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AIRPORT NOISE REDUCTION FORECAST

VOLUME II — NEF COMPUTER PROGRAM DESCRIPTION AND USER'S MANUAL

Carroll Bartel, Charles Coughlin, John Moran and Larry Watkins

OCTOBER 1974

FINAL REPORT

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16. Abstract

A fundamental requirement of this contract was that the noise impact of air traffic around major airports on the surrounding community be described and that predictions of various noise abatement alternatives be made. For this the DOT/Wyle Noise Exposure Forecast Computer Program was developed. Volume II of this report is a description of this program.

Included in this volume are brief descriptions of the calculations performed, the subroutines that perform them, and a User's Guide. Also included is a complete listing of the program, in Fortran V.

Inputs to the program are a description of the airport geometry including flight paths, aircraft noise and performance characteristics, and the aircraft fleet mix. Outputs are contours of equal value of Noise Exposure Forecasts around the airport.

Volume I of this report (Report DOT-TST-75-3) contains information pertaining to the input data, all the computer runs that were made, and the conclusions drawn from those data.

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The computer program described herein evolved from a program provided by the Department of Transportation and described in DOT Report OST-ONA-71-1, November 1970. Although the program has been vastly expanded and altered, the basic methodology developed in the DOT supplied program has been used for continuing guidance. Our appreciation is expressed to both the Department of Transportation and the authors of that original document.

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1.0 INTRODUCTION

This volume presents a description of a Noise Exposure Forecast (NEF) Computer Model developed for the Department of Transportation. Brief descriptions are given of the computations performed by the program and the routines that perform them, a description is given of the Test Case used to verify the program correctness, and a User's Guide is included.

The computer program described in the following sections was used to generate the Noise Exposure Forecast information utilized for the "Airport Noise Reduction Forecast" Project for the Department of Transportation, Contract Number DOT-OS-20088. The program operates on a Univac 1108 computer with an EXEC 2 operating system. The program is machine dependent and the coding corresponds to University Computing Corporation's version of Fortran V. Several nonstandard subroutines are used (see Section 2.3) and at least one of these is unique to the facility at which the program was operated (see Figure 2.3.1-1).

Section 2 includes a general description of the program function and required inputs with functional flow charts, followed by a detailed description of terms used and significant calculations performed. Next is a set of brief subroutine descriptions with subroutine linkage diagrams. Also included is a detailed explanation of the aircraft performance and noise data stored in the Block Data Subprogram.

Section 3 contains a definition of the imaginary airport used for program verification. Included is a description of the calculations checked by each part of the test case.

Section 4 is the NEF Program User's Guide. This section contains all the details that would be required by a programmer or engineer desiring to set up an execution of the program, such as input card formats, input restrictions, computer hardware requirements, etc.

Section 5 contains a sample run of the program with both input and output shown.

Section 6 contains the source listing of the program.

2.0 PROGRAM DESCRIPTION

2.1 General Description

Program NOISE 1 is the executive routine of the DOT/Wyle Noise Exposure Forecast Computer Program. Given a suitable definition of the airport system, it will generate Noise Exposure Forecast (NEF) contours, defined by a sequence of points around the airport. The program will also, if desired, provide a graphic display of the generated contours and will record the point data on magnetic tape.

Program GRID is an alternate executive program which uses the same noise computation routines as NOISE 1. The purpose of GRID is to compute and display noise exposure values at a set of discrete points, defined either explicitly or in a rectangular grid pattern. Since this is intended for diagnostic purposes, the only available output is printed. Figures 2.1.1 and 2.1.2 are functional flow diagrams for these programs.

The "airport system definition" must include the following data, in terms of a Cartesian coordinate system with the origin chosen (arbitrarily) somewhere near the center of the airport:

- The endpoints of each runway used
- The airport altitude above sea level and mean temperature
- The ground tracks followed by all aircraft, both arriving and departing
- Altitude, thrust level, and velocity versus distance profile data for each approach track
- Takeoff altitude restrictions and power cutbacks, if any
- The number of daily flights, divided into night and day operations, for every significant combination of aircraft type and ground track. (Note that the same aircraft with a different weight will be considered a distinct aircraft type.)

In addition, the following aircraft dependent data are required:

- Noise versus distance for several thrust levels
- Altitude, thrust, and velocity versus distance from brake release for takeoffs

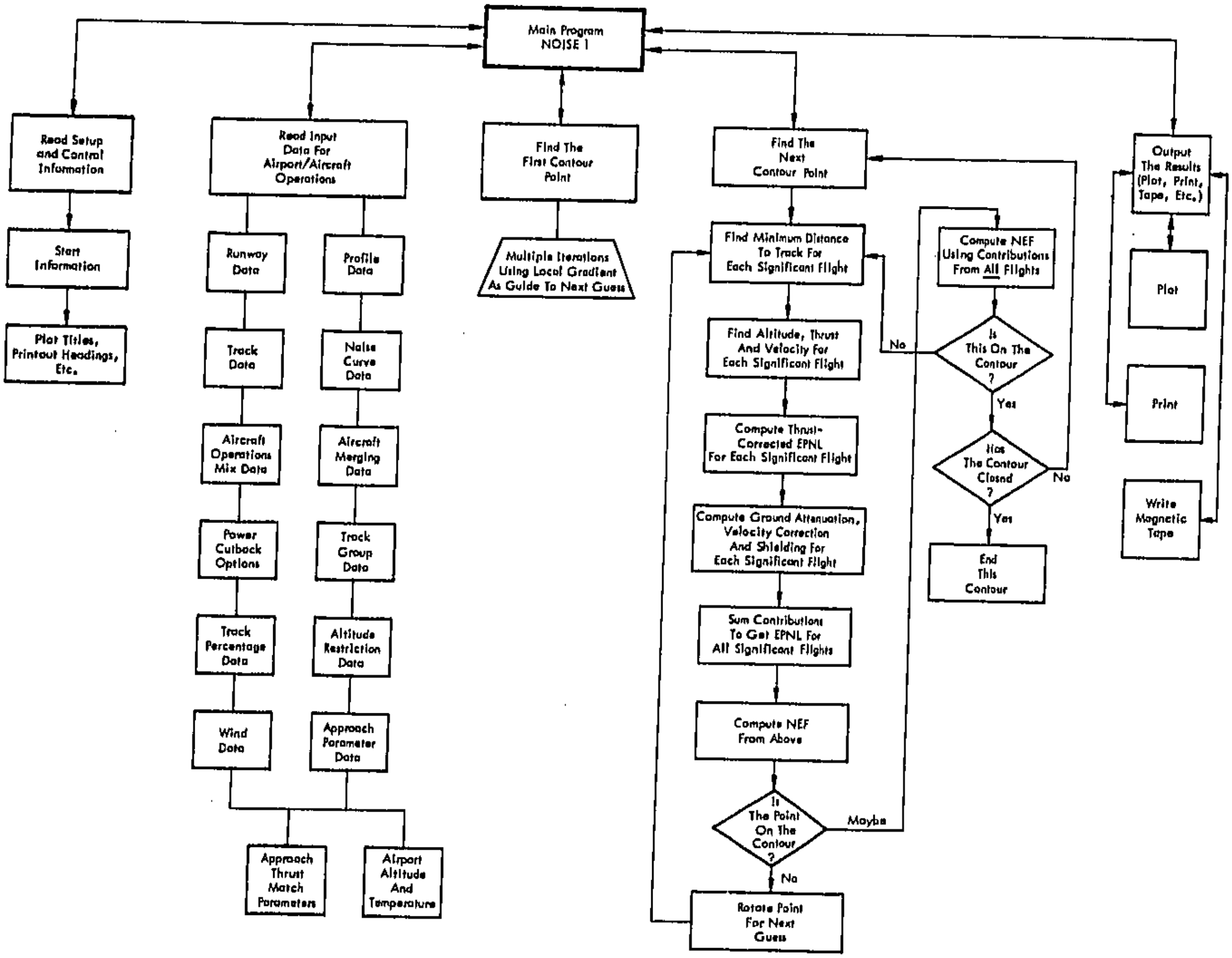


Figure 2.1.1. Functional Flow Diagraom of Program NOISE 1

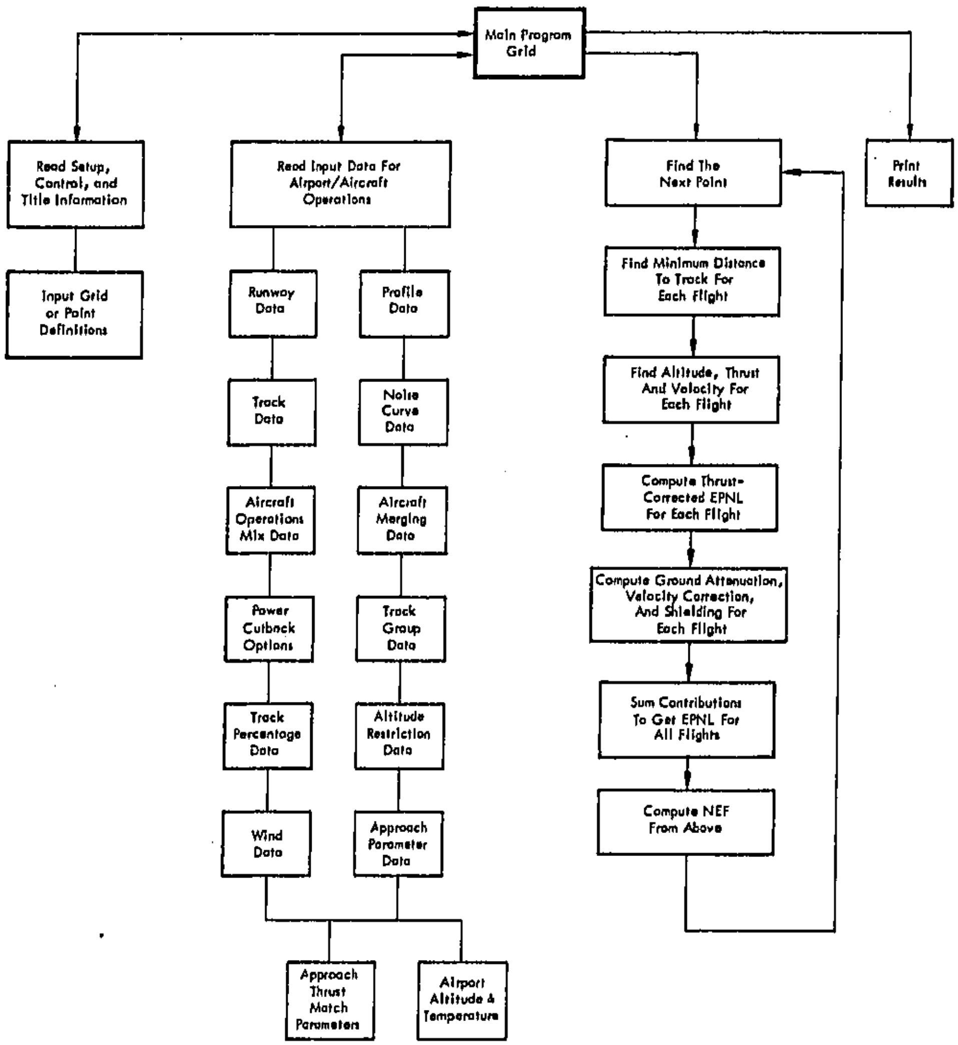


Figure 2.1.2. Functional Flow Diagram of Program GRID

Given all the above data, the noise level at a point caused by a single flight can be determined. First, the ground track is examined to determine the point of closest approach. This defines the distance of the aircraft from touchdown or liftoff which then determines its altitude, thrust, and speed. Using the altitude, the slant range is determined, and then the noise level in EPNdB can be found by interpolating in a table. The noise level is then corrected for ground attenuation, shielding, and velocity effects to determine the noise level due to this flight.

To determine the total NEF at the point, the above procedure is repeated for every flight and summed. By considering the noise exposure level at any point in the plane of the airport to be a scalar function of that point's position vector, it is possible to apply methods of vector analysis to find points on the desired contour.

2.2 Detailed Method

2.2.1 Definitions

- Altitude Restriction - At some airports it is necessary to set maximum altitudes for takeoffs along certain tracks. These cases can be included in the program by specifying the maximum altitude and distance to the end of the restriction for each track involved. This is a special case of a power cutback.
- Elevation Angle - The elevation angle is the angle between the ground plane and the line-of-sight from the observer to the nearest point of the flight, as defined by the slant range (the angle β in Figure 2.2.1-1).
- Mix Data - The mix data specify the number of operations for all significant combinations of ground track, profile, and noise curve. To define a flight, the following information must be provided:
  - Track number.
  - Profile number (this will distinguish between takeoffs and landings).
  - Noise curve number.
  - Number of day operations.
  - Number of night operations.

- Origin of Coordinate System - The origin is chosen arbitrarily near the center of the airport, suitable for convenient runway definitions.

- Power Cutback - Occasionally, usually for noise abatement reasons, it is desirable to modify the standard takeoff procedures by a power cutback. There are five types of cutback allowed by the program:

  1. Altitude restriction.
  2. Takeoff power.
  3. Max climb power.
  4. FAR 36.
  5. Maintain specified climb gradient.

- Profile - A profile is a set of data that defines the aircraft altitude (actually the height above the airport), velocity, and thrust as a function of the distance along the track from brake release or threshold. Note that profiles are track dependent on approach and aircraft dependent on takeoff. See Figures 2.2.1-2 and 2.2.1-3. Note also that there is a standard form for takeoff profiles that must be used if any type of power cutback is to be applied.

- Runways - A runway is defined by the coordinates of its endpoints. Furthermore, the endpoints are ordered so that an aircraft taking off from that runway will go from the first endpoint to the second endpoint. Thus, if a runway is used in both directions, it must be defined as two distinct runways. The coordinates of the runways are given in feet.

- Slant Range - For computational reasons, it is much easier to use an approximation to the closest distance to a given flight, rather than find the actual closest distance. This approximation is called the slant range or slant distance. See Figure 2.2.1-1.

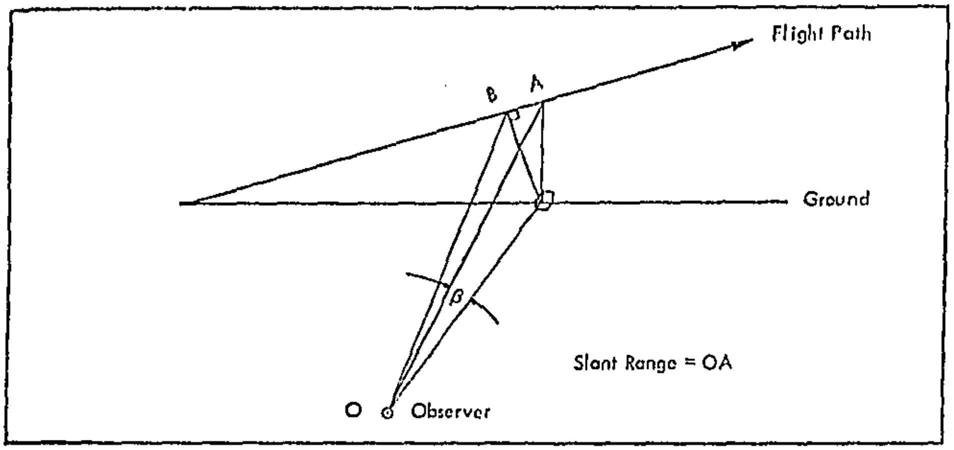
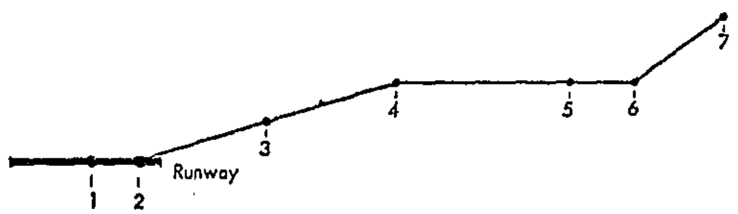


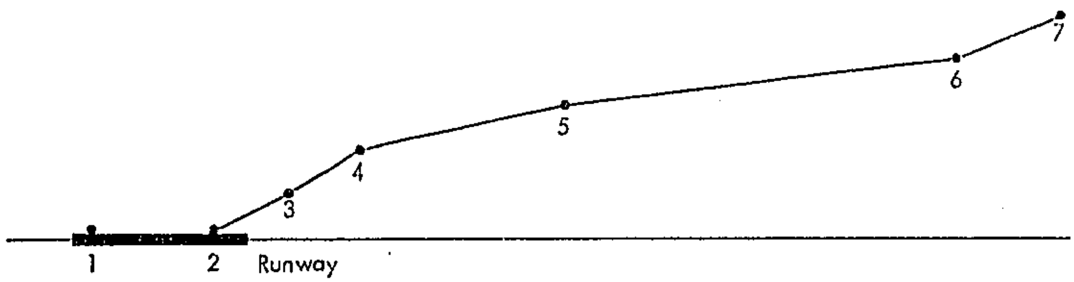
Figure 2.2.1-1. Slant Range Definition



Point #	1	2	3	4	5	6	7
Distance (n.mi. Ref. Threshold	-1.	-0.157	3.12	7.83	20.75	22.3	30.3
Altitude (ft)	0.	0.	1000.	2500.	2500.	2500.	6500.
Velocity Indicators (ktas)*	32.	-2.	-2.	-2.	160.	160.	200.
Thrust Indicators*	-10.	-3.	-6.	-5.	-7.	-8.	

*Negative numbers are indicators (See Table 2.4.3-1).

Figure 2.2.1-2. Example of an Approach Profile



Point	1	2	3	4	5	6	7
Distance (ft)	0	10,000	15,000	26,500	43,000	63,000	103,000
Altitude (ft)	0	0	500	1,500	3,000	4,000	6,000
Velocity (ktas)	80	160	160	160	160	250	250
Thrust (lbs)	40,000	40,000	40,000	35,000	35,000	35,000	

Figure 2.2.1-3. Example of a Takeoff Profile (Standard Form)

It can be seen that the true closest distance is $\overrightarrow{OB}$, but the slant range, $\overrightarrow{OA}$, is much simpler to compute. It can be shown that the error incurred by using slant distance is small.[1]

- Standard Takeoff Profile - The standard profile describes a takeoff as performed under normal ATA procedures. It must have seven segments, each of which has a particular meaning as shown in Figure 2.2.1-4. There must also be additional data stored in the end of the profile (also shown in Figure 2.2.1-4).

