 27 has an actual heading of 272° but no heading value was entered then the default option would assign a heading value of 270°.

3.2.2 AIRCRAFT SECTION

This section of the input data contains six major groups of data: TYPES, NOISE CURVES, APPROACH PARAMETERS, PROFILES APPROACH, PROFILES TAKEOFF, and MODIFICATIONS TAKEOFF. The TYPES subsection is mandatory but the other five subsections are optional. Parts 2 and 3 of Figure 3-1 illustrate a sample AIRCRAFT section.

3.2.2.1 TYPES Subsection

This subsection is used to (1) select aircraft from the data base, (2) modify data base aircraft and (3) enter user-defined aircraft types. At least one aircraft type must be listed under this subsection.

Each aircraft definition begins with the keyword "AC " and a unique aircraft type name. If an aircraft is to be selected from the data base, the definition requires no more data. If the aircraft is to be modified from the data base aircraft, then those items to be modified must be entered. For example, " CURVE =JET-Y " would indicate that the noise curve for this aircraft is to be replaced by JET-Y. If the aircraft is a user-defined aircraft, the definitions must include the approach parameter set name, the noise curve name, the takeoff profiles for all stages to be used and the aircraft category. At least one takeoff profile must be given.

The valid takeoff stage numbers are 1 through 7 and represent the following trip length ranges:

1	0 to 500	miles
2	500 to 1000	miles
3	1000 to 1500	miles
4	1500 to 2500	miles
5	2500 to 3500	miles
6	3500 to 4500	miles
7	over 4500	miles

The names used within a definition may refer to a data base item or to a user-defined item. In the latter case, the item must be properly defined in the user input.

3.2.2.2 NOISE CURVES Subsection

This subsection contains the user-defined noise curves. Each noise curve definition begins with the keyword "NC " and a unique noise curve name. Each noise curve consists of noise levels at a number of distances for various engine thrust settings.The data is broken into two sections, one for EPNL and the other for SEL.

The noise curve name is followed by the number of EPNL thrusts and distances and the number of SEL thrusts and distances. The thrusts are in user-defined units. The units, however, must be constant within a noise curve definition and must be used only in conjunction with profiles having thrusts in the same units.

Next, the EPNL data is entered. The first line following the keyword "EPNL" provides the thrust values. Then for each distance, a line of data is entered giving the distance value and the noise levels at each of the thrust settings. The SEL data is entered similarly.

If the noise curve is a replacement for one in the data base, its name must match the data base name. The user must remember that whenever a data base noise curve is replaced it is replaced for all aircraft which use it. If the noise curve is a new one, the name must be unique from all data base names and all other user-defined names.

3.2.2.3 APPROACH PARAMETERS Subsection

This subsection contains the user-defined approach parameter sets. Each approach parameter set definition begins with the keyword "AP " and a unique approach parameter set name. Each parameter set must provide the aircraft landing weight and number of engines and then the definitions for any parameters to be used in approach profiles. Each parameter name must be followed by " = " and the parameter value, all on the same line. The only valid distance parameter is "STOP ", which designates the distance the aircraft travels from the touchdown point to the point where the airplane stops. The stop distance is treated as a negative value whether it is entered as a negative or a positive value. The valid speed parameters are "TAXI ", "FINSP " and "TERMSP " for taxi, final speed and terminal speed, respectively. Taxi speed is the aircraft taxiing speed. Final speed is the speed at which an aircraft flies in order to maintain its final approach course. Terminal speed is the speed at which an aircraft enters the terminal control area. Any parameter names, except " STOP ", " TAXI ", " FINSP " and "TERMSP ", may be used for thrusts. See subsection 2.1.6 for a description of the thrust parameters used in the data base.

If the approach parameter set is a replacement for one in the data base, its name must match the data base name. The user must remember that whenever a data base approach parameter set is replaced it is replaced for all aircraft which use it. If the approach parameter set is a new one, the name must be unique from all data base names and all user-defined names.

3.2.2.4 PROFILES APPROACH Subsection

This subsection contains the user-defined approach profiles. Each profile begins with the keyword "PF " and a unique profile name. The approach profile is entered in the order in which the aircraft would fly on landing.

The input data consists of the number of segment points in the profile and the distance, altitude, speed and thrust values for each point. Parameter names may be used in place of values but they must be defined in the approach parameter set for any aircraft which uses the profile. The input data is described below:

(1) The distance is the distance of the point (along the runway or ground track) from the threshold point. By convention, distances along the runway (after passing the threshold point) are entered as negative values. The distance for the last point in the profile must be negative or the parameter "STOP ".

(2) The altitude is the height of the point, in feet, above the runway, not above sea level. On and after touchdown, the height is zero (0).

(3) The speed is the speed of the aircraft in knots as it crosses the point being described. For the last point this will be the taxiing speed.

(4) The thrust is the thrust of the aircraft in user-selected units. The units, however, must agree with those used in the noise curves for any aircraft which uses the profile. Each thrust entry is applied to the segment connecting the point specified to the next higher numbered point. Therefore, no thrust value is entered for the last segment point.

In the approach profile, the next to last point must be touchdown and the last point the stopping point of the aircraft. Therefore, the altitude for these two points must be zero (0).

The name for a user-defined approach profile must be unique from the data base names because the data base profiles are always extracted from the data base for use in the scenario.

3.2.2.5 PROFILES TAKEOFF Subsection

This subsection contains the user-defined takeoff profiles. Each profile begins with the keyword "PF" and a unique profile name. The takeoff profile is entered in the order in which the aircraft would fly on takeoff.

The input data consists of the number of segment points in the profile, the aircraft's takeoff weight, the number of engines on the aircraft using the profile, and the profile data. The profile data consists of the distance, altitude, speed, and thrust for each point and is described below:

(1) The distance is the distance of the point (along the runway or ground track) from the point where the takeoff roll starts.

(2) The altitude is the height of the point, in feet, above the runway, not above sea level.

(3) The speed is the speed of the aircraft in knots as it crosses the point being described.

(4) The thrust is the thrust of the aircraft in user-selected units. The units, however, must agree with those used in the noise curves for any aircraft which used this profile. Each thrust entry is applied to the segment connecting the point specified to the next higher numbered point. Therefore, no thrust value is entered for the last segment point.

The takeoff profile should begin at the start of takeoff roll, i.e., the brake release point, and a later point must be the liftoff point. Therefore, the altitude for the first two points, at least, must be zero (0).

As with noise curves, if a user-defined profile is a replacement for one in the data base, its name must match the data base name. The user must remember that whenever a data base takeoff profile is replaced, it is replaced for all aircraft which use it. If the profile is a new one, the name must be unique from all data base names and all user-defined names.

3.2.2.6 MODIFICATIONS TAKEOFF Subsection (AVAILABLE IN NEAR FUTURE)

The user may modify takeoff profiles that are part of the INM data base without completely replacing them. This subsection of input data contains those takeoff modifications. The model applies these modifications only to commercial jet aircraft operations. Each modification definition begins with a modification type and index. The valid types are described in Table 3-6. The indexes are used to distinguish between modifications of the same type and are numbered sequentially from 1 to n. For example, OUTLVL(1), OUTLVL(2), and ACCVZF(1) might be used in an input scenario. The modification type and index are followed by the "START", "END", and "GRADIENT" data, as required for the specific modification. "START" is the point on the profile at which the modification is to start and may be identified by its altitude or distance. The letters A and D indicate which reference is being used. For example, "START A=3000" indicates that the starting point is at altitude 3000 feet. "END" is the point on the profile at which the modification is to terminate and may also be identified as an altitude or distance. "END" is required for all the modification types except ACCVZF. The "GRADIENT" is climb gradient to be used and applies only to type CLMGRD.

3.2.3 TAKEOFFS SECTION

Takeoff traffic may be entered via two methods: BY FREQUENCY or BY PERCENTAGE. With the first method, the user describes a track together with each operation on that track. Each operation description gives the number of day,

TABLE 3-6

DESCRIPTION OF VALID TAKEOFF MODIFICATIONS

MODIFICATION TYPE	KEYWORD	DEFINITION	INPUT REQUIRED
Altitude restriction	ALTRST(n)	the aircraft cannot exceed the assigned altitude	START,END The end must be a distance.
Takeoff power	TKOPOW(n)	the airccraft uses full power	START,END
Climb power	CLMPOW(n)	the aircraft uses maximum continuous climb power	START,END If start is an altitude, it must be_400 ft.
Engine-out level flight power	OUTLVL(n)	the aircraft uses that power per engine which would maintain level flight if one engine were lost	START,END If start is an altitude, it must be_400 ft.
Specified climb gradient	CLMGRD(n)	the aircraft will alter power to maintain the climb gradient	START,END,GRADIENT Gradient must be_0 to 1.0.
Acceleration to clean-up	ACCVZF(n)	the aircraft accelerates to the 0^{o} flap minimum safe maneuvering speed while retracting flaps on schedule	START

evening and night departures for the operation for that particular track. With the second method, the user describes each of the takeoff operations first, giving the number of day, evening and night departures for the operation for all tracks. Then he describes each track, giving the percentage of commercial, general aviation and military operations that are to take place on that particular track. In any given scenario, only one of the two methods may be used for takeoffs. However, landings and touch-and-go's do not have to be entered using the same method as for takeoffs. Figure 3-1 part 4 shows TAKEOFFS BY FREQUENCY.

3.2.3.1 TAKEOFFS BY FREQUENCY Option

If the user elects the first method, he inputs a section of data headed by the keywords "TAKEOFFS BY FREQUENCY: ". First a track is described and then its operations.

The track description consists of a track name, a runway name and a description of up to 16 track segments. The track name must be unique for that runway. However, for ease of identification the user would be well advised to make the track name unique to all other tracks. The runway must have been defined previously. The track name is preceded by the keyword "TRACK" and the runway name by the keyword "RWY". Each track segment is designated either as being "STRAIGHT " for a given distance or as being a "LEFT " or " RIGHT " turn of a given radius. The distance or radius is given in the user-specified ground distance units. The turn angle may be given in degrees (e.g.,30 D) or as a new heading (e.g., 130 H). For takeoff tracks, the first segment must be straight because it is part or all of the takeoff roll.

Next, the operations for the track are described. Each operation begins with the keyword "OPER" and the name of the aircraft flying the operation. This is followed by "STAGE", a stage number, and the number of day, evening and night takeoffs for that stage and track. Takeoffs for several stages may be included within one operation definition. For each stage included, at least one day (D), evening (E) or night (N) designator must be entered with a non-zero value.

If the user wishes to apply a takeoff modification defined under the AIRCRAFT section, he inserts the keyword "MOD.", the modification type and the index before the track or operation to be modified. The modification is in effect for all takeoff tracks and operations which follow until a new "MOD." command is given or a "NOMOD." command is given. The "NOMOD." command means that there are no modifications in effect. The INM applies the modification only to data base takeoff profiles used for commercial jet aircraft.

3.2.3.2 TAKEOFFS BY PERCENTAGE Option

If the user elects the second method, he inputs a section of data headed by the keywords "TAKEOFFS BY PERCENTAGE: ". All of the operations are defined first, and then all of the tracks.

Each operation begins with the keyword "OPER" and the name of the aircraft flying the operation. This is followed by "STAGE", a stage number, and the number of day, evening and night takeoffs for that stage on all tracks. Takeoffs for several stages may be included within one operation definition. For each stage included, at least one day (D), evening (E) or night (N) designator must be entered with a non-zero value.

After all operations have been input, the tracks are described. The track description consists of a track name, runway name, a description of up to 16 track segments, and the percentage distribution of aircraft operations to this track. The track name must be unique for that runway. However, for ease of identification the user would be well advised to make the track name unique to all other tracks. The runway must have been defined previously. The track name is preceded by the keyword "TRACK" and the runway name by "RWY". Each track segment is designated either as being "STRAIGHT" for a given distance or as being a "LEFT" or "RIGHT " turn of a given radius. The distance or radius is given in the user-specified ground distance units. The turn angle may be given in degrees (e.g., 30 D) or as a new heading (e.g., 130 H). For takeoff tracks, the first segment must be straight because it is part or all of the takeoff roll. The distribution of operations is given with the keyword "PERCENT " and the percentage of

"COM " (commercial), "GA" (general aviation) and/or "MIL" (military) aircraft operations which take place on the given track. At least one percentage value is required. The INM uses these percentages to determine the number of takeoffs of each operation for the track.

If the user wishes to apply a takeoff modification defined under the AIRCRAFT section, he inserts the keyword "MOD.", the modification type and the index before the track to be modified. Note that when takeoffs are described by percentage the modifications can not be applied to the operation but must be applied to the track. The modification is in effect for all takeoff tracks which follow until a new "MOD." command is given or a "NOMOD." command is given. The "NOMOD." command means that there are no modifications in effect. The INM applies the modification to all commercial jet operations on the tracks but only to their data base takeoff profiles.

3.2.4 LANDINGS SECTION

Landing traffic may be entered via two methods: BY FREQUENCY or BY PERCENTAGE. With the first method, the user describes a track together with each operation on that track. Each operation description gives the number of day, evening and night arrivals for the operation for that particular track. With the second method, the user describes each of the landing operations first, giving the number of day, evening and night arrivals for the operation for all tracks. Then he describes each track, giving the percentage of commercial, general aviation and military operations that are to take place on that particular track. In any given scenario, only one of the two methods may be used for landings. However, takeoffs and touch-and-go's do not have to be entered using the same method as for landings. Figure 3-1 part 5 shows LANDINGS BY PERCENTAGE.

3.2.4.1 LANDINGS BY FREQUENCY Option

If the user elects the first method, he inputs a section of data headed by the keywords "LANDINGS BY FREQUENCY: ". First a track is described and then its operations.

The track description consists of a track name, a runway name, an initial track heading, and a description of up to 16 track segments. The track name must be unique for that runway. However, for ease of identification the user would be well advised to make the track name unique to all other tracks. The runway must have been defined previously. The initial heading preceded by the keyword "HEADING" is required only if track turns use the heading designator as described below. The track name is preceded by the keyword "TRACK" and the runway name by "RWY". Each track segment is designated either as being "STRAIGHT" for a given distance or as being a "LEFT" or "RIGHT" turn of a given radius. The distance or radius is given in the user-specified ground distance units. The turn angle may be given in degrees (e.g., 30 D) or as a new heading (e.g., 130 H). Landing tracks end at the landing threshold point on the runway.

Next the operations for the track are described. Each operation begins with the keyword "OPER" and the name of the aircraft flying the operation. This is followed by "PROF ", an approach profile name, and the number of day, evening and night landings for that track. For the operation, at least one day (D), evening (E) or night (N) designator must be entered with a non-zero value.

3.2.4.2 LANDINGS BY PERCENTAGE Option

If the user elects the second method, he inputs a section of data headed by the keywords "LANDINGS BY PERCENTAGE: ". All of the operations are defined first, and then all of the tracks.

Each operation begins with the keyword "OPER" and the name of the aircraft flying the operation. This is followed by "PROF ", an approach profile name, and the number of day, evening and night landings for all tracks. For the operation, at least one day (D), evening (E) or night (N) designator must be entered with a non-zero value.

After all operations have been input, the tracks are described. The track description consists of a track name, runway name, an initial track heading, a description of up to 16 track segments, and the percentage distribution of aircraft operations to this track. The track name must be unique for that runway. However, for ease of identification the user would be well advised to make the track name unique to all other tracks. The runway must have been defined previously. The track name is preceded by the keyword "TRACK" and the runway name by "RWY". The initial heading preceded by the keyword "HEADING" is required only if track turns use the heading designator as described below. Each track segment is either designated as being "STRAIGHT" for a given distance or as being a "LEFT " or "RIGHT" turn of a given radius. The distance or radius is given in the user-specified ground distance units. The turn angle may be given in degrees (e.g.,30 D) or as a new heading (e.g., 130 H). Landing tracks end at the landing threshold point of the runway. The distribution of operations is given with the keyword "PERCENT " and the percentage of "COM " (commercial), "GA" (general aviation) and/or "MIL" (military) aircraft operations which take place on the given track. At least one percentage value is required. The INM uses these percentages to determine the <u>number</u> of landings of each operation for the track.

3.2.5 TOUCHGOS SECTION

Touch-and-go traffic may be entered via two methods: BY FREQUENCY or BY PERCENTAGE. With the first method, the user describes a track together with each operation on that track. Each operation description gives the number of day, evening and night touch-and-go's for the operation for that particular track. With the second method, the user describes each of the touch-and-go operations first, giving the number of day, evening and night touch-and-go's for the operation for <u>all</u> tracks. Then he describes each track, giving the percentage of commercial, general aviation and military operations that are to take place on that particular track. In any given scenario, only one of the two methods may be used for touch-and-go's. However, takeoffs and landings do not have to be entered using the same method as for touch-and-go's. Figure 3-1 part 6 shows TOUCHGOS BY FREQUENCY.

3.2.5.1 TOUCHGOS BY FREQUENCY Option

If the user elects the first method, he inputs a section of data headed by the keywords "TOUCHGOS BY FREQUENCY:". First, a track is described and then its operations.

The track description consists of a track name, a runway name, and a description of up to 16 track segments. The track name must be unique for that runway. However, for ease of identification the user would be well advised to make the track name unique to all other tracks. The runway must have been defined previously. The track name is preceded by the keyword "TRACK" and the runway name by "RWY". Each track segment is designated as being either "STRAIGHT" for a given distance or as being a "LEFT" or "RIGHT" turn of a given radius. The distance or radius is given in user-specified ground distance units. The turn angle may be given in degrees (e.g., 30 D) or as a new heading (e.g., 130 H). For touch-and-go tracks, the first segment must be straight because it is part or all of the takeoff roll.

Next, the operations for the track are described. Each operation begins with the keyword "OPER" and the name of the aircraft flying the operation. This is followed by "STAGE", a stage number, "PROF", an approach profile name, and the number of day, evening, and night touch-and-go's for that track. Touch-and-go operations have only one stage. For the operation, at least one day (D), evening (E), or night (N) designator must be entered with a non-zero value.

3.2.5.2 TOUCHGOS BY PERCENTAGE Option

If the user elects the second method, he inputs a section of data headed by the keywords "TOUCHGOS BY PERCENTAGE:". All of the operations are defined first and then all of the tracks.

Each operation begins with the keyword "OPER" and the name of the aircraft flying the operation. This followed by "STAGE", a stage number, "PROF", an approach profile name, and the number of day, evening, and night touch-and-go's for <u>all</u> tracks. Touch-and-go operations have only one stage. For the operation, at least one day (D), evening (E) or night (N) designator must be entered with a non-zero value.

After all operations have been input, the tracks are described. The track description consists of a track name, runway name, a description of up to 16 track segments, and the percentage distribution of aircraft operations to this track. The track name must be unique for that runway. However, for ease of identification the user would be well advised to make the track name unique to <u>all</u> other tracks. The runway must have been defined previously. The track name is preceded by the keyword "TRACK" and the runway name by "RWY". Each track segment is designated either as being "STRAIGHT" for a given distance or as being a "LEFT" or "RIGHT" turn of a given radius. The distance or radius is given in the user-specified ground distance units. The turn angle may be given in degrees (e.g., 30 D) or as a new heading (e.g., 130 H). For touch-and-go tracks, the first segment must be straight because it is part or all of the takeoff roll. The distribution of operations is given with the keyword "PERCENT " and the percentage of "COM " (commercial), "GA" (general aviation) and/or "MIL" (military) aircraft operations which take place on the given track. At least one percentage value is required. The INM uses these percentages to determine the <u>number</u> of touch-and-go's of each operation for the track.

3.3 SELECTING THE PROCESSES TO BE PERFORMED

The PROCESS section of input data contains the commands for the processes to be performed by the INM. These processes are discussed in the following subsections.
Figure 3-1 part 7 illustrates a PROCESS section.

3.3.1 DATA VERIFICATION AND EXECUTION OPTIONS

Under normal conditions, the INM model will verify the input data and execute all of the analysis modules requested via the process commands. However, the user may suppress data verification with the command "NOVERIFY" and may suppress execution of the analysis modules for the current scenario with "NOEXECUTE". The "NOEXECUTE" command does not, however, suppress the execution of the "DATA BASE" process or the "RETRIEVE" process for an old file. The user may enter the commands "VERIFY" or "EXECUTE" but they are not necessary since they are the default options on the basic scenario. (The edit option uses these command differently. See Subsection 3.3.) Any of these four commands which are used must be input before any analysis command, i.e., "PREVIEW", "GRID", "CONTOUR", or "RETRIEVE" from a new file. The analysis commands are discussed in subsequent subsections.

Although the model will accept the process commands in a number of orders, for efficient utilization of the model, the user should enter the command "DATA BASE" and the commands for "RETRIEVE" from an old file before any process command should be entered after the "RETRIEVE" from an old file. For example, an input data file might contain "RETRIEVE" from an old file, "NOEXECUTE," and then "CONTOUR" and "RETRIEVE" from a new file.

3.3.2 WARNINGS OPTION

During execution of the analysis modules, the INM may produce warning messages for the user. However, the user may elect to print or not print these messages by using the keywords "WARN." and "NOWARN." in the appropriate places within the PROCESS data section. The keywords must be inserted immediately before a level 2 keyword. The option is in effect until the other option is elected. The default option is "WARN.". In Figure 3-1 warning messages are suppressed for the DATA BASE and PREVIEW processes. Fatal messages are always written to the printer.

3.3.3 DATA BASE SELECTION

The user may request the printing and plotting of portions of the INM data base to aid him in selecting items from the data base for his input data scenario. The request is made with the "DATA BASE" process command followed by the DATA

BASE PRINT Module input data. Each input item consists of a keyword designator and the name of the specific data base item which the user is selecting. The selection options are first, if a plot is desired, (PLOT) followed by aircraft definition (*AIR), noise curve (*NOI), approach parameter set (*APP), and takeoff profile (*PRO). Whenever an aircraft definition is selected, its associated noise curve, approach parameter set, and takeoff profiles are also printed after the aircraft definition. Any number of items may be selected from the data base, but each selection requires one keyword and one data base item name. Selection of *APP does not produce a plot. For ease of reading, each request should be on a separate line. The end of the data base input items must be indicated by the keyword "*END". Table 3-4 presents the pertinent information about the format of the input selections and Subsection 1.3 describes the items in the data base. Subsection 5.3 describes the Data Base Selection Report and PLOT which are produced in response to the "DATA BASE" process command.

3.3.4 PREVIEW OF FLIGHTS

Before performing grid or contour analyses of his input data, the user may wish to preview some or all of the flights in his scenario. The request for a PREVIEW plot is made with the "PREVIEW" process command followed by the PREVIEW Module input data. PREVIEW provides the capability to plot data base items or those items included in the input file. Each input item consists of a keyword designator and the name of the specific data base item which the user is selecting. The selection options are noise curve (*NOI) and takeoff profile (*PRO). Any number of items may be previewed but each selection requires one keyword and one data base item name. For ease of reading, each request should be on a separate line.

PREVIEW can also plot all the tracks in the input file. The keyword is "*TRACK". The user may specify the paper X-axis and Y-axis lengths, the plot scale, and the plot origin point. The proper X-axis length is the size of the paper along the X-axis. Similarly, the Y-axis length is the size of the paper along the Y-axis. These two values in inches may be specified following the keyword "SIZE". The default size is 8.5 by 11 inches. The plot scale is in feet per inch and must follow the keyword "SCALE". The default is 8000 feet per inch. The plot origin position (X,Y) in inches relative to the lower left hand corner of the paper is entered following the keyword "ORIGIN". If no origin is specified, the center of the paper is selected as the origin.

The end of the PREVIEW input data must be indicated by the keyword "*END". Table 3-4 presents the pertinent information about the format of the preview input data. Subsection 5.4 describes the Preview of Flight Plot.