- Tracks - (Ground Tracks) - The ground track is the projection of the aircraft flight path onto the plane of the runways and is defined for the program by a sequence of straight and circular segments, with each segment specified by a length and radius. If the radius is zero, the segment is straight and the length is given in nautical miles. If the radius is non-zero, it gives the radius in nautical miles and the length is the angle of the turn in degrees. A negative radius implies a left turn and a positive radius a right turn when tracking from the runway outward. The track definition is completed by specifying the associated runway. Figure 2.2.1-5 is a track definition example.

- Track Group - Frequently, several different tracks will coincide in regions near the airport. In order to simplify calculations, these common regions are defined by means of the track group. A group is specified by the numbers of all tracks belonging to the group, and by the distance from the start of the runway that the tracks remain common.

[1] See References, Page R-1.

Point*	1	2	3	4	5	6	7	8**	9**	10**
Segment	1	2	3	4	5	6	7			
Data Meaning	Ground Roll	Lift Off	Takeoff	Maximum Climb to 3000' Altitude	Accelerate and Clean Up Flaps	Climb Out	Climb Out	General Information	Climb Gradients for Cutback	Thrusts for Cutback
Distance	Brake Release to Lift Off	Lift Off to Gear Up	Gear Up to 1500' Altitude	Climb to 3000' Altitude	Accelerate to 250 ktas	Start Climb Out			0	Level Flight
Altitude	0	0 to Gear Up	Gear Up to 1500'	1500' to 3000'	Gradual Climb from 3000'	Climb Out			Takeoff	Takeoff Power
Velocity (ktas)	≥ 32 to V_2 + 10	$V_2 + 10$	$V_2 + 10$	$V_2 + 10$	V_2 + 10 to 250	250	250	Number of Engines	Climb	Climb Power
Thrust	Takeoff	Takeoff	Takeoff	Climb	Climb	Climb		Gross Weight	FAR 36 Simulation	One Engine Out - Level Flight

*See Figure 2.2.1-3

**These parts of each standard form profile contain power cutback performance parameters

Figure 2.2.1-4. Meaning of Data in Standard Takeoff Profile

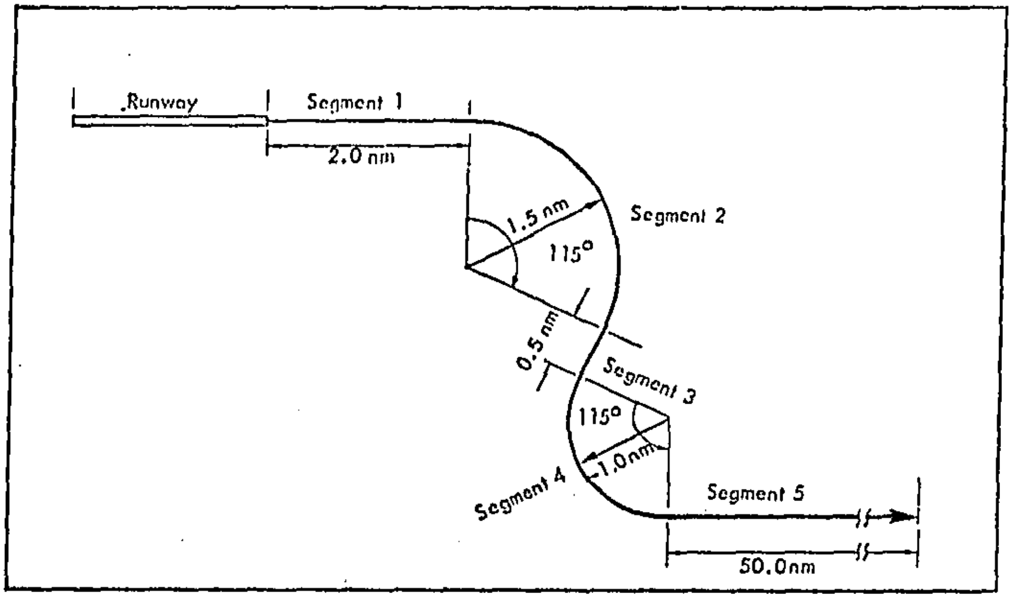


Figure 2.2.1-5. Example of a Track Definition

2.2.2 Calculations

Delta Correction – The δ correction is a correction to aircraft performance to account for pressure-altitude variations. The use of this correction is based on these assumptions:

1) Noise is a function of corrected net thrust.
2) Thrust level specifications are descriptions of throttle settings and do not change with pilot or altitude changes; therefore, the performance of the aircraft must change.
3) If the aircraft is required to maintain a fixed climb gradient, the uncorrected net thrust must be constant, so the corrected net thrust must change.

This correction is used for the following purposes in the program:

1) Aircraft performance changes caused by airport altitude are simulated by changing the climb gradients defined in the profiles. (See the following section on temperature correction.)
2) Approach thrusts as input are uncorrected and must be divided by δ to correct for airport altitude.
3) δ is used to compute the corrected net thrust for a fixed gradient cutback.
4) After a cutback is inserted into a profile, the remaining profile must be corrected for the altitude shift caused by the cutback segment.

The value of δ is computed by:

$$\delta = [1 - (6.9406 \cdot 10^{-6})\, H]^{5.2044}$$

where H is the aircraft altitude, in feet above mean sea level.

- Temperature Correction – A temperature correction can be applied to standard takeoff profiles to correct takeoff roll distance and climb gradients. The corrected ground roll distance is given by:

$$D' = D \cdot \theta \cdot \delta_r^{-2}$$

where D is the original roll distance

$\theta = \frac{T_2}{T_1}$, T_2 is new temperature and

T_1 is old temperature.

$\delta_r = \frac{\delta_1}{\delta_2}$, δ_1 is old pressure-altitude correction and

δ_2 is new pressure-altitude correction.

The corrected climb gradient, γ, is given by:

$$\gamma = \gamma' + \frac{T}{W} (\delta_r - 1) \cdot \delta_2$$

where

γ' is the old gradient

T is the total thrust

W is the aircraft weight

δ_r, δ_2 are as defined above.

Derivations of these corrections may be found in Reference 5.

- Distance to track – In order to find the minimum distance to the track, the minimum distance to each segment of the track is computed and the smallest of these distances chosen as the minimum distance to the track. To find the minimum distance to each segment, two distinct types of calculation are required; one for straight segments and one for circular segments. The parameters required for these calculations are described in Table 2.2.2-1.

Table 2.2.2-1

Parameters Available for Distance to Track Calculation

Straight Segment	Circular Segment
P_1 – x, y coordinates of the beginning of the segment ℓ – segment length $\hat{r}$ – x, y components of the unit vector in the direction of the segment	P_1 – x, y coordinates of the center of the turn r – radius of curvature α – turn angle τ – angle between the line joining the center with the start of the turn and the positive x-direction

Referring to Figures 2.2.2-1 and 2.2.2-2, it can be shown that the center segments cannot be the closest segments on the track to the point unless the point falls in the unshaded area. Moreover, if the point does occur in this area, neither of the two adjacent segments can be closer unless 1) one of them is a curved segment of over 180 degrees turn angle or 2) the segment itself is a curve of over 180 degrees. These properties speed the computation of distance to an individual segment and reduce the number of segments that have to be considered.

Distance to a Straight Segment

Define

$$x = \overrightarrow{P_1P} \cdot \hat{r} \qquad \text{(vector dot product)}$$

where $\overrightarrow{P_1P}$ is the vector from P_1 to P.

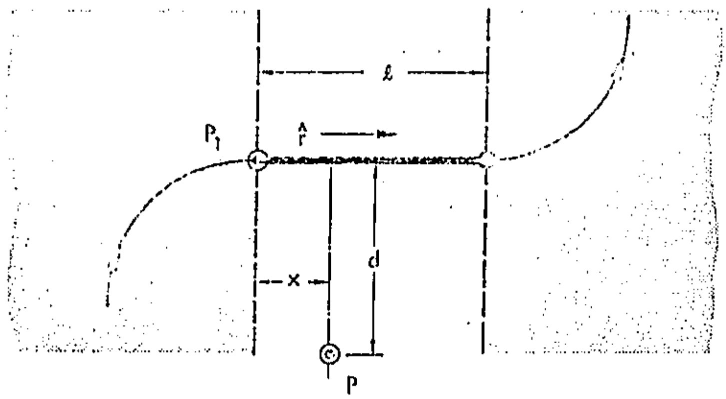


Figure 2.2.2-1. Distance to a Straight Segment

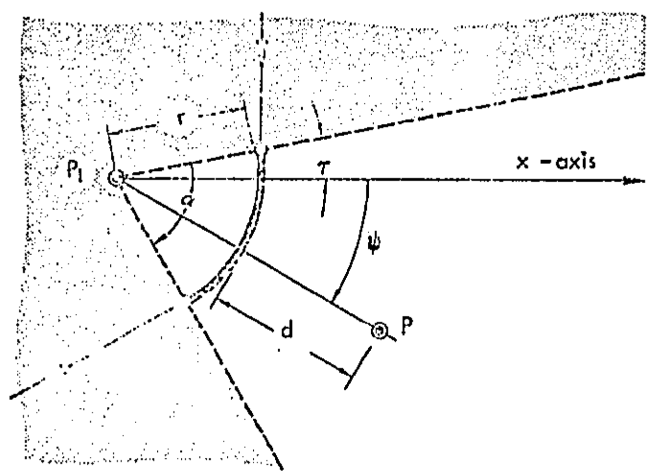


Figure 2.2.2-2. Distance to a Curved Segment

Point P lies within the unshaded region if and only if

$$0 < x < \ell$$

If P falls within the allowable region, the perpendicular distance to the segment d, is calculated by

$$d = \sqrt{|\overrightarrow{P_1P}|^2 - x^2}$$

Distance to a Circular Segment

Compute ψ, the angle between P_1P and the positive x-direction, such that ψ is in the range $-\pi$ to π. The point P lies within the unshaded sector if and only if one and only one of the following is true

$$0 < (\psi - \tau) S < \alpha$$

or

$$(\psi - \tau) S + 2\pi < \alpha$$

where $-\pi \leq \tau \leq \pi$, $0 < \alpha < 2\pi$ and $S = -1, +1$ for right and left turns respectively when tracing the track from the runway outward.

If P is in the unshaded sector, then the shortest distance to the segment, d, is given simply as:

$$d = |\overrightarrow{P_1P}| - r$$

- dB Corrections for Track Geometry – There are two reasons for the development of the following algorithms. Before these were developed, the noise was computed using only the closest track segment. Thus, if a track made a large turn so that, in some regions, two segments of the same track are close to the point of computation, severe discontinuities can appear in the noise function. These corrections remove (or reduce to insignificance) those discontinuities. Also, the EPNL data stored in the program are for a single straight flyover. Consequently, if the flight track is curved, the actual noise exposure will be greater than that obtained from the stored tables on the inside of the turn and less on the outside. These factors will correct for the inside of the turn only.

The following definitions are required:

MAX 1 = Segment number of the closest segment.

MAX 2 = Segment number of the next to closest segment.

S 1 = Distance from the point to MAX 1.

S 2 = Distance from the point to MAX 2.

D = S 2 – S 1.

DM = Length of the shortest segment of the track or 1/2 the smallest turn radius, whichever is less.

DX = DM/3

$G(D) = (D/DM)^2$

$F(\alpha) = 3 - \mathrm{MIN}\,(3,\ 6\,\frac{\alpha}{\pi})$, where α is a turn angle

(See Figures 2.2.2-3 and 2.2.2-4)

DA = a dB correction to be added arithmetically to the noise computed from segment MAX 1.

DB = a dB correction to the noise from segment MAX 2.

$$XX = \begin{cases} \text{Zone B: distance along MAX 2 to the point of closest approach measured from the end of the segment nearer the MAX 1.} \\ \text{Zone C: distance along shorter segment measured from the far end of the segment to the point of closest approach.} \end{cases}$$

The following corrections are applied if and only if $D < DM$ (See Figure 2.2.2-4)

(1) If $| MAX\ 1 - MAX\ 2 | > 2$ or MAX 1 and MAX 2 are both curved and are separated by one segment, then

$$DA = 0$$

$$DB = -20 \cdot G\ (D)$$

(2) Zone A

$$DA = -F\ (\alpha) \cdot \left[1 - G\ (D)\right]$$
$$DB = -F\ (\alpha) \quad -20 \cdot G(D)$$

Zone B

$$DA = -F\ (\alpha) \cdot \frac{XX}{DX} \cdot \left[1 - G(D)\right]$$
$$DB = -20 \cdot G(D) - F\ (\alpha) \left(\frac{XX}{DX}\right) -20 \left(\frac{DX-XX}{DX}\right)$$

Zone C

$$DA = -F\ (\alpha) \cdot \left[1 - G\ (D)\right] \cdot \left(\frac{XX}{DX}\right)$$
$$DB = -20\ G\ (D) - F\ (\alpha) \left(\frac{XX}{DX}\right)$$

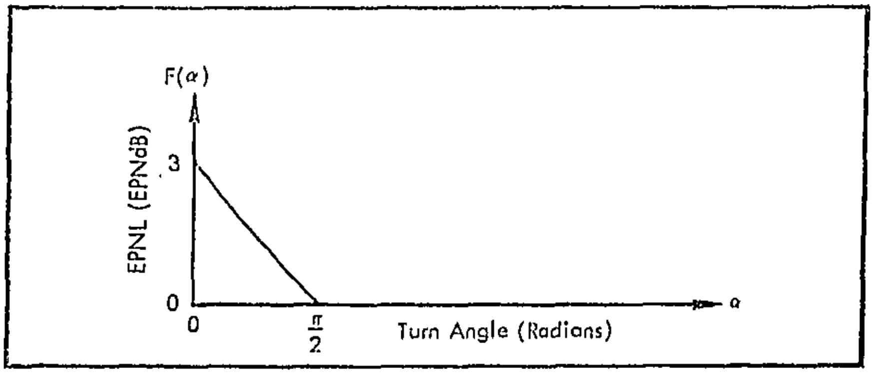


Figure 2.2.2-3. Graph of Function F(α)

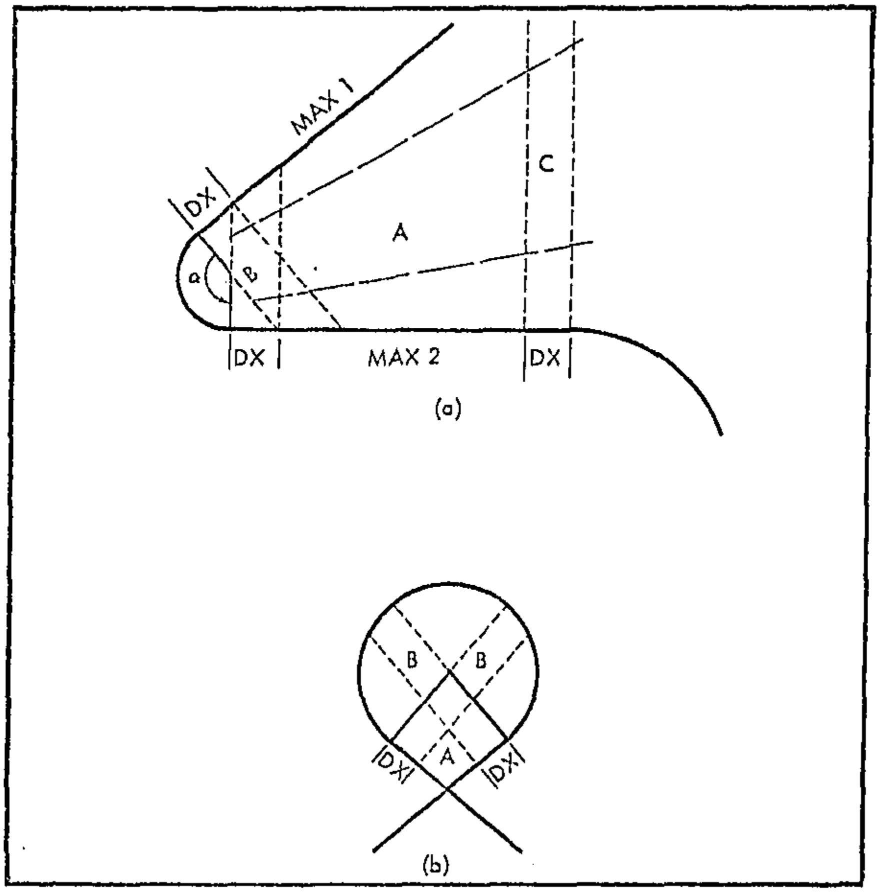


Figure 2.2.2-4. dB Correction Zones

Inside a turn a correction to DA is given by

$$\Delta DA = \text{MIN}\left(3,\ 3 \cdot \left[\frac{2\alpha}{\pi}\right]\right) \cdot \frac{d}{r} \cdot \text{MIN}\left(1,\ \frac{5\Phi}{\alpha}\right)$$

where

α = turn angle

r = turn radius

d = distance to track

Φ = the angle between lines joining the center of the turn with the computation point and with the start of the turn.

- Slant Distance – After the closest distance to the track and the altitude have been computed, the slant distance can be found by the Pythagorean Theorem, where DTT is the distance to track, H is the altitude, and SLR is the slant distance, as shown in Figure 2.2.2-5.

- Profile Modifications for Cutback – The Standard ATA takeoff procedures are modified by inserting a profile segment where the thrust and climb gradient are as specified by the cutback definition. The start and end points of the cutback segment must be specified by the user and may be given as either an altitude, in feet, or a distance along the track from brake release, in nautical miles. The only exception to this is that if the cutback climb gradient is zero, the end point must be specified as a distance from brake release.

  There are five different types of cutback allowed for in the program:

  (1) Altitude Restriction ($\gamma = 0$)
  (2) Maximum Power
  (3) Climb Power
  (4) FAR 36
  (5) Maintain a Specified Gradient (γ)

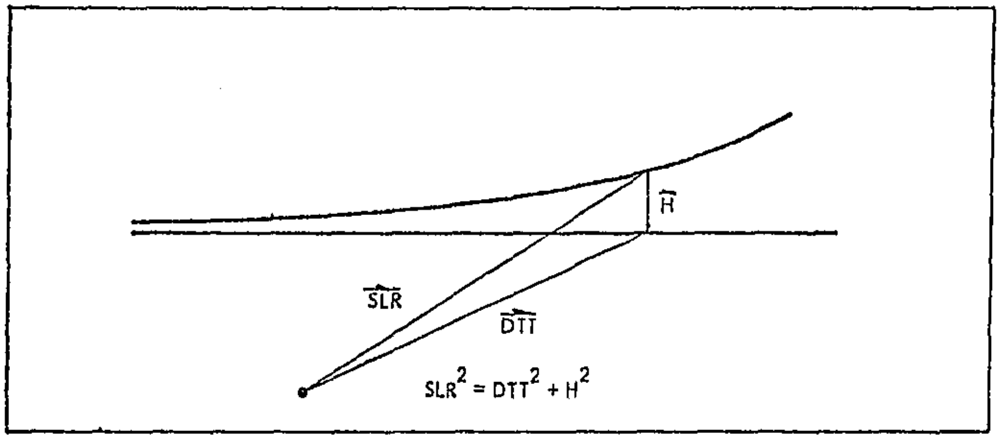


Figure 2.2.2-5. Slant Distance Calculation

where the FAR 36 cutback is defined by:

T = thrust required for level flight with one engine out

and

γ = gradient at which speed will be constant with the above thrust

Cutback types 1 through 4 have the climb gradients and power settings stored in the aircraft takeoff profile (See the Standard Profile definition). The type 5 cutback requires some special computation. Since the gradient is input and is the same for all aircraft types, the thrust required must be computed. This is done by:

$$T = \frac{\gamma W + T_{36} (N-1)}{N}$$

where

γ is the climb gradient

W is the gross weight of the aircraft

T_{36} is the thrust for FAR 36 cutback

N is the number of engines

The thrust T is that which would be required at sea level and must be corrected by $\frac{1}{\delta}$. (See the δ correction.) A check is made to be sure that T does not exceed climb power for this option.

Two methods are used to insert the cutback segment into the standard profile. If the cutback starts before the start of the fifth profile segment (Standard Profile), then, after the cutback ends, the aircraft reenters the standard profile at the start of the fourth segment. Note that since this part of the profile is defined based on an altitude of 1500 feet at the start of the fourth segment, performance for the remainder of the profile must again be corrected by δ.

If the cutback begins during or after the fifth segment, then at the end of the cutback segment the aircraft returns to the standard profile at the point where the cutback started.

Also, it is possible to specify override modes for specific aircraft types. These are:

0 – Accept any cutback.
1 – No cutback of any type.
2 – FAR 36 cutback only.
3 – Takeoff and climb only.

- Altitude – Basically, the altitude is found by linear interpolation on the distance along the track in the profile tables in a manner shown schematically in Figure 2.2.2-6. However, there are some modifications that can be applied to takeoffs. First, if there is a wind, the aircraft performance relative to the ground will change. This modification is performed by multiplying the distance flown along straight track segments by the factor

$$\Delta D = \frac{Va}{Va - V}$$

where Va is the aircraft speed and V is the component of the wind speed along the track segment. Note that if $V > 0$, then it is a tail wind. Also, if there is a power cutback applicable to the track in question, this must be accounted for. For an explanation of this process, see the section on profile modifications for cutback and on the pressure altitude correction.

- Thrust - Like the altitude, the thrust is determined by interpolation in the profile tables, (see Figure 2.2.2-6), with thrust transitions smoothed over 1000 feet of ground track distance. Since noise is considered to be a function of corrected net thrust, a correction for pressure altitude must be made whenever uncorrected net thrust is stored in or computed by the program. This is the case for thrusts stored in the approach profiles and for the level flight and power cutback thrusts stored in the standard takeoff profiles.

  An additional modification is made to simulate thrust changes for an approach with a wind. This change is given by

$$\Delta \frac{F_n}{\delta} = \frac{W \cdot \gamma \cdot V_w}{(V_a - V_w) \cdot \delta \cdot N}$$

where:

W = aircraft weight
γ = gradient (negative for descent)
V_w = wind speed (positive for a tailwind)
V_a = aircraft air speed
δ = pressure altitude correction
N = number of engines

  See the section on profile changes for power cutback for details on the computation of the thrust level for a fixed gradient power cutback.

- Velocity - The velocity, like the thrust, is basically interpolated from the profile tables, but with two possible corrections. A wind correction is applied to straight track segments by adding the aircraft speed and the component of the wind speed in the direction of the track. To curved segments, it is applied by interpolating the velocity between the corrected velocities on the surrounding track segments. For cutbacks, the velocity is assumed to be constant during cutback and is set equal to the velocity at the start of the cutback. In order to prevent an excessive correction, the velocity is not permitted to be less than 32 knots. See Figure 2.2.2-6.

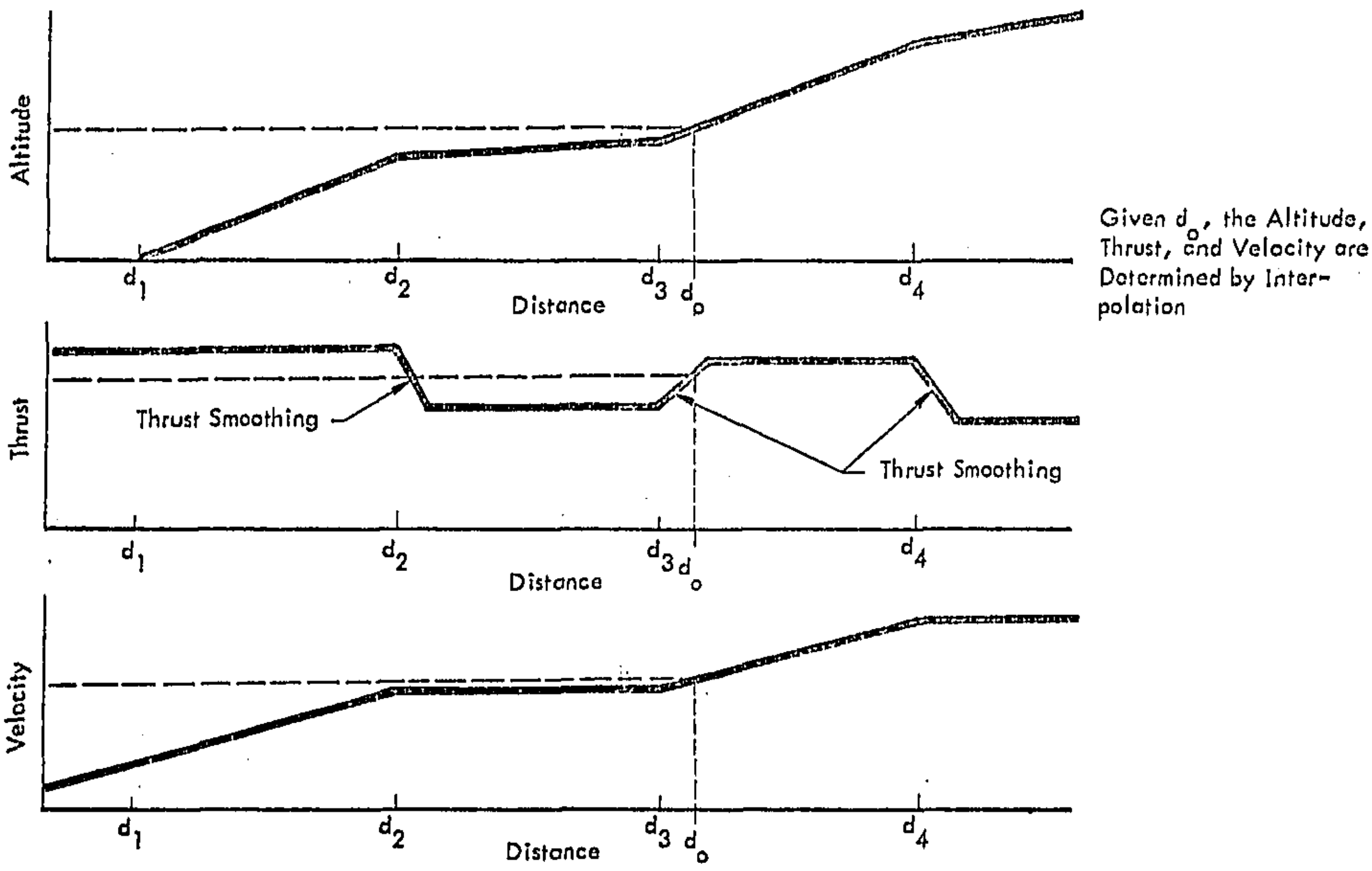


Figure 2.2.2-6. Calculation of Altitude, Thrust, and Velocity

- Ground Attenuation - A curve (in tabular form, see Figure 2.2.2-7) of ground attenuation versus slant distance is stored in the program via block data for 0^{o} elevation angle. A semilog interpolation is performed in the table to obtain a dB correction which is then modified for elevation angle by

$$A = \frac{1 + \cos (18\beta)}{2}$$

where β is the elevation angle.

If $\beta > 10^{o}$ then A is set to zero.

- Velocity Correction - The noise data in the program are given for an aircraft speed of 160 knots; a correction is required for other speeds. The correction used is

$$\Delta EPNL = -10 \log \left(\frac{V}{160}\right)$$

where V is the actual aircraft ground speed.

- Engine Shielding Correction - Another correction for engine shielding is computed by[4]

$$\Delta EPNL = -3 \left(1 - \sqrt{\sin \beta}\right)$$

where β is the elevation angle.

- Noise from One Flight - Figure 2.2.2-8 summarizes this process briefly. The point of closest approach is found first. Then this point is used to interpolate in the profile for altitude, thrust, and velocity, and to compute the slant range. The thrust corrected EPNL is then found by interpolation in a table, as shown in Figure 2.2.2-9. This table will normally contain a noise value for each of eight slant ranges and up to six thrust settings. Interpolations are linear on thrust and the logarithm of the slant range. The final step is to add corrections for ground attenuation, velocity, shielding, and the number of operations (weighted for NEF).

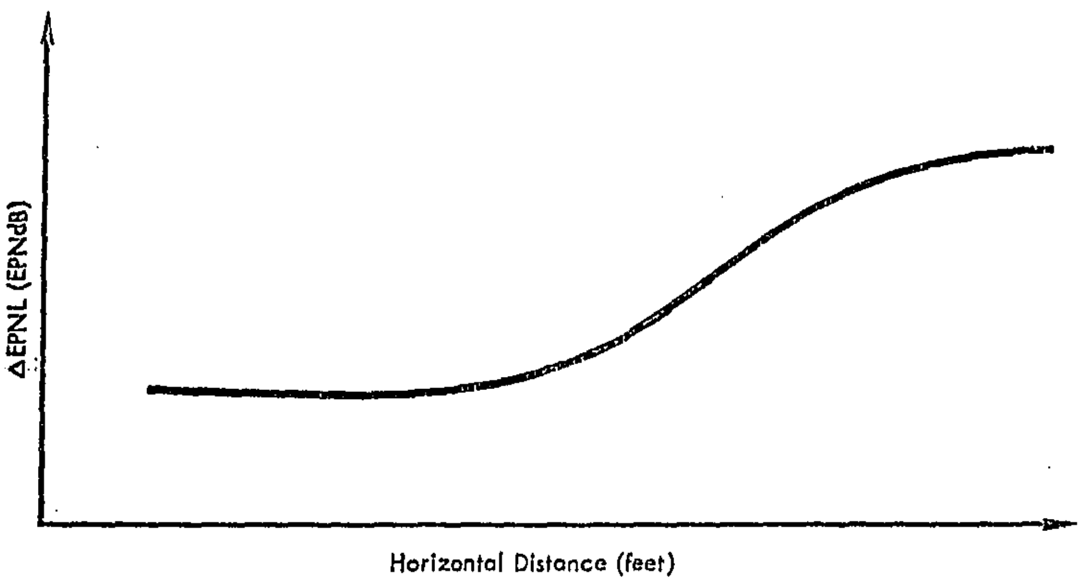


Figure 2.2.2-7. Ground Attenuation at 0° Elevation Angle

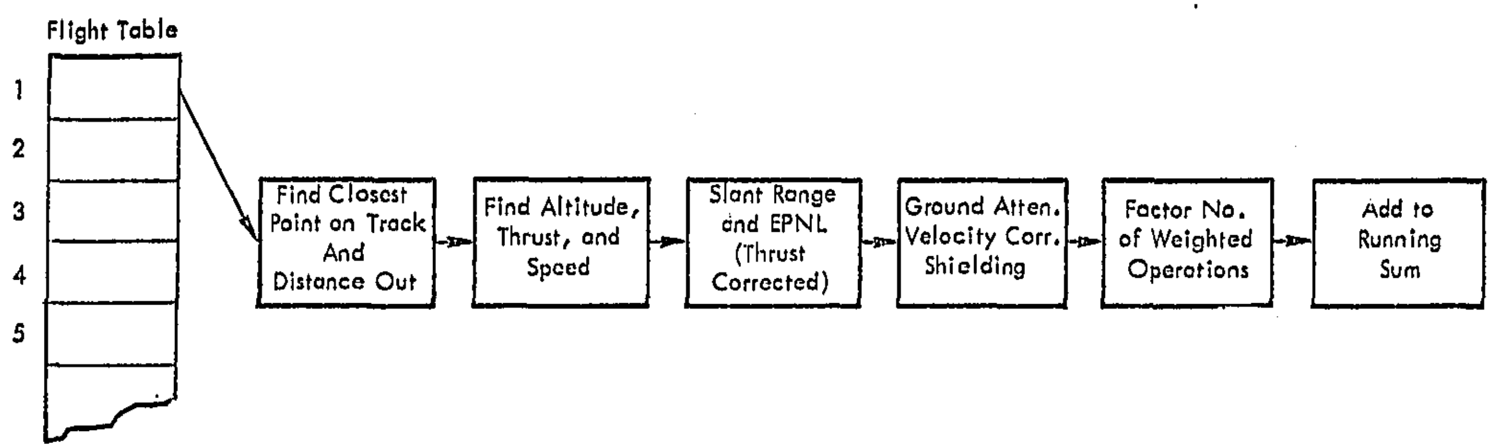


Figure 2.2.2-8. Noise Calculation

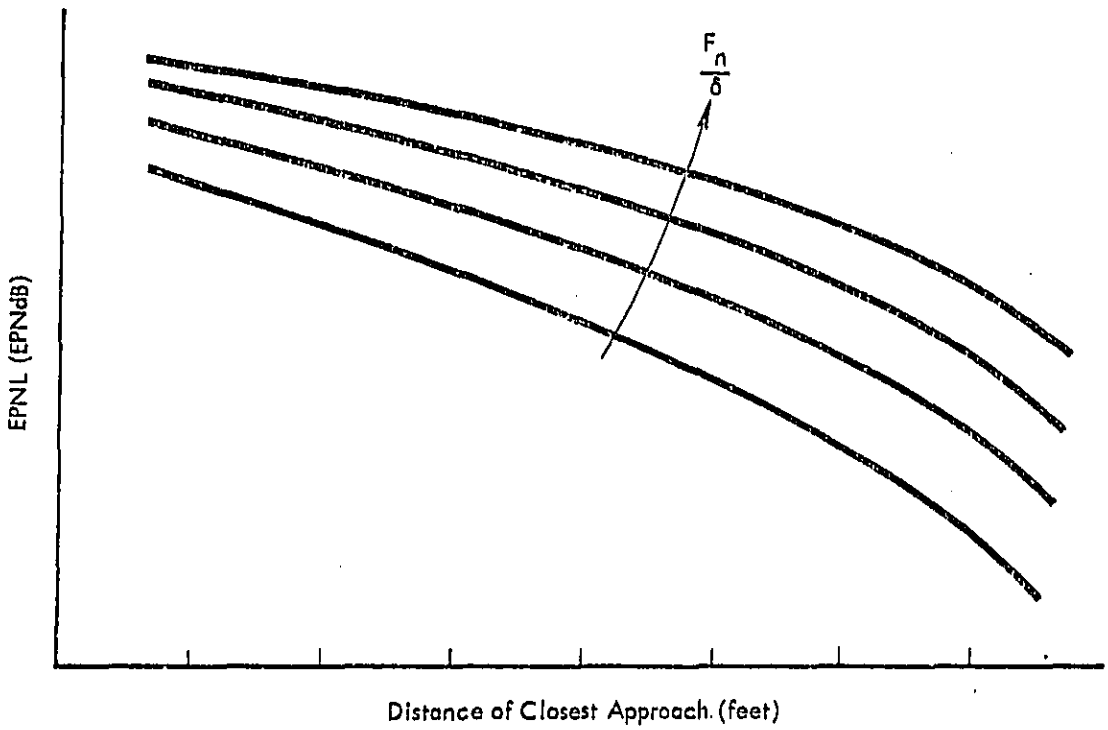


Figure 2.2.2-9. Noise Data

- NEF - To compute the total NEF at a point, the noise due to each flight is computed as above and summed according to:

$$\mathrm{NEF} = 10 \log \left[\sum 10^{\left(\frac{\mathrm{EPNL}_i}{10}\right)} \right] - 88$$

where noise levels from nighttime events are increased by 12 dB. (This is equivalent to multiplying the nighttime events by 16.7.)

- Search for First Contour Point - The first guess at the first point is an input to the program. This point is evaluated to see if it is on the desired contour. If not, the gradient is computed as for the contour search, and a new guess is made in the direction of the gradient (or opposite). The distance moved in that direction is determined by the magnitude of the gradient. (See Figure 2.2.2-10). This process is repeated until a point on the contour is found.