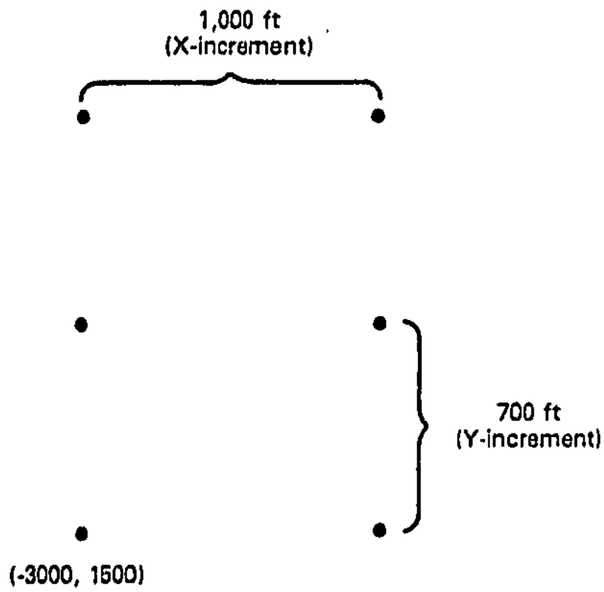
3.3.5 GRID ANALYSIS

A grid analysis determines the noise levels for a given metric at specified points on a grid around the airport area. The user may request this type of analysis with the process command "GRID" followed by the metrics for which the calculations are to be made. Any combination of the four metrics LDN, NEF, TA, and LEQ may be selected. If the user does not specify a metric, calculations are performed for LDN. The process command is followed by a description of the actual grid and optionally a report selection keyword "DETAIL". The TA metric has an optional keyword "DBA" to specify threshold.

The actual grid is defined by three entries: (1) the coordinates of the point in the lower left hand corner of the grid. The same coordinate system as was used to define the runways for the airport data file must be used here. The coordinates must be expressed in the user specified units; (2) the increment (distance) between points in each direction (X and Y) expressed in the same units; (3) the number of values along the grid in the X- and Y-directions. The actual number of points in the grid is the product of the number of X-values times the number of Y-values.

If the grid is considered as a rectangle with corners indicated by points and filed with a regular array of points, it will appear as in Figure 3-2.

The starting X- and Y-coordinates define the lower left corner of the rectangle. They should be entered after the keyword "START". The X-increment is the distance to the next point moving parallel to the X-axis. The Y-increment is the distance to the next point along the Y-axis. These values are entered after the



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

FIGURE 3-2. SCHEMATIC OF THE GRID

keyword "STEP". The number of X-values and Y-values gives the rest of the information required to define the grid and follows the keywords "SIZE" and "BY", respectively.

It is possible for the grid to consist of a single point by using "1" as the number of both the X- and Y-values. Points along one line (parallel to one axis) can form the grid by having either one X-value or one Y-value. If the grid consists of only one point, the keywords "STEP" and "SIZE" and their associated data may be omitted from the input file.

The normal output from the grid analysis is a Standard Grid Analysis Report. In addition to this report, the user may elect to receive a Detailed Grid Analysis Report provided the grid contains no more than 20 points. This option is selected by entering the keyword "DETAIL" after the grid description.

Any number of grid analyses may be requested in one execution. However, each request must consist of the process command "GRID" together with all of its associated keywords and data. Table 3-4 presents the format of the "GRID" command. Subsection 5.5 describes the two grid reports.

3.3.6 CONTOUR ANALYSES

A contour analysis determines an irregular grid of points from which may be extracted contours of the selected noise values for a given metric in the area around the airport. For example, if the metric is NEF (Noise Exposure Forecast) and the contour value is 30 dB, the area enclosed by the curve will have an NEF at or above 30 dB.

The user may request this type of analysis with the process command "CONTOUR" followed by the metric for which the calculations are to be made, the keyword "AT", and up to ten (10) levels at which contours are to be determined. Any one of the four metrics LDN, NEF, TA, or LEQ may be selected. If the user does not specify both a metric and at least one level, then the calculations are performed for LDN at levels 65 and 75. The metric TA has an optional keyword "DBA" to specify threshold.

Several user options may be selected for the contour calculations. The keyword "WITH" is used to indicate that input for some of these options follow. These options are described below.

If the user desires to save the contour data to a file for retrieval during a subsequent execution of the model, he must specify a name by which the contour data is to be identified. To select this option, the user enters the keyword "NAME" followed by a six-character name. Each contour which is to be saved must have a unique name. A maximum of 20 contours may be saved during one execution. If no name is specified for the contour, the contour data will be written to a scratch file and can only be retrieved during the current execution.

The user may also specify a contour value tolerance; i.e., the measure of smoothness of the contour line. Tolerance in decibels or minutes indicates the section of the airport noise surface which will require more detailed calculations. The default tolerance is 2.0 units. If the minimum requested contour value is 65.0 and the point being checked has a value of 63.1 then the area around this point will be subdivided further to produce more points at which to calculate noise levels. The user may change this to any desired tolerance. However, a very small tolerance will generate several thousand calculations and will greatly increase the cost of computing the contour. To exercise this option the user enters "TOLERANCE=" followed by the desired contour value tolerance. See Appendix B on methods of controlling run cost.

The last option the user has is to specify the rectangular area (or window) within which he wants the contour calculations to be restricted. The window is defined by the X- and Y-coordinates of its lower left and upper right hand corners. The keywords "XSTART", "YSTART", "XSTOP", and "YSTOP" are used to enter these data. All four window coordinates must be specified if this user option is selected. Otherwise, the model uses the default window which is a square of 100,000 foot sides around the origin.

The user may select three types of reports from the contour calculations. The selection is made with the keywords "REPORT", "PLOT", and "IMPACT". The "REPORT" option yields a tabular report of the points which define the contours. This report is automatic unless "NOREPORT" is specified. The "PLOT" option provides a CalComp plot of the contours. The "IMPACT" report is a tabular report of the numbers of people and residences contained within the various contours. The user is not required to select any type of report from a "CONTOUR" analysis and it may be very reasonable to do this if he is saving the contour for later retrieval. See Subsection 5.6 for examples of these reports.

The "PLOT" option allows additional user input and the "IMPACT" option requires additional input. These data are described below.

Under "PLOT", the user may specify the paper X-axis and Y-axis lengths, the plot scale, and the plot origin point. The proper X-axis length is the size of the paper along the X-axis. Similarly, the Y-axis length is the size of the paper along the Y-axis. These two values in inches may be specified following the keyword "SIZE". The default size is 8.5 by 11 inches. The plot scale is in feet per inch and must follow the keyword "SCALE". The default is 8000 feet per inch. The plot origin position (X,Y) in inches relative to the lower left hand corner of the paper is entered following the keyword "ORIGIN". If no origin is specified, the center of the paper is selected as the origin.

Under the "IMPACT" option the user must define the Cartesian coordinates and the geographic coordinates of three non-colinear points in the area of the contour. The Cartesian coordinates are pairs measured along the same set of axes used for the runway definitions. These values are entered after the keyword "CARTESIAN". The geographic coordinates are the longitude and latitude in degrees, minutes, and seconds. Directions North and East are entered as positive values and South and West are entered as negative values. These coordinates must follow the keyword "GEOGRAPHIC" and must describe the three points in the same order as they were described under "CARTESIAN".

Any number of contour analyses may be requested in one execution. However, each request must consist of the process command "CONTOUR" together with all of its associated keywords and data. Table 3-4 presents the format of the "CONTOUR" command.

3.3.7 RETRIEVAL OF A CONTOUR

The user may elect to retrieve data for a contour from three sources: (1) an old grid file produced by a previous execution; (2) a new saved grid file produced by the current execution; or (3) the current scratch grid file. To retrieve from the first two sources, the user must identify the name under which the contour was saved. To retrieve from the scratch file, no name is required but the "RETRIEVE" command must directly follow the "CONTOUR" command which created the contour on the scratch file.

The keywords and data used under the "RETRIEVE" command are a subset of those under the "CONTOUR" command. However, a few values have different meanings.

No metric may be specified under a "RETRIEVE" because the contour data was calculated for only one metric. However, since up to ten (10) levels of contours can be selected under "CONTOUR" any subset of these levels may be selected under the "RETRIEVE". If no levels are specified under "RETRIEVE", all of the levels which were specified for the contour are used.

The name option as discussed above is used to select the correct contour. Note that "TOLERANCE" is not a keyword under "RETRIEVE".

The window described under "RETRIEVE" should be <u>within</u> the window specified for the "CONTOUR". If no window is specified, the "CONTOUR" window is used. Again, all four coordinates must be specified to define a window.

The three types of reports are again "REPORT", "PLOT", and "IMPACT". The user must select at least one of these options. He may suppress the default "REPORT" with "NOREPORT" but must then specify "PLOT" and/or "IMPACT".

Any number of retrievals may be requested in one execution. However, each request must consist of the process command "RETRIEVE" together with all of its associated keywords and data. Table 3-4 presents the format of the "RETREIVE" command.

4.0 RUNNING THE CASE

In the previous two sections, case preparation and input into the INM were described. Section 4 describes the procedures for running the INM case on a computer system.

The input case file, as prepared in Section 3, is identified and made available to the INM on the appropriate computer system. The input case is then combined with computer instructions which make the INM available to be run, the desired modules are executed, and the results are returned. The specific instructions for executing the model vary from system to system, and therefore will not be discussed further here. However, the user may consult the Installation Instructions Manual (reference 4) for the specific procedures for running the model on those computer systems for which the model is available.

4.1 INPUT CASE CHECKLIST

The user should closely inspect his input case for completeness prior to executing the INM. The input case for the example airport is shown in Figure 4-1. Every input case must contain the following data sections:

1)	SETUP	(which contains airport descriptions and runway data)
2)	AIRCRAFT	(which selects or defines the aircraft types and inputs optional noise curves, etc.)
3)	TAKEOFFS	(which describes takeoff tracks, and defines takeoff operations BY FREQUENCY or BY PERCENTAGE)
4)	LANDINGS	(which describes landing tracks, and defines landing operations BY FREQUENCY or BY PERCENTAGE)

```
BEGIN.

SETUP:
  TITLE <ANNUAL AVERAGE EXPOSURE AT AN EXAMPLE OF A MEDIUM HUB AIRPORT>
  AIRPORT <EXAMPLE (MHA)>
  ALTITUDE 23 TEMPERATURE 12.66 C

  RUNWAYS
    RW 09L-27R      0       0 TO  9487    -497      HEADING=93
    RW 27L-09R   4203   -1410 TO -6920   -1044      HEADING=272
    RW  35-17    7355    1366 TO  6407    6742


AIRCRAFT:

  TYPES
    AC 747200
    AC DC1030
    AC 707320
    AC A300
    AC 727200
    AC DC930
    AC GAMTF
    AC COMSEP
    AC S-76    CURVE=250C30 PARAM=HELI STAGE 1=HORFLT
               CATEGORY=PGA

  NOISE CURVES
    NC 250C30     3 BY 8   3 BY 8
      EPNL
      THRUSTS      1        2        3
          200    90.2     91.2     97.2
          400    85.8     87.2     93.1
          600    83.1     84.5     90.6
         1000    79.4     80.7     87.4
         2000    73.7     75.1     82.6
         4000    67.6     68.2     77.2
         6000    63.1     63.8     73.7
        10000    56.8     57.4     68.7
```

FIGURE 4-1. THE ASSEMBLED INPUT CASE FOR THE EXAMPLE AIRPORT (PART 1 OF 5)

```
          SEL
          THRUSTS        1        2        3
              200     88.6     90.0     95.6
              400     84.2     85.6     91.5
              600     81.5     82.9     89.0
             1000     77.8     79.1     85.8
             2000     72.1     73.5     81.0
             4000     66.0     66.6     75.6
             6000     61.5     62.2     72.1
            10000     55.2     55.8     67.1

NOECHO.
  APPROACH PARAMETERS
    AP HELI    WEIGHT=10000  ENGINE=2  STOP=1
               TERMSP=160    FINSP=160 TAXI=160
               LEVAPP=3      3DLND=3

INT.NM.

  PROFILES APPROACH
    PF ALT3D SEGMENTS=7
             DISTANCES     10.      8.      5.      3.      1.    -.164    STOP
             ALTITUDES    3236    2600    1644    1007     370      0        0
                SPEEDS TERMSP TERMSP TERMSP   FINSP   FINSP   FINSP    TAXI
               THRUSTS 3DAPTS 3DAPTS 3DAPTS   3DLND   3DLND    REV

    PF COPTR SEGMENTS=7
            DISTANCES    3.9    3.1    2.4    1.6    0.8     0       0
            ALTITUDES   2500   2000   1500   1000    500     0       0
               SPEEDS FINSP FINSP FINSP FINSP FINSP FINSP       TAXI
              THRUSTS 3DLND 3DLND 3DLND 3DLND 3DLND 3DLND

ECHO.
FT.

  PROFILES TAKEOFF
    PF HORFLT SEGMENTS=8 WEIGHT=10000 ENGINES=2
              DISTANCES       0    1376    4126    6876    6877    9626   10000   15000
              ALTITUDES       0       0     500    1000    1000    1500    1500    1500
              SPEEDS         32     160     160     160     160     160     160     160
              THRUSTS         2       2       2       2       1       1       1
```

FIGURE 4-1. THE ASSEMBLED INPUT CASE FOR THE EXAMPLE AIRPORT (PART 2 OF 5)

```
INT.NM.

  MODIFICATIONS TAKEOFF
    ACCVZF(1) START A=700


TAKEOFFS BY FREQUENCY:
  MOD. ACCVZF(1)
  TRACK TR1 RWY 09L STRAIGHT 4.1 LEFT 5 H 1.6 STRAIGHT 50
    OPER 747200 STAGE 1 D=1.1 STAGE 2 D=1.1 STAGE 3 D=1.1
    OPER DC1030 STAGE 1 D=1.5 STAGE 2 D=2.5 STAGE 4 D=2
    OPER 727200 STAGE 1 D=3 N=.5 STAGE 2 D=2.6 N=.6
                STAGE 3 D=1.2 N=.1
    OPER DC930 STAGE 1 D=26.5 N=.5 STAGE 2 D=8 N=.5
               STAGE 3 D=1.5
  NOMOD.
  TRACK TR2 RWY 27R STRAIGHT 4.1 LEFT 88 D 1.6 STRAIGHT 50
    OPER DC1030 STAGE 1 D=1.5 STAGE 2 D=3 STAGE 3 D=1
                STAGE 4 D=1 STAGE 5 D=.5 STAGE 6 D=.5
    OPER 707320 STAGE 1 D=2 N=.5 STAGE 2 D=3.5 N=1
                STAGE 3 D=1 STAGE 4 D=2.5 STAGE 5 D=1
                STAGE 6 D=.5
    OPER A300  STAGE 2 D=2 STAGE 3 D=1
    OPER 727200 STAGE 1 D=6 N=1 STAGE 2 D=4.4 N=1.4 STAGE 3 D=1.8
                N=.4
  TRACK TR3 RWY 09R STRAIGHT 1.3 LEFT 15 D 1.0 STRAIGHT 1.4
                   RIGHT 57 D 1.8 STRAIGHT .5 RIGHT 50 D 1.6
                   STRAIGHT 50
    OPER 707320 STAGE 1 D=2 N=.5 STAGE 2 D=3.5 N=1 STAGE 3 D=1
                STAGE 4 D=1.5 STAGE 5 D=.5
    OPER 727200 STAGE 1 D=21 N=2.5 STAGE 2 D=16.5 N=4
                STAGE 3 D=8 N=.5
    OPER DC930  STAGE 1 D=26.5 N=.5 STAGE 2 D=8 N=.5 STAGE 3 D=1.5
  TRACK TR4 RWY 27R STRAIGHT 4.1 LEFT 230 H 2.2 STRAIGHT 50
    OPER GAMTF STAGE 1 D=3 N=.1
```

FIGURE 4-1. THE ASSEMBLED INPUT CASE FOR THE EXAMPLE AIRPORT (PART 3 OF 5)

```
TRACK TR5 RWY 35 STRAIGHT 50
  OPER GAMTF STAGE 1 D=18 N=1.5 STAGE 2 D=12.5 N=1
  OPER COMSEP STAGE 1 D=13 N=1
TRACK TR6 RWY 17 STRAIGHT 50
  OPER GAMTF STAGE 1 D=6 N=.5 STAGE 2 D=6.5
  OPER COMSEP STAGE 1 D=30 N=3
TRACK TR7 RWY 17 STRAIGHT 1.5 RIGHT 265 H .25 STRAIGHT 3
                 LEFT 245 H 1.0 STRAIGHT 50
  OPER S-76  STAGE 1 D=5

LANDINGS BY PERCENTAGE:
    OPER 747200 PROF=STD3D D=3  N=0
    OPER DC1030 PROF=STD3D D=22 N=2
    OPER 707320 PROF=ALT3D D=22 N=2
    OPER A300  PROF=STD3D D=2 N=1
    OPER 727200 PROF=ALT3D D=70 N=10
    OPER DC930 PROF=ALT3D D=70 N=4
    OPER GAMTF PROF=GA3D D=25 N=2
    OPER COMSEP PROF=GA3D D=42 N=5
    OPER S-76 PROF=COPTR D=5
  TRACK TR8 RWY 27R STRAIGHT 50 RIGHT 82 D 1.5 STRAIGHT 4.2
                    PERCENT COM=72 GA=0
  TRACK TR9 RWY 09R HEADING 260 STRAIGHT 50 RIGHT 272 H 1.5 STRAIGHT 7
                   PERCENT COM=28 GA=0
  TRACK TR10 RWY 35 STRAIGHT 50 PERCENT COM=0 GA=30
  TRACK TR11 RWY 17 STRAIGHT 50 PERCENT COM=0 GA=70

TOUCHGOS BY FREQUENCY:
  TRACK TR14 RWY 17 STRAIGHT 3 LEFT 180 D 2.0 STRAIGHT 6
                    LEFT 180 D 2.0 STRAIGHT 3
    OPER COMSEP STAGE 1 PROF=GA3D D=23


PROCESS:
FT.
NOWARN.
    DATA BASE
      PLOT
      *NOI CGASEP
      *END
```

FIGURE 4-1. THE ASSEMBLED INPUT CASE FOR THE EXAMPLE AIRPORT (PART 4 OF 5)

```
     PREVIEW
       *PRO HORFLT
       *TRACK SIZE=11 8.5 SCALE=8000
       *END
WARN.
     GRID NEF LDN TA START=-3000 1500 STEP=1000 700 SIZE= 2 BY 3

     GRID LEQ TA DBA=75 START=11000 3000 STEP=0 0 SIZE= 1 BY 1 DETAIL

     CONTOUR LDN AT 65 75
             WITH NAME=CASE1
             TOLERANCE=1.0
             XSTART=-50000 YSTART=-50000
             XSTOP=50000 YSTOP=50000

     CONTOUR NEF AT 30 40
             WITH TOLERANCE=2.5
             XSTART=-10000 YSTART=-3000
             XSTOP=15000  YSTOP=5000
             NOREPORT
             PLOT

     RETRIEVE AT 65 75
             WITH NAME=CASE1
             NOREPORT
             PLOT SIZE=11 8.5 SCALE=8000

END.
```

FIGURE 4-1. THE ASSEMBLED INPUT CASE FOR THE EXAMPLE AIRPORT (PART 5 OF 5)

5) TOUCHGOS (which describes touch-and-go tracks, and defines touch-and-go operations BY FREQUENCY or BY PERCENTAGE)

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

The only exception to this rule is in the case that one or two types of operations are not to be included in the scenario. In this case, the user may omit the TAKEOFFS, or LANDINGS, or TOUCHGOS sections if there are no operations of that type. However, the input data must include at least one of these sections and for each of these sections that is included at least one operation must be entered.

4.2 OUTPUT CHECKLIST

The INM INPUT Module includes a large number of warning and fatal error messages. The printout should be checked for these messages and the input case should be corrected to be error free. To aid the user, as the INPUT Module begins to process a major section of input it prints out a processing location message. For example, the message "*** PROCESSING SETUP SECTION" is printed prior to the processing of the section of data which follows the keyword "SETUP: ". Subsection 4.3 contains an extensive description of the INPUT Module error messages. If a fatal error is detected by the INPUT Module, execution of the model terminates immediately. If any warning errors are detected by the INPUT Module no analyses will be performed on the data and execution of the model terminates after execution of the INPUT Module.

The INPUT Module also prints out the input data in the form of ECHO reports. The user should verify that the information processed by the program is as intended. For example, the INM will compute runway lengths based upon the start and end coordinates. A runway length of 100 feet should indicate an error in the INPUT case.

If the input case is acceptable to the INPUT Module, execution of the process commands will begin. All of the other modules also produce warning and fatal error messages. The execution printout should be checked for these messages.

Section 4.3 describes these messages and instructs the user as to the action to be taken when the messages are encountered. A fatal error within any one of these modules, except the FLIGHT OVERLAY Module, causes termination of the execution of the module only and not termination of the execution of the model. Any fatal error within FLIGHT OVERLAY causes termination of the model execution. All fatal errors must be eliminated for proper execution. In addition, measures should be taken to eliminate all warning messages, if possible.

If warning messages have been suppressed via the "NOWARN" option, the user must check the message "n WARNING MESSAGES WERE PRODUCED BY MODULE abc." for each executed module. If there were messages, he may have to rerun the case for that particular analysis requesting that the "WARN" option be used. The user is cautioned not to use the "NOWARN" option on first time executions. Only after the user has analyzed these messages for a particular case and determined that no errors exist in the data should he elect the "NOWARN" option. Note that the "NOWARN" option does not affect the INPUT Module and, therefore, all messages produced by this module are written to the printer.

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

4.3 ERROR ANALYSIS AND CORRECTION

Each module of the INM produces its own error messages. Each message is of the form

Axx *FATAL: ....

or

Axx *WARNING: ...

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

C	COMPUTATION
CN	CONTOUR
DB	DATA BASE PRINT
E	EXECUTIVE
F	FLIGHT OVERLAY
I	INPUT
M	IMPACT
P	PLOT
PR	PREVIEW
RG	REPORT GENERATOR
V	VERIFY

A fatal message within the EXECUTIVE or within the INPUT or FLIGHT OVERLAY Modules causes termination of the model execution. A fatal message within any other module causes control to be returned to the EXECUTIVE Module which will attempt to continue the processing of modules as directed by the processing template.

Appendix A contains a list of the model error messages, their causes and possible correction. The error messages are arranged in alphabetic order and separated into groups by modules.

The INPUT Module error messages require special discussion. The module processes the user input data file and produces error messages to aid the user in debugging his input data file. After the entire input data file has been processed with no fatal errors and the requested ECHO Reports have been produced, the module checks to see if any warning messages were produced. If there were warning messages, the module terminates execution of the model with fatal error 122. This procedure eliminates costly execution of inaccurate or incomplete input scenarios.

In order to use the INPUT Module error messages to debug the input data, the user must understand the general procedure by which the module processes the input data. That procedure is described below.

The input data file is processed by first identifying if a keyword is a level 1 keyword and determining if it is in the proper order. The proper order is that shown in Table 3-1 in Section 3.0 with the exception that only one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) need be present in the input file. If the keyword is " BEGIN.", the next keyword is processed. If the keyword is " END.", no more input data is processed. Otherwise, the next keyword is checked against the level 2 keyword list for that particular level 1 keyword. Similarly, successively lower level keywords are identified and their associated data processed. Whenever a keyword does not match the list of allowable keywords at that level, it is checked against the next higher level of allowable keywords until a match is found or ultimately that there is no level 1 match. In the latter case error message 13 is printed out and the next keyword is checked against level 1. Checking will remain at level 1 until a match is found. Because of this method of checking, if a lower level keyword is misspelled all subsequent keywords within that section will not be recognized. However, this method does allow for extensive checking within a section and eliminates having one long list of allowable keywords. Note that flag keywords are recognized at all level 2's and at level 1.

5.0 INTERPRETING THE OUTPUT

The output of the INM consists of printed reports, and flight and contour plots. The INPUT Module produces formatted ECHO Reports of the input data file. The VERIFY Module produces a report of warning messages about the consistency of the input data and the data base. The DATA BASE PRINT Module prints selected portions of the data base in formatted reports. The PREVIEW Module produces a plot of selected flights from the input case.

A grid analysis produces a printed report of noise exposure at specific locations on the ground. A contour analysis creates a report of ground locations with equal noise exposure. In addition, a contour analysis may produce a plot of these contours and a report of population impact within the contours. The following subsections describe each of these reports.

5.1 ECHO REPORTS

The INPUT Module produces 12 ECHO Reports to provide the user with a quick means of detecting errors in the input data. Figures 5-1 through 5-12 illustrate the 12 reports. The reports, which are formatted with headers, are easy to read and essentially self-explanatory. Ground distances are given in all three units so that the user can check if the input is in the appropriate units. To facilitate processing within the model, approach profiles and tracks, which are entered in the order in which they are flown, have been reversed. The ECHO Reports show these items in the reversed order and consequently tracks are associated with the runway in the opposite direction. Subsection 3.1 describes how to obtain these reports.

5.2 VERIFY REPORT

(TO BE ADDED)

S E T U P

TITLE	ANNUAL AVERAGE EXPOSURE AT AN EXAMPLE OF A MEDIUM HUB AIRPORT		
AIRPORT	EXAMPLE (MHA)		
ALTITUDE	23. FT.		
TEMPERATURE	514.5 R	54.8 F	12.7 C

NOISE METRICS

EQUIVALENT SOUND LEVEL (LEQ) - THE 24 HOUR AVERAGE OF AN ENERGY SUMMATION OF INTEGRATED A-WEIGHTED LEVELS.

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

NOISE EXPOSURE FORECAST (NEF) - THE 24 HOUR AVERAGE OF AN ENERGY SUMMATION OF EFFECTIVE PERCEIVED NOISE LEVELS.

TIME ABOVE A SPECIFIED THRESHOLD OF A-WEIGHTED SOUND (TA) - MINUTES THAT A DBA LEVEL IS EXCEEDED IN 24 HOURS.

FIGURE 5-1. SAMPLE EXHO REPORT NO. 1 - SETUP

RUNWAYS

NAME	HEADING	UNITS	STARTING COORDINATES X	STARTING COORDINATES Y	ENDING COORDINATES X	ENDING COORDINATES Y	RUNWAY LENGTH
09L	93	FT	0.	0.	9487.	-497.	9500.
		M	0.	0.	2892.	-151.	2896.
		NMI	0.000	0.000	1.561	-0.082	1.563
27R	273	FT	9487.	-497.	0.	0.	9500.
		M	2892.	-151.	0.	0.	2896.
		NMI	1.561	-0.082	0.000	0.000	1.563
27L	272	FT	4203.	-1410.	-6920.	-1044.	11129.
		M	1281.	-430.	-2109.	-318.	3392.
		NMI	0.692	-0.232	-1.139	-0.172	1.832
09R	92	FT	-6920.	-1044.	4203.	-1410.	11129.
		M	-2109.	-318.	1281.	-430.	3392.
		NMI	-1.139	-0.172	0.692	-0.232	1.832
35	350	FT	7355.	1366.	6407.	6742.	5459.
		M	2242.	416.	1953.	2055.	1664.
		NMI	1.210	0.225	1.054	1.110	0.898
17	170	FT	6407.	6742.	7355.	1366.	5459.
		M	1953.	2055.	2242.	416.	1664.
		NMI	1.054	1.110	1.210	0.225	0.898

FIGURE 5-2. SAMPLE ECHO REPORT NO. 2 - RUNWAYS

REPORT 3

A I R C R A F T

NAME	CATEGORY	NOISE CURVE NAME	APPROACH PARAMETER NAME	TAKEOFF PROFILE NAMES STAGE1	STAGE2	STAGE3	STAGE4	STAGE5	STAGE6	STAGE7
747200	JCOM	JT9DFL	AP2	TOP7	TOP8	TOP9	TOP10	TOP11	TOP12	TOP13
DC1030	JCOM	CF66D	AP16	TOP91	TOP92	TOP93	TOP94	TOP95	TOP96	
707320	JCOM	JT3D	AP7	TOP38	TOP39	TOP40	TOP41	TOP42	TOP43	TOP44
A300	JCOM	CF650	AP25	TOP138	TOP139	TOP140	TOP141			
727200	JCOM	3JT8D	AP20	TOP117	TOP118	TOP119	TOP120			
DC930	JCOM	2JT8D	AP30	TOP155	TOP156	TOP157				
GAMTF	JGA	CF700	AP40	TOP183	TOP183	TOP183	TOP183			
COMSEP	PGA	CGASEP	AP52	TOP195	TOP195					
S-76	PGA	250C30	HELI	HORFLT						

FIGURE 5-3. SAMPLE ECHO REPORT NO. 3 - AIRCRAFT

NOISE CURVE - 250C30 REPORT 4

	DISTANCE (FT)	-	THRUST SETTINGS 1.00	2.00	3.00
EPNL	200.	-	90.20	91.20	97.20
	400.	-	85.80	87.20	93.10
	600.	-	83.10	84.50	90.60
	1000.	-	79.40	80.70	87.40
	2000.	-	73.70	75.10	82.60
	4000.	-	67.60	68.20	77.20
	6000.	-	63.10	63.80	73.70
	10000.	-	56.80	57.40	68.70

	DISTANCE (FT)	-	THRUST SETTINGS 1.00	2.00	3.00
SEL	200.	-	88.60	90.00	95.60
	400.	-	84.20	85.60	91.50
	600.	-	81.50	82.90	89.00
	1000.	-	77.80	79.10	85.80
	2000.	-	72.10	73.50	81.00
	4000.	-	66.00	66.60	75.60
	6000.	-	61.50	62.20	72.10
	10000.	-	55.20	55.80	67.10

FIGURE 5-4. SAMPLE ECHO REPORT NO. 4 - NOISE CURVES

A P P R O A C H   P A R A M E T E R S

REPORT 5

NAME	WEIGHT	ENGINES	STOPPING DISTANCE FT	STOPPING DISTANCE M	STOPPING DISTANCE NMI	SPEEDS TAXI	SPEEDS FINAL	SPEEDS TERMINAL	THRUST SETTINGS NO.	THRUST SETTINGS NAME	THRUST SETTINGS VALUE
HELI	10000.	2.0	-1.	-0.	-0.000	160.00	160.00	160.00	1	LEVAPP	3.0
									2	3DLND	3.0

FIGURE 5-5. SAMPLE ECHO REPORT NO. 5 - APPROACH PARAMETERS

APPROACH PROFILES

NAME	SEGMENT	DISTANCE FROM RUNWAY END FT	M	NMI	ALTITUDE(FT)	SPEED(KNTS)	THRUST
ALT3D	1	STOP			0.00	TAXI	REV
	2	-996.48	-303.73	-0.16	0.00	FINSP	3DLND
	3	6076.12	1852.01	1.00	370.00	FINSP	3DLND
	4	18228.35	5556.01	3.00	1007.00	FINSP	3DAPTS
	5	30380.58	9260.02	5.00	1644.00	TERMSP	3DAPTS
	6	48608.93	14816.03	8.00	2600.00	TERMSP	3DAPTS
	7	60761.16	18520.04	10.00	3236.00	TERMSP	0.00
COPTR	1	0.00	0.00	0.00	0.00	TAXI	3DLND
	2	0.00	0.00	0.00	0.00	FINSP	3DLND
	3	4860.89	1481.60	0.80	500.00	FINSP	3DLND
	4	9721.79	2963.21	1.60	1000.00	FINSP	3DLND
	5	14582.68	4444.81	2.40	1500.00	FINSP	3DLND
	6	18835.96	5741.21	3.10	2000.00	FINSP	3DLND
	7	23696.85	7222.82	3.90	2500.00	FINSP	0.00
STD3D	1	STOP			0.00	TAXI	REV
	2	-1002.56	-305.58	-0.17	0.00	FINSP	3DLND
	3	18076.40	5509.70	2.97	1000.00	FINSP	3DAPFS
	4	56234.50	17140.31	9.26	3000.00	FINSP	3DAPFS
	5	60050.30	18303.37	9.88	3200.00	FINSP	3DAPFS
	6	75313.50	22955.60	12.40	4000.00	TERMSP	3DAPTS
	7	113471.00	34586.03	18.67	6000.00	TERMSP	0.00
GA3D	1	STOP			0.00	32.00	3DLND
	2	-1002.56	-305.58	-0.17	0.00	FINSP	3DLND
	3	18076.40	5509.70	2.97	1000.00	FINSP	3DLND
	4	56234.50	17140.31	9.26	3000.00	FINSP	3DLND
	5	60050.30	18303.37	9.88	3200.00	FINSP	3DLND
	6	75313 50	22955.60	12.40	4000.00	FINSP	3DLND
	7	113471.00	34586.03	18.67	6000.00	FINSP	0.00
MIL3D	1	STOP			0.00	32.00	3DLND
	2	-1002.56	-305.58	-0.17	0.00	FINSP	3DLND
	3	18076.40	5509.70	2.97	1000.00	FINSP	3DLND
	4	56234.50	17140.31	9.26	3000.00	FINSP	3DLND
	5	60050.30	18303.37	9.88	3200.00	FINSP	3DLND
	6	75313.50	22955.60	12.40	4000.00	FINSP	3DLND
	7	113471.00	34586.03	18.67	6000.00	FINSP	0.00

FIGURE 5-6. SAMPLE ECHO REPORT NO. 6 - APPROACH PROFILES

T A K E O F F   P R O F I L E S

REPORT 7

NAME	ENGINES	WEIGHT	SEGMENT	DISTANCE FROM RUNWAY END FT	M	NMI	ALTITUDE(FT)	SPEED(KTS)	THRUST
HORFLT	2	10000.	1	0.00	0.00	0.00000	0.00	32.00	2.00
			2	1376.00	419.41	0.22646	0.00	160.00	2.00
			3	4126.00	1257.61	0.67905	500.00	160.00	2.00
			4	6876.00	2095.81	1.13164	1000.00	160.00	2.00
			5	6877.00	2096.11	1.13181	1000.00	160.00	1.00
			6	9626.00	2934.01	1.58424	1500.00	160.00	1.00
			7	10000.00	3048.01	1.64579	1500.00	160.00	1.00
			8	15000.00	4572.01	2.46868	1500.00	160.00	0.00

FIGURE 5-7. SAMPLE ECHO REPORT NO. 7 - TAKEOFF PROFILES

TAKEOFF MODIFICATIONS REPORT 8

		START				FINISH				
		ALTITUDE	DISTANCE			ALTITUDE	DISTANCE			
ID	TYPE	FT	FT	M	NMI	FT	FT	M	NMI	GRADIENT
1	ACCVZF(1)	700.00								

FIGURE 5-8. SAMPLE ECHO REPORT NO. 8 - TAKEOFF MODIFICATIONS

REPORT 9 - PART A

TAKEOFF - TRACKS

TRACK	RUNWAY	INITIAL HEADING	SEGMENT	DIRECTION	LENGTH (NMI)	TURN ANGLE (DEG)	RESULTANT HEADING (DEG)	TURN RADIUS (NMI)
TR1	09L	93	1	STRAIGHT	4.10		93	
			2	LEFT		88	5	1.60
			3	STRAIGHT	50.00		5	
TR2	27R	273	1	STRAIGHT	4.10		273	
			2	LEFT		88	185	1.60
			3	STRAIGHT	50.00		185	
TR3	09R	92	1	STRAIGHT	1.30		92	
			2	LEFT		15	77	1.00
			3	STRAIGHT	1.40		77	
			4	RIGHT		57	134	1.80
			5	STRAIGHT	0.50		134	
			6	RIGHT		50	184	1.60
			7	STRAIGHT	50.00		184	
TR4	27R	273	1	STRAIGHT	4.10		273	
			2	LEFT		43	230	2.20
			3	STRAIGHT	50.00		230	
TR5	35	350	1	STRAIGHT	50.00		350	
TR6	17	170	1	STRAIGHT	50.00		170	
TR7	17	170	1	STRAIGHT	1.50		170	
			2	RIGHT		95	265	0.25
			3	STRAIGHT	3.00		265	
			4	LEFT		20	245	1.00
			5	STRAIGHT	50.00		245	

FIGURE 5-9. SAMPLE ECHO REPORT NO. 9 - TAKEOFF TRACKS, OPERATIONS, DISTRIBUTION

(PART 1 OF 4)

TAKEOFF - OPERATIONS

REPORT 9 - PART B

TRACK	RUNWAY	AIRCRAFT	CLASS	STAGE	PROFILE	MOD	OPERATIONS DAY	OPERATIONS EVENING	OPERATIONS NIGHT
TR1	09L	747200	COM	1	TOP7	1	1.10	0.00	0.00
		747200	COM	2	TOP8	1	1.10	0.00	0.00
		747200	COM	3	TOP9	1	1.10	0.00	0.00
		DC1030	COM	1	TOP91	1	1.50	0.00	0.00
		DC1030	COM	2	TOP92	1	2.50	0.00	0.00
		DC1030	COM	4	TOP94	1	2.00	0.00	0.00
		727200	COM	1	TOP117	1	3.00	0.00	0.50
		727200	COM	2	TOP118	1	2.60	0.00	0.60
		727200	COM	3	TOP119	1	1.20	0.00	0.10
		DC930	COM	1	TOP155	1	26.50	0.00	0.50
		DC930	COM	2	TOP156	1	8.00	0.00	0.50
		DC930	COM	3	TOP157	1	1.50	0.00	0.00
TR2	27R	DC1030	COM	1	TOP91	0	1.50	0.00	0.00
		DC1030	COM	2	TOP92	0	3.00	0.00	0.00
		DC1030	COM	3	TOP93	0	1.00	0.00	0.00
		DC1030	COM	4	TOP94	0	1.00	0.00	0.00
		DC1030	COM	5	TOP95	0	0.50	0.00	0.00
		DC1030	COM	6	TOP96	0	0.50	0.00	0.00
		707320	COM	1	TOP38	0	2.00	0.00	0.50
		707320	COM	2	TOP39	0	3.50	0.00	1.00
		707320	COM	3	TOP40	0	1.00	0.00	0.00
		707320	COM	4	TOP41	0	2.50	0.00	0.00
		707320	COM	5	TOP42	0	1.00	0.00	0.00
		707320	COM	6	TOP43	0	0.50	0.00	0.00
		A300	COM	2	TOP139	0	2.00	0.00	0.00
		A300	COM	3	TOP140	0	1.00	0.00	0.00
		727200	COM	1	TOP117	0	6.00	0.00	1.00
		727200	COM	2	TOP118	0	4.40	0.00	1.40
		727200	COM	3	TOP119	0	1.80	0.00	0.40
TR3	09R	707320	COM	1	TOP38	0	2.00	0.00	0.50
		707320	COM	2	TOP39	0	3.50	0.00	1.00
		707320	COM	3	TOP40	0	1.00	0.00	0.00
		707320	COM	4	TOP41	0	1.50	0.00	0.00
		707320	COM	5	TOP42	0	0.50	0.00	0.00
		727200	COM	1	TOP117	0	21.00	0.00	2.50
		727200	COM	2	TOP118	0	16.50	0.00	4.00
		727200	COM	3	TOP119	0	8.00	0.00	0.50
		DC930	COM	1	TOP155	0	26.50	0.00	0.50
		DC930	COM	2	TOP156	0	8.00	0.00	0.50
		DC930	COM	3	TOP157	0	1.50	0.00	0.00
TR4	27R	GAMTF	GA	1	TOP183	0	3.00	0.00	0.10
TR5	35	GAMTF	GA	1	TOP183	0	18.00	0.00	1.50
		GAMTF	GA	2	TOP183	0	12.50	0.00	1.00
		COMSEP	GA	1	TOP195	0	13.00	0.00	1.00
TR6	17	GAMTF	GA	1	TOP183	0	6.00	0.00	0.50

FIGURE 5-9. SAMPLE ECHO REPORT NO. 9 - TAKEOFF TRACKS, OPERATIONS, DISTRIBUTION (PART 2 OF 4)

TAKEOFF - OPERATIONS (CONT.)

TRACK	RUNWAY	AIRCRAFT	CLASS	STAGE	PROFILE	MOD	OPERATIONS DAY	EVENING	NIGHT
		GAMTF	GA	2	TOP183	0	6.50	0.00	0.00
		COMSEP	GA	1	TOP195	0	30.00	0.00	3.00
TR7	17	S-76	GA	1	HORFLT	0	5.00	0.00	0.00

FIGURE 5-9. SAMPLE ECHO REPORT NO. 9 - TAKEOFF TRACKS, OPERATIONS, DISTRIBUTION

(PART 3 OF 4)

TAKEOFF - DISTRIBUTION

REPORT 9 - PART

		OPERATIONS DAY	EVENING	NIGHT
COMMERCIAL	-	175.3	0.0	16.0
GENERAL AVIATION	-	94.0	0.0	7.1
MILITARY	-	0.0	0.0	0.0

PROPORTIONS

		COMMERCIAL			GENERAL AVIATION			MILITARY		
TRACK	RUNWAY	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT
TR1	09L	0.30	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00
TR2	27R	0.19	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00
TR3	09R	0.51	0.00	0.59	0.00	0.00	0.00	0.00	0.00	0.00
TR4	27R	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00
TR5	35	0.00	0.00	0.00	0.46	0.00	0.49	0.00	0.00	0.00
TR6	17	0.00	0.00	0.00	0.45	0.00	0.49	0.00	0.00	0.00
TR7	17	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00
	TOTAL	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00

FIGURE 5-9. SAMPLE ECHO REPORT NO. 9 - TAKEOFF TRACKS, OPERATIONS, DISTRIBUTION

(PART 4 OF 4)

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

REPORT 10 - PART A

TRACK	RUNWAY	INITIAL HEADING	SEGMENT	DIRECTION	LENGTH (NMI)	TURN ANGLE (DEG)	RESULTANT HEADING (DEG)	TURN RADIUS (NMI)
TR8	09L	93	1	STRAIGHT	4.20		93	
			2	LEFT		82	11	1.50
			3	STRAIGHT	50.00		11	
TR9	27L	272	1	STRAIGHT	7.00		272	
			2	LEFT		12	260	1.50
			3	STRAIGHT	50.00		260	
TR10	17	170	1	STRAIGHT	50.00		170	
TR11	35	350	1	STRAIGHT	50.00		350	

FIGURE 5-10. SAMPLE ECHO REPORT NO. 10 - LANDING TRACKS, OPERATIONS, DISTRIBUTION

(PART 1 OF 3)

L A N D I N G - O P E R A T I O N S

TRACK	RUNWAY	AIRCRAFT	CLASS	PROFILE	OPERATIONS DAY	OPERATIONS EVENING	OPERATIONS NIGHT
TR8	09L	747200	COM	STD3D	2.16	0.00	0.00
		DC1030	COM	STD3D	15.84	0.00	1.44
		707320	COM	ALT3D	15.84	0.00	1.44
		A300	COM	STD3D	1.44	0.00	0.72
		727200	COM	ALT3D	50.40	0.00	7.20
		DC930	COM	ALT3D	50.40	0.00	2.88
TR9	27L	747200	COM	STD3D	0.84	0.00	0.00
		DC1030	COM	STD3D	6.16	0.00	0.56
		707320	COM	ALT3D	6.16	0.00	0.56
		A300	COM	STD3D	0.56	0.00	0.28
		727200	COM	ALT3D	19.60	0.00	2.80
		DC930	COM	ALT3D	19.60	0.00	1.12
TR10	17	GAMTF	GA	GA3D	7.50	0.00	0.60
		COMSEP	GA	GA3D	12.60	0.00	1.50
		S-76	GA	COPTR	1.50	0.00	0.00
TR11	35	GAMTF	GA	GA3D	17.50	0.00	1.40
		COMSEP	GA	GA3D	29.40	0.00	3.50
		S-76	GA	COPTR	3.50	0.00	0.00

FIGURE 5-10. SAMPLE ECHO REPORT NO. 10 - LANDING TRACKS, OPERATIONS, DISTRIBUTION

(PART 2 OF 3)

L A N D I N G - D I S T R I B U T I O N

REPORT 10 - PART C

		OPERATIONS DAY	EVENING	NIGHT
COMMERCIAL	-	189.0	0.0	19.0
GENERAL AVIATION	-	72.0	0.0	7.0
MILITARY	-	0.0	0.0	0.0

P R O P O R T I O N S

TRACK	RUNWAY	COMMERCIAL DAY	COMMERCIAL EVENING	COMMERCIAL NIGHT	GENERAL AVIATION DAY	GENERAL AVIATION EVENING	GENERAL AVIATION NIGHT	MILITARY DAY	MILITARY EVENING	MILITARY NIGHT
TR8	09L	0.72	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00
TR9	27L	0.28	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.00
TR10	17	0.00	0.00	0.00	0.30	0.00	0.30	0.00	0.00	0.00
TR11	35	0.00	0.00	0.00	0.70	0.00	0.70	0.00	0.00	0.00
	TOTAL	1.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00

FIGURE 5-10. SAMPLE ECHO REPORT NO. 10 - LANDING TRACKS, OPERATIONS, DISTRIBUTION

(PART 3 OF 3)

TOUCH AND GO - TRACKS

REPORT 11 - PART A

TRACK	RUNWAY	INITIAL HEADING	SEGMENT	DIRECTION	LENGTH (NMI)	TURN ANGLE (DEG)	RESULTANT HEADING (DEG)	TURN RADIUS (NMI)
TR14	17	170	1	STRAIGHT	3.00		170	
			2	LEFT		180	350	2.00
			3	STRAIGHT	6.00		350	
			4	LEFT		180	170	2.00
			5	STRAIGHT	3.00		170	

FIGURE 5-11. SAMPLE ECHO REPORT NO. 11 - TOUCH-AND-GO TRACKS, OPERATIONS DISTRIBUTION

PART 1 OF 3)

TOUCH AND GO - OPERATIONS

REPORT 11 - PART B

TRACK	RUNWAY	AIRCRAFT	CLASS	STAGE	TOUCH AND GO PROFILE	APPROACH PROFILE	OPERATIONS DAY	EVENING	NIGHT
TR14	17	COMSEP	GA	1	TGP195	GA3D	23.00	0.00	0.00

FIGURE 5-11. SAMPLE ECHO REPORT NO. 11 - TOUCH-AND-GO TRACKS, OPERATIONS, DISTRIBUTION

(PART 2 OF 3)

TOUCH AND GO - DISTRIBUTION

	OPERATIONS DAY	EVENING	NIGHT
COMMERCIAL -	0.0	0.0	0.0
GENERAL AVIATION -	23.0	0.0	0.0
MILITARY -	0.0	0.0	0.0

PROPORTIONS

		COMMERCIAL			GENERAL AVIATION			MILITARY		
TRACK	RUNWAY	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT
TR14	17	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

FIGURE 5-11. SAMPLE ECHO REPORT NO. 11 - TOUCH-AND-GO TRACKS, OPERATIONS, DISTRIBUTION

(PART 3 OF 3)

```
P R O C E S S E S
-----------------

DATA BASE
   *AIRA300
   *NOICGASEP
   *END

VERIFY

EXECUTE

PREVIEW
   VARIABLES = TRACK      34 AIRCRAFT      8 PROFILE    343 TOPROF      28
               START
               END

GRID
   METRIC = NEF  LDN  TA
   DBA THRESHOLD =  65.0
   STARTING POINT =   -3000.    1500.
   STEP =     1000.     700.
   SIZE =      2    3
   REPORT

GRID
   METRIC = LEQ  TA
   DBA THRESHOLD =  75.0
   STARTING POINT =   11000.    3000.
   STEP =       0.        0.
   SIZE =      1     1
   REPORT
   DETAIL

CONTOUR
   LEVELS =  65.00  75.00
   METRIC LDN
   TOLERANCE = 1.00
   DEFAULT WINDOW
   SAVED AS CASE1
   REPORT
```

FIGURE 5-12. SAMPLE ECHO REPORT NO. 12 - PROCESSES

(PART 1 OF 2)

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

```
CONTOUR
   LEVELS =  30.00  40.00
   METRIC NEF
   TOLERANCE = 2.50
   WINDOW =  -10000.  -3000.  15000.   5000.
   PLOT
      X AXIS      8.5
      Y AXIS     11.0
      SCALE    8000.0
      AUTOMATIC CENTERING

RETRIEVE
   LEVELS =  65.00  75.00
   NAME CASE1
   DEFAULT WINDOW
   PLOT
      X AXIS     11.0
      Y AXIS      8.5
      SCALE    8000.0
      AUTOMATIC CENTERING
```

FIGURE 5-12. SAMPLE ECHO REPORT NO. 12 - PROCESSES

(PART 2 OF 2)

Figure 5-13. SAMPLE VERIFY REPORT
(TO BE ADDED)

5.3 DATA BASE SELECTION REPORT

The DATA BASE PRINT Module produces a report which presents internally stored aircraft performance and noise data in an easily read tabular format and, if you desire, a plot of the same data. Subsection 3.3.3 describes how to obtain this report.

Figure 5-14a is a sample DATA BASE Selection Report for retrieval by aircraft definition ("*AIR"). The DATA BASE PRINT Module generates the following four subreports for this selection option:

1) aircraft definition data
2) noise curve data
3) takeoff profile and profile modification data
4) approach profile parameter data

The remaining three selection options, "*NOI", "*PRO", and "*APP", generate subreports 2, 3, or 4, respectively.

The first section of the DATA BASE Selection Report presents aircraft definition data. Aircraft definitions consist of identification numbers and names for data base retrieval and cross referencing purposes.

The data base revision number and the subreport title are at the top of each page of the DATA BASE Selection Report. Each update of the INM data base will be reflected in the revision number.