- Search for Contour Points - Assuming that at least one point on the contour is available, the first step is to determine the gradient of the noise function at the last point known to be good. The initial guess is then made in a direction perpendicular to the gradient and at a distance (the "stepsize") which has been specified as an input. (See Figure 2.2.2-11). If this first guess is not on the contour, subsequent guesses are made by rotating around the last good point. This rotation is done in two steps of 15°, in a direction that, according to the gradient, should cause the noise exposure to approach the contour value. If this fails, the stepsize is halved, and the angle step increased to 30°, and the rotation is repeated. If the second rotation fails, the stepsize is halved again, and the point rotated for four steps of 30°. If the third rotation fails, the stepsize is halved again, and the point rotated in 12 steps. If the contour point has still not been found, one more full rotation is made with both the stepsize and angle step halved again. If this fails, the contour is deleted. While the above search is being performed,

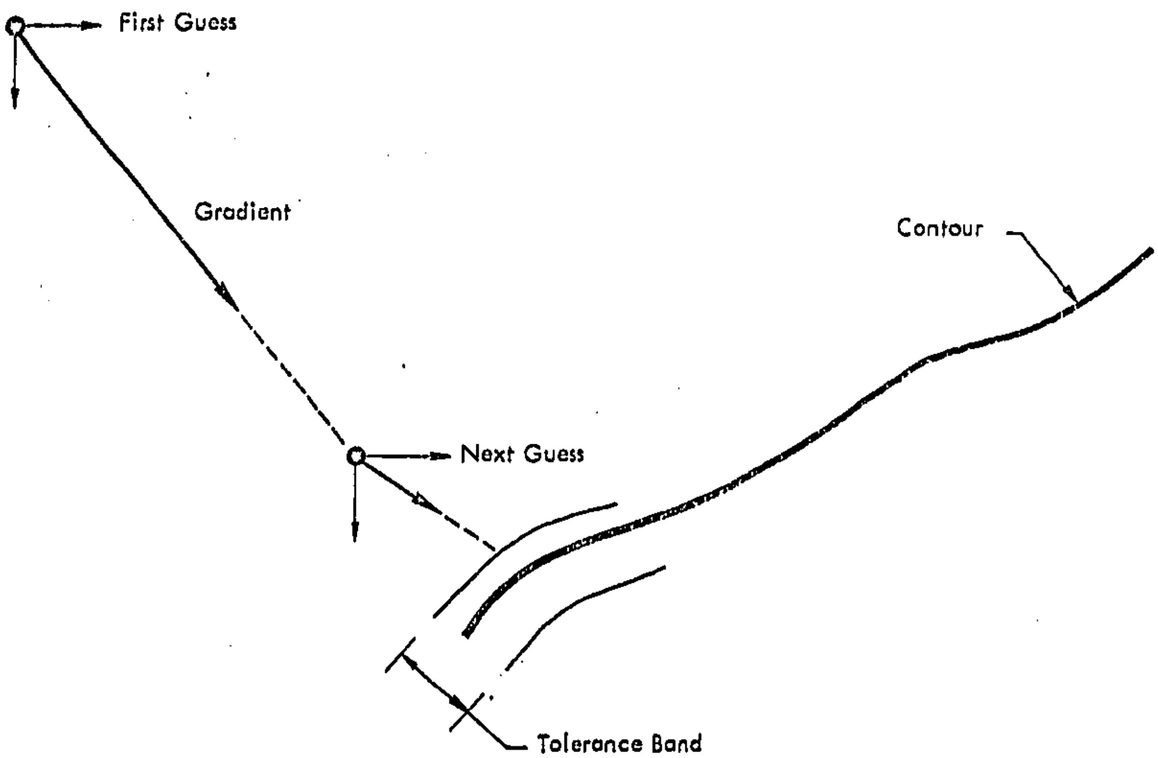


Figure 2.2.2-10. Search for the First Contour Point

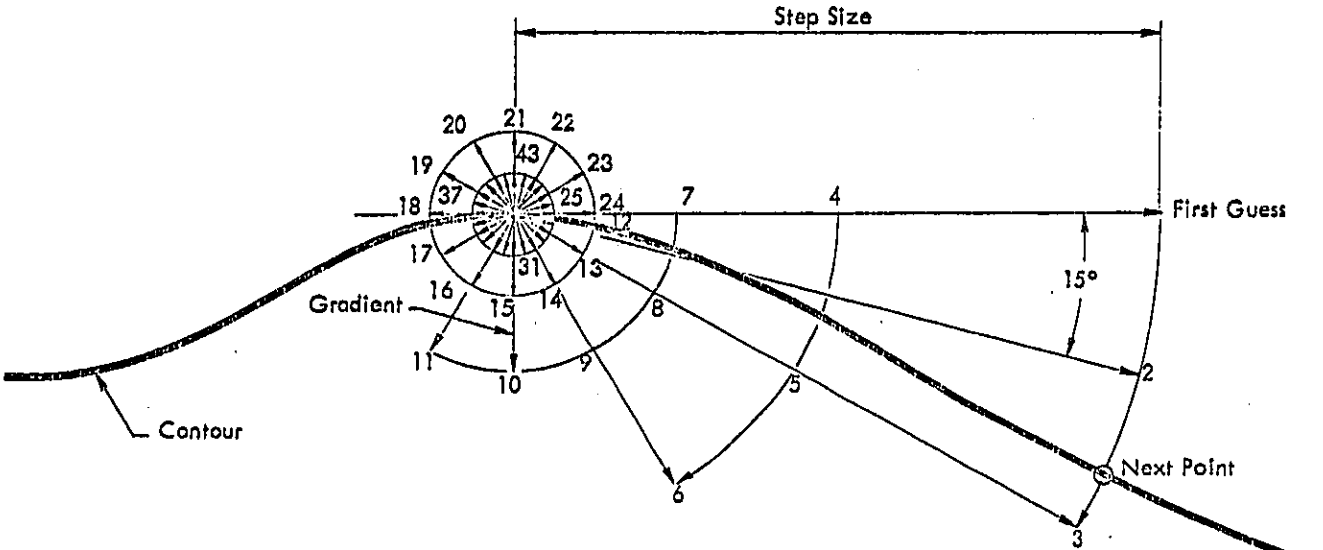
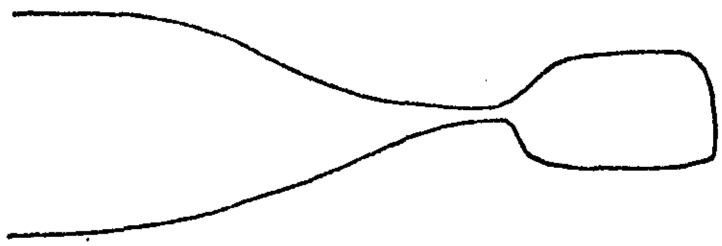


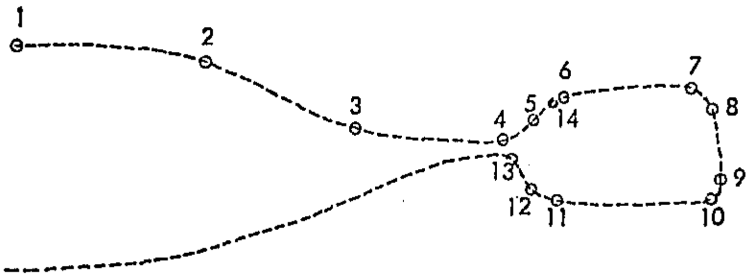
Figure 2.2.2-11. Search for Contour Points

a check is made for crossing the contour. If it is crossed, the contour point is then found by repeated linear interpolation. After a potential point has been found, checks are made to verify that this point is not across a finger or inlet of the contour from the last contour point. If it is, the stepsize is halved and the search procedure is repeated. This insures a faithful tracking of the actual contour.

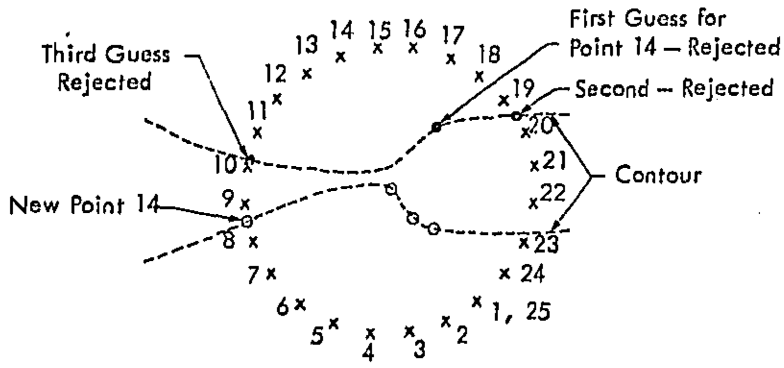
- Contour Loop Prevention - Under certain circumstances, it is possible for the contour search program to become caught in a loop in a distant part of the contour and never return to the start point. (See Figure 2.2.2-12 for an example of such a situation.) A looping situation is detected by comparing a potential new contour point with pairs of points already determined to be on the contour. If the new point is within one tenth of the input stepsize of a straight line joining a pair of consecutive contour points, then the program is looping. To correct the situation, the program returns to the last good contour point and computes the noise exposure at a full circle of 24 points. The radius of the circle is 1.5 times the currently updated stepsize. The search is begun with the point in the same direction as the previous contour point. (Figure 2.2.2-12). After all points on the circle have been computed, they are examined to determine all places where the contour crosses the circle of points. All such contour crossings are then examined in reverse order to determine if they are on a previously found portion of the contour. The first new contour point found is chosen as the next contour point. If no new point is found, and if the radius of the circle is less than the input stepsize, the search is repeated with a radius equal to the input stepsize. If a new point still cannot be found, the run is aborted.



(a) True Contour



(b) Contour Points Found by Program



(c) Altered Search Pattern, After Finding and Rejecting Point 14

Figure 2.2.2-12. Search Pattern for Loop Prevention

• <u>Area</u> – A straight line approximation is used between consecutive points on the contour. Let $\vec{R_0}$ and $\vec{R_1}$ be the vectors defined by any two consecutive points on the contour, the area A_1, of the triangular sector defined by $\vec{R_0}$ and $\vec{R_1}$ is

$$A_1 = \frac{1}{2} \left| \vec{R_0} \times \vec{R_1} \right|$$

where x denotes the vector cross product.

The areas A_i for all such sectors can then be summed to obtain the total area within the contour.

2.3 Module Descriptions

2.3.1 Main Program NOISE 1

NOISE 1 is the executive routine for the NEF contour search program. It initializes some variables, the plot routines, and the contour data tape, reads control cards, controls transitions between contour points and between contours, checks for completion of the current contour, and prints the computed contour points. See Figure 2.3.1-1 for subroutine linkages.

2.3.2 Main Program GRID

GRID is the executive routine for the computation of noise exposure at discrete points. It performs initialization, reads control cards, and directs control to the proper computation routines. See Figure 2.3.2-1 for subroutine linkages.

2.3.3 Subroutine Descriptions

- Function ACNOIS - Given the aircraft type, slant range, and thrust, ACNOIS will return the EPNL, computed by interpolation in the tables of noise curves.
- Subroutine ALTRRD - ALTRRD inputs the definitions for altitude restrictions, power cutback, and the cutback override modes. It also checks for errors in the cutback definitions and sets up internal arrays describing the cutbacks.
- Subroutine APPTRD - This routine inputs and stores alternate aircraft approach parameters.
- Function ATTENG - ATTENG computes the ground attenuation, the engine shielding correction, and the velocity correction, and returns the sum of these corrections. Required inputs are the distance to track, altitude, aircraft type, thrust setting, and velocity.
- Subroutine BLOCK DATA - Block data sets up the common blocks which contain the noise curves, takeoff profiles, the aircraft dependent data for the approach profiles, and the ground attenuation curves. Refer to Section 2.4 for a detailed explanation of the data stored.

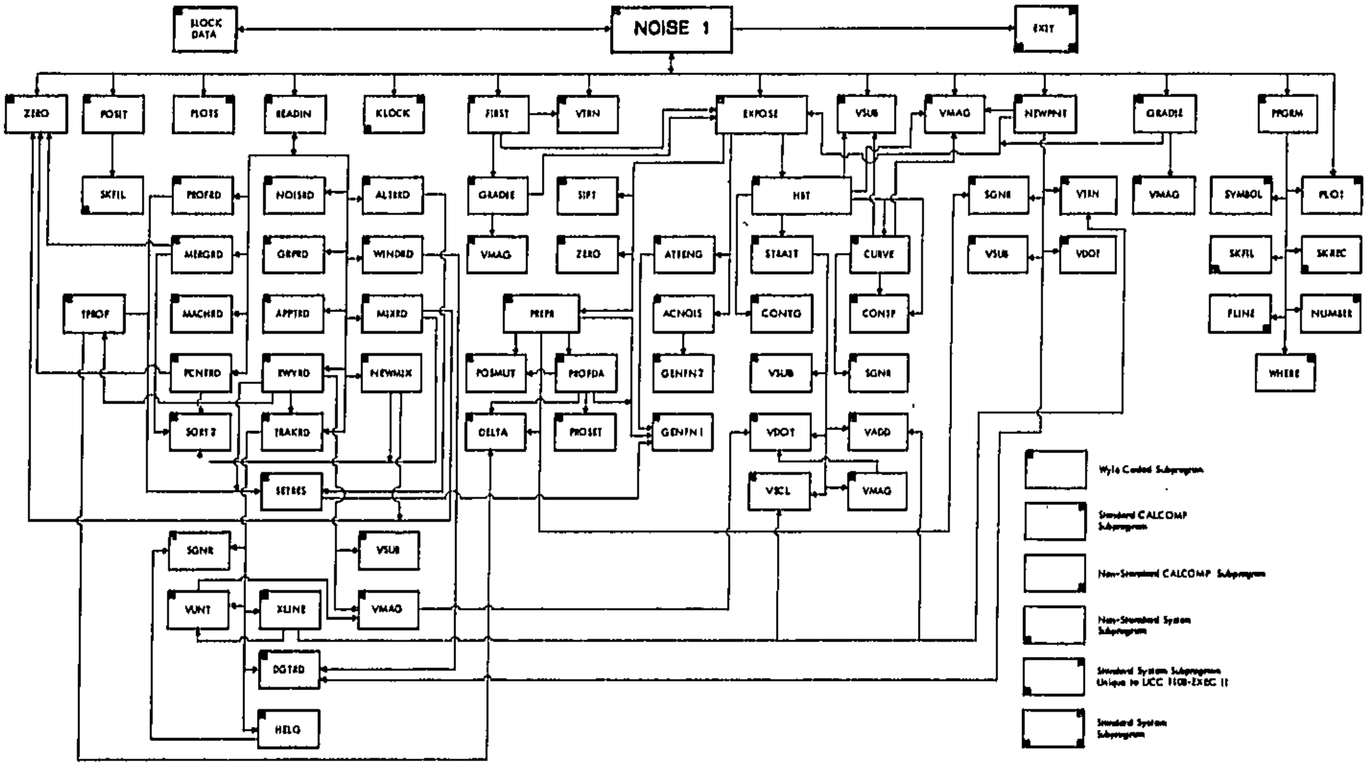


Figure 2.3.1-1. Subroutine Linkages for NEF Contour Program

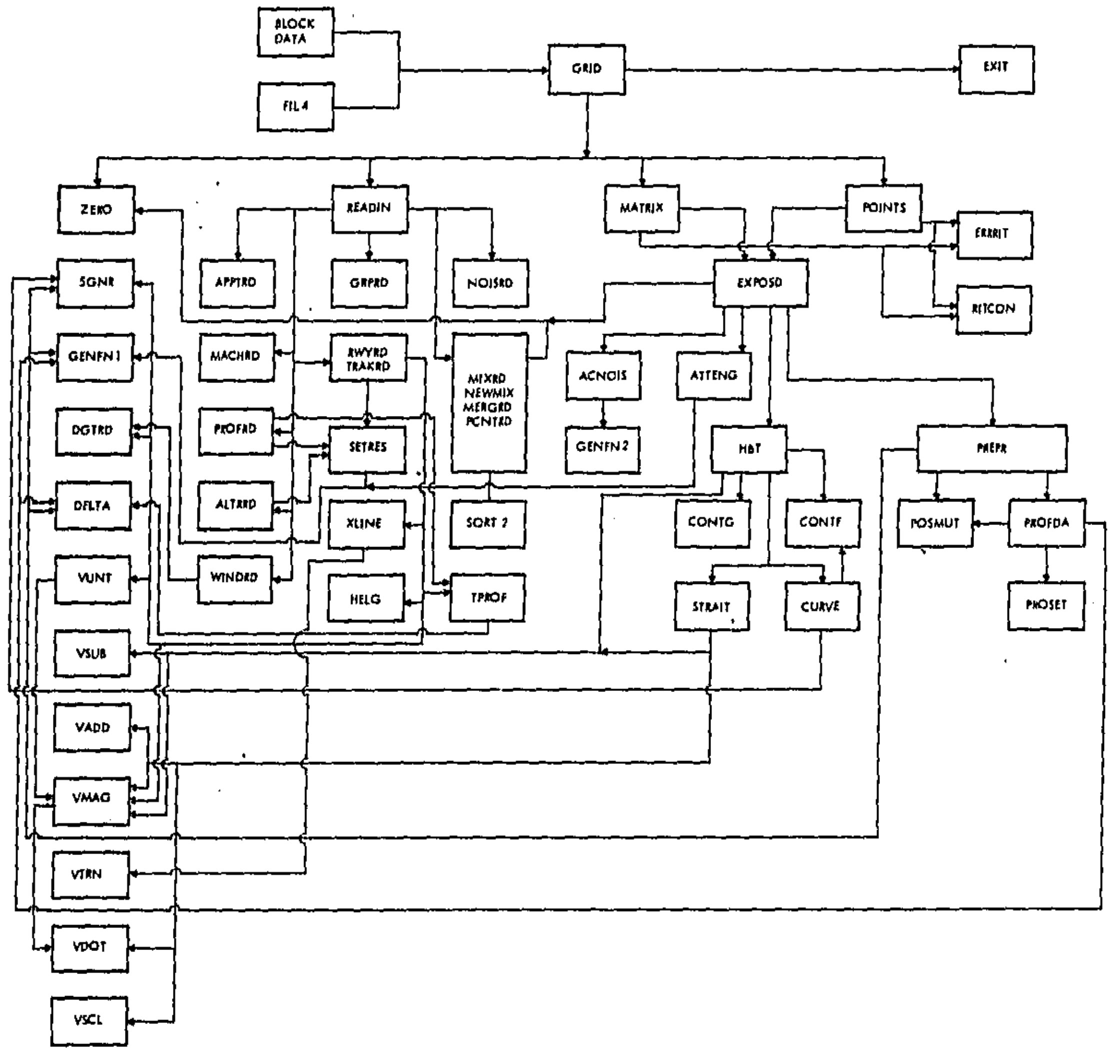


Figure 2.3.2-1. Subroutine Linkages for NEF GRID Program

- Function CONTF - This is a special purpose computation function used in the continuous noise algorithms in subroutine HBT.

- Function CONTG - This is another special purpose function used in continuous noise computations.

- Subroutine CURVE - CURVE computes the closest distance from a point to a curved track segment and the distance along the segment to the point of closest approach. A nonstandard return is taken if the segment cannot be the closest segment of the track or if the turn is greater than 180°. Inputs are the point of computation and an array of parameters describing the track segment.

- Function DELTA - This function computes and returns the pressure-altitude correction factor.

- Function DGTRD - The purpose of DGTRD is to convert an angle from degrees to radians.

- Subroutine ERRRIT - When a diagnostic dump is requested from GRID, the dump is first written on a temporary drum file in order to obtain a suitable printout. ERRRIT copies that temporary file to the printer.