The aircraft identification number, name, description, and category are shown, followed by the noise curve identification number and name and the approach parameter identification number. Then the takeoff profile identifiers by stage length are shown. Identification numbers are for internal use only and are presented for completeness. As discussed in Subsection 3.3.3, items are retrieved from the data base by names, not identification numbers. The user should note that a takeoff profile identifier of zero signifies that the aircraft is incapable of operating at that range.

FAA INTEGRATED NOISE MODEL VERSION 3 DATA BASE

DATA BASE
REVISION: 8

A I R C R A F T   D E F I N I T I O N   D A T A

AIRCRAFT ID NUMBER	AIRCRAFT NAME	AIRCRAFT DESCRIPTION	AIRCRAFT CATEGORY
30	A300	A300/CF6-50C	JCOM

NOISE CURVE ID NUMBER	NOISE CURVE NAME	APPROACH PARAMETER ID NUMBER
17	CF650	25

TAKEOFF PROFILE ID AT FLIGHT RANGE (NM)

0-500	500-1000	1000-1500	1500-2500	2500-3500	3500-4500	OVER 4500
138	139	140	141	0	0	0

FIGURE 5-14a. SAMPLE DATA BASE SELECTION REPORT

(PART 1 OF 4)

FAA INTEGRATED NOISE MODEL VERSION 3 DATA BASE

DATA BASE
REVISION: 8

N O I S E   C U R V E   D A T A

NOISE CURVE ID NUMBER	NOISE CURVE NAME
17	CF650

EPNL NOISE LEVELS
(EPNDB)

DISTANCE	THRUST LEVELS 8000.00	14000.00	20000.00	28000.00	36000.00	0.00
200	103.50	108.50	110.50	112.50	114.50	0.00
400	97.90	103.10	105.30	107.50	109.60	0.00
630	93.70	99.10	101.40	103.70	105.90	0.00
1000	89.00	94.50	97.00	99.50	102.00	0.00
2000	80.30	86.10	89.20	92.30	95.20	0.00
4000	71.20	77.60	81.00	84.40	87.90	0.00
6300	65.10	71.70	75.30	78.90	82.60	0.00
10000	58.40	65.10	69.20	73.00	76.90	0.00
16000	49.80	57.10	61.60	65.80	70.20	0.00
25000	41.00	48.70	53.40	58.10	62.80	0.00

SEL NOISE LEVELS
(DBA)

DISTANCE	THRUST LEVELS 8000.00	14000.00	20000.00	28000.00	36000.00	0.00
200	98.90	102.90	105.40	108.00	109.50	0.00
400	93.50	97.70	100.30	103.00	104.80	0.00
630	89.70	94.10	96.70	99.50	101.40	0.00
1000	85.50	90.00	93.00	96.00	98.00	0.00
2000	78.80	83.50	86.70	90.00	92.20	0.00
4000	71.50	76.40	80.00	83.40	85.60	0.00
6300	66.10	71.20	74.70	78.30	80.70	0.00
10000	60.30	65.50	69.20	72.80	75.30	0.00
16000	53.60	58.90	62.70	66.40	69.10	0.00
25000	47.00	52.30	56.20	60.00	62.80	0.00

FIGURE 5-14a. SAMPLE DATA BASE SELECTION REPORT (PART 2 OF 4)

FAA INTEGRATED NOISE MODEL VERSION 3 DATA BASE

DATA BASE
REVISION: 8

T A K E O F F   P R O F I L E   D A T A

TAKEOFF PROFILE ID NUMBER	TAKEOFF PROFILE NAME
133	TOP133

	DISTANCE FROM BRAKE RELEASE (FT)	ALTITUDE (FT)	VELOCITY (KTS)	THRUST
SEGMENT 1	0.0	0.0	16.0	36746.00
SEGMENT 2	5561.0	0.0	160.0	36746.00
SEGMENT 3	11182.0	1000.0	160.0	36746.00
SEGMENT 4	13756.0	1295.0	170.0	36746.00
SEGMENT 5	14756.0	1363.0	175.0	33150.00
SEGMENT 6	21577.0	1827.0	208.0	33150.00
SEGMENT 7	28921.0	3000.0	208.0	33150.00
SEGMENT 8	37444.0	3478.0	250.0	33150.00
SEGMENT 9	51949.0	5500.0	250.0	33150.00
SEGMENT 10	67984.0	7500.0	250.0	33150.00
SEGMENT 11	90318.0	10000.0	250.0	0.00

THRUST FOR LEVEL FLIGHT	GRADIENT AT TAKE-OFF POWER	TAKE-OFF THRUST	GRADIENT AT CLIMB POWER
12656.00	.177904	36746.00	.159722

CLIMB THRUST	GRADIENT AT FAR36 CUTBACK	THRUST FOR ENGINE OUT LEVEL FLIGHT	V2F (KTS)
33150.00	.089600	25311.00	208.

NUMBER OF ENGINES	AIRCRAFT WEIGHT (LBS)
2.	265000.

FIGURE 5-14a. SAMPLE DATA BASE SELECTION REPORT (PART 3 OF 4)

FAA INTEGRATED NOISE MODEL VERSION 3 DATA BASE

DATA BASE
REVISION: 8

A P P R O A C H   P A R A M E T E R   D A T A

APPROACH PARAMETER ID NUMBER	APPROACH PARAMETER NAME
25	AP25

STOP DISTANCE (FEET)	TAXI SPEED (KTS)	FINAL SPEED (KTS)	TERMINAL SPEED (KTS)
-5400.	30.	143.	250.

THRUST AT 3 DEGREE GLIDE LANDING FLAP FINAL SPEED	THRUST AT 3 DEGREE GLIDE APPROACH FLAP FINAL SPEED	THRUST AT 3 DEGREE GLIDE APPROACH FLAP TERMINAL SPEED	THRUST FOR LEVEL FLIGHT APPROACH FLAP TERMINAL SPEED
11445.	11445.	11435.	19425.

THRUST FOR LEVEL FLIGHT MANEUVER FLAP TERMINAL SPEED	THRUST FOR 500 FPM SINK MANEUVER FLAP TERMINAL SPEED	IDLE THRUST TAXI SPEED	REVERSE THRUST FINAL SPEED
11765.	8765.	3675.	22050.

LANDING WEIGHT (LBS)	NUMBER OF ENGINES
260000.	2.

FIGURE 5-14a. SAMPLE DATA BASE SELECTION REPORT (PART 4 OF 4)

The second section of the DATA BASE Selection Report presents aircraft noise curve data. The noise curve identification number and noise curve name follow the report header information. The EPNL and SEL noise tables are then given. Each table shows the noise values for ten slant distances and up to six thrust levels. As noted, slant distances are given in feet, whereas thrusts may be given in pounds per engine, EPR, or percent RPM.

The third section of the DATA BASE Selection Report presents the takeoff profiles for the aircraft. A profile for each operable stage length is shown with duplicate profiles omitted. The profile identification number and profile name follow the report header information. For each segment of the takeoff profile the distance from brake release, altitude, speed, and thrust are given. A maximum of 14 segments is presently stored in the INM Data Base.

The takeoff profile information is followed by profile modificaton data. These data, consisting primarily of climb gradients and thrusts, are used whenever the user selects to modify the aircraft's takeoff. The gross takeoff weight is presented to assist the user in assigning a stage length.

The last section of the DATA BASE Selection Report shows aircraft approach profile parameter data. The approach parameter identification number and name follow the report header information. The various landing speeds and thrusts are then shown. These data are the numerical values that are substituted for the approach parameter identifiers in the approach profile.

Figure 5-14b is a sample DATA BASE Selection Plot of the Sound Exposure Level (SEL) vs. distance data retrieved by noise curve name ("*NOI"). Not shown is the Effective Perceived Noise Level (EPNL) vs. distance plot which is also generated by "*NOI".

The noise curve name is shown in the heading. The X-axis is logarithmic and shows the slant range distance in feet. The Y-axis is the noise units in decibels. Each curve represents a different power setting which is indicated at bottom right in the appropriate units.

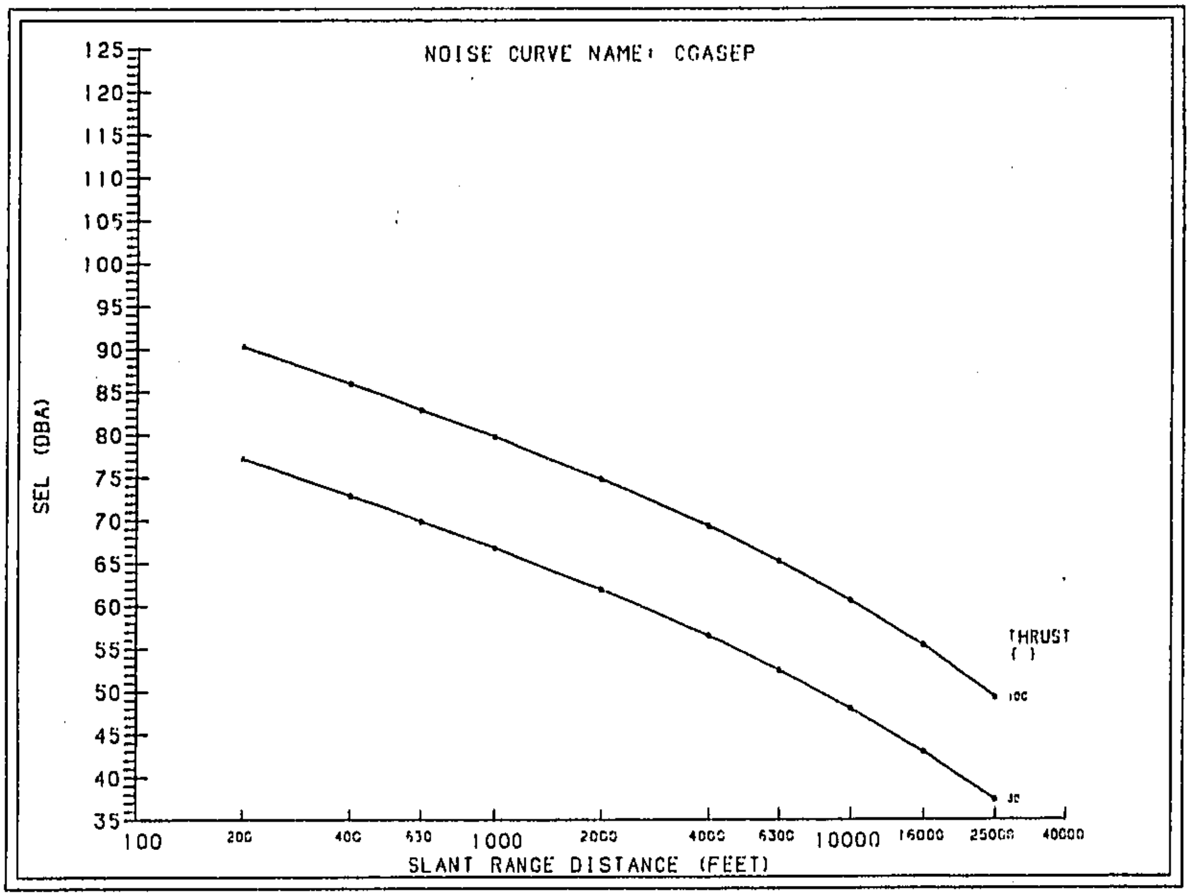


FIGURE 5-14b. SAMPLE DATA BASE SELECTION PLOT - SEL VS. DISTANCE

Figure 5-14c is a sample DATA BASE Selection Plot of a takeoff profile retrieved by takeoff profile name ("*PRO").

The takeoff profile plot is composed of three plot frames The top frame displays aircraft altitude in feet as a function of distance in feet from brake release (start of takeoff roll). The middle frame shows velocity in knots as a function of distance from brake release. The bottom frame displays power setting in the appropriate units as a function of distance from brake release.

The keyword "*AIR" generates plots of the SEL and EPNL vs. distance curves and plots of all the takeoff profiles associated with the particular aircraft definition.

5.4 PREVIEW OF FLIGHTS PLOT

The PREVIEW Module produces plots of noise data, takeoff profiles and tracks appended to runways. Subsection 3.3.4 describes how to obtain these plots.

PREVIEW plot of noise data is identical in format to the DATA BASE Selection Plot of noise data as shown in Figure 5-14b. Unlike DATA BASE Selection, PREVIEW also plots user defined noise data contained within the input file. The PREVIEW option is "*NOI".

PREVIEW plot of takeoff profiles is identical in format to the DATA BASE Selection Plot as shown in Figure 5-14c. Unlike DATA BASE Selection, PREVIEW also plots user defined takeoff profiles contained within the input file. The PREVIEW option is "*PRO".

Figure 5-15 is a sample PREVIEW plot of runways and tracks. The outer border of the plot is drawn to user specified height and width. The default width is 8.5 inches and the default height is 11 inches. An inner border is drawn to define the actual plotting area. This border serves as a window against which the airport runways, tracks, and coordinate system axes are drawn. Any runways, tracks, or portions of these that lie outside this window will not be shown.

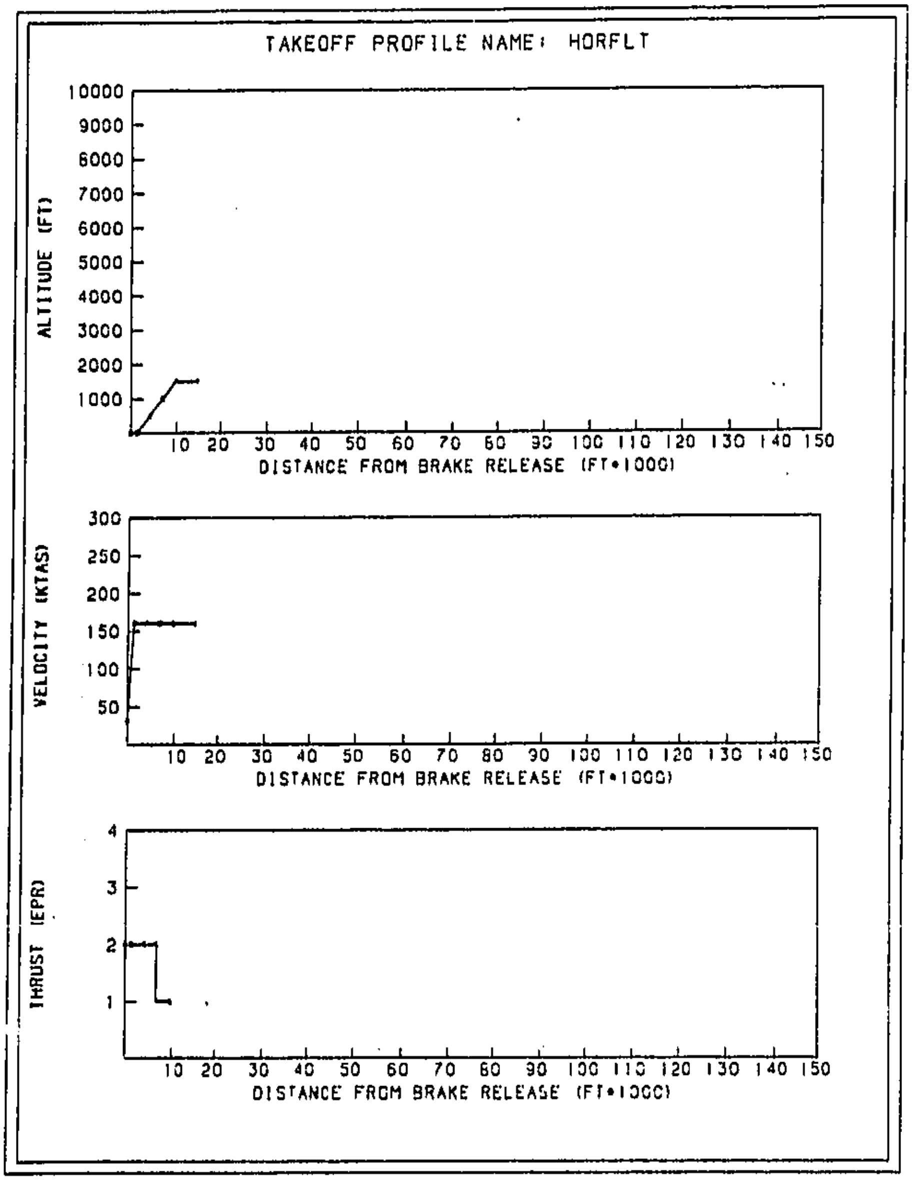


FIGURE 5-14c. SAMPLE DATA BASE SELECTION PLOT - TAKEOFF PROFILE

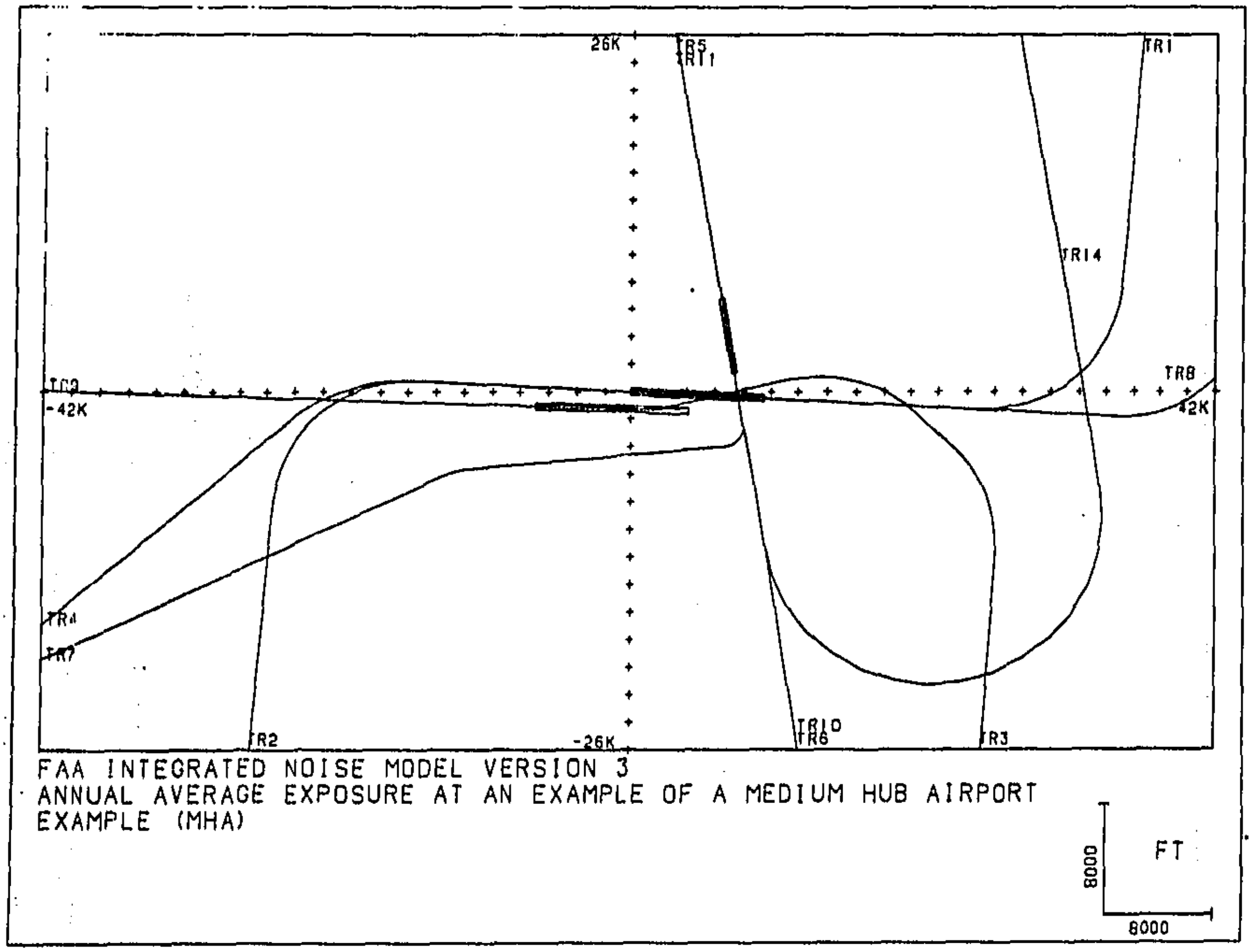


FIGURE 5-15. SAMPLE PREVIEW OF TRACKS PLOT

The airport origin used in the runway definitions, is automatically centered within the plottiong area. This default may be overridden if the user inputs non-zero plot origin values. Tic marks are drawn along the X- and Y-axes of the airport coordinate system every 2,000 feet regardless of scale. The limits of the plotting area, in feet, are shown by annotation at the intersection of the axes with the plot window. Each track is drawn and annotated with its name.

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

5.5 GRID ANALYSIS

A grid analysis produces a standard tabular report and optionally a detailed tabular report. Subsection 3.3.5 describes how to obtain these reports.

Figure 5-16 is a sample Standard Grid Analysis Report. Following the report title are shown the case title and airport name as input by the user. Then follows a table of noise values for the specified grid points. The grid point locations are listed under the headings "X" and "Y" for X-coordinate and Y-coordinate, respectively. The headings which follow the grid coordinates are the metrics for which the grid analysis was performed. Under each of these headings is listed the computed noise values for the particular metric.

A maximum of 20 grid points may be specified in the Detailed Grid Analysis Report. A separate page is printed for each point and each metric. Figure 5-17 represents a page from the detailed report. The boxed area identifies the X- and Y-coordinates of the grid point, the metric for which the calculations were performed, and the total noise value at the point. The next section of the report gives the individual contributions made by the 20 flights making the most contribution to the total. A flight is defined as a unique combination of the ordered triple (track, aircraft type, and profile). A line of information is printed for each flight, giving the following information:

ANNUAL AVERAGE EXPOSURE AT AN EXAMPLE OF A MEDIUM HUB AIRPORT

AIRPORT - EXAMPLE (MHA)

X	Y	NEF	LDN	TA (DBA THRESHOLD = 85.0)	X	Y	NEF	LDN	TA (DBA THRESHOLD = 85.0)
-3000.	1500.	37.4	72.1	10.0	-2000.	1500.	37.4	72.0	10.7
-3000.	2200.	33.2	68.2	7.3	-2000.	2200.	33.1	68.2	8.6
-3000.	2900.	29.6	65.1	3.7	-2000.	2900.	29.6	65.0	3.7

FIGURE 5-16. SAMPLE STANDARD GRID ANALYSIS REPORT

INTEGRATED NOISE MODEL - DETAILED GRID ANALYSIS REPORT

X = 11000.	Y = 3000.
METRIC LEQ	TOTAL = 67.9

AIRCRAFT	PROFILE	MOD	APPROACH PARAM	NOISE CURVE	STAGE	T AND G APPROACH	FLIGHT TYPE	TRACK	RUNWAY	SEL	OPERATIONS DAY	OPERATIONS EVENING	OPERATIONS NIGHT	CONTRIBUTION
727200	TOP117	0	AP20	3JT8D	1		T	TR3	09R	97.4	21.0	0.0	2.5	.61724E+02
727200	TOP118	0	AP20	3JT8D	2		T	TR3	09R	97.5	16.5	0.0	4.0	.61172E+02
DC930	TOP155	0	AP30	2JT8D	1		T	TR3	09R	95.1	26.5	0.0	.5	.60035E+02
727200	TOP119	0	AP20	3JT8D	3		T	TR3	09R	97.5	8.0	0.0	.5	.57387E+02
DC930	TOP156	0	AP30	2JT8D	2		T	TR3	09R	95.6	8.0	0.0	.5	.55544E+02
DC930	TOP155	1	AP30	2JT8D	1		T	TR1	09L	90.4	26.5	0.0	.5	.55327E+02
707320	TOP39	0	AP7	JT3D	2		T	TR3	09R	96.9	3.5	0.0	1.0	.54029E+02
707320	TOP38	0	AP7	JT3D	1		T	TR3	09R	96.4	2.0	0.0	.5	.50934E+02
707320	TOP41	0	AP7	JT3D	4		T	TR3	09R	97.6	1.5	0.0	0.0	.49957E+02
DC930	TOP156	1	AP30	2JT8D	2		T	TR1	09L	89.9	8.0	0.0	.5	.49775E+02
DC930	TOP157	0	AP30	2JT8D	3		T	TR3	09R	96.0	1.5	0.0	0.0	.48331E+02
707320	TOP40	0	AP7	JT3D	3		T	TR3	09R	97.2	1.0	0.0	0.0	.47027E+02
727200	TOP117	1	AP20	3JT8D	1		T	TR1	09L	90.7	3.0	0.0	.5	.46754E+02
727200	TOP117	0	AP20	3JT8D	1		T	TR2	27R	87.1	6.0	0.0	1.0	.46160E+02
707320	TOP42	0	AP7	JT3D	5		T	TR3	09R	97.9	.5	0.0	0.0	.45492E+02
727200	TOP118	1	AP20	3JT8D	2		T	TR1	09L	89.5	2.6	0.0	.6	.45142E+02
727200	TOP118	0	AP20	3JT8D	2		T	TR2	27R	86.9	4.4	0.0	1.4	.45114E+02
707320	TOP39	0	AP7	JT3D	2		T	TR2	27R	87.0	3.5	0.0	1.0	.44116E+02
707320	TOP41	0	AP7	JT3D	4		T	TR2	27R	87.5	2.5	0.0	0.0	.42064E+02
DC930	TOP157	1	AP30	2JT8D	3		T	TR1	09L	89.5	1.5	0.0	0.0	.41821E+02

HIGHEST LEVEL = 97.9

		DECIBELS BELOW 98									
		0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
NUMBER OF FLIGHTS	-	6	2	3	0	0	0	0	2	3	0
NUMBER OF OPERATIONS	DAY -	49	6	36	0	0	0	0	30	12	0
	EVENING-	0	0	0	0	0	0	0	0	0	0
	NIGHT -	7	2	1	0	0	0	0	1	1	0

FIGURE 5-17. SAMPLE DETAILED GRID ANALYSIS REPORT

1) aircraft name
2) takeoff profile for takeoffs or touch-and-go's, or approach profile for landings
3) takeoff modification I.D., if applicable (this I.D. is assigned by the INM and is matched to a takeoff modification in ECHO Report No. 8).
4) approach parameter set name
5) noise curve name
6) takeoff stage number for takeoffs or touch-and-go's
7) touch-and-go approach profile name
8) flight type, "T " for takeoff, "A" for approach, and "G" for touch-and-go.
9) track name
10) runway name
11) individual noise level at the grid point
12) number of day, evening and night operations
13) individual contribution to the total noise exposure.

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

5.6 CONTOUR ANALYSIS

Three types of reports can be produced from a contour analysis: a tabular Contour report, a Contour plot or a tabular Population Impact report. Subsection 3.3.6 describes how to obtain these reports, whose contents are discussed in the following subsections.

5.6.1 CONTOUR REPORT

The Contour Analysis Report provides a list of the points which define the contours of equal noise values within the user-specified or default contour window. Separate reports are given for each level requested. Figure 5-18 represents a sample page from this report.

INTEGRATED NOISE MODEL - CONTOUR ANALYSIS REPORT PAGE 1

C O N T O U R - CASE1

ANNUAL AVERAGE EXPOSURE AT AN EXAMPLE OF A MEDIUM HUB AIRPORT
AIRPORT - EXAMPLE (MHA)
LEVEL = 65.0 DB AREA = 15.11 METRIC = LDN

ISLAND	PNT	X	Y	PNT	X	Y	PNT	X	Y
1	1	25000.	-14723.	2	25003.	-14124.	3	25426.	-12926.
	4	26353.	-13153.	5	26969.	-13042.	6	27388.	-12570.
	7	27404.	-12500.	8	27522.	-11097.	9	27557.	-11719.
	10	27578.	-11404.	11	27674.	-10938.	12	27738.	-10551.
	13	27763.	-10156.	14	27769.	-9731.	15	27797.	-9375.
	16	27820.	-9070.	17	27823.	-8594.	18	27823.	-8114.
	19	27844.	-7813.	20	27831.	-7519.	21	27807.	-7031.
	22	27741.	-6634.	23	27658.	-6250.	24	27492.	-5617.
	25	27463.	-5469.	26	27455.	-5350.	27	27344.	-4930.
	28	27284.	-4688.	29	27274.	-4610.	30	27237.	-4244.
	31	27422.	-3984.	32	27663.	-3764.	33	27718.	-3499.
	34	28125.	-3308.	35	28251.	-3251.	36	28533.	-3125.
	37	28906.	-3041.	38	29480.	-2917.	39	29688.	-2884.
	40	29977.	-2835.	41	30469.	-2738.	42	30802.	-2677.
	43	31250.	-2599.	44	31858.	-2517.	45	32031.	-2493.
	46	32164.	-2477.	47	32813.	-2396.	48	33140.	-2344.
	49	33451.	-2201.	50	33594.	-2097.	51	34259.	-1679.
	52	34375.	-1618.	53	34408.	-1597.	54	34453.	-1563.
	55	34393.	-1545.	56	34375.	-1540.	57	34135.	-1522.
	58	33594.	-1250.	59	33266.	-1109.	60	32813.	-813.
	61	32759.	-781.	62	32315.	-497.	63	32031.	-241.
	64	31741.	0.	65	31670.	428.	66	31260.	701.
	67	31250.	789.	68	30737.	1050.	69	30469.	1015.
	70	30313.	937.	71	29688.	910.	72	28944.	819.
	73	28906.	808.	74	28884.	804.	75	28688.	781.
	76	28125.	725.	77	27428.	697.	78	27344.	703.
	79	27272.	710.	80	26563.	732.	81	26874.	781.
	82	25813.	813.	83	25781.	816.	84	25739.	824.
	85	25000.	961.	86	24515.	1078.	87	24219.	1148.
	88	23699.	1301.	89	23438.	1370.	90	23301.	1420.
	91	27905.	1563.	92	22656.	1665.	93	22195.	1883.
	94	21875.	2025.	95	21568.	2190.	96	21179.	2429.
	97	20313.	2804.	98	19528.	3125.	99	18994.	3369.
	100	18750.	3492.	101	18274.	3601.	102	17608.	3847.
	103	17188.	4005.	104	16894.	4101.	105	16664.	4164.
	106	15625.	4378.	107	14163.	4587.	108	14106.	4600.
	109	14063.	4609.	110	14025.	4613.	111	13907.	4622.
	112	12500.	4651.	113	11062.	4563.	114	11001.	4560.

FIGURE 5-18. SAMPLE CONTOUR ANALYSIS REPORT

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

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

5.6.2 CONTOUR PLOT

The CONTOUR PLOT Option of the Contour Analysis produces a standard CalComp plot. Subsection 3.3.6 describes how to obtain a Contour plot.

Figure 5-19 is a sample Contour plot. The outer border of the plot is drawn to user-specified height and width. As the default, the plot width is 8.5 inches and the plot height is 11 inches. This allows for inclusion of the plot in written reports without reducing its size. An inner border is drawn to define the actual plotting area. This border serves as a window against which the airport runways, noise contours, and airport coordinate system axes are drawn. Any contours or portions of contours that lie outside of this window will not be shown.

The airport origin, used in the runway definitions, is automatically centered within the plotting area. This default may be overridden if the user inputs non-zero plot origin values. Tic marks are drawn along the X- and Y-axes of the airport coordinate system every 2000 feet regardless of scale. The limits of the plotting area, in feet, are shown by annotation at the intersection of the axes with the plot window. Each contour is drawn and annotated with its noise level.

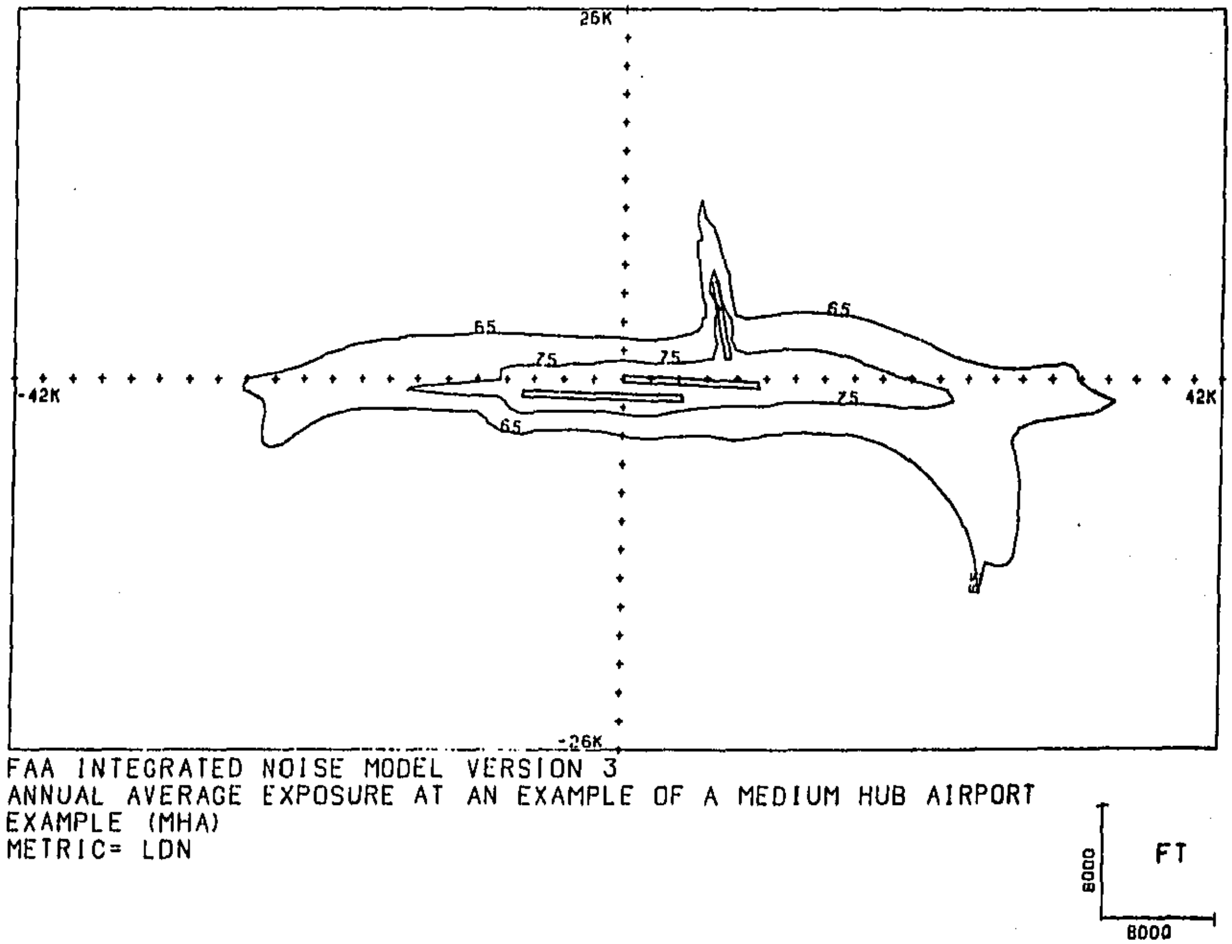


FIGURE 5-19. SAMPLE CONTOUR PLOT

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

5.6.3 POPULATION IMPACT REPORT (UNAVAILABLE AT THIS TIME)

An IMPACT analysis produces a standard tabular report. Subsection 3.3.6 describes how to obtain this report.

Figure 5-20 is a sample Population Impact Report. The case title and airport name as input by the user are shown, followed by the name of the noise metric selected for IMPACT analysis. Then, for each noise level, the 1970 residence and population counts are presented. The user should note that the census counts reflect exposure to noise that is greater than or equal to that noise level.

ANNUAL AVERAGE EXPOSURE AT AN EXAMPLE OF A MEDIUM HUB AIRPORT
EXAMPLE (MHA)

POPULATION IMPACT REPORT

METRIC NAME

LDN

CONTOUR LEVEL	RESIDENCES	POPULATION
45.00	16069	49534

0 WARNING MESSAGES WERE PRODUCED BY THE IMPACT MODULE

FIGURE 5-20. SAMPLE POPULATION IMPACT REPORT

APPENDIX A

TABLE OF INM ERROR MESSAGES AND ACTIONS TO BE TAKEN

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

C1 *FATAL: NO METRIC SELECTED FOR COMPUTATION

Cause:	No valid noise metric name was found on the processing template.
Correction:	Correct the misspelled metric name. Valid noise metric names are: LDN, NEF, LEQ, and TA.

C2 *FATAL: NO OBSERVERS SELECTED FOR NOISE COMPUTATION

Cause:	Either the number of X grid points or the number of Y grid points was entered as zero.
Correction:	Correct the regular grid parameter in error.

C3 *FATAL: NO CONTOUR LEVEL SELECTED

Cause:	No contour level values were found on the processing template.
Correction:	Supply the missing noise contour level(s).

C4 *FATAL: TOLERANCE CAN NOT BE ZERO

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

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

CN1 *FATAL: CONTOUR NAME XXXXXX DOES NOT EXIST

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

Correction: Case 1. If this message occurs when a RETRIEVE command is being processed, then an invalid CONTOUR name was used to retrieve from the given old Grid File. Correct the name or select the appropriate old Grid File.
Case 2. If this message occurs when a CONTOUR command is being processed, there was a previous error in the COMPUTATION Module and no GRID File was created for this contour name. Correct the error reported by the COMPUTATION Module.

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

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

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

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

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

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

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

DB1 *WARNING: UNRECOGNIZABLE KEYWORD XXXX

Cause: The DATA BASE PRINT Module was given an invalid selection keyword.

Correction: Correct the misspelled or invalid keyword.

DB2 *WARNING: AIRCRAFT NAME XXXXXX DOES NOT EXIST

Cause: The aircraft name was not found in the INM Data Base.

Correction: Consult the User's Guide for the list of available aircraft names.

DB3 *WARNING: NOISE CURVE NAME XXXXXX DOES NOT EXIST

Cause: The noise curve name was not found in the INM Data Base.

Correction: Consult the User's Guide for the list of available noise curve names.

DB4 *WARNING: TAKE-OFF PROFILE NAME XXXXXX DOES NOT EXIST

Cause: The takeoff profile name was not found in the INM Data Base.

Correction: Consult the User's Guide for the list of available take-off profile names.

DB5 *WARNING: APPROACH PARAMETER NAME XXXXXX DOES NOT EXIST

Cause: The approach parameter name was not found in the INM Data Base.

Correction: Consult the User's Guide for the list of available approach parameter names.

****** EXECUTIVE ERROR MESSAGES ******

EI *FATAL: KEYWORD kkkk IS AN INVALID EXECUTIVE KEYWORD. PROGRAM TERMINATED.

Cause: The processing template has encountered a keyword which it does not recognize. This indicates that the INPUT Module is writing incorrect data or that another module is not reading all of its data.

Correction: Check for previous errors which may have caused this error. If there are none, have the maintenance programmer check for programming errors.

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

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

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

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

F2 *FATAL: RUNWAY XXXX TRACK: YYYY PROFILE: ZZZZZZ
TRACK SEGMENT IS NEITHER STRAIGHT NOR TURN.

Cause: A track segment has been incorrectly defined.

Correction: Correct the track segment in error.

F3 *FATAL: RUNWAY XXXX TRACK: YYYY PROFILE: ZZZZZZ
RESTRICTION NOT IN PROFILE

Cause: A takeoff modification specified a start or end point not within the profile.

Correction: Correct the takeoff modification or the profile to be compatible.

F4 *FATAL: RUNWAY XXXX TRACK: YYYY PROFILE: ZZZZZZ
TRACK SEGMENT OUT OF RANGE.

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

Correction: Correct the track in error.

F5 *FATAL: RUNWAY XXXX TRACK: YYYY PROFILE: ZZZZZZ
ANGLE=0 IN A TURN.

Cause: Turns of zero degrees are not permitted.

Correction: Correct the track segment in error.

F6 *FATAL: RUNWAY XXXX TRACK: YYYY PROFILE: ZZZZZZ
0 DIVIDE IN ROUTINE DIRVEC.

Cause:	A flight path segment of zero length has been generated.
Correction:	Verify the track and profile definitions for this flight.

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

Cause:	A flight path segment has been generated where the aircraft's change in altitude is greater than the actual length of the flight segment.
Correction:	Verify the track and profile definitions for this flight.

F8 *FATAL: THE TAKEOFF SEGMENT DISAPPEARED.
THE MODIFICATION HAS NOT BEEN EXECUTED.

Cause:	The takeoff profile has been incorrectly defined. There is no takeoff roll segment.
Correction:	Correct the takeoff profile in error. The first segment must always be the takeoff roll segment.

F9 *FATAL: RUNWAY: XXXX TRACK: YYYY PROFILE: ZZZZZZ
APPROACH PROFILE THRUST NAME NOT FOUND

Cause:	The approach thrust name was not found in the approach parameter data.
Correction:	Correct the approach profile or approach parameter definition.

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

I1 *FATAL: USER INPUT FILE EMPTY.

Cause: Input file specified by user contains no data.

Correction: Attach correct user input file.

I2 *FATAL: PREMATURE EOF ON USER INPUT FILE AFTER ABOVE CARD.

Cause: INPUT Module expected more data on user input file.

Correction: Check that all sections of input data are on the file. Correct all previous input errors and resubmit job.

I3 *WARNING: NO LEVEL I MATCH FOR THIS KEYWORD. REST OF CARD SKIPPED.

Cause: INPUT Module is expecting a level I keyword at this point. The keyword may be a misspelled level I keyword or an invalid keyword for any level. This error may also appear if a previous error has passed the keyword search up to level I. Note that the remainder of the card has not been processed.

Correction: Correct the mispelled or invalid keyword or determine the previous error which caused the INPUT Module to look for a level I keyword.

I4 *WARNING: CATERGORY IS INVALID. MUST BE P OR J FOLLOWED BY COM, GA, OR MIL.

Cause: Invalid input for aircraft category.

Correction: Determine and input the appropriate combination of "P" (propeller) or "J" (jet) with the category types "COM" (commercial), "GA" (general aviation) or "MIL" (military).

15 *FATAL: SECOND SETUP SECTION MUST FOLLOW A PROCESS SECTION.

Cause: A second SETUP section was encountered before all of the basic scenario input was entered. The ordering of sections is that the second SETUP section follows a PROCESS section.

Correction: Check that all input sections are present and in order. The order for a basic scenario is SETUP, AIRCRAFT, TAKEOFFS, LANDINGS, TOUCHGOS, PROCESSES, where at least one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) must be present along with all of the other sections. Then check that no previous error caused the INPUT Module not to recognize a section. Note that just prior to processing a section a message is printed to indicate which section is being processed.

16 *FATAL: AIRCRAFT SECTION MUST FOLLOW SETUP SECTION.

Cause: AIRCRAFT section is out of order.

Correction: Check that all input sections are present and in order. The order for a basic scenario is SETUP, AIRCRAFT, TAKEOFFS, LANDINGS, TOUCHGOS, PROCESSES, where at least one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) must be present along with all of the other sections. Then check that no previous error caused the INPUT Module not to recognize a section. Note that just prior to processing a section a message is printed to indicate which section is being processed.

17 *FATAL: TAKEOFFS SECTION MUST FOLLOW AIRCRAFT SECTION.

Cause: TAKEOFFS section is out of order.

Correction: Check that all input sections are present and in order. The order for a basic scenario is SETUP, AIRCRAFT, TAKEOFFS, LANDINGS, TOUCHGOS, PROCESSES, where at least one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) must be present along with all of the other sections. Then check that no previous error caused the INPUT Module not to recognize a section. Note that just prior to processing a section a message is printed to indicate which section is being processed.

I8 *FATAL: LANDINGS SECTION MUST FOLLOW AIRCRAFT OR TAKEOFFS SECTION.

Cause: LANDINGS section is out of order.

Correction: Check that all input sections are present and in order. The order for a basic scenario is SETUP, AIRCRAFT, TAKEOFFS, LANDINGS, TOUCHGOS, PROCESSES, where at least one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) must be present along with all of the other sections. Then check that no previous error caused the INPUT Module not to recognize a section. Note that just prior to processing a section a message is printed to indicate which section is being processed.

I9 *FATAL: TOUCHGOS SECTION MUST FOLLOW AIRCRAFT, TAKEOFFS OR LANDINGS SECTION.

Cause: TOUCHGOS section is out of order.

Correction: Check that all input sections are present and in order. The order for a basic scenario is SETUP, AIRCRAFT, TAKEOFFS, LANDINGS, TOUCHGOS, PROCESSES, where at least one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) must be present along with all of the other sections. Then check that no previous error caused the INPUT Module not to recognize a section. Note that just prior to processing a section a message is printed to indicate which section is being processed.

I10 *FATAL: PROCESS SECTION MUST FOLLOW ONE OF THE THREE OPERATIONS SECTIONS.

Cause: PROCESS section is out of order. It must follow a TAKEOFFS, LANDINGS, or TOUCHGOS section.

Correction: Check that all input sections are present and in order. The order for a basic scenario is SETUP, AIRCRAFT, TAKEOFFS, LANDINGS, TOUCHGOS, PROCESSES, where at least one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) must be present along with all of the other sections. Then check that no previous error caused the INPUT Module not to recognize a section. Note that just prior to processing a section a message is printed to indicate which section is being processed.

111 *FATAL: /END/ MUST FOLLOW PROCESS SECTION.

Cause:	Keyword "END" is out of order.
Correction:	Check that all input sections are present and in order. The order for a basic scenario is SETUP, AIRCRAFT, TAKEOFFS, LANDINGS, TOUCHGOS, PROCESSES, where at least one of the operations sections (TAKEOFFS, LANDINGS or TOUCHGOS) must be present along with all of the other sections. Then check that no previous error caused the INPUT Module not to recognize a section. Note that just prior to processing a section a message is printed to indicate which section is being processed.

112 *FATAL: ABOVE KEYWORD ENDS SETUP SECTION AND NO RUNWAYS HAVE BEEN DEFINED.

Cause:	No valid runway definitions were processed.
Corrections:	Check that keyword "RUNWAYS" was present and recognized. Check that there is at least one runway defined and that all definitions are valid.

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

Cause:	Since data is entered by keyword, if a keyword is repeated the new data replaces the previous data.
Correction:	If the keyword is a duplicate delete the duplicate keyword and associated data.

114 *WARNING: INVALID TEMPERATURE UNIT. DEFAULT TEMPERATURE USED.

Cause:	Temperature unit is invalid; it must be "R", "F" or "C" for Rankine, Fahrenheit, Celsius, respectively.
Correction:	Change unit to valid letter.

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

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

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

116 *WARNING: INVALID RUNWAY NAME. RUNWAY CARD SKIPPED.

Cause: Runway name not found on this card or is not of proper format. The runway in each direction consists of a two digit number or a two digit number followed by an "L", "R" or "C" for left, right and center, respectively. The two runway names are separated by a hyphen and have no embedded blanks.

Correction: Put runway definition on one card or correct runway name.

117 *WARNING: INVALID RUNWAY DESCRIPTION. RUNWAY CARD SKIPPED.

Cause: Runway description not found on this card or does not consist of two starting coordinates, the keyword "TO" and the two ending coordinates.

Correction: Put runway description on one card or correct description.

118 *WARNING: INVALID HEADING KEYWORD OR VALUE. DEFAULT VALUES USED.

Cause: After the runway description a keyword other than "HEADING" was encountered, a value not in the range of 0 to 360 was entered for the heading, or no heading value was entered.

Correction: If a heading is to be specified, use the keyword HEADING followed by a value in the proper range, all on the card with the runway description.

119 *WARNING: ABOVE CARD SHOULD CONTAIN DELIMITER FOR TITLE OR AIRPORT INPUT.

Cause: TITLE or AIRPORT starting or ending delimiter was expected on this card but was not found.

Correction: Check for "< >" to set off the input for these two keywords and check that the input extends no further than the card following the one on which the keyword is located. The first delimiter must be on the same line as the keyword and the second on the same card as the end of the data.

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

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

Correction: Correct all of the preceding errors and resubmit the job.

121 *WARNING: INVALID CHARACTER DETECTED WITHIN A VALUE, INPUT NOT ACCEPTED.

Cause: Input value contains an invalid character such as an alpha character, an imbedded minus sign, or a second decimal.

Correction: Make value valid numeric input.

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

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

Correction: Correct all of the preceding errors.

123 *WARNING: ABOVE COMBINATION OF KEYWORDS IS INVALID. KEYWORDS IGNORED.

Cause: Within the AIRCRAFT section valid keyword combinations are "NOISE CURVE", "APPROACH PARAMETERS", "PROFILES APPROACH", "PROFILES TAKEOFF" AND "MODIFICATIONS TAKEOFF". The above combination is not one of these. Whenever this error occurs, the INPUT Module searches for the next keyword and tries to find a match for it at level 2 under AIRCRAFT, and then at level 1 if no match is found at level 2.

Correction: Select a valid keyword or combination, or check to see if previous errors caused this error.

124 *WARNING: KEYWORD EXPECTED TO BE COMBINED WITH OTHER KEYWORDS. WORD IGNORED.