- Function EXPOSD - This function is used by GRID to perform the same computations as EXPOSE. Differences are the optional output of noise curve contributions and the use of all flights at all times.

- Function EXPOSE - This function subprogram is the executive routine which computes and returns the total noise exposure at a given point. There are three options, controlled by the variable NTST, which is passed as an argument. If NTST = 1, the exposure is computed using all flights; if NTST = 3, the computation is done using only the most significant flights from a previous call;

if NTST = 2, the computation is identical to the case when NTST = 3, except that the closest segment of each track is also used from the previous call. EXPOSE can also print debug data when the program is unable to find the next contour point.

- Subroutine FIRST - This is a special purpose subroutine, used only to find the first point on a contour. This is required because when the search is made for the first point, there is no point available which is known to be on the contour, so that the standard search process cannot be used. In this routine, the gradient is used repeatedly to predict the point to the desired accuracy. A required input is a first guess for a contour point, outputs are the first good point, the noise exposure at that point, and the number of iterations required to find it.

- Function GENFN 1 - This function performs a one dimensional linear interpolation. Inputs are a table of the dependent variable, a corresponding table of the independent variable in ascending order, the value to be interpolated, and the size of the tables.

- Function GENFN 2 - GENFN 2 does a two dimensional linear interpolation. Inputs are a matrix of data points, two tables of independent variables, the dimensions of the tables, and the point to be interpolated.

- Subroutine GRADIE - Subroutine GRADIE computes the approximate gradient at the given point on the contour. This is done by computing the noise exposure at a point 5 feet in the +X direction and again at a point 5 feet in the +Y direction and comparing these two values to that at the original point.

- Subroutine GRPRD - GRPRD inputs the track group data.

- Subroutine HBT - Given a point and a track number, HBT will find the point on the track closest to the given point and return the distance along the track and distance to the track. It will also determine the closest point on the next to closest track segment and determine if any corrections to the noise exposure are required due to the next to closest segment or due to a curved segment. These corrections (in dB) are also returned.

- Subroutine HELG - Subroutine HELG is used to set up the parameter array to describe the circular segments of a track in a form suitable for later computation. This routine is called only by TRAKRD (RWYRD).

- Subroutine MACHRD - This subroutine inputs Match Indicators that correlate noise curves with approach parameters.

- Subroutine MATRIX - MATRIX is a secondary executive routine used by GRID. It inputs a definition of a rectangular array of points, obtains the noise exposure of every point in the array, and prints out the noise at the array points. Optionally, it will also obtain and print diagnostic information.

- Subroutine MIXRD - The purpose of MIXRD is to input the fleet mix data, sum equivalent flights, and store in a suitable format. There are four entry points that perform the following functions:

  (1) MIXRD - Input the fleet mix data in the basic format that describes each flight specifically.

  (2) PCNTRD - Input track use percentages as a fraction of total departures and a fraction of total arrivals, then continue to the next section.

  (3) NEWMIX - Input total airport fleet mix to be distributed according to the percent track usages previously input.

  (4) MERGRD - Input noise curve merging information.

- Subroutine NEWPNT - NEWPNT performs all calculations involved in the search for the next contour point, including the loop check procedure.

- Subroutine NOISRD - This routine inputs noise curves not previously stored in Block Data.

- Subroutine POINTS - POINTS performs the same function as subroutine MATRIX except that the points to be computed must be individually defined in the input.

- Subroutine POSIT - The purpose of POSIT is to position the contour data tape before the last end-of-file, in order to receive more data.

- Function POSMUT - When thrust changes are encountered in a profile, they are smoothed over the first 1000 feet of the new profile segment. POSMUT computes the smoothed thrust and returns the value. Inputs are the old power, the new power, the new segment start point, the new segment end point, and point at which the power is desired.

- Subroutine PPGRM - This routine controls the plot output data. It is called every time a new contour point is found, so that the point can be saved. When the contour has closed, an indicator is set and the contour will then be scaled and plotted. Provision is made for either 12" or 30" drum plotters. This routine also writes the contour data tape.

- Subroutine PREPR - The purpose of PREPR is to determine if profile modifications due to wind or power cutback are required and, if so, to perform the necessary calculations. Inputs are the profile number, the distance along the track, the aircraft type, the track number, and the closest track segment. Outputs are the aircraft height, velocity, and thrust. If no modifications are required, the computations are performed in PROFDA.

- Subroutine PROFDA - Given the distance along a flight track and the profile number, this routine will return the height, thrust setting, and velocity. These are all computed by linear interpolation in the profile tables.

- Subroutine PROFRD - Subroutine PROFRD is used to input and store approach profiles and any takeoff profiles not stored in Block Data.

- Subroutine PROSET - The purpose of this routine is to retrieve aircraft dependent variables from the appropriate tables and store them, where required, in the approach profiles. This permits the use of the standard interpolation routines in subroutine PROFDA. The updated profile is always stored in profile 100.

- Subroutine READIN - READIN is the input executive routine. Its only purpose is to read data code cards and transmit control to the proper input routine.

- Subroutine RITCON - This routine copies the noise curve contribution data from the temporary file to the printer in the same manner that ERRRIT copies the diagnostic dump.

- Subroutine RWYRD - RWYRD inputs the runway and track definitions and the airport altitude and temperature. When the track definitions are stored, they are carefully checked for valid definition. The alternate entry point TRAKRD permits redefining the tracks without changing the runways.

- Subroutine SETRES - When new cutback definitions or profiles are read in, it is necessary to calculate the start point, end point, and end height for each cutback - profile combination. These calculations are done in SETRES.

- Function SGNR - This function returns the value 1 (in floating point) if the argument is greater than or equal to zero or -1 if the argument is less than zero.

- Subroutine SIFT - SIFT is used to determine the significant flights used for the initial contour point search. Statistical methods are used to estimate a minimum noise level for significance and provision is made for updating the estimate based on results of the contour search. An array of significant flight numbers is returned.

- Subroutine SORT 2 - Given a table of integers, a corresponding table of real numbers, and the size of the table, SORT 2 will sort the two tables in a like manner, so that the integer table is in descending order.

- Subroutine STRAIT - STRAIT determines the point of closest approach of a straight track segment. An alternate return is taken if the segment cannot be the closest segment of the track.
- Subroutine TOLRD - Occasionally, it is necessary to alter the standard tolerances used in contour loop prevention and significant flight determination. The new tolerances are input and stored by TOLRD.
- Subroutine TPROF - The purpose of TPROF is to correct takeoff profiles for the effects of airport altitude and temperature. Inputs are the old altitude, the new altitude, the old temperature, the new temperature, and the profile number. The profile must be in standard form to obtain full benefit of the corrections.

  NOTE: The next seven routines are general-purpose vector handling routines. Subroutines have two or three arguments with the vector result returned in the first argument. Functions have one or two arguments with the scalar result returned as the functional value.

  - Subroutine VADD adds two vectors.
  - Function VDOT forms the dot product of two vectors.
  - Function VMAG returns the magnitude of the vector.
  - Subroutine VSCL multiplies a vector by a scalar (the second argument is the scalar).
  - Subroutine VSUB subtracts the third vector argument from the second.
  - Subroutine VTRN transfers one vector to another.
  - Subroutine VUNT returns a unit vector in the direction of the vector second argument.
- Subroutine WINDRD - WINDRD inputs wind definitions.
- Subroutine XLINE performs the same function as HELG, but for straight track segments.
- Subroutine ZERO is used to initialize arrays to zero.

System Subroutines

- Plotting Subroutines - The standard Calcomp software is used for most functions (PLOT, SYMBOL, NUMBER, etc.). In addition, a special Calcomp routine, FLINE, is used. This routine performs the same function as LINE but will, in addition, create a smoothed curve (using a spline technique) through the data points.

- Math Subroutines - Only standard FORTRAN math routines are used, such as SIN, COS, ATAN2, ALOG10, etc.

- Miscellaneous Subroutines - SKFIL skips files on magnetic tape,
  SKREC skips records on magnetic tape, and
  FIL4 defines FORTRAN logical units 3 and 4 as temporary drum files.

2.4 Stored Data Files (Block Data)

While the NEF program can be run exclusively with user-supplied data, there is a large amount of aircraft noise and performance data already stored in the program. These data correspond to aircraft as they operated in 1972. Data for retrofit is not stored in the program and must be input in the form of punched cards at the time of program execution. Data input in this manner will, in general, replace data presently stored in the program.

Table 2.4-1 is a short guide to the various sections, tables and figures that pertain to noise and performance data.

Table 2.4-1

Guide to Information for Aircraft Noise and Performance Data

Item	Section	Table
Noise Data		
Definition	2.4.1	2.4.1-1
Retrofit	2.4.4	2.4.4-1 (SAM) 2.4.4-3 (Refan)
Modification	4.1 4.3 (Format)	4.1-1 (Code Card)
Program Listing	6.0 (P.6-4 to 6-6)	
Takeoff Performance Data		
Definition	2.2.1 2.4.2	2.2.1-3, 4 2.4.2-1, 2
Retrofit	2.4.4	2.4.4-4, 5 (Refan)
Modification	4.1 4.3 (Format)	4.1-1 (Code Card)
Program Listing	6.0 (P. 6-6 to 6-15)	
Approach Performance Data		
Definition	2.2.1 2.4.3	 2.4.3-1, 2, 3
Modification	4.1 4.3 (Format)	4.1-1 (Code Card)
Program Listing	6.0 (P. 6-15 to 6-16)	

2.4.1 Stored Noise Data

The NEF program is capable of storing up to 16 sets of noise curve definitions in memory tables. Each set consists of up to six noise curve definitions corresponding to up to six different thrust values. Each of the up to six curves is approximated by defining the noise levels at eight slant ranges of 200, 400, 600, 1000, 2000, 4000, 6000 and 10,000 feet. Since there is a possibility of 16 of these sets, each set is assigned a distinct number from 1 to 16. Table 2.4.1-1 relates these numeric assignments to the corresponding aircraft types for both the 1972 and future time periods. Also included are the numeric assignments for takeoff and approach performance definitions which are described in Sections 2.4.2 and 2.4.3.

Some of the noise data used for analyses in future time periods differ from the data for the 1972 time period. Since the 1972 data are compiled in the program, the definitions for noise data applied in the analyses for future time periods will replace some of the 1972 data. The replacement process, described in Section 4, is a feature in the program which allows internal data to be modified or replaced with data read in at execution time. The noise curve numbers in Table 2.4.1-1 which are followed by "-R" indicate which of the 1972 data were replaced for future time period analyses and indicate the types of aircraft to which they correspond.

2.4.2 Takeoff Profiles

All takeoff profiles contained in the NEF program correspond to the standard ATA takeoff procedure. Briefly this procedure, shown schematically in Figure 2.4.2-1 consists of: takeoff at full power and $V_2 + 10$ knots; at a height of 1500 feet reduce power to a level no less than climb power; at a height of 3000 feet, pitch over, accelerate and clean up falps; finally when a speed of 250 knots is reached, resume climb. The rate of acceleration is not stated specifically in the procedure, so a rate of 1 kt/sec is assumed.

Table 2.4.1-1

Aircraft Noise Curve/Takeoff Profile/Approach Parameter Designations

Aircraft Type/Description	Noise Curve Set*		Approach Parameter Set**		Takeoff Profile Number*** Stage Length (1000 Nautical Miles)						
	1972	Future	1972	Future	0-0.5	0.5-1	1-1.5	1.5-2.5	2.5-3.5	3.5-4.5	4.5+
720	11	NA	1	NA	21	22	23	24	25	25	-
720B	2	2	5	5	37	38	39	40	42	42	-
707-120/320	9	NA	5	NA	21	22	23	24	25	26	-
707-120B	2	2	5	5	38	39	40	41	42	42	-
707-320B/C	2	2	5	5	27	28	29	31	34	36	36
727-100	10	10	6	7	17	18	19	20	-	-	-
727-200	10	10	6	7	18	20	20	20	-	-	-
737-100/200	12	12	8	8	43	44	45	45	-	-	-
747-100	13	13	9	9	1	2	3	4	5	5	5
DC-8-30	4	NA	1	NA	21	22	23	24	25	26	-
DC-8-55	6	6	2	2	27	28	29	31	34	36	36
DC-8-61/63	6	6	2	2	30	32	33	35	36	36	36
DC-10-10	7	7	4	4	12	13	14	15	16	16	-
DC-9-15	5	5	10	3	46	47	47	-	-	-	-
DC-9-32	5	5	10	3	48	49	49	-	-	-	-
BAC-111	1	1	10	10	48	49	49	-	-	-	-
L-1011	8	8	4	4	12	13	14	15	16	16	-
VC-10	9*	NA	5	NA	27	28	29	30	31	32	32
Cv. 880	9	NA	5	NA	22	23	24	25	25	-	-
Cv. 990	2	NA	5	NA	28	30	31	32	34	34	-
Caravelle	3	NA	10	NA	48	49	49	-	-	-	-
707 (New)	NA	3-R	NA	5	27	28	29	31	34	36	36
SST	NA	3-R	NA	5	27	28	29	31	34	36	36
4 Eng., M.R., 747SR	NA	13	NA	9	6	7	8	9	10	-	-
Long Range 747/747B	NA	13	NA	9	6	7	8	9	10	11	11
747 Stretch	NA	13	NA	9	79	79	80	81	82	83	83
727 (QN)	NA	9-R	NA	7	17	18	19	20	-	-	-
727 Adv.	NA	9-R	NA	7	63	63	64	65	-	-	-
2 Eng., S.R., W.B.	15	15	11	11	54	55	55	55	55	-	-
2 Eng., M.R., W.B.	15	15	11	11	54	55	55	55	55	-	-
3 Eng., M.R., W.B.	NA	7	NA	4	12	13	14	15	16	-	-
3 Eng., M.R., W.B., Stretch	NA	7	NA	4	56	56	56	58	58	58	-
3 Eng., L.R., W.B., DC-10-30	NA	7	NA	4	56	56	57	58	59	60	60
3 Eng., L.R., W.B.	NA	7	NA	4	56	56	57	58	59	60	60
3 Eng., L.R., W.B., Stretch	NA	7	NA	4	56	57	58	59	84	85	85
2 Eng., M.R., Narrow	NA	11-R/16*	NA	•	•	•	•	•	•	•	•
2 Eng., S.R., Narrow	NA	4-R	12	12	61	62	-	-	-	-	-
STOL	NA	4-R	12	12	61	62	-	-	-	-	-
737 (SAM) Retrofit	NA	11-R	NA	8	43	44	45	45	-	-	-
DC-9 (SAM) Retrofit	NA	16	NA	3	48	49	49	-	-	-	-
727 (SAM) Retrofit	NA	9-R	NA	7	17	18	19	20	-	-	-
737 (RFN) Retrofit	NA	11-R*	NA	8	43-R	44-R	45-R	45-R	-	-	-
DC-9 (RFN) Retrofit	NA	16-R*	NA	3	48-R	49-R	49-R	-	-	-	-
727 (RFN) Retrofit	NA	9-R*	NA	7	17-R	18-R	19-R	20-R	-	-	-
707 (SAM) Retrofit	NA	3-R	NA	5	27	28	29	31	34	36	36
DC-8 (SAM) Retrofit	NA	3-R	NA	5	30	32	33	35	36	36	36

*Numbers followed by R indicate replacement curve definitions for the future. The VC-10 noise is considered equivalent to 707-120/320. The 2 Eng., M.R., Narrow aircraft are considered equivalent to DC9/737 (SAM) aircraft. The RFN retrofit replacement definition curves differ from the SAM retrofit replacement definitions.

**See Section 2.4.3.

***See Section 2.2.1 and 2.4.2. Numbers followed by R are replacement profile definitions.

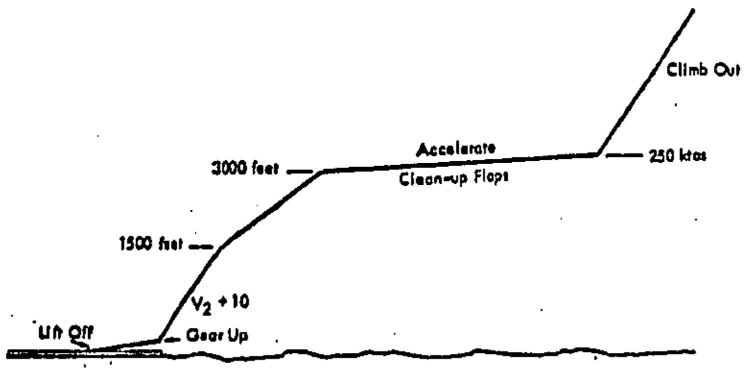


Figure 2.4.2-1. Typical Takeoff Profile

The NEF program is capable of storing up to 149 profile definitions. Each profile definition consists of altitudes, velocities and thrust levels at various distances from brake release or landing threshold. Each profile definition is assigned a number from 1 to 99 or 101 to 150. Profile definition number 100 is reserved for use by the program. Profiles numbered 1 to 95 are takeoff profiles while landing profiles are numbered 95 to 99 or 101 to 150. In addition, profiles numbered 1 through 85 must be in "standard form" as described in Section 2.2.1 and Figure 2.2.1-4.

A total of 68 takeoff profile definitions are stored in the program. These definitions represent the most common types of commercial jet aircraft for a range of operating weights. A list of the profile definition numbers and their corresponding aircraft types, engine types and takeoff weights is found in Table 2.4.2-1. Figure 2.4.2-2 correlates the takeoff weights of various aircraft with stage length (trip length). Thus, the profile numbers can be related to stage length. Table 2.4.1-1 gives the matrix of profile numbers corresponding to the aircraft types listed for a common grouping of stage lengths.