Cause: Within the aircraft section the keywords "NOISE", "APPROACH", "PROFILES" and "MODIFICATIONS" must be followed by a second keyword. See 123 for legal combinations. Whenever this error occurs, the INPUT Module searches for the next keyword and tries to find a match for it at level 2 under AIRCRAFT, and then at level 1 if no match is found at level 2.

Correction: Select a valid keyword or combination, or check to see if previous errors caused this error.

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

Cause: No valid aircraft definitions were processed.

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

126 *WARNING: FIRST KEYWORD AFTER /TYPES/ MUST BE /AC/.

Cause: Within the TYPES subsection of the AIRCRAFT section, each aircraft definition must begin with the keyword "AC". The INPUT Module encountered a different keyword. Whenever this error occurs, the INPUT Module tries to find a match for this keyword at level 2 under AIRCRAFT, and then at level 1 if no match is found at level 2.

Correction: Check for the missing or misspelled keyword after "TYPES" or for previous errors which may have caused this error.

127 *WARNING: NUMBER FOR THE ABOVE STAGE IS MISSING OR INVALID. TP NAME IGNORED.

Cause: The stage number for a takeoff profile within an aircraft definition is missing or invalid.

Correction: Use a valid stage number of 1 through 7.

128 *WARNING: ABOVE NAME IS TOO LONG. IT HAS BEEN TRUNCATED TO 6 CHARACTERS.

Cause: A maximum of 6 characters are allowed for the names of aircraft, noise curves, approach parameters, profiles and contours. The input name exceeds 6 characters.

Correction: Use a unique 6-character name.

129 WARNING: ABOVE NAME IS TOO LONG. IT HAS BEEN TRUNCATED TO 4 CHARACTERS.

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

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

130 *WARNING: FIRST KEYWORD AFTER /NOISE CURVES/ MUST BE /NC/.

Cause: Within the NOISE CURVES subsection of the AIRCRAFT section, each noise curve definition must begin with the keyword "NC". The INPUT Module encountered a different keyword. Whenever this error occurs, the INPUT Module tries to find a match for this keyword at level 2 under AIRCRAFT, and then at level 1 if no match is found at level 2.

Correction: Check for a missing or misspelled keyword after "NOISE CURVES" or for previous errors which may have caused this error.

131 *WARNING: ABOVE KEYWORD PROCESSED AS KEYWORD /BY/.

Cause: The INPUT Module expected the keyword "BY" but encountered another keyword which it processed as "BY".

Correction: Change the keyword to "BY" if that is the appropriate keyword at this point in the input. "BY" is expected in the noise curve definitions to separate the dimensions and in the operations section titles, e.g., "TAKEOFFS BY PERCENTAGE".

132 *WARNING: ABOVE KEYWORD PROCESSED AS NC KEYWORD /EPNL/.

Cause: The INPUT Module expected the keyword "EPNL" but encountered another which it processed as "EPNL".

Correction: Change the keyword to "EPNL" if that is the appropriate keyword at this point in the noise curve definition. Otherwise, check for previous errors which may have caused this error.

133 *WARNING: ABOVE KEYWORD PROCESSED AS NC KEYWORD /THRUSTS/.

Cause: The INPUT Module expected the keyword "THRUSTS" but encountered another which it processed as "THRUSTS".

Correction: Change the keyword to "THRUSTS" if that is the appropriate keyword at this point in the noise curve definition. Otherwise, check for previous errors which may have caused this error.

134 *WARNING: ABOVE KEYWORD PROCESSED AS NC KEYWORD /SEL/.

Cause: The INPUT Module expected the keyword "SEL" but encountered another which it processed as "SEL".

Correction: Change the keyword to "SEL" if that is the appropriate keyword at this point in the noise curve definition. Otherwise, check for previous errors which may have caused this error.

135 *WARNING: NC INDEX INVALID. DATA FOR THIS METRIC WILL BE SKIPPED.

Cause: The noise curve definition may include a maximum of 10 thrusts and 22 distances, i.e., be of size 10 by 22. Invalid indexes were encountered and, therefore, the noise curves data could not be processed.

Correction: Correct the indexes making certain they reflect the correct size of the noise curve matrix.

136 *WARNING: VALUE HAS TOO MANY CHARACTERS BEFORE THE DECIMAL. VALUE IGNORED.

Cause: The input value was in a format too large to write to the definition file without losing significant digits. The input was therefore ignored.

Correction: Check that the value is within range for that data item and correct its format.

137 *WARNING: FIRST KEYWORD AFTER /APPROACH PARAMETERS/ MUST BE /AP/.

Cause: Within the APPROACH PARAMETER subsection of the AIRCRAFT section, each approach parameter definition must begin with the keyword "AP". The INPUT Module encountered a different keyword. Whenever this error occurs, the INPUT Module tries to find a match for this keyword at level 2 under AIRCRAFT, and then at level 1 if no match is found at level 2.

Correction: Check for missing or misspelled keyword after "APPROACH PARAMETER" or for previous errors which may have caused this error.

138 *WARNING: A VALUE WAS EXPECTED ON THIS CARD BUT WAS NOT FOUND. DEFAULT USED IF IT EXISTS.

Cause:	INPUT Module expected to find numeric data on this card but did not. Default values were stored for the expected input data.
Correction:	Add the appropriate data to this card.

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

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

140 *WARNING: ABOVE PARAMETER ENCOUNTERED MORE THAN ONCE FOR THE SET. VALUE RESET.

Cause:	A parameter was defined more than once within an approach parameter definition. Only the last definition is saved.
Correction:	Delete invalid or duplicate parameter definitions.

141 *WARNING: ABOVE THRUST PARAMETER CANNOT BE STORED. 8 THRUSTS ALREADY DEFINED.

Cause:	Only 8 thrusts are allowed in an approach parameter definition. The input module has already stored 8 thrusts and cannot store this one.
Correction:	Limit the number of thrusts to 8 and check that no other parameter name was misspelled so that it was taken as a thrust name.

142 *WARNING: TO MOD KEYWORDS MUST BE /START/, /END/, /GRADIENT/ IN THAT ORDER.

Cause:	Takeoff modifications are defined using the keywords "START", "END" and "GRADIENT" in that order. The keyword encountered did not follow this format but was processed as if it did.
Correction:	Check for missing or misspelled keywords.

143 *WARNING: TO MOD INDICATORS MUST BE /A/ OR /D/. INDICATOR SET TO BLANK.

Cause: Within the takeoff modification definition the START and END points must be qualified as being an altitude ("A") or distance ("D"). Invalid indicators were encountered.

Correction: Select a valid indicator.

144 *WARNING: TEMPERATURE IN SOME UNIT EXCEEDS 4 CHARACTERS BEFORE DECIMAL.

Cause: When the input temperature was converted to the other two units, one of the new values could not be stored on the definition file in F6.1 format without losing significant digits.

Correction: Make certain that the temperature is within range in all units.

145 *WARNING: FIRST KEYWORD INSIDE A PROFILE SUBSECTION MUST BE /PF/.

Cause: Within both the PROFILES APPROACH and PROFILES TAKEOFF subsections of the AIRCRAFT section, each profile definition must begin with the keyword "PF". The INPUT Module encountered a different keyword. Whenever this error occurs, the INPUT Module tries to find a match for this keyword at level 2 under AIRCRAFT, and then at level 1 if no match is found at level 2.

Correction: Check for a missing or misspelled keyword or for previous errors which may have caused this error.

146 *WARNING: PROFILE DEFINITION INCOMPLETE. MISSING KEYWORD(S).

Cause: Within the PROFILES APPROACH subsection within the AIRCRAFT section, each profile requires the 5 keywords "SEGMENTS", "DISTANCES", "ALTITUDES", "SPEEDS", and "THRUSTS". Within the PROFILES TAKEOFF subsection, each profile requires these same 5 keywords plus "WEIGHT" and "ENGINE". At least one of the keywords was missing from the profile definition.

Correction: Add the missing keyword(s) and the associated data or check for misspelled keyword(s) which would prematurely end the profile definition.

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

Cause: Within the profile definition the number of segments must be from 3 through 14. Since an invalid value was entered for the number of segments, the data for the distances, altitudes, speeds and thrusts could not be processed. If this error occurs for an approach profile, any parameter name will be read as a keyword and the program will go back to a level 1 search on keywords.

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

148 *WARNING: ABOVE THRUST PARAMETER CANNOT BE USED. EIGHT THRUSTS ALREADY USED.

Cause: Within the PROFILES APPROACH subsection of the AIRCRAFT section, a maximum of eight different thrust parameter names may be used to describe the profile. The INPUT Module has encountered more than eight thrusts names in this profile.

Correction: Check for misspelled parameter names that would be processed as new parameters, and limit the profile definition to use a maximum of eight unique thrust names.

149 *WARNING: NUMBER OF AIRCRAFT USED IN THE SCENARIO EXCEEDS 100.

Cause: The scenario cross reference tables hold a maximum of 100 aircraft. The user has defined more than 100.

Correction: Limit the scenario to 100 aircraft. Use the ECHO Reports to determine all of the aircraft that have been defined.

150 *WARNING: NUMBER OF NOISE CURVES USED IN THE SCENARIO EXCEEDS 100.

Cause: The scenario cross reference tables hold a maximum of 100 noise curves. The user has defined and/or referenced more than 100.

Correction: Limit the scenario to 100 noise curves. The Noise Curve Definition ECHO Report shows all of the user-defined noise curves. The Aircraft Definition ECHO Report shows all of the referenced noise curves.

151 *WARNING: NUMBER OF APPROACH PARAMETER SETS USED IN THE SCENARIO EXCEEDS 100.

Cause: The scenario cross reference tables hold a maximum of 100 approach parameter sets. The user has defined and/or referenced more than 100.

Correction: Limit the scenario to 100 approach parameter sets. The Approach Parameter Definition ECHO Report shows all of the user-defined parameter sets. The Aircraft Definition ECHO Report shows all of the referenced approach parameter sets.

152 *WARNING: NUMBER OF TAKEOFF PROFILES USED IN THE SCENARIO EXCEEDS 300.

Cause: The scenario cross reference tables hold a maximum of 300 takeoff profiles. The user has defined and/or referenced more than 300.

Correction: Limit the scenario to 300 takeoff profiles. The Takeoff Profiles ECHO Report shows all of the user-defined takeoff profiles. The Aircraft Definition ECHO Report shows all of the referenced takeoff profiles.

153 *WARNING: NUMBER OF RUNWAYS USED IN THE SCENARIO EXCEEDS 50.

Cause: The scenario cross reference tables hold a maximum of 50 runways. The user has defined more than 50.

Correction: Limit the scenario to 50 runways. The Runways ECHO Report shows all of the runways defined.

154 *WARNING: NUMBER OF TRACKS USED IN THE SCENARIO EXCEEDS 200.

Cause: The scenario cross reference tables hold a maximum of 200 tracks. The user has defined more than 200.

Correction: Limit the scenario to 200 tracks. The Tracks ECHO Report shows all of the tracks defined.

155 *WARNING: NUMBER OF TAKEOFF MODIFICATIONS USED IN THE SCENARIO EXCEEDS 30.

Cause: The scenario cross reference tables hold a maximum of 30 takeoff modifications. The user has defined more than 30.

Correction: Limit the scenario to 30 takeoff modifications. The Takeoff Modifications ECHO Report shows all of the takeoff modifications defined.

156 *WARNING: NUMBER OF APPROACH PROFILES USED IN THE SCENARIO EXCEEDS 50.

Cause: The scenario cross reference tables hold a maximum of 50 approach profiles. The user has defined and/or referenced more than 50.

Correction: Limit the scenario to 50 approach profiles. The Approach Profiles ECHO Report shows all of the approach profiles. All of the default approach profiles are included in the cross reference table whether or not they have been referenced by the user.

157 *WARNING: INVALID KEYWORD IN TRACK DEFINITION. EXPECTED /RWY/.

Cause: Within a track definition, the track name must be followed by the keyword "RWY" and the associated runway name. Another keyword was encountered where "RWY" was expected but was processed as "RWY".

Correction: Check for a missing or misspelled keyword.

158 *WARNING: INITIAL APPROACH HEADING NOT GIVEN BEFORE TRACK DESCP USING H TURN.

Cause: If an approach track description uses headings to describe its turns, the runway name must be followed by the keyword "HEADING" and the associated initial heading of the approach track.

Correction: Add the keyword "HEADING" and its associated data after the runway name.

159 *WARNING: ABOVE KEYWORD BEGINS 17TH SEGMENT. ONLY 16 ALLOWED IN A TRACK DEF.

Cause:	Within a track definition a maximum of 16 segments are allowed. More than 16 have been encountered.
Correction:	Limit the number of track segments to 16.

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

Cause:	Within a track definition there must be at least one segment. None were found for this track.
Correction:	Enter at least one segment description for the track.

161 *WARNING: ABOVE KEYWORD ENDS TRACK DEF BUT NO PERCENT DISTRIBUTION WAS GIVEN.

Cause:	When TAKEOFFS, LANDINGS and TOUCHGOS are given BY PERCENTAGE, each track definition must include a percentage distribution of commercial ("COM"), general aviation ("GA") and military ("MIL") aircraft and at least one of these percentages must be non-zero. No percentages were entered for this track.
Correction:	Add the percentage data for this track.

162 *WARNING: INVALID VALUE FOR A TURN WITHIN A TRACK DEFINITION. VALUE IGNORED.

Cause:	Within a track definition a turn must be defined either as an angle from 0 to 360 degrees (e.g., 90 D) or a heading from 0 to 360 (e.g., 110 H). Either the turn value or designator "D" or "H" was invalid.
Correction:	Enter a valid value with the designator "D" or "H" for degrees or heading. A space must separate the value and the designator.

163 *WARNING: ABOVE AC NAME NOT IN XREF. ASSOCIATED OPERATIONS IGNORED.

Cause: Within a TAKEOFFS, LANDINGS or TOUCHGOS section, after the keyword "OPER", an aircraft was referenced but was not found in the cross reference table. Therefore, no traffic mix records could be created for this operation.

Correction: Verify that the aircraft name is spelled correctly and was defined under the AIRCRAFT section. This message will also occur if the cross reference table was filled before this aircraft was defined (check for a previous 149 error message).

164 *WARNING: ABOVE PROFILE NAME NOT IN XREF. TRAFFIC MIX RECORD IS INCOMPLETE.

Cause: Within a LANDINGS or TOUCHGOS section each operation definition must include an approach profile name. For this operation a name was used which could not be found in the cross reference table.

Correction: Verify that the approach profile name is spelled correctly, and is user-defined or is one of the data base approach profiles. This message will also occur if the cross reference table was filled before this profile was defined or extracted from the data base (check for a previous 156 error message).

165 *WARNING: PROFILE NOT GIVEN IN AC DEF FOR THIS STAGE. TRAFFIC RECORD INCOMP.

Cause: Within a TAKEOFFS or TOUCHGOS section the operation definition must specify the stage number indicating the takeoff profile to be used for this operation. The aircraft definiton associated with this operation does not contain a takeoff profile for this stage number. Therefore, the traffic mix record is incomplete.

Correction: Add the takeoff profile for this stage to the aircraft definition, making certain that the profile is also user-defined or can be obtained from the data base.

166 *WARNING: ABOVE RUNWAY NAME NOT FOUND IN XREF. ID SET TO 0.

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

Correction: Verify that the name is spelled correctly and was defined in the SETUP section. This message will also appear if the cross reference table was filled before this runway was defined (check for a previous 153 error message).

167 *WARNING: ABOVE VALUE IN NM CANNOT BE STORED ON DEFINITION FILE. SET TO 0.

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

Correction: Enter a distance within the proper range.

168 *WARNING: KEYWORDS /FREQUENCY/ OR /PERCENTAGE/ EXPECTED. OPERATIONS IGNORED.

Cause: TAKEOFFS, LANDINGS, and TOUCHGOS must be by "FREQUENCY" or by "PERCENTAGE". Neither of these keywords was encountered so the INPUT Module could not process the section and began searching for the next level 1 keyword. When this error occurs, all of the data within this section will be flagged as invalid level 1 keywords (message 13).

Correction: Add the appropriate keyword "FREQUENCY" or "PERCENTAGE".

169 *WARNING: TAKEOFF MOD INVALID OR NOT IN XREF. /MOD./ COMMAND IGNORED.

Cause: Within TAKEOFFS, operations can be modified using the keyword "MOD.", followed by a takeoff modification type and index. This modification was invalid or not found in the cross reference table.

Correction: Check that a valid modificaton type was selected and that it was defined under the MODIFICATIONS TAKEOFF subsection of the AIRCRAFT section. This message will also occur if the cross reference table was filled before this modification was defined (check for a previous 155 error message).

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

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

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

171 *WARNING: ABOVE KEYWORD ENDS APP OR T AND G OPERATION BUT NO PROFILE GIVEN.

Cause: Within LANDINGS and TOUCHGOS, operations must include the keyword "PROF" followed by the approach profile name. The keyword "PROF" was missing in this operation and therefore no profile name was recorded.

Correction: Check for a missing or misspelled keyword and for a valid profile name.

172 *WARNING: ABOVE KEYWORD ENDS TO OR T AND G OPERATION BUT NO STAGE NO. GIVEN.

Cause: Within TAKEOFFS and TOUCHGOS, operations must include the keyword "STAGE" followed by a number from 1 through 7. The keyword "STAGE" was missing in this operation and therefore no stage number was recorded.

Correction: Check for a missing or misspelled keyword and for a valid stage number.

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

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

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

174 *WARNING: KEYWORD INVALID FOR TAKEOFF OPERATION DEFINITION. INPUT IGNORED.

Cause: The keyword "PROF" has no meaning in a TAKEOFF operation. The keyword "PROF" was encountered in this operation but the associated input was ignored.

Correction: Delete the keyword "PROF" and its associated approach profile name.

175 *WARNING: KEYWORD INVALID FOR LANDING OPERATION DEFINITION. INPUT IGNORED.

Cause: The keyword "STAGE" has no meaning in a LANDING operation. The keyword "STAGE" was encountered in this operation but the associated input was ignored.

Correction: Delete the keyword "STAGE" and its associated stage number.

176 *WARNING: ONLY ONE STAGE NO. ALLOWED IN TOUCHGO OPERATION DEF. INPUT IGNORED.

Cause: For TOUCHGOS operations only one stage number is allowed. Additional stage numbers were encountered but the data was ignored.

Correction: Delete any additional occurrence of the keyword "STAGE" and its associated stage number.

177 *WARNING: INVALID STAGE NUMBER. ASSOCIATED TAKEOFF PF CANNOT BE DETERMINED.

Cause: For TAKEOFF and TOUCHGOS operations or for PREVIEW commands the takeoff profile is referenced by a stage number from 1 through 7. An invalid stage number was encountered.

Correction: Use a stage number from 1 through 7.

178 *WARNING: ABOVE OPTION MUST BE SELECTED BEFORE ANY CALCULATION PROCESS IS.

Cause: Within the PROCESS section, the keywords "VERIFY" or "NOVERIFY" and "EXECUTE" or "NOEXECUTE" must occur before any requests for calculations such as "CONTOUR", "GRID", and "PREVIEW". One of these keyword was encountered out of order.

Correction: Rearrange the keywords to the proper order. The default options are "VERIFY" and "EXECUTE".

179 *WARNING: ABOVE KEYWORD PROCESSED AS /BASE/ WHICH SHOULD FOLLOW /DATA/.

Cause: Within the PROCESS section the keyword "DATA" must be followed by "BASE". A different keyword was encountered but treated as if it were "BASE".

Correction: Check for a missing or misspelled keyword.

180 *WARNING: ABOVE NON DATA BASE PRINT KEYWORD ENCOUNTERED BEFORE /*END/.

Cause: Within the PROCESS section, the keywords "DATA BASE" must be followed by the input data for the DATA BASE PRINT Module. This data must be terminated with an "*END" card. A non DATA BASE PRINT Module keyword was encountered before the "*END" card.

Correction: Check for misspelled DATA BASE PRINT Module keywords or for misspelled or missing "*END" card. Valid Data Base Print keywords are *AIR, *NOI, *APP, and *PRO.

181 *WARNING: ABOVE DATA BASE PRINT KEYWORD IGNORED BECAUSE IT FOLLOWS /*END/.

Cause: Within the PROCESS section, the keywords "DATA BASE" must be followed by the input data for the DATA BASE PRINT Module. An "*END" card indicates the end of this input data. However, additional Data Base Print keywords follow an "*END" card in the user input file.

Correction: Change the DATA BASE PRINT Module data so that there is only one "*END" card and it is the last card in the DATA BASE PRINT Module data.

182 *WARNING: ONLY 1 METRIC ALLOWED FOR CONTOUR. ABOVE METRIC IGNORED.

Cause:	Within the PROCESS section, only one metric may be specified for a "CONTOUR" command. More than one was encountered.
Correction:	Delete the additional metrics.

183 *WARNING: ONLY 10 LEVELS ALLOWED IN PROCESS COMMAND. ABOVE LEVEL(S) IGNORED.

Cause:	Within the PROCESS section, a maximum of ten levels may be specified for a "CONTOUR" or "RETRIEVE" command. More than ten levels were encountered.
Correction:	Delete the additional levels.

184 *WARNING: ABOVE KEYWORD ENCOUNTERED BEFORE TOTAL WINDOW DESCRIBED.

Cause:	Within the PROCESS SECTION, A "CONTOUR" or "RETRIEVE" command may include a window within which the contour is to lie. Only a partial description of the window was encountered.
Correction:	Complete the description of the window. A description includes the four keywords "XSTART", "YSTART", "XSTOP", and "YSTOP" and their associated data for the lower left corner and the upper right corner of the window.

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

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

186 *WARNING: ABOVE KEYWORD HIT BEFORE /START/ DATA IN GRID COMMAND.

Cause: Within the PROCESS section, the "GRID" commands require the keyword "START" followed by the X and Y starting coordinates for the grid. The keyword "START" was not encountered for this command.

Correction: Check for a missing or misspelled keyword and for its associated data.

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

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

Correction: Add requests for the types of reports desired.

188 *WARNING: ABOVE PREVIEW KEYWORD ENCOUNTERED AFTER /*END/. INPUT IGNORED.

Cause: Within the PROCESS section, the keyword "PREVIEW" must be followed by the input data for the PREVIEW Module. An "*END" card indicates the end of input data. However, additional PREVIEW keywords follow an "*END" card in the user input file.

Correction: Change the PREVIEW data so that there is only one "*END" card and it is the last card in the PREVIEW data.

189 *WARNING: FLIGHT DATA PRECEDING ABOVE KEYWORD IS INCOMPLETE.

Cause: Within the PORCESS section, the input data for PREVIEW Module consists of flight descriptions. Each flight description must include the keyword "*TRACK" followed by a 4-character track name; "RUNWAY" followed by a 3-character runway name; "AIRCRAFT" and a 6-character aircraft name; for landing and touch-and-go flights, "PROFILE" followed by an approach profile name; and for takeoff and touch-and-go flights, "STAGE" followed by a stage number from 1 through 7. The proceding flight does not contain all of this information.

Correction: Check for missing or misspelled keywords and for their associated data. Remember that this flight must have been previously described in one of the oprations sections.

190 *WARNING: ABOVE RUNWAY NAME IS PART OF AN INVALID PREVIEW TRACK DEFINITION.

Cause: Within the PROCESS section, a PREVIEW flight description must include a track name and runway name combination which was defined previously in one of the operations sections, TAKEOFF, LANDINGS, or TOUCHGOS. The combination in this flight description could not be found in the cross reference table.

Correction: Choose a previously defined track and runway combination. The message will also occur if the cross reference table was filled before this track was defined (check for a previous 154 error message).

191 *WARNING: ABOVE AC NAME INVALID FOR PREVIEW FLIGHT DEFINITION.

Cause: Within the PROCESS section, a PREVIEW flight description refers to an aircraft name not found in the cross reference table.

Correction: Check the spelling of the aircraft name and that the aircraft was defined under "TYPES" in the AIRCRAFT section. This message will also occur if the cross reference was filled before this aircraft was defined (check for a previous 149 error message).

192 *WARNING: ABOVE PROFILE NAME INVLIAD FOR PREVIEW FLIGHT DEFINITION.

Cause: Within the PROCESS section, a PREVIEW flight description contained the keyword "PROFILE" followed by an approach profile name which could not be found in the cross reference table.

Correction: Check the spelling of the profile name and that the profile was a data base profile or was user-defined in the AIRCRAFT section. This message will also occur if the cross reference table was filled before this approach profile was defined or extracted from the data base (check for a previous 156 error message).