Table 2.4.2-1

Takeoff Profile Listing

Profile Number	Aircraft Model	Engine	Takeoff Flap Setting	Takeoff Weight in pounds
1	747-100	JT9D-3A	10	555,000
2				580,000
3				620,000
4				680,000
5				712,000
6	747-200	JT9D-7 (W)	10	550,000
7				575,000
8				600,000
9				640,000
10				700,000
11				775,000
12	DC-10-10	CF6-60	15	360,000
13				375,000
14				400,000
15			11	420,000
16			8	430,000
17	727-200	JT8D09	15	140,000
18				155,000
19				165,000
20				173,000
21	DC-8-33	JT4A-9/10	25	215,000
22				228,000
23				243,000
24				267,000
25				303,000
26				315,000
27	DC-8-61/707-320B/C	JT3D-3B	15	215,000
28				225,000
29				240,000
30				250,000
31				260,000
32				270,000
33				280,000
34				290,000
35				305,000
36				325,000
37	720B	JT3D-1	30	170,000

Table 2.4.2-1 (Continued)

Number	Aircraft Model	Engine	Takeoff Flap Setting	Takeoff Weight in pounds
38	707-120B	JT3D-3	30	195,000
39				210,000
40				220,000
41				240,000
42				255,000
43	737-200	JT8D-9	5	103,000
44				108,000
45				114,500
46	DC-9-15	JT8D-7	20	83,000
47				90,000
48	DC-9-32	JT8D-7	15	100,000
49			5	108,000
54	2 Eng. W.B.	–	*	290,000
55				300,000
56	DC-10-30	CF6-50 A	15	420,000
57				450,000
58				480,000
59			10	520,000
60			2	550,000
61	F-28-2000	Spey MK 555	**	50,000
62				65,000
63	727-200 Adv.	JT8D-15	15	165,000
64				175,000
65				190,500
79	747 Stretch	JT9D-XX	10	655,000
80				680,000
81				720,000
82				775,000
83				850,000
84	DC-10 Stretch	CF6-50 C	*	570,000
85				610,000

*Modified DC-10 data.

**Modified DC-9 data.

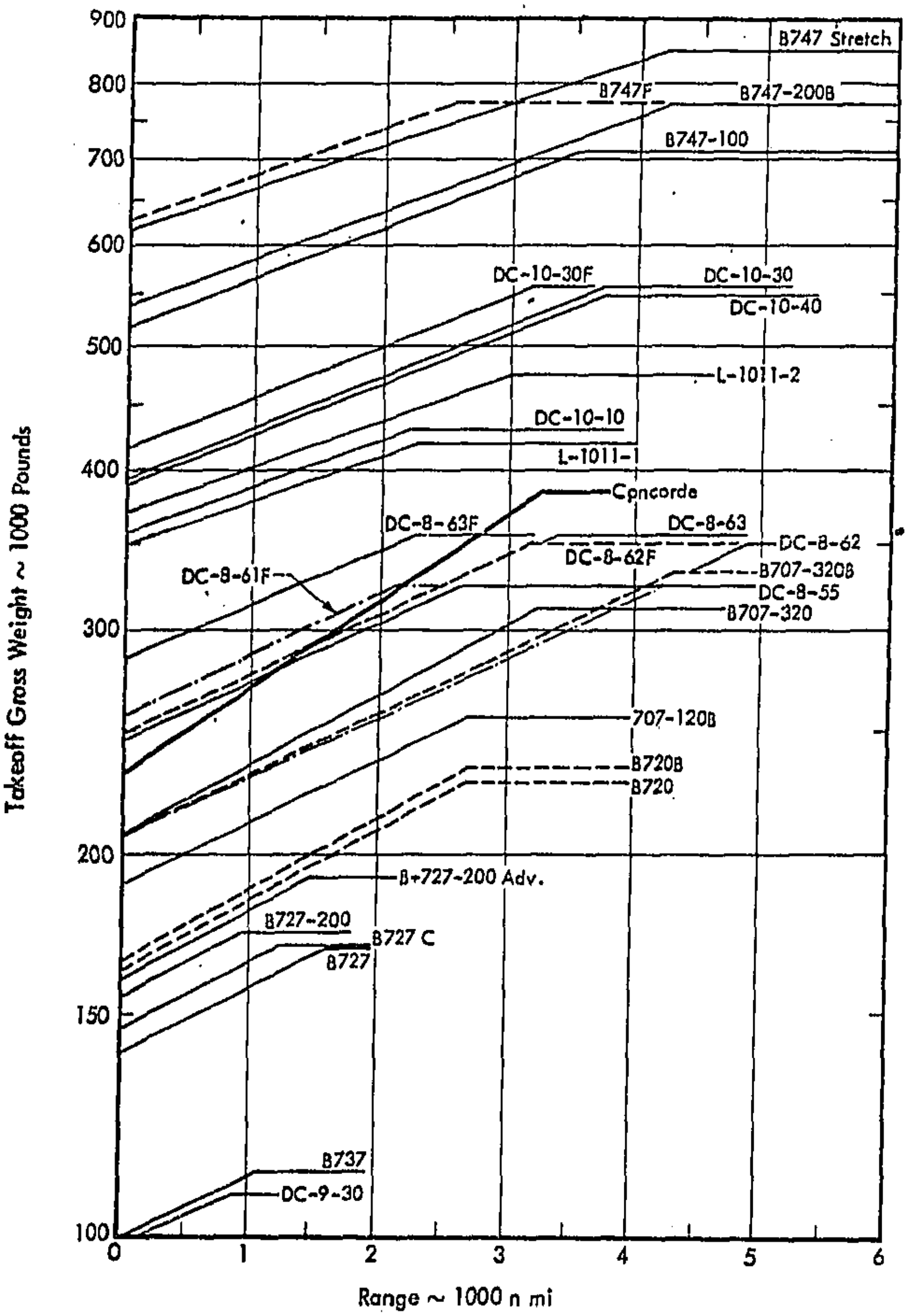


Figure 2.4.2-2. Takeoff Weight Versus Range

2.4.3 Approach Data Files

In order to allow the user to construct approach profiles that correspond to the air traffic control restrictions at the particular airport of interest, a selection of approach performance parameters are stored in the program. These facilitate simulation of a large number of different approach procedures, including the standard ATA procedure. The ATA procedure calls simply for approach 1.3 V_S + 10 kts and transition to landing flaps no higher than 1000 feet above the runway. A typical approach procedure is shown in Figure 2.4.3-1. The assortment of parameters available in the program data bank for use in constructing these profiles is listed in Table 2.4.3-1. When a proper indicator (a negative number whose absolute value corresponds to a number in the "Indicator" column in Table 2.4.3-1) is placed in the profile definition, the program automatically assigns the parameter corresponding to the particular aircraft type. Thus a single profile definition may be used for a large number of different types of aircraft. Use of these parameters, however, precludes consideration of a range of landing weights for each type of aircraft. The mix of aircraft of a given type must be approximated by an equivalent number of aircraft at one typical weight. The aircraft models for which approach parameters are stored, their associated weights and assumed flap settings are listed in Table 2.4.3-2.

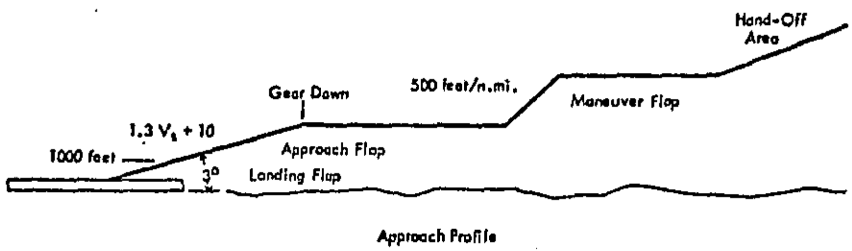


Figure 2.4.3-1. Typical Approach Profile

Table 2.4.3-1

Approach Parameter Descriptions

Indicator	Stored Quantity
1	Stop distance (~ feet)
2	Landing speed (~ knots)
3	Thrust required for 3 glide slope, landing flap
4	Thrust required for 6 glide slope, landing flap
5	Thrust required for level flight, approach flap
6	Thrust required for 3 glide slope, approach flap
7	Thrust required for level flight, maneuver flap
8	Thrust required for 500 ft/n.mi. sink, maneuver flap
9	Idle thrust
10	Thrust for reversal
11	Landing weight (~ pounds)
12	Aircraft label (6 characters)
13	Aircraft label (6 characters)
14	Number of engines

NOTES:

1. Stop distance is a negative quantity.
2. Thrusts are uncorrected net thrusts ~ lbs/eng.
   Program corrects for pressure altitude before the noise calculation.

Table 2.4.3-2

Stored Approach Data Sets

Set Number	Flaps*	Landing Weight
1. DC-8-33	30-35-50	180,000 pounds
2. DC-8-61	25-35-50	197,500 pounds
3. DC-9-32	15-20-50	75,000 pounds
4. DC-10-10	5-18-35	300,000 pounds
5. 707-320B/C	14-30-40	190,000 pounds
6. 727-200	5-25-40	138,200 pounds
7. 727-200	5-15-30	138,200 pounds
8. 737-200	5-25-40	88,000 pounds
9. 747-100/-200B	10-25-30	500,000 pounds
10. DC-9-15	15-20-50	50,000 pounds
11. 2Eng.,W.B. (DC-10 data)	5-18-35	225,000 pounds
12. F-28 2000 (DC-9 data)	15-20-50	55,000 pounds

*Maneuver, approach and landing.

2.4.4 Data for Retrofit

The following tables contain aircraft noise and performance data that can be used for evaluation of either JT8D/JT3D nacelle retrofit or JT8D refan.*

Table 2.4.4-1, which contains noise information for nacelle retrofit, also shows levels for the 747-200 with "B" nacelles and the F-28-2000. The 747 data stored in the program correspond to the 747-100 "A" nacelles, an earlier, noisier version than the 747-200 (B) which was certified to Appendix C levels of FAR 36 for production after December 1971. The F-28 noise levels have been constructed to agree with published FAR 36 certification levels.

The noise curve merging suggestions contained in Table 2.4.4-2 are valid only for the noise curve usage shown in the previous table. The evaluation of retrofit for a fleet in which a fraction of the aircraft are already quieted is an ideal situation for the use of noise curve merging.

The refan data shown in Tables 2.4.4-3 to 2.4.4-5 correspond to minimum treatment configurations of JT8D refan engine installations.

* Most of these data are presented in a format suitable for direct input into the NEF program.

Table 2.4.4-1

Noise Data Including Data for Nacelle Retrofit

	Noise Levels ~ EPNdB								
	F_n/δ	200'	400'	600'	1000'	2000'	4000'	6000'	10000'
747-200 (B)	35500.	117,5	113.2	110.2	106,7	100.9	95.2	91,1	85,0
JT9D-7W	31100.	115,6	111.6	109.0	105,3	99.0	93.2	89,1	83,0
Boeing test data	23700.	114,6	110.1	107,2	102,8	96,4	89.7	85,6	79,8
	16500.	112,0	107.1	103,9	99,0	91.3	82,9	78,2	72,0
	10250.	108,2	103.5	100.1	95,2	87,9	79.6	74,7	67,6
	8850,	107,0	102.1	98,8	93,8	86.1	77.9	72,9	65,9
F-28-2000	8600.	112.0	109.2	106,9	103.4	98.0	91.9	88.0	82,0
Spey 555-15	5900.	111,5	107.0	103.0	97,4	89.2	82,4	77,9	71,6
Constructed to agree	4200,	109,9	100,9	96,1	89,2	80,1	70,6	64,9	57,7
w/cert. results	0,								
	0,								
	0,								
707-320B/C	13930.	117,7	113,6	111,2	107,4	102,2	96.2	92,1	86,3
JT3D-3B	11030.	114,3	110.	107,2	103,4	98.	91.4	86,8	80,2
Quiet Nacelle	8670,	112,2	107.	103,5	99,1	92.8	85,6	80,8	73,1
Boeing test data	6130,	108,2	103,4	99,9	95,4	88,7	81,2	76,	68,8
	3490,	103,2	98,1	94,4	90.	83.	75,6	70,4	62,4
	0,								
727-200	12800.	121,0	116,7	114,2	110,8	106,2	101,3	98,1	93,8
JT8D-9	11900.	118,2	114,2	111,6	108,5	104,0	99,2	96,1	91,7
Quiet Nacelle	10000.	114,5	110,8	108,4	105,1	100,5	95,2	92,0	87,5
Boeing test data	8200,	109,3	105,6	103,0	99,9	95,3	90,0	86,9	82,4
	5900,	106,7	101,5	98,3	94,4	89,1	83,3	80,2	75,9
	3800,	102,9	97,5	94,3	90,3	84,7	78,9	75,3	70,8
737-200	13480,	118,7	114,7	112,1	108,5	103,0	96,9	93,0	86,8
JT8D-9	12550,	117,0	113,0	110,5	106,9	101,5	95,3	91,3	85,0
Quiet Nacelle	8050,	113,7	108,2	104,1	98,5	91,7	85,3	80,9	74,7
Boeing test data	6120,	113,0	107,0	102,4	95,6	87,6	80,8	76,1	68,8
	5370,	112,7	106,5	102,0	95,2	86,7	79,0	74,7	67,1
	4180,	108,8	102,3	97,9	91,7	83,3	75,7	70,9	63,0
DC-9-30	12000.	118,9	115,5	112,7	108,6	102,2	95,4	91,4	86,0
JT8D-7	10000.	114,8	111,3	108,3	104,0	97,6	90,7	86,2	80,1
Quiet Nacelle	8000,	110,1	106,9	104,0	99,7	92,9	85,2	80,5	74,1
from Boeing data	6000,	106,8	104,5	100,8	95,0	87,6	79,8	74,6	67,8
	4000,	105,5	100,8	96,9	91,0	84,1	76,5	71,4	64,8
	0,								

Table 2.4.4-2

Suggested Noise Curve Merging for Retrofit*

104	1	MERGE DATA FOR 727 RETROFIT
10	9	727 -> 727 QN
104	2	MERGE DATA FOR 737/DC9 RETROFIT
12	11	737 -> 737 QN
5	16	DC9 -> DC9 QN
104	2	MERGE DATA FOR JT3D RETROFIT
6	3	DC-8-61 -> 707-320B QN
2	3	707-320B-> 707-320B QN

*See Table 2.4.1-1 for retrofit noise curve assignments.

Table 2.4.4-3

JT8D Refan Noise Levels

	Noise Levels ~ EPNdB								
	F_n/δ	200′	400′	600′	1000′	2000′	4000′	6000′	10000′
727-200 JT8D-109 Configuration 2 Boeing Estimates	12690. 9800, 8080, 6310, 4300, 0, 0,	107,8 105,3 103,2 101,1 97,7	104,7 101,8 99,5 96,5 92,7	102,5 99,3 96,8 93,3 89,6	99,6 95,9 93,2 89,2 85,5	95.4 91,1 88.0 83.3 79,5	90.4 85.4 82,3 77.1 72.2	86,9 81,6 78,5 72,9 67,8	82,6 77,0 73,9 67,7 62,1
737-200 JT8D-109 Configuration 2 Boeing Estimates	13290. 6380, 5450, 3720, 0, 0,	107,4 107,1 106,7 105,7	101,3 101,0 100,0 98,7	97,3 96,8 95,3 93,8	92.3 91.5 89.7 87.6	86,2 84.3 81,5 78.9	80.5 77.6 73,5 69.8	76,0 72,9 68,0 63,9	69,3 66,2 61,3 56,2
DC-9-30 JT8D-107 Minimum Treatment Douglas Estimates	13530. 9625, 5410, 2785, 0,	109,0 107,4 104,0 103,3	106,3 104,0 100,0 98,9	103,4 100,7 96,2 95,0	98.7 95.3 90.6 89.0	91.0 86.8 81.6 79.8	82.4 77.1 71.9 70.0	77,1 72,0 66,7 65,0	70,5 65,2 60,6 58,9

Table 2.4.4-4

Takeoff Performance for the 727 Refan*

0171	727-200,JT8D-109,FLAP 5,S/L,59 DEG (REFAN)							TOGW=143500	
0,	3950,	6775,	14235,	25265,	55125,	65125,	0,	0,	2920,
0,	0,	250,	1500,	3000,	5435,	6660,	0,	.1676	12995,
32,	163.5	163.5	166.5	166.5	250.	250.	3.	.1360	11400,
12995,	12995,	12995,	11400,	11400,	10825,	0,	143500,	.0448	6435,
0181	727-200,JT8D-109,FLAP 5,S/L,59 DEG (REFAN)							TOGW=158500	
0,	4975,	8210,	17220,	30330,	58630,	68630,	0,	0,	3200,
0,	0,	225,	1500,	3000,	5200,	6245,	0,	.1415	12915,
32,	170,	170,	173,	173,	250,	250,	3,	.1144	11400,
12915,	12915,	12915,	11400,	11400,	10825,	0,	158500,	.0450	7130,
0191	727-200,JT8D-109,FLAP 5,S/L,59 DEG (REFAN)							TOGW=168500	
0,	5730,	9105,	19360,	34035,	60545,	70545,	0,	0,	3510,
0,	0,	200,	1500,	3000,	4845,	5935,	0,	.1268	12860,
32,	174.5	174.5	177,	177,	250,	250,	3,	.1022	11400,
12860,	12860,	12860,	11400,	11400,	10825,	0,	168500,	.0450	7585,
0201	727-200,JT8D-109,FLAP 5,S/L,59 DEG (REFAN)							TOGW=176000	
0,	6290,	9685,	21025,	37090,	62775,	72775,	0,	0,	3700,
0,	0,	175,	1500,	3000,	4750,	5640,	0,	.1168	12820,
32,	178,	178,	179.7	179.7	250,	250,	3,	.0939	11400,
12820,	12820,	12820,	11400,	11400,	10825,	0,	176000,	.0451	7930,
0631	727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG							TOGW=168500	
0,	5340,	8020,	17135,	30210,	58050,	68050,	0,	0,	3520,
0,	0,	200,	1500,	3000,	5165,	6660,	0,	.1426	13800,
32,	174.5	174.5	177,	177,	250,	250,	3,	.1147	12145,
13800,	13800,	13800,	12145,	12145,	11615,	0,	168500,	.0450	7585,
0641	727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG							TOGW=178500	
0,	6040,	9370,	19665,	34200,	59950,	69950,	0,	0,	3705,
0,	0,	175,	1500,	3000,	4775,	6170,	0,	.1287	13750,
32,	179,	179,	180.5	180.5	250,	250,	3,	.1032	12145,
13750,	13750,	13750,	12145,	12145,	11615,	0,	178500,	.0451	8045,
0651	727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG							TOGW=194000	
0,	7115,	10640,	23175,	40300,	64450,	74450,	0,	0,	3845,
0,	0,	125,	1500,	3000,	4450,	6025,	0,	.1097	13655,
32,	186,	186,	186.3	186.3	250,	250,	3,	.0876	12145,
13655,	13655,	13655,	12145,	12145,	11615,	0,	194000,	.0451	8755,

*Profiles are in "standard form" (See Table 2.2.1-4).