193 *WARNING: ABOVE NON PREVIEW KEYWORD HIT BEFORE /*END/. LAST FLIGHT IGNORED.

Cause: Within the PROCESS section, the keyword "PREVIEW" must be followed by the input data for the PREVIEW Module. This data must be terminated with an "*END" card. A non PREVIEW keyword was encountered before the "*END" card.

Correction: Check for misspelled PREVIEW keywords or for a misspelled or missing "*END" card. Valid PREVIEW keywords are "*TRACK", "RUNWAY", "AIRCRAFT", "PROFILE" and "STAGE".

194 *WARNING: PREVIOUS PARAMETER SET MISSING WEIGHT AND/OR ENGINE.

Cause: Within the APPROACH PARAMETERS subsection of the AIRCRAFT section, each parameter set must contain the keywords "WEIGHT" and "ENGINE" along with their associated data. One or both of these data items were missing from the previous parameter set.

Correction: Check for missing or misspelled keywords and for their associated data.

195 *WARNING: ABOVE NON PREVIEW KEYWORD HIT BEFORE ANY FLIGHTS WERE PROCESSED.

Cause: Within the PROCESS section, PREVIEW flight descriptions begin with the keyword "*TRACK". No such keyword was encountered on the input file before the "*END" card was encountered.

Correction: Check for misplaced "*END" card or missing flight description.

196 *WARNING: FLIGHT PRECEDING ABOVE KEYWORD CALLS FOR UNDEFINED TAKEOFF PROFILE.

Cause: Within the PROCESS section, a PREVIEW flight description for takeoff and touch-and-go flights includes the keyword "STAGE" followed by a stage number. The preceding flight description used a stage number for which the flight aircraft has no takeoff profile.

Correction: Select a stage number which is valid for this aircraft.

197 *WARNING: PARAMETER NAME ILLEGAL FOR THIS PROFILE COMPONENT.

Cause: Within an approach profile, the parameter name "STOP" may be used for distances and the names "TAXI", "TERMSP", and "FINSP" may be used for speeds. Any parameter name other than the four above may be used for thrusts. No parameter names are allowed for altitudes. The INPUT Module encountered a parameter name which has been entered in such a way as to violate these rules.

Correction: Check for misspelled or misplaced parameter names or for a misuse of parameters.

198 *WARNING: IMPACT DATA PRECEDING ABOVE KEYWORD IS INCOMPLETE.

Cause: For IMPACT Reports, the cartesian and geographic coordinates of three non-colinear points are required. This data has not been supplied for the above IMPACT request.

Correction: Check for missing or misspelled keywords and their associated data.

199 *WARNING: DEF FOR AC aaaaaa INVALID. ttt nnnnnn NOT IN DATA BASE OR USER SET.

Cause: For IMPACT reports, the cartesian and geographic coordinates of three non-colinear points are required. This data has not been supplied for the above IMPACT request.

Correction: Check for missing or misspelled keywords and for their associated data.

1100 *WARNING: DEF FOR AC aaaaaa INCOMPLETE. ttt MISSING. AC IS NOT IN DATA BASE.

Cause: Within an approach profile, the parameter name "STOP" may be used for distances and the names "TAXI", "TERMSP", and "FINSP" may be used for speeds. Any parameter name other than the four above may be used for thrusts. No parameter names are allowed for altitudes. The INPUT Module encountered a parameter name which has been entered in such a way as to violate these rules.

Correction: Check for misspelled or misplaced parameter names or for a misuse of parameters.

1101 *WARNING: ttt nnnnnn NOT FOUND IN DATA BASE. DID NOT EXTRACT: mmmmmm --- pppppp.

Cause: After the AIRCRAFT section has been processed, the aircraft definitions must be completed by extracting data from the data base. In this case the definition of aircraft aaaaaa is invalid because the name nnnnnn specified for the noise curve (NC), approach parameter (AP), or takeoff profile (PF), was not found in the cross reference tables or in the data base.

Correction: Select valid names which have been user-defined or are in the data base. This message will also appear if the cross reference tables were filled before the user-defined NC, AP, or PF were defined (check for later 150, 151, or 152 error message).

102 *WARNING: ttt aaaaaa NUMBER iii IS A DUPLICATE OF NUMBER jjj.

Cause: After all of the user input have been processed, the cross reference tables are checked for duplicate entries. Entries are made to the cross reference table as they are defined and then as they are referenced in the aircraft definition as items to be extracted from the data base. The entry is of type aircraft (AC), approach paramenter (AP), noise curve (NC), takeoff profile (TOPF), approach profile (APPF), track (TRK), runway (RW), or takeoff modification (MOD). The entry named aaaaaa and of number iii is a duplicate of entry number jjj.

Correction: Correct this user input so that each of the entries of a given type has a unique name and is defined only once.

**** IMPACT MODULE ERROR MESSAGES ****

M1 *FATAL: CONTOUR NAME XXXXX DOES NOT EXIST

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

Correction: Case 1. If this message occurs when a RETRIEVE command is being processed, then an invalid CONTOUR name was used to retrieve from the given old Grid File. Correct the name or select the appropriate old Grid File.
Case 2. If this message occurs when a CONTOUR command is being processed, there was a previous error in the COMPUTATION Module and no GRID File was created for this contour name. Correct the error reported by the COMPUTATION Module.

M2 *WARNING: XXXX YY.YY CENSUS COUNTS MAY BE INCOMPLETE

Cause: IMPACT level = YY.YY for metric XXXX was determined not to be within the range of contour levels input to the COMPUTATION Module.

Correction: No action is required as long as the IMPACT level is correct.

M3 *FATAL: NOISE SURFACE BELOW MINIMUM IMPACT LEVEL

Cause: All noise values calculated by the COMPUTATION Module are less than the minimum IMPACT level. Therefore, no tabulation of census data is possible.

Correction: No action is required as long as the IMPACT level is correct.

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

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

Cause:	It is not possible to plot the requested contours due to a previously encountered error in the CONTOUR Module.
Correction:	Correct the CONTOUR Module processing error.

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

Cause:	No contour for this noise level exists.
Correction:	As long as the contour value input to the COMPUTATION Module was correct, no action is required.

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

PR1 *WARNING: UNRECOGNIZABLE KEYWORD XXXX

Cause: The PREVIEW Module was given and invalid selection keyword.

Correction: Correct the misspelled or invalid keyword.

PR2 *WARNING: NOISE CURVE NAME XXXXXX DOES NOT EXIST

Cause: The NOISE CURVE NAME was not found in the INM Data Base.

Correction: Consult the User's Guide for the list of available noise curve names.

PR3 *WARNING: TAKE-OFF PROFILE NAME XXXXXX DOES NOT EXIST

Cause: The takeoff profile name was not found in the INM DATA BASE.

Correction: Consult the User's Guide for the list of available takeoff profile names.

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

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

Cause:	The COMPUTATION Module did not run successfully and consequently did not produce the CONTRIBUTIONS file from which the Detailed Grid Analysis Report is produced.
Correction:	Correct the error previously reported by the COMPUTATION Module.

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

Cause:	The COMPUTATION Module did not run successfully and consequently did not produce the regular GRID File from which the Standard Grid Analysis Report is produced.
Correction:	Correct the error previously reported by the COMPUTATION Module.

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

Cause:	The COMPUTATION Module did not run successfully and consequently did not produce the irregular GRID File which supplies data for the Contour Analysis Report.
Correction:	Correct the error previously reported by the COMPUTATION Module.

**** VERIFY MODULE ERROR MESSAGES ****

(To be added when VERIFY Module
is added to the model)

APPENDIX B

COST EFFECTIVE USE

OF VERSION 3

B.0 COST EFFECTIVE USE

Integrated Noise Model (INM) Version 3 is substantially more expensive to run than Version 2. This is especially critical to those parties dependent upon commercial computer timeshare vendors. Comparative dollar amounts and methods to hold down the cost are presented later in the text.

B.1 CAUSE OF INCREASED RUN COST

Simply put, Version 3 requires many more calculations than Version 2. Version 2 uses the point follower technique in which the next contour point is found by scanning the area around the previous contour point. This method kept calculations to a minimum and produced smooth contour lines. However, its simplicity led to several shortcomings. The follower method cannot find islands of noise. An example of this is a study of Dulles International Airport in which separate L_{dn} 75 contours exist around each of the parallel runways. These contours were finally "found" by Version 2 after several trial and error runs. Another weakness of the follower method is the tendency to crossover and prematurely close a contour when handling very thin contours. This has happened in many studies in which both commercial jets and general aviation aircraft are involved. The only solution has been a trial and error process of changing Step Size and Tolerance to properly complete the contour. Again, several runs were required to produce the finished contour. Because of these shortcomings the point follower technique has been replaced by the noise surface technique in Version 3. The noise surface is actually levels calculated at the intersections of an irregular grid. The grid is irregular because instead of constant spacing between the intersections, the grid boxes can be subdivided several times as needed to produce a smooth noise surface. An irregular grid is shown in Figure B-1. The contour lines are then found by interpolating between intersections. This technique requires many more calculations than the point follower method but Version 3 will always produce a complete contour.

The second factor in the calculation of noise is the location and description of the source of noise, the aircraft. INM uses the aircraft flight to give position and the operational characteristics of thrust and speed. Version 3 subdivides a flight into several more segments to overcome some of the problems in Version 2. A turning aircraft is no longer following an arc but a series of short straight segments. In this way, Version 3 accounts for the difference in the duration of a flyby from a point inside the turn as opposed to an equidistant location outside the turn. The new definition of a flight now allows an aircraft to fly on a track which crosses over itself. This capability was sorely missed in Version 2 for the Boston-Logan 22R Study and for those studies involving military aircraft performing a 360 overhead approach. In a related area, Version 3 no longer looks at the single segment of closest point of approach of the nearest track to calculate Sound Exposure Level (SEL) or Effective Perceived Noise Level (EPNL). Version 3 looks at the segments preceding and succeeding the segment of closest point to more faithfully represent the integrated time history aspect of SEL and EPNL.

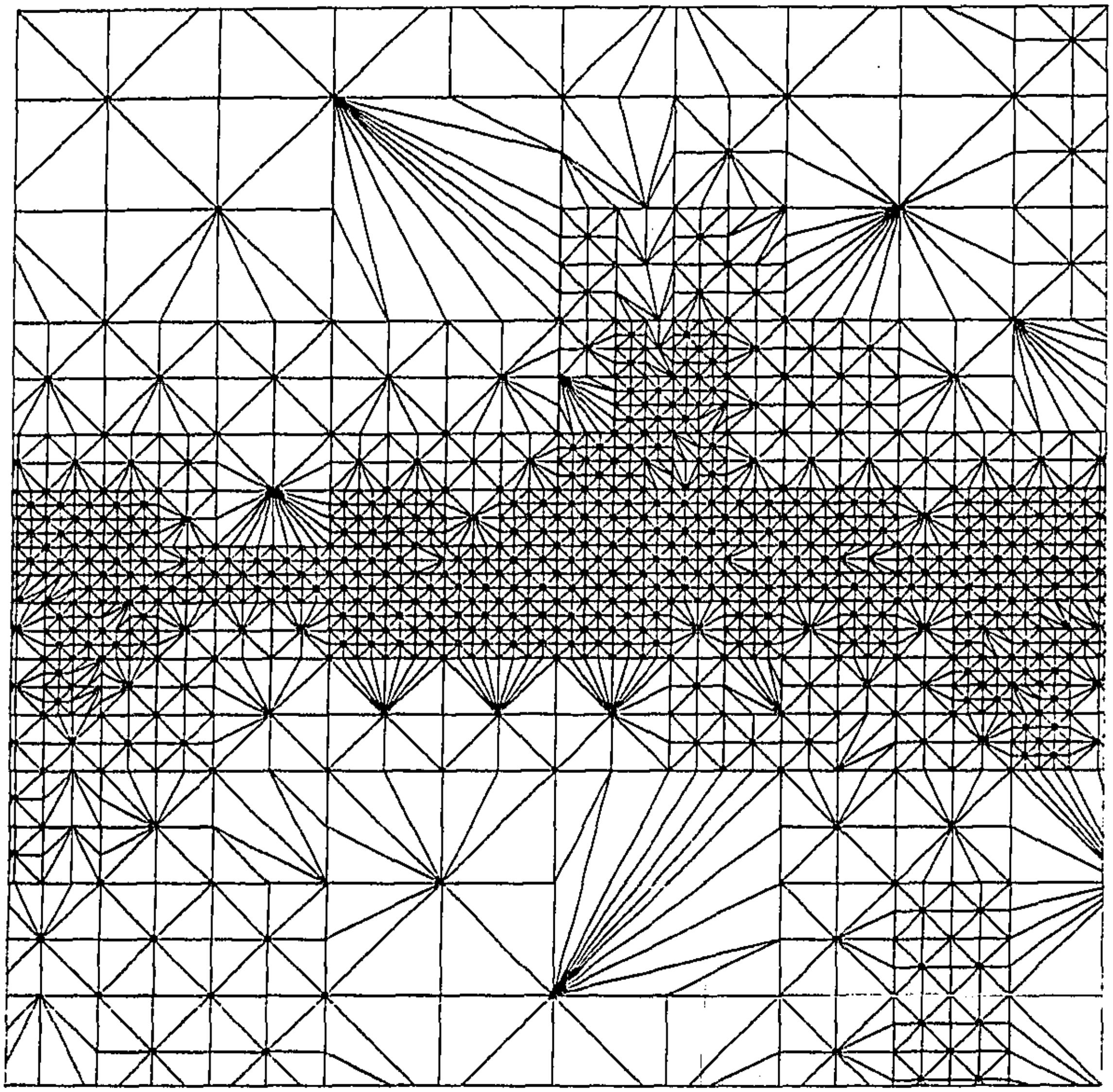


Figure B-1. Sample of an Irregular Grid

B.2. TEST CASES

Two test cases form the basis of the cost comparison between Versions 2 and 3. All computer runs were made on United Information Services (UIS) computers. INM Version 2 is run on the UIS Cyber 170 and Version 3 on the Cray-1. The small case consists of the operations of three commercial jet types allocated to three departure tracks and three arrival tracks. The second test is a realistic representation of a medium sized international airport. The general characteristics of the two cases are presented in Table B-1.

B.3 COST CONTROL INPUTS

In addition to the cost comparison, methods of controlling Version 3 run cost were examined. The two direct methods of cost control are contour level tolerance and irregular grid refinement. Tolerance indicates the area in which refinement will begin and is identified in input by the keyword TOLERANCE. The default value for TOLERANCE is 2.0 dB which is a change from the default of 1.0 stated in the main body of the User's Guide. Refinement is the extent of the subdivision of the grid boxes to calculate a noise surface and the keyword is REFINE. REFINE is a new keyword and not discussed anywhere in the main body of this report. A discussion of the use of REFINE is next, followed by the details of the cost analysis.

TABLE B-1

CHARACTERISTICS OF THE SAMPLE CASES

	Case	
	Small	Medium
A/C types	3	9
Tracks	6	24
Daily Operations	400	388
65 Ldn Area (sq. mi.)	10.5	13.9
75 Ldn Area (sq. mi.)	1.9	3.6

B.4 REFINE KEYWORD

The keyword REFINE applies only to the keyword CONTOUR and no other. The specification for refinement is "REFINE=" followed by an integer between the values 3 and 10. The number 3 represents the lowest number of grid boxes at which the Version 3 will calculate noise and is the least expensive. The number 10 represents the fullest extent of the subdivision of grid boxes into smaller grid boxes and is the most expensive. Examples of the use of refinement are shown in Figure B-2. The default value for REFINE is 6.

B.5 COST COMPARISON

The initial comparison of Version 2 and 3 run costs indicated ratios of up to 10 to 1. The small case which cost $60 with Version 2 cost $200 with Version 3. The medium case was $180 with Version 2 and $1900 with Version 3. The Version 3 runs assumed TOLERANCE = 1 and REFINE = 10, which represents the most expensive set of conditions.

B.6 COST CONTROL ANALYSIS

With these reference points, the analysis then proceeded to test various combinations of tolerance and refinement to lower the run costs. The results of the cost effective analysis are presented in Figures B-3 and B-4 for the small and medium cases, respectively. In addition to looking at run costs, the L_{dn} 65 and 75 contour areas were compared for each combination and the relative quality of the contour plots were studied. For both the small and medium cases, refinement levels 10 to 6

```
PROCESS:

    CONTOUR LDN AT 65 75
        WITH NAME=CASE1
        TOLERANCE=1.0                              (DEFAULT IS 2.0)
        REFINE=5                                   (DEFAULT IS   6)
        PLOT SIZE=11 8.5
             SCALE=8000
             ORIGIN=3.5 5
```