Table 2.4.4-5

Takeoff Performance for 737/DC-9 Refan Configurations*

0431	737-200,JT8D-109,FLAP 1,S/L,59 DEG (REFAN)								TOGW=105500
0,	4925,	7720,	14720,	26240,	35490,	60990,	0,	0,	3035,
0,	0,	300,	1500,	3000,	3545,	6015,	0,	.1714	13210,
32,	169,	169,	169,	169,	250,	250,	2,	.1302	11400,
13210,	13210,	13210,	11400,	11400,	10825,	0,	105500,	.0745	7060,
0441	737-200,JT8D-109,FLAP 1,S/L,59 DEG (REFAN)								TOGW=110500
0,	5375,	8055,	15750,	28165,	37665,	63700,	0,	0,	3205,
0,	0,	275,	1500,	3000,	3540,	6040,	0,	.1592	13150,
32,	173,	173,	173,	173,	250,	250,	2,	.1208	11400,
13150,	13150,	13150,	11400,	11400,	10825,	0,	110500,	.0746	8240,
0451	737-200,JT8D-109,FLAP 1,S/L,59 DEG (REFAN)								TOGW=117000
0,	6715,	9295,	17900,	31550,	41550,	70750,	0,	0,	3425,
0,	0,	250,	1500,	3000,	3430,	6030,	0,	.1453	13100,
32,	178,	178,	178,	178,	250,	250,	2,	.1099	11400,
13100,	13100,	13100,	11400,	11400,	10825,	0,	117000,	.0746	8730,
0461	DC-9-15,JT8D-109,FLAP 20,S/L,59 DEG (REFAN)								TOGW= 85500
0,	4085,	5445,	11710,	20655,	55155,	59390,	0,	0,	1800,
0,	0,	200,	1500,	3000,	6950,	7650,	0,	.2075	13500,
32,	150,	150,	150,	150,	250,	250,	2,	.1677	11400,
13500,	13500,	13500,	11400,	11400,	10825,	0,	85500,	.1051	8990,
0471	DC-9-15,JT8D-109,FLAP 20,S/L,59 DEG (REFAN)								TOGW= 92500
0,	4685,	6560,	13340,	22375,	53875,	64350,	0,	0,	2140,
0,	0,	200,	1500,	3000,	6040,	7620,	0,	.1910	13500,
32,	155,	155,	155,	155,	250,	250,	2,	.1660	11400,
13500,	13500,	13500,	11400,	11400,	10825,	0,	92500,	.0974	9010,
0481	DC-9-32,JT8D-109,FLAP 15,S/L,59 DEG (REFAN) PITCH LTD								TOGW=102500
0,	4105,	6160,	16410,	28720,	64470,	79390,	0,	0,	2545,
0,	0,	280,	1500,	3000,	5640,	7640,	0,	.1679	13500,
32,	145.5	145.5	145.5	145.5	250,	250,	2,	.1218	11400,
13500,	13500,	11735,	11400,	11400,	10825,	0,	102500,	.0931	9545,
0491	DC-9-32,JT8D-109,FLAP 15,S/L,59 DEG (REFAN) PITCH LTD								TOGW=110500
0,	5025,	6650,	17400,	30675,	69215,	85300,	0,	0,	2960,
0,	0,	220,	1500,	3000,	4600,	6600,	0,	.1558	13500,
32,	150.5	150.5	150.5	150.5	250,	250,	2,	.1130	11400,
13500,	13500,	10885,	11400,	11400,	10825,	0,	110500,	.0867	9575,

*Profiles are in "standard form" (See Table 2.2.1-4).

3.0 PROGRAM VERIFICATION

A series of 14 tests was devised to verify the correctness of all mathematical computations and algorithms in the NEF Program. For each test, the values of the quantities in question were computed by hand and compared to the values computed by the program.

For the purposes of this test series, a hypothetical airport was devised, a ground track map of which is shown in Figure 3-1. Test cases 1 to 11 use only a portion of the airport traffic at a time, while test cases 12 to 14 consider the entire airport. Each test case is described briefly below.

3.1 TEST CASE NUMBER 1

Test Case number 1 consists of three parts.

Part 1

The first part of Test Case 1 tests the input and output of basic data. These data consist of the parameters defining the following:

- Runways and Ground Tracks
- Noise Curves
- Altitude Profiles
- Approach Parameters

  Landing Roll
  Variety of Thrust Values
  Landing Velocities
  Aircraft Weight
  Number of Engines

- Airport Altitude and Mean Temperature
- Power Cutback and Altitude Restriction Designations
- Track Grouping Information

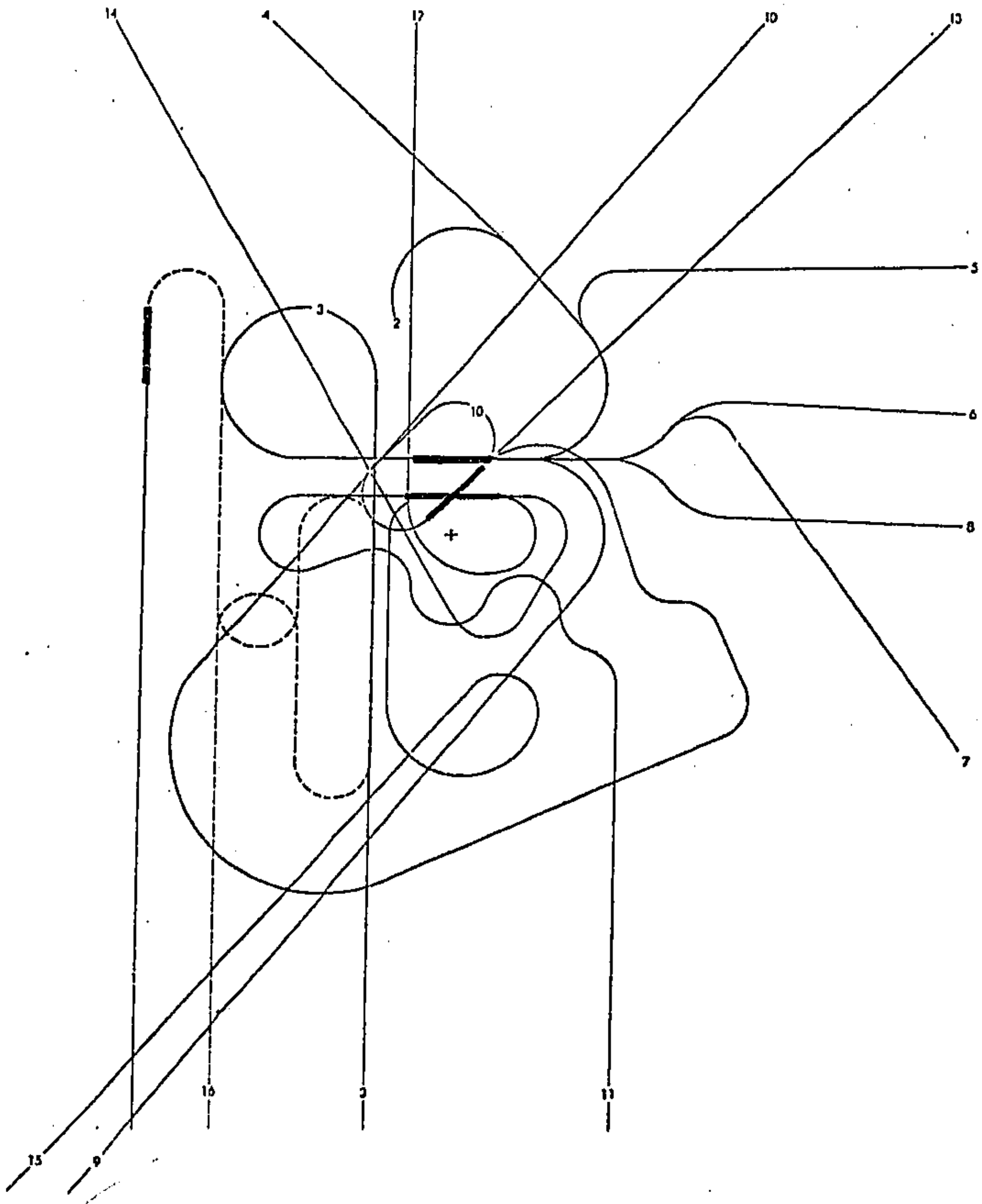


Figure 3-1. NEF Test Ground Tracks

- Wind Direction and Velocity
- Aircraft Operations Assignments (Mix)

This part of Test Case 1 verifies that the above input data and their associated indicator codes are properly interpreted and that the card formats are as expected.

Part 2

The second part of Test Case 1 verifies that the input data are properly stored in their assigned memory locations. Also, all necessary conditioning calculations (such as ground track geometry and cutback and altitude restriction preparation) are verified.

Part 3

The third part of Test Case 1 verifies the basics involved in computing the NEF value at a specific point under a variety of conditions. Runway 1 and Track 1 are used for these analyses. The basic computations verified are as follows (with reference to an arbitrary point):

- The distance to the track
- The distance along the track to the point of closest approach
- The aircraft altitude at the point of closest approach
- The aircraft thrust setting at the point of closest approach
- The aircraft ground velocity at the point of closest approach
- The ground attenuation at the point of closest approach
- The shielding correction at the point of closest approach
- The velocity correction at the point of closest approach
- The computation of EPNL for each flight

- The computation of NEF for each flight, modified by the weighted number of operations

- The computation of the composite NEF value

The above computations were verified at several points. The following table describes the ambient conditions for which the calculations were verified.

Table 3.1-1

The Conditions Under Which Test Case 1 Was Performed

Condition	Airport Altitude[1]	Mean Ambient Temperature	Wind Velocity	Wind Direction[2]
1	5000'	15°C	0	-
2	-1000'	0°C	0	-
3	0'	15°C	40 kts	90°
4	0'	15°C	40 kts	180°

[1]The airport altitude is the altitude above mean sea level.

[2]This indicates the direction from which the wind is blowing, measured clockwise from the positive y-axis in the Cartesian coordinate system

Condition 1 represents a test where the aircraft performances relative to mean sea level must be modified because of the difference in air density at ground level at the airport.

Condition 2 represents a test where the aircraft performances must be modified because of a non-sea level airport altitude and a non-standard day mean ambient temperature.

Condition 3 represents a test where the performances of the aircraft are not altered, since the wind is at a right angle to the track (in this case), and standard day conditions, 0' altitude and 15° Centigrade, exist otherwise.

Condition 4 represents a test where the performances are modified due to a 40 knot headwind for departures (a tailwind for arrivals).

3.2 TEST CASE NUMBER 2

Test Case number 2 demonstrates the function of the program to force the last segment of a track to be a long straight one. In this case, the last segment of Track 2 was input as a curved segment and was modified to be a long straight one by the program.

3.3 TEST CASE NUMBER 3

Test Case number 3 illustrates a three-segment track with a 270 degree turn included (Track number 3). The continuity and summation algorithms inside and outside of the turn are examined. Additionally, a point was chosen which computed a slant range to the aircraft of zero feet. This causes the noise at that point to be set to a very large number. Also, a type 2 cutback, a maximum power climbout, was applied to the aircraft following the track.

3.4 TEST CASE NUMBER 4

Test Case number 4 considers track numbers 4 through 9 and track number 2. These tracks are used to examine the track grouping algorithm. This algorithm simplifies the computations in the area where tracks are coincident. In addition, the continuity and summation algorithms are examined inside several of the turns. Also, on Track 8, a type 4 cutback, a FAR-36 cutback procedure simulation, is applied.

3.5 TEST CASE NUMBER 5

Test Case number 5 considers Track number 10. The track has 15 segments, the maximum allowable. The continuity algorithm is examined in the area of two consecutive turns in the same direction. Also, the effects of angular wind components are examined.

3.6 TEST CASE NUMBER 6

Test Case number 6 illustrates a multitude of consecutive turns on Track 11. The noise continuity algorithm is examined in the area of the "S" turns and on the inside of the first turn. In addition, a type 1 cutback, an altitude restriction, is applied to the aircraft on the track.

3.7 TEST CASE NUMBER 7

Test Case number 7 illustrates the use of two consecutive turns in the same direction on Track 12. The turns have different radii. The continuity algorithm is examined on the inside area of the turns.

3.8 TEST CASE NUMBER 8

Test Case number 8 examines the effects of an angular wind component to the aircraft on Track 13. Also, a type 5 cutback, a fixed gradient climbout, is applied to the aircraft on the track.

3.9 TEST CASE NUMBER 9

Test Case number 9 illustrates a track (Track 14) where three segments may be of equal importance. The continuity algorithm is examined in this area. Also, a type 3 cutback, a climb power climbout, is applied to the aircraft following the track.

3.10 TEST CASE NUMBER 10

Test Case number 10 tests the ability of the program to correctly handle an input track segment length of less than zero feet for the first segment of Track 15. This action is taken if the aircraft on the track turn before the end of the runway. Also, a type 3 cutback, a climb power climbout, is applied to the aircraft following the track.

Note that track 15 as shown in Figure 3.1 has two consecutive turns of more than 270° total in length and is therefore not permitted under the restrictions described in Section 4.5 of this volume. Track 15 should be rejected by the program and must be redefined in order to run Test Case 10.

3.11 TEST CASE NUMBER 11

Test Case number 11 considers Track number 16 to test the continuity algorithm. The area within the overlapping turns is examined.

3.12 TEST CASE NUMBER 12

Test Case number 12 uses the data from Test Cases 1 through 11 as the input data describing the activity of all aircraft operating in the vicinity of the airport. A coarse matrix of points around the airport is examined and compared to similar matrices generated in each of the previous test cases. The sum of the values at each point in the previous matrices is equal to the value of the corresponding points for the matrix in this test. Also, alternate methods of inputting mix data are examined.

3.13 TEST CASE NUMBER 13

Test Case number 13 tests the contour generating program. Test Cases 1 through 12 tested the ability of the common subroutines to perform properly. The data for Test Case 12 is also used for this test case. Specifically, this test checks the ability of the program to:

- Find a point within a specified tolerance of a given contour when the guess at the first point is not within tolerance.
- Find successive points within a specified tolerance of the given contour once the first point has been found.
- Determine when the contour has closed and calculations should terminate.
- Provide a graphic output of the contour and other appropriate information.

3.14 TEST CASE NUMBER 14

Test Case number 14 uses the diagnostic option of the contour generation program to compute the composite NEF at several of the same points as in Test Case 12. A comparison of the values indicates that the grid program and the contour program produce identical results at identical points.