Figure B-2 EXAMPLE OF THE USE OF THE KEYWORD REFINE IN VERSION 3

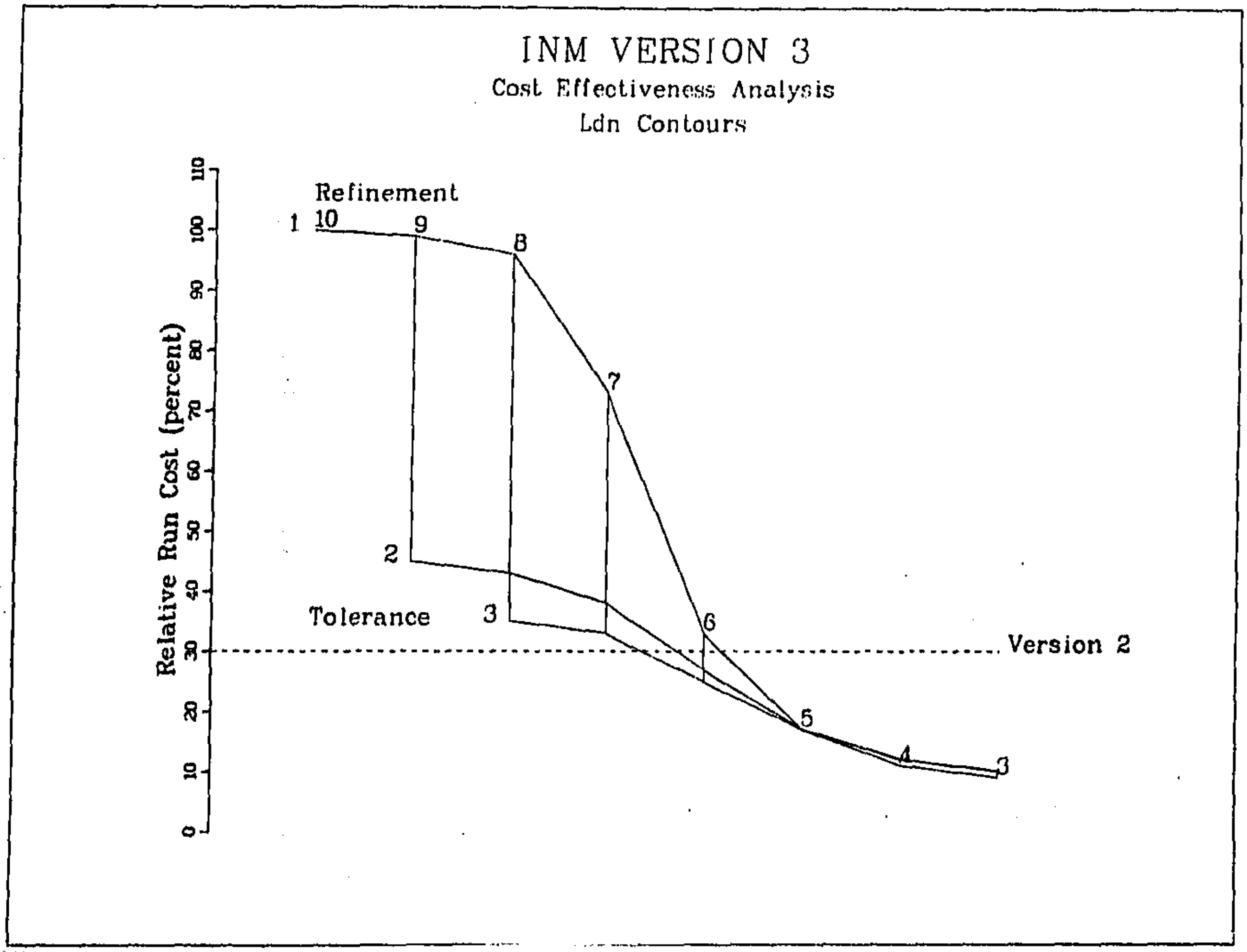


FIGURE B-3. INM VERSION 3 RUN COST AS A FUNCTION OF TOLERANCE AND REFINEMENT

SMALL CASE

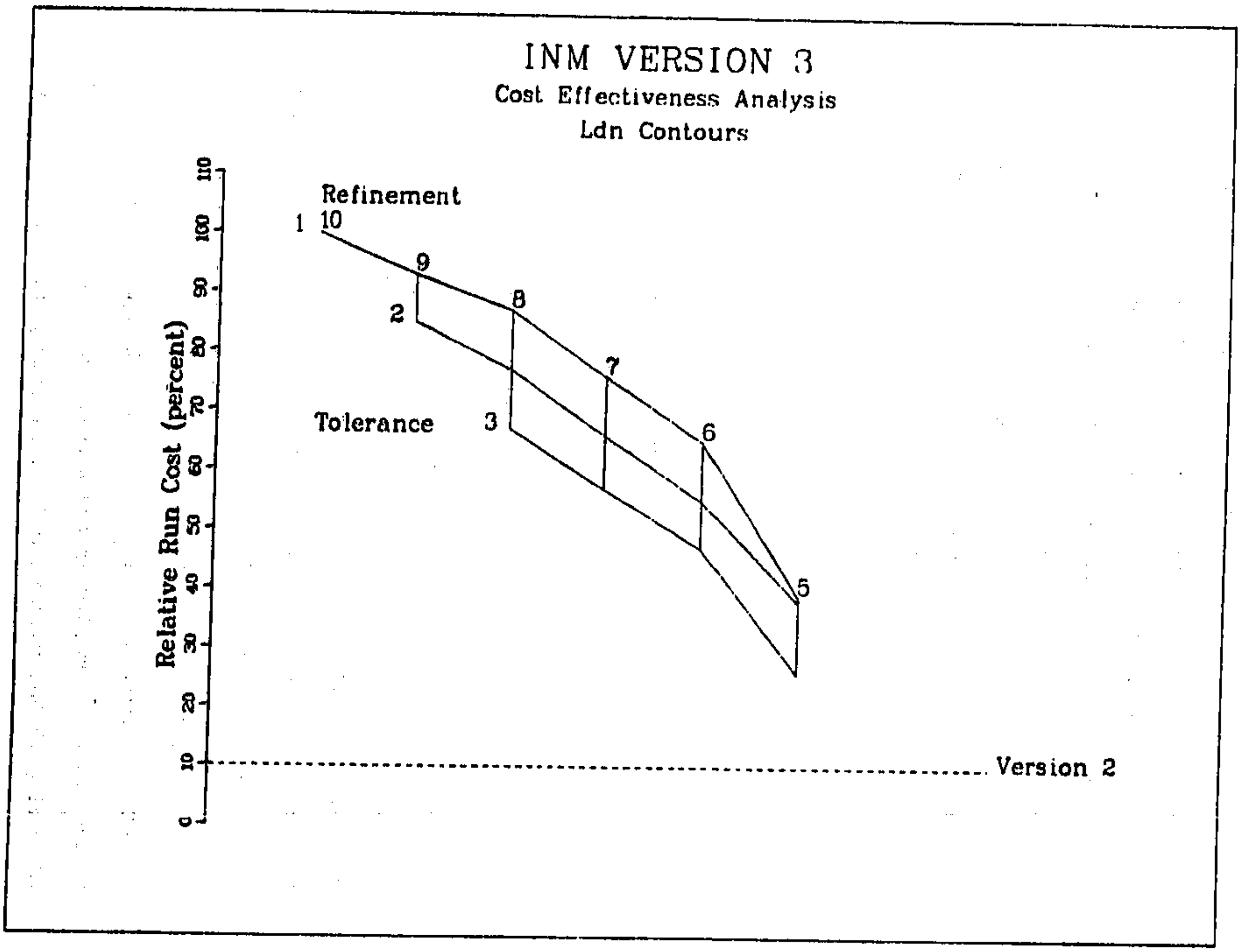


FIGURE B-4. INM VERSION 3 RUN COST AS A FUNCTION OF TOLERANCE AND REFINEMENT

MEDIUM CASE

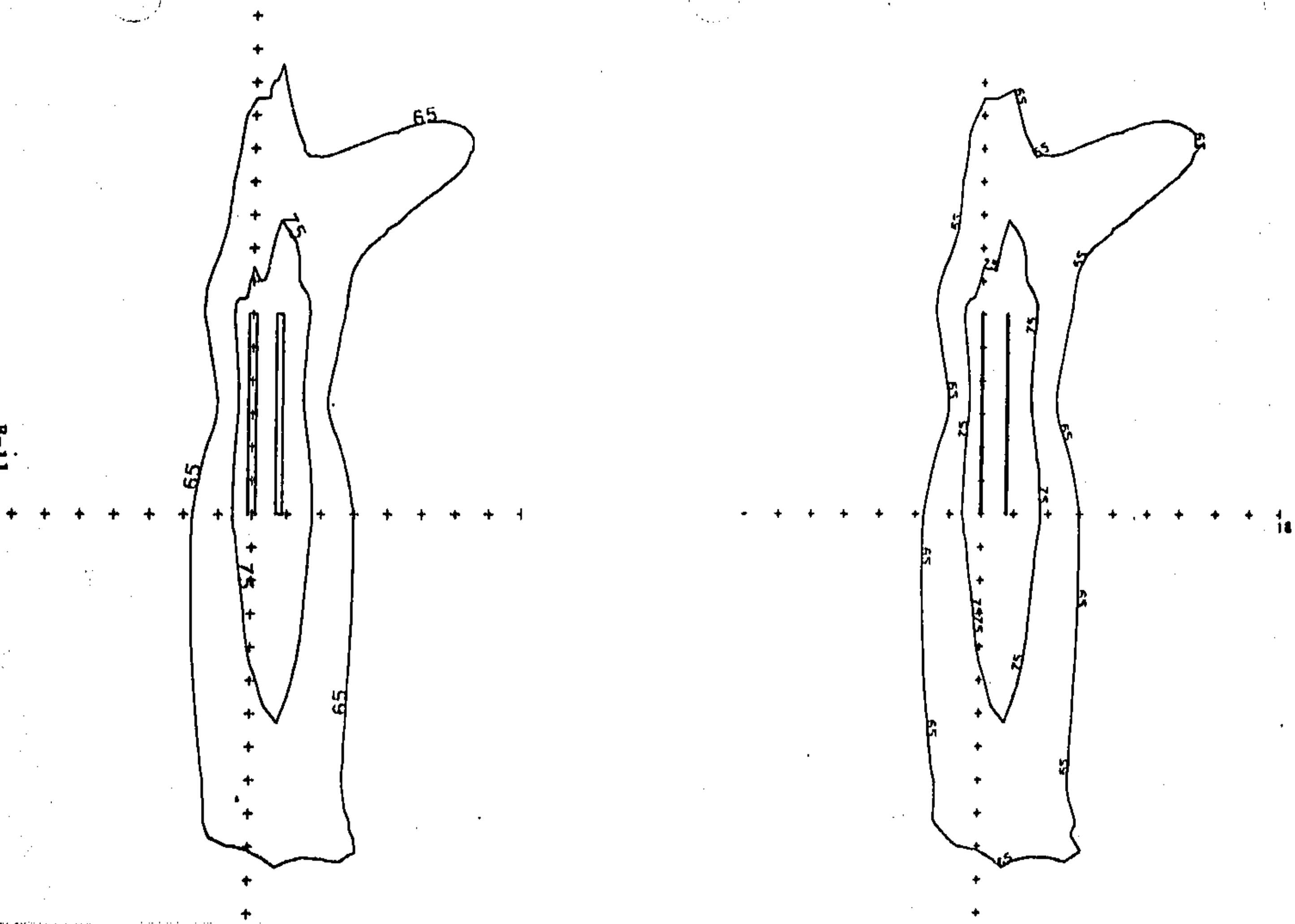
produced almost identical results both in area and plot quality. The smoothest looking contour lines were produced with the tolerance of 1.0 but the tolerance of 2.0 and refinement of 6 plot contained just a few jagged sections as shown in Figure B-5. The quality of the plot began to fall off rapidly at refinements less than 6. The plots using refinements of 5 at all tolerances were very similar to the reference plot except for a tendency to cutoff contour ends. The plots using the refinement 4 and 3 were poor in comparison. Based upon this analysis, the new recommended defaults for cost control are TOLERANCE = 2 and REFINE = 6. Of course the user has the input control to perform a similar analysis with his data.

B.7 CONTROLLED COST COMPARISON

The cost comparison of Version 2 and Version 3 with the new cost control defaults produced vastly different results. The small case with Version 3 cost $50 as compared to the $60 Version 2 run. The medium case dropped to $1,000 to compare with a $180 Version 2 run. Version 3 offers additional cost saving flexibility in that the cost of producing the 70 L_{dn} contour with the 65 and 75 L_{dn} contours is $5 and $12 for the small and medium cases, respectively. This is possible by saving the irregular grid on file through input and job stream commands and retrieving that file during a later execution. With Version 2 the entire job must be rerun at full cost.

B.8 AVAILABILITY OF TIMESHARE DISCOUNTS

All cost numbers cited previously do not take into account the various discount rates given by timeshare vendors. For example, under the UIS pricing schedule available to Federal agencies, the actual cost of any particular run is 60% of what is shown. All vendors offer similar rates.



TOLERANCE = 1.0
REFINE =10

TOLERANCE = 2.0
REFINE = 6

FIGURE B-5. COMPARISON OF LDN CONTOUR PLOT QUALITY
MEDIUM CASE

Additional savings can be achieved through the different types of services available from a vendor. UIS offers the SUPRA Service to access their CRAY-1 computer. Under SUPRA, the Version 3 run costs dropped tremendously for the medium airport case. A $1300 overnight run became a $300 overnight run under SUPRA. The relative cost reduction is shown in Figure B-6. This discussion is in no way an endorsement of UIS. UIS is simply an example and a vendor that is available to this office. The sole purpose of this section is to present ideas to control INM computer costs through timeshare vendors. Special services such as SUPRA do require guaranteed minimum levels of use on non-government accounts and the sales representatives of the various timeshare vendors can provide that information.

B.9 INPUT GUIDELINES

The use of TOLERANCE and REFINE are direct controls of run cost through the level of detail at which noise calculations are permitted. The run cost is also a reflection of the size and complexity of the input case. The numbers of aircraft types, profiles and tracks directly correspond to the cost of producing noise contours. There are several means of streamlining these inputs while maintaining output integrity. The following observations on modeling of airport noise are keys to streamlining an input file:

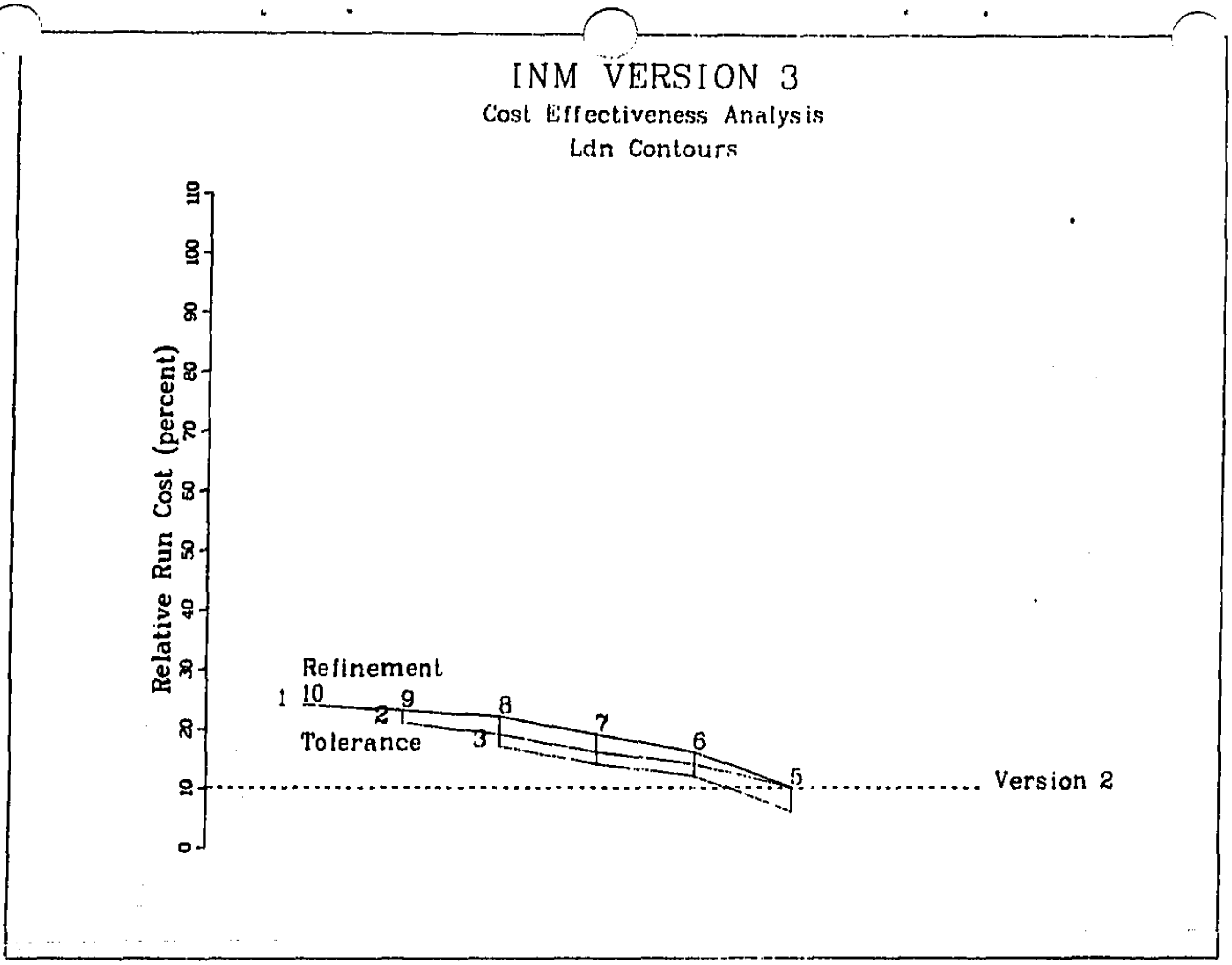


FIGURE B-6. INM VERSION 3 RUN COST AS A FUNCTION OF TOLERANCE AND REFINEMENT

MEDIUM CASE WITH UIS SUPRA PRICING

a. Small propeller-driven airplanes are much quieter than any commercial jet.

b. The difference in noise exposure due to an aircraft's takeoff profiles from adjoining trip length categories, such as between Stage 1 and Stage 2, is insignificant to the total exposure.

c. Aircraft of generally the same size, with the same number of engines, and sharing the same set of noise curves produce almost identical results.

d. As a result of distributing the operations over all tracks, any aircraft with less than one departure or arrival on a track is insignificant to the total exposure.

Using these fairly obvious observations can help simplify the input requirements. The quietest aircraft can be removed from all ground tracks which are dominated by other aircraft without affecting output. Departures can be grouped into fewer trip categories to lower cost. Aircraft such as DC-9-10, DC-9-30 and B737 can be defined as one aircraft type in the input and will produce valid results. Other ways to simplify the calculations concern the complexity and dispersion of ground tracks. However, hard and fast rules for tracks do not exist. In all, the careful examination of the types, numbers and dispersions of operations in an airport study can lead to the elimination and consolidation of input to form a cost efficient case.

APPENDIX C.

HOW TO GET VERSION 3

U.S. Department
of Transportation
**Federal Aviation
Administration**

APR 23 1985

800 Independence Ave., S.W.
Washington, D.C. 20591

* * * * * * INTEGRATED NOISE MODEL VERSION 3.8 FOR IBM XT * * * * * *

The Federal Aviation Administration is now offering a version of the Integrated Noise Model (INM) Version 3.8 for the IBM XT personal computer. This is the same model as available on magnetic tape for large computer systems.

For those of you who have run INM 3.8, the personal computer version is slow. The test case input as described in the INM user's guide (Report No. FAA-EE-81-17) <u>without</u> the request for NEF contours requires 15 hours to run. In addition, the INM PC version takes approximately an hour to produce contours for a small general aviation airport.

To run the INM PC version requires an IBM XT with:
- 512K RAM
- MSDOS 2.0 (or higher)
- 8087 math co-processor
- 1Mbyte unused space on the hard disk drive

This model is also compatible with the COMPAQ and new IBM AT personal computers with hard disk drives. In fact, the INM PC version should also work on other IBM PC compatible computers which are equipped with hard disk drives and MSDOS 2.0. The math co-processor is not really required but without it the INM PC runs 2 to 3 times slower than the test times mentioned above.

The INM PC version is composed of four executable modules; INPUT.EXE, FLIGHT.EXE, COMPUTE.EXE and DBASEPR.EXE. In addition, we provide three methods to produce contour plots. INMDRAW.BAS can draw contours on an IBM Graphics Display screen and produce Hewlett Packard (HP) plotter graphs. INMHPLOT.BAS produces the HP plotter graphs for those of you with monochrome displays. We also include the FORTRAN source code for a Plot Module for those of you with a FORTRAN compiler, graphics library and plotting device other than what is identified above.

To order the INM PC version, please fill out the enclosed form and return to this office with check or money order in the amount of $15 payable to "United States Treasury." Unlike the ordering procedure for INM magnetic tapes, you do not have to sign a loan agreement for the INM PC version. To certify your PC version, we do require the test case output report and a good quality contour plot to scale.

Sincerely,

Thomas L. Connor

Thomas L. Connor
Operations Research Analyst

INM ON IBM PC/XT REQUEST FORM

DATE: ______________

NAME: ____

TITLE: ____

COMPANY: ____

ADDRESS: ____

CITY, STATE: ____

ZIPCODE: ____________

PHONE NUMBER: _________________ COMPUTER: ____________________

Check the appropriate box(es):

☐ Please send me the INM PC version with plotting capability. Enclosed is my check or money order in the amount of $15 payable to the "United States Treasury."

☐ I would also like a copy of "INM, Integrated Noise Model - Version 3 User's Guide" (Report No. FAA-EE-81-17) at no additional cost to me.

Send to:

Federal Aviation Administration
Office of Environment and Energy
AEE-120
800 Independence Ave., S.W.
Washington, DC 20591
(Attention: Thomas L. Connor)

C.0 WHAT IS AVAILABLE

The Integrated Noise Model (INM) Version 3 is available on a 9-track tape and is currently compatible with IBM, DEC-10, CDC, and CRAY computer systems. Documentation currently available include the Users Guide, Installation Instructions, and two reports prepared by MITRE Corporation. A Programmer's Maintenance Manual and Data Base Manual are planned for the future.

C.1 DOCUMENTATION

To obtain copies of any INM document fill in the lower portion of Figure C-1, INM Request Form, and send to:

Federal Aviation Administration
Office of Environment and Energy
AEE-120, Room 433
800 Independence Avenue, S.W.
Washington, D.C. 20591
Attention: Thomas L. Connor OR
Donna G. Warren

C.2 9-TRACK TAPE

To obtain a copy of the INM Version 3 on 9-track tape, fill in Figure C-1 also Figure C-2, Blank Loan Agreement, as shown in Figure C-3 Sample Loan Agreement. Send the form and agreement along with a check for $77, made payable to the "United States Treasury," to the address in paragraph C.1, above.

INM VERSION 3.8 REQUEST

1. Type of Computer System: ______________________

2. ☐ IBM ☐ DEC-10 ☐ CDC ☐ CRAY

3. ☐ Labelled ☐ Unlabelled

4. ☐ EBCDIC ☐ ASCII

DOCUMENTATION REQUEST

1. ☐ Users Guide, FAA-EE-81-17

2. ☐ Installation Instructions, FAA-EE-81-18

3. ☐ "A Comparison of FAA Integrated Model Flight Profiles with Profiles Observed at Seattle-Tacoma Airport", DOT/FAA/EE-82/10

4. ☐ "FAA Integrated Noise Model Validation: Analysis of Air Carrier Flyovers at Seattle-Tacoma Airport", DOT/FAA/EE-82-19

5. ☐ Programmer's Maintenance Manual (planned document)

6. ☐ Data Base Manual (planned document)

NAME: ______________________

TITLE: ______________________

COMPANY: ______________________

STREET ADDRESS: ______________________

CITY, STATE, ZIP: ______________________

TELEPHONE NO.: ______________________

FIGURE C-1. INM REQUEST FORM

LOAN AGREEMENT

WHEREAS, property owned by the United States and now in the custody of the Federal Aviation Administration (FAA) is identified as follows:

1. The DOT/FAA Integrated Noise Model (INM), Version ,

2. A noise-simulation computer program capable of describing and defining the impact of aircraft noise at or around airports.

3. Compiled on one (1) reel of 1/2 inch computer tape containing the complete INM program, in Fortran IV source code for a computer with the following specifications:

   a. ☐ IBM ☐ DEC-10 ☐ CDC ☐ CRAY
   b. ☐ Labelled ☐ Unlabelled
   c. ☐ EBCDIC ☐ ASCII

WHEREAS, use of the INM will increase FAA efficiency in processing noise assessment actions,

and WHEREAS,
desires the use of the INM program, hereafter referred to as computer tape, on a loan basis at

for calculating the impact of aircraft noise; NOW, therefore, pursuant to the authority vested in the Administrator under the Federal Aviation Act of 1958, Section 305, as amended, and the authority contained in the Airport and Airway Development Act of 1970, Section 16, the FAA, hereafter referred to as the Licensor, grants to

hereafter referred to as the Licensee, the custody and possession of the computer tape described above from the effective date of this agreement, subject to the following terms and conditions:

1. This agreement may be terminated at any time by the Licensor and may be terminated by the Licensee at any time upon furnishing 30 days notice to the Licensor.

2. The costs of producing the computer tape from the master tape and the costs of packing, handling, and shipment of the computer tape from FAA, Office of Environment and Energy, Washington, D.C., will be borne by the Licensee. The total costs covering these items is $77.00. Payment shall be made to the order of The Treasury of the United States, and received by the Licensor prior to delivery of the computer tape.

3. Licensee assumes responsibility for the computer tape upon receipt by either the Licensee or his agent.

4. The Licensee agrees to:

   a. Maintain the computer tape to original operating condition at all times; if needed, obtain a replacement tape from the Licensor at no expense to the Licensee and permit the Licensor to inspect the computer tape at any time during the period of the loan agreement.

FIGURE C-2. BLANK LOAN AGREEMENT (Part 1 of 2)

b. Make no modification or alteration to the computer tape or its contents except as authorized by the Licensor. Such authorization covers modifications or alterations to the computer tape or its contents which may be required by the Licensee to install the computer tape on certain types of computer hardware; however, this authorization will be given only after the Licensee has submitted required changes and test results of the changes.

c. Provide the Licensor with sample test output using the test data provided to verify the instruction and accuracy of output produced by the INM on the equipment used by the Licensee. This test output is to be provided to and approved by the Licensor prior to general INM usage.

d. Assume the liabilities, responsibilities, and cost incurred in or arising from the operation or use of the computer tape during the period of the loan agreement.

e. Use exclusively the authorized version of the INM computer tape program in the preparation of noise impact data submitted to FAA during the term of the agreement. All submissions prepared by or with the assistance of the Licensee will be accompanied by assurances to this effect.

f. Defend any suit brought against the United States, the FAA, or any officer or instrumentality of the United States arising out of the use of the leased article, and further agrees to hold the United States, the FAA, and any instrumentality or officer of the United States harmless against any claim of the Licensee or any third person for personal injury, death, or property damage arising out of use of the leased article.

5. Upon termination of this loan agreement, the Licensee will return the computer tape at no expense to the Licensor to FAA, Office of Environment and Energy, Noise Technology Branch, AEE-120, 800 Independence Avenue, SW., Washington, D.C. 20591.

6. The Licensor and Licensee agree to the terms of this agreement as indicated by the signature of the duly authorized officers as of the dates shown below each signature. The effective date of this agreement is the date the Licensee receives the computer tape from the Licensor.

LICENSOR	LICENSEE
BY______________________	BY______________________
TITLE___________________	TITLE___________________
DATE____________________	DATE____________________

FIGURE C-2. BLANK LOAN AGREEMENT (Part 2 of 2)

S A M P L E

LOAN AGREEMENT

WHEREAS, property owned by the United States and now in the custody of the Federal Aviation Administration (FAA) is identified as follows:

1. The DOT/FAA Integrated Noise Model (INM), Version (1-Version No.) ;

2. A noise-simulation computer program capable of describing and defining the impact of aircraft noise at or around airports.

3. Compiled on one (1) reel of 1/2 inch computer tape containing the complete INM program, in Fortran IV source code for a (2-Computer System) computer with the following specifications:

(3)	a. ☐ IBM	☐ DEC-10	☐ CDC	☐ CRAY
(4)	b. ☐ Labelled		☐ Unlabelled	
(5)	c. ☐ EBCDIC		☐ ASCII	

WHEREAS, use of the INM will increase FAA efficiency in processing noise assessment actions,

and WHEREAS, (6-Name of Organization)
desires the use of the INM program, hereafter referred to as computer tape, on a loan basis at (7-Mailing Address of Computer Facility)

for calculating the impact of aircraft noise: NOW, therefore, pursuant to the authority vested in the Administrator under the Federal Aviation Act of 1958, Section 305, as amended, and the authority contained in the Airport and Airway Development Act of 1970, Section 16, the FAA, hereafter referred to as the Licensor, grants to (8-Name and Address of Organization)

hereafter referred to as the Licensee, the custody and possession of the computer tape described above from the effective date of this agreement, subject to the following terms and conditions:

1. This agreement may be terminated at any time by the Licensor and may be terminated by the Licensee at any time upon furnishing 30 days notice to the Licensor.

2. The costs of producing the computer tape from the master tape and the costs of packing, handling, and shipment of the computer tape from FAA, Office of Environment and Energy, Washington, D.C., will be borne by the Licensee. The total costs covering these items is $77.00. Payment shall be made to the order of The Treasury of the United States, and received by the Licensor prior to delivery of the computer tape.

3. Licensee assumes responsibility for the computer tape upon receipt by either the Licensee or his agent.

4. The Licensee agrees to:

   a. Maintain the computer tape to original operating condition at all times; if needed, obtain a replacement tape from the Licensor at no expense to the Licensee and permit the Licensor to inspect the computer tape at any time during the period of the loan agreement.

FIGURE C-3. SAMPLE LOAN AGREEMENT (Part 1 of 2)

b. Make no modification or alteration to the computer tape or its contents except as authorized by the Licensor. Such authorization covers modifications or alterations to the computer tape or its contents which may be required by the Licensee to install the computer tape on certain types of computer hardware; however, this authorization will be given only after the Licensee has submitted required changes and test results of the changes.

c. Provide the Licensor with sample test output using the test data provided to verify the instruction and accuracy of output produced by the INM on the equipment used by the Licensee. This test output is to be provided to and approved by the Licensor prior to general INM usage.

d. Assume the liabilities, responsibilities, and cost incurred in or arising from the operation or use of the computer tape during the period of the loan agreement.

e. Use exclusively the authorized version of the INM computer tape program in the preparation of noise impact data submitted to FAA during the term of the agreement. All submissions prepared by or with the assistance of the Licensee will be accompanied by assurances to this effect.

f. Defend any suit brought against the United States, the FAA, or any officer or instrumentality of the United States arising out of the use of the leased article, and further agrees to hold the United States, the FAA, and any instrumentality or officer of the United States harmless against any claim of the Licensee or any third person for personal injury, death, or property damage arising out of use of the leased article.

5. Upon termination of this loan agreement, the Licensee will return the computer tape at no expense to the Licensor to FAA, Office of Environment and Energy, Noise Technology Branch, AEE-120, 800 Independence Avenue, SW., Washington, D.C. 20591.

6. The Licensor and Licensee agree to the terms of this agreement as indicated by the signature of the duly authorized officers as of the dates shown below each signature. The effective date of this agreement is the date the Licensee receives the computer tape from the Licensor.

LICENSOR	LICENSEE (9)
BY____________________	BY____________________
TITLE____________________	TITLE____________________
DATE____________________	DATE____________________

FIGURE C-3. SAMPLE LOAN AGREEMENT (Part 2 of 2)

U.S. Department
of Transportation

Federal Aviation Administration

800 Independence Ave., S.W.
Washington, D.C. 20591

Official Business
Penalty for Private Use $300

Postage and Fees Paid
Federal Aviation
Administration
DOT 515

U.S. MAIL

FOURTH CLASS BOOK RATE

RETURN POSTAGE GUARANTEED