3.15 TEST CASE DATA DECKS

```
DTA
103   5             **ALTITUDE RESTRICTIONS FOR THE TEST CASE**
001  1         2.       10.       11
002  2         2000.    10.        3
003  3         2.       3000.     12    14    15
004  4         600.     3000.      4     5     6     7     8     9     2
005  5.05      1.65     10000.    13
    0    0    0    0    1    1    1    1    1    1    0    2    3    2    3    0
1011016            **PROFILES FOR THE TEST CASE**
0011                          PROFILE IN STANDARD FORM  (DEPARTURE)
0.       10000.   15000.   26500.   43000.   63000.   103000. 0.       0.       15785.
0.       0.       500.     1500.    3000.    4000.    6000.    0.       0,1045   40000.
80.      80.      160.     160.     160.     320.     320.     3.       .0909    35000.
45000.   45000.   40000.   35000.   35000.   35000.   0.       570000.  .0517    25000.
0022                          PROFILE IN STANDARD FORM  (DEPARTURE)
0.       12500.   18000.   30000.   48000.   68000.   108000. 0.       0.       16200.
0.       0.       400.     1500.    3000.    3500.    5500.    0.       .0958    40000.
160.     160.     160.     160.     160.     160.     160.     3.       .0833    35000.
45000.   45000.   40000.   35000.   35000.   35000.   35000.   610000.  .0492    30000.
0033                       PROFILE WITH ABRUPT THRUST TRANSITION
0.       14750.   15250.   17000.   27000.   62000.   87000.   0.       0.       12650.
0.       0.       200.     1500.    3000.    5000.    7500.    0.       .1575    40000.
32.      80.      80.      160.     160.     160.     160.     2.       .1339    35000.
45000.   40000.   40000.   35000.   35000.   35000.   0.       290000.  .1045    30320.
0044
0.       7000.    10000.   12000.   30000.   62000.   85000.   0.       0.       13540.
0.       0.       300.     600.     3000.    4500.    6500.    0.       .1533    40000.
160.     160.     160.     160.     160.     160.     160.     2.       .12      35000.
45000.   45000.   40000.   35000.   35000.   35000.   0.       300000.  .1       30000.
0055
0.       8000.    12000.   24000.   44000.   70000.   90000.   0.       0.       13000.
0.       0.       300.     1500.    3000.    3700.    4800.    0.       .1       30000.
160.     160.     160.     160.     160.     160.     160.     3.       .0779    25000.
35000.   35000.   35000.   25000.   25000.   22000.            430000.  .0779    25000.
0066
0.       4000.    6000.    13000.   28000.   62000.   75000.   0.       0.       2600.
0.       0.       300.     1500.    3000.    5200.    7000.    0.       .1655    15000.
160.     160.     160.     160.     160.     160.     320.     4.       .1       12000.
15000.   15000.   15000.   12000.   12000.   12000.   0.       215000.  .0391    8400.
0077
0.       4500.    7250.    15000.   32000.   65000.   82000.   0.       0.       2700.
0.       0.       0.       1500.    3000.    4800.    7000.    0.       .1548    15000.
160.     160.     160.     160.     160.     160.     160.     4.       .087     12000.
15000.   15000.   15000.   12000.   12000.   12000.   0.       230000.  .0373    8500.
0888                       TWO SEGMENT TAKE-OFF PROFILE
0.       1.       100000.
0.       0.       10000.
160.     160.     160.
10000.   10000.
0909                       TAKE-OFF PROFILE (NON-STANDARD FORM)
0.       10000.   12000.   32000.   36000.   136000.
0.       0.       100.     100.     5000.    10000.
160.     160.     160.     160.     160.     160.
15000.   15000.   12000.   15000.   15000.
101                     TWO SEGMENT APPRCACH PROFILE
-1.      0.       10.
0.       0.       6076.115
-2.      -2.      -2.
```

```
-10,    -3,
103                MAX SEGMENT APPROACH PROFILE
-,5     0.      1,      5.      6,      15,     16,     25,     27,     30,
0.      0.      200.    200.    2000,   2000.   4000,   4000,   4000,   8000.
160.    160.    160.    160,    160,    160,    160,    160,    160,    160,
20000.  4000,   8000,   2000,   8000.   4000.   8000,   4000,   2000,
104
-1,     0,      1,      2,
0,      0.      400.    1200,   1200,
-2,     -2,     -2,
-10,    -3,     -4,     -5,     -8,     -7,
105
-1,     0,      1,      5,      6,
0,      0,      400.    400,    2400,
-2,     -2,     -2,     -2,     -2,

-10,    -3,     -5,     -9,
107
-1,     0,      1,      2.      10,     11,
0,      0,      400,    800,    800,    1000,
-2,     -2,     -2,     -2,     -2,     -2,
-10,    -3,     -6,     -5,     -8,
110
-1.     -,165   1,      2,
0.      0,      400.    1200,
160.    -2,     -2,     160,
-10.    -3,     -4,
150                 APPROACH PROFILE -- NO INDICATORS
-1,5    0,      10,
0,      0,      6076,115
160,    160,    160,
15000,  6000,                                                          100,
100   1                   **RUNWAYS FOR THE TEST CASE**
5000,     15,
  0                    *RUNWAYS FOR THE TEST CASE*
  1 -39900,  20000,            -39900,  30000,
  2 -39900,  30000,            -39900,  20000,
  3 -5000.    10100,           5000.    10100,
  4 5000,    10100,            -5000,   10100,
  5 6000,    5100,             -6000,   5100,
  6 -6000,   5100,             6000,    5100,
  7 -3000,   2100,             4000,    9100,
  8 4000,    9100,             -3000,   2100,

1001  2                  **TRACKS FOR THE TEST CASE**
 16                 *GROUND TRACKS FOR THE TEST CASE*
 2 1 150,
 3 2 5,8229132, -1,652,4690,   5,   -,823150,  -1,5
 4 3 32,469270,01,65 50,
 3 4 5,8229132, -1,652,4690,   5,    -,82350,
 3 5 4,8229132, -1,6513i, ,823 50,
 3 6 42,46952,  -1,6555,  1,65 50,
 3 7 42,46952,  -1,65107, ,823 50,
 3 8 42,46952,  1,65 50,  -1,6550,
 3 9 3,8229129, 1,65 50,
 710150,   180, -,8231,65 0,   180, -,8231,65 0,   117, 1,65 1,81 0,   79,
 710 C-,82373,  ,823 1,4810,   90,  ,823 7,8170,   130, 3,29224,  1,65 50,
 511 92,304200, -,8231,1520,   110, ,823 160, -,823160, ,823 75,  -,82375,
 511 C,823 50,
 612 40,   161, ,823 109, 1,65 50,
 713 10,
```

```
 614 5,6583120, ,823 1,65 0,   120, ,823 50,
 515 6-,49490,  -,8233,6210,   162, -1,65157, -,82350,
 116110,   180, ,823 6,5830,   180, -,8231,65 0,   180, ,823 4,9370,   180,
 116 C,823 2,7980,   180, -,82350,
108   4               **APPROACH PARAMETERS FOR THE TEST CASE**
  1
AIRCRAFT 1  200000,    4.
 -4500, 127,09257500, , 5000,   9000,   6000,   8000,   2500,   1000,   10000,
  2
AIRCRAFT 2  160000,    3.
-3700,  127,09257500,   5000,   9000,   6000,   8000,   2500,   1000,   10000,
  3
AIRCRAFT 3  160000,    2.
 -3000, 100,953215000,  10000,  18000,  12000,  16000,  5000,   2000,   20000,
  4
AIRCRAFT 4  220000,    4.
 -4500, 201,42815625,   3750,   6750,   4500,   6000,   1875,   750,    7500,
106   1                   **WIND DATA - TRACK 1**
  1 40,   90,
102  96              **NOISE CURVES FOR THE TEST CASE**
 1 1 40000,0134,000128,000124,490120,068114,068108,068104,559100,137
 1 2 20000,0130,000124,000120,490116,068110,068104,068100,559 96,137
 1 3 10000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
 1 4  8000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
 1 5  4000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
 1 6  2000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
 2 1 30000,0133,000127,000123,490119,068113,068107,068103,559 99,137
 2 2 15000,0129,000123,000119,490115,068109,068103,068 99,559 95,137
 2 3  7500,0123,000117,000113,490109,068103,068 97,068 93,559 89,137
 2 4  6000,0119,000113,000109,490105,068 99,068 93,068 89,559 85,137
 2 5       ,0   ,000   ,000   ,000   ,000   ,000   ,000   ,000   ,000
 2 6       ,0   ,000   ,000   ,000   ,000   ,000   ,000   ,000   ,000
 3 1 40000,0132,000126,000122,490118,068112,068106,068102,559 98,137
 3 2 20000,0128,000122,000118,490114,068108,068102,068 98,559 94,137
 3 3 10000,0122,000116,000112,490108,068102,068 96,068 92,559 88,137
 3 4  8000,0118,000112,000108,490104,068 98,068 92,068 88,559 84,137
 3 5  4000,0115,000109,000105,490101,068 95,068 89,068 85,559 81,137
 3 6  2000,0114,000108,000104,490100,068 94,068 88,068 84,559 80,137
 4 1 30000,0131,000125,000121,490117,068111,068105,068101,559 97,137
 4 2 15000,0127,000121,000117,490113,068107,068101,068 97,559 93,137
 4 3  7500,0121,000115,000111,490107,068101,068 95,068 91,559 87,137
 4 4  6000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
 4 5       ,0   ,000   ,000   ,000   ,000   ,000   ,000   ,000   ,000
 4 6       ,0   ,000   ,000   ,000   ,000   ,000   ,000   ,000   ,000
 5 1 40000,0130,000124,000120,490116,068110,068104,068100,559 96,137
 5 2 20000,0126,000120,000116,490112,068106,068100,068 96,559 92,137
 5 3 10000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
 5 4  8000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
 5 5  4000,0113,000107,000103,490 99,068 93,068 87,068 83,559 79,137
 5 6  2000,0112,000106,000102,490 98,068 92,068 86,068 82,559 78,137
 6 1 30000,0129,000123,000119,490115,068109,068103,068 99,559 95,137
 6 2 15000,0125,000119,000115,490111,068105,068 99,068 95,559 91,137
 6 3  7500,0119,000113,000109,490105,068 99,068 93,068 89,559 85,137
 6 4  6000,0115,000109,000105,490101,068 95,068 89,068 85,559 81,137
 6 5       ,0   ,000   ,000   ,000   ,000   ,000   ,000   ,000   ,000
 6 6       ,0   ,000   ,000   ,000   ,000   ,000   ,000   ,000   ,000
 7 1 40000,0128,000122,000118,490114,068108,068102,068 98,559 94,137
 7 2 20000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
 7 3 10000,0118,000112,000108,490104,068 98,068 92,068 88,559 84,137
 7 4  8000,0114,000108,000104,490100,068 94,068 88,068 84,559 80,137
```

```
 7 5   4000,0111,000105,000101,490 97,068 91,068 85,068 81,559 77,137
 7 6   2000,0110,000104,000100,490 96,068 90,068 84,068 80,559 76,137
 8 1  30000,0127,000121,000117,490113,068107,068101,068 97,559 93,137
 8 2  15000,0123,000117,000113,490109,065103,068 97,068 93,559 89,137
 8 3   7500,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
 8 4   6000,0113,000107,000103,490 99,068 93,068 87,068 83,559 79,137
 8 5         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
 8 6         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
 9 1  40000,0126,000120,000116,490112,068106,068100,068 96,559 92,137
 9 2  20000,0122,000116,000112,490108,068102,068 96,068 92,559 88,137
 9 3  10000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
 9 4   8000,0112,000106,000102,490 98,068 92,068 86,068 82,559 78,137
 9 5   4000,0109,000103,000 99,490 95,068 89,068 83,068 79,559 75,137
 9 6   2000,0108,000102,000 98,490 94,068 88,068 82,068 78,559 74,137
10 1  30000,0125,000119,000115,490111,068105,068 99,068 95,559 91,137

10 2  15000,0121,000115,000111,490107,068101,068 95,068 91,559 87,137
10 3   7500,0115,000109,000105,490101,068 95,068 89,068 85,559 81,137
10 4   6000,0111,000105,000101,490 97,068 91,068 85,068 81,559 77,137
10 5         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
10 6         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
11 1  40000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
11 2  20000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
11 3  10000,0114,000108,000104,490100,068 94,068 88,068 84,559 80,137
11 4   8000,0110,000104,000100,490 96,068 90,068 84,068 80,559 76,137
11 5   4000,0107,000101,000 97,490 93,068 87,068 81,068 77,559 73,137
11 6   2000,0106,000100,000 96,490 92,068 86,068 80,068 76,559 72,137
12 1  30000,0123,000117,000113,490109,068103,068 97,068 93,559 89,137
12 2  15000,0119,000113,000109,490105,068 99,068 93,068 89,559 85,137
12 3   7500,0113,000107,000103,490 99,068 93,068 87,068 83,559 79,137
12 4   6000,0109,000103,000 99,490 95,068 89,068 83,068 79,559 75,137
12 5         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
12 6         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
13 1  40000,0122,000116,000112,490108,068102,068 96,068 92,559 88,137
13 2  20000,0118,000112,000108,490104,068 98,068 92,068 88,559 84,137
13 3  10000,0112,000106,000102,490 98,068 92,068 86,068 82,559 78,137
13 4   8000,0108,000102,000 98,490 94,068 88,068 82,068 78,559 74,137
13 5   4000,0105,000 99,000 95,490 91,068 85,068 79,068 75,559 71,137
13 6   2000,0104,000 98,000 94,490 90,068 84,068 78,068 74,559 70,137
14 1  30000,0121,000115,000111,490107,068101,068 95,068 91,559 87,137
14 2  15000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
14 3   7500,0111,000105,000101,490 97,068 91,068 85,068 81,559 77,137
14 4   6000,0107,000101,000 97,490 93,068 87,068 81,068 77,559 73,137
14 5         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
14 6         ,0   ,000   ,000   ,000   ,000   ,000   ,000    ,000    ,000
15 1  40000,0134,000128,000124,490120,068114,068108,068104,559100,137
15 2  20000,0130,000124,000120,490116,068110,068104,068100,559 96,137
15 3  10000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
15 4   8000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
15 5   4000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
15 6   2000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
16 1 30000, 135,0  132,0  129,0  124,0  114,0  100,0  95,0   91,0
16 2 15000, 131,0  127,0  123,0  115,0  102,0  95,0   91,0   88,0
16 3 7500,  123,0  117,0  112,0  107,0  97,0   90,0   85,0   81,0
16 4 6000,  115,0  108,0  105,0  100,0  93,0   83,0   80,0   75,0
16 5
16 6
105   1         TRACK GROUP DATA
 1 1,0          1
107              **NOISE CURVE APPROACH THRUST MATCH**
    1    1    1    1    2    2    2    2    3    3    3    3    4    4    4    4
```

```
100    3              TEST 1                    5000FT AIRPORT ALT
 1   88 13 16,7         1    5 14 10,        1    1 15 10,           1    5 16,1,
 1   90  9 100,         1 101 10 100,        1 101 11 100,           1 150 12 100,
 1    1  1 10,          1    2  2 20,        1    3  3 40,   10,     1    4  4 100,
 1    5  5 10,          1    6  6 1,         1    7  7 1,            1   88  8 10,
 1   88 13         1,

PTS
NEF PROGRAM TEST CASE -- TRACK 1            5000FT
CHECK THRUST AND NOISE CALCULATIONS -- AND NECESSARY INTERPOLATIONS
    2
-39900,   3000,          1
-39900,   0,             1
DTA
100   1             **CHANGE A/P PRESSURE,ALTITUDE AND TEMPERATURE**
-1000,    0,


PTS
NEF PROGRAM TEST CASE -- TRACK 1         -1000FT
CHECK THRUST AND NOISE CALCULATIONS -- AND NECESSARY INTERPOLATIONS
    3
-39900,   15000,         1
-39900,   3000,          1
-39900,   0,             1
DTA
100   1             **CHANGE A/P PRESSURE,ALTITUDE AND TEMPERATURE**
0,        15,


PTS
NEF PROGRAM TEST CASE -- TRACK 1
USE THESE POINTS TO CHECK GROUND ATTENUATION @ BETA = 0
    5
-39500,   30000,         1
-38900,   30000,         1
-37900,   30000,         1
-36900,   30000,         1
-29900,   30000,         1
PTS
NEF PROGRAM TEST CASE -- TRACK 1
USE THESE POINTS TO CHECK GROUND ATTENUATION @ BETA = 0
    7
-39500,   0,             1
-38900,   0,             1
-37900,   0,             1
-36900,   0,             1
-29900,   0,             1
-19900,   0,             1
-9900,    0,             1
PTS
NEF PROGRAM TEST CASE -- TRACK 1
CHECK THRUST AND NOISE CALCULATIONS -- AND NECESSARY INTERPOLATIONS
    3
-39900,   15000,         1
-39900,   3000,          1
-39900,   0,             1
DTA
106   1                   **WIND DATA - TRACK 1**
  1 40,  100,
```

```
MAT
NEF PROGRAM TEST CASE NO,1
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,   10000,   -10000,      10   11
PTS
NEF PROGRAM TEST CASE -- TRACK 1                         WITH WIND
CHECK THRUST AND NOISE CALCULATIONS -- AND NECESSARY INTERPOLATIONS
    3
-39900,   15000,        1
-39900,   3000,         1
-39900,   0,            1
DTA
100    3              * TEST CASE NO, 2 AND 4 * NO TRACK GROUPS *
 2    4   1 40,          2    4  5 100,        2    4 12 10,        2    4 13 20,

 4    4   1 40,          2    4  5 100,        2    4 12 10,        2    4 13 20,
 5 105   1 100,          5 105  2 60,          6    6 12 10,        6    6 15 10,
 7 107   1 100,          7 107  2 60,          7 107  3 60,         7 107 16 100,
 8 105   1 10,           8    4  6 10,         8    4 12 10,        8    6 12 10,
 8    6 15 1,            8    4 13 1,

MAT
NEF PROGRAM TEST CASE                          TEST 2 & 4 -- NO GROUPING
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,    10000,    -10000,      10   11
PTS
NEF PROGRAM TEST CASE -- TRACK 2 AND 4  W/O TRACK GROUPING
THIS RUN IS ** WITHOUT ** TRACK COUPING
    5
0,        10200,        1
2000,     10200,        1
4000,     10200,        1
6000,     10200,        1
8000,     10200,        1
DTA
105    3            **TRACK GROUP DATA**
 1 1,64        1
 2 1,6        10   13
 3 2,45        2    4    5    6    7    8    9
100    3              * TEST CASE NO, 2 AND 4 *     TRACK GROUPS *
 2    4   1 40,          2    4  5 100,        2    4 12 10,        2    4 13 20,
 4    4   1 40,          2    4  5 100,        2    4 12 10,        2    4 13 20,
 5 105   1 100,          5 105  2 60,          6    6 12 10,        6    6 15 1C,
 7 107   1 100,          7 107  2 60,          7 107  3 60,         7 107 16 100,
 8 105   1 10,           8    4  6 10,         8    4 12 10,        8    6 12 1C,
 8    6 15 1,            8    4 13 1,

MAT
NEF PROGRAM TEST CASE        WITH TRACK GROUPING
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,    10000,    -10000,      10   11
PTS
NEF PROGRAM TEST CASE -- TRACK 2 AND TRACK 4
THIS RUN IS ** WITH ** TRACK GROUPING
    5
0,        10100,        1
2000,     10200,        1
4000,     10200,        1
6000,     10200,        1
8000,     10200,        1
```

```
DTA
100    3                  *TEST CASE NO, 3 ,TRACK 3*
 3    5  1 60,              3  88 10 200,

MAT
NEF PROGRAM TEST CASE                                                         TST 3
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,    10000,    -10000,        10   11
PTS
NEF PROGRAM TEST CASE------ TRACK 3
USE THESE POINTS TO CHECK CONTINUITY
    15
-20101,9   10110,          1
-20011,9   10110,          1
-20002,9   10110,          1
-20001,9   10110,          1
-20000,9   10110,          1
-19999,9   10110,          1
-19990,9   10110,          1
-19900,9   10110,          1
-19900,9   10090,          1
-19990,9   10090,          1
-19999,9   10090,          1
-20000,9   10090,          1
-20001,9   10090,          1
-20011,9   10090,          1
-20101,9   10090,          1
DTA
100    3          **MIX DATA FOR THE TEST CASE**                          TEST 5
10  88   4 20,         10    2 12 10,         10    5  4 40,
106    1                  **WIND DATA - TRACKS 10 & 13**
  2 20,   180,

MAT
NEF PROGRAM TEST CASE                                                         TST 5
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,    10000,    -10000,        10   11
PTS
NEF PROGRAM TEST CASE ----TRACK 10
USE THESE POINTS TO CHECK FOR CONTINUITY
    21
-4000,      17000,         1
-3500,      16500,         1
-3000,      16000,         1
-1000,      15000,         1
-1000,      14000,         1
-1000,      13000,         1
-1000,      12000,         1
-1000,      11000,         1
0,          10000,         1
0,          9000,          1
0,          8000,          1
0,          7000,          1
0,          6000,          1
0,          5000,          1
0,          4000,          1
1000,       3000,          1
2000,       2000,          1
3000,       1000,          1
4000,       0,             1
```

```
5000,      -1000,         1
6000,      -2000,         1
PTS
NEF PROGRAM TEST CASE ---- TRACK 10
USE THESE POINTS TO CHECK FOR CONTINUITY - CONSECUTIVE TURNS
     6
-32000,    -18000,        1
-32000,    -20000,        1
-32000,    -22000,        1
-32000,    -24000,        1
-32000,    -26000,        1
-32000,    -28000,        1
DTA
100   3              * TEST CASE NO, 6 ---- TRACK 11 *
11  88  4 40,        11   5  5 40,        11   6 16 60,


MAT
NEF PROGRAM TEST CASE                                              * TST 6
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,    40000,    10000,    -10000,      10   11
PTS
NEF PROGRAM TEST CASE                                                TST 6
USE THESE POINTS TO CHECK FOR CONTINUITY -- FIRST TURN
    10
-20999,4  200,           1
-20099,4  200,           1
-19998,4  200,           1
-19999,4  200,           1
-19989,4  200,           1
-19999,    0,            1
-19998,4   0,            1
-19980,4   0,            1
-19800,    0,            1
-19700,    0,            1
PTS
NEF PROGRAM TEST CASE                                                TST 6
USE THESE POINTS TO CHECK FOR CONTINUITY --- 'S' TURNS
    4
12900,     -10322,       1
12900,     -10327,       1
12900,     -10332,       1
14397,58   -10326,9      1
PTS
NEF PROGRAM TEST CASE                                                TST 6
USE THIS POINT TO CHECK CUTBACK CAPABILITY (TYPE 1)
    1
22000,     -20000,       1
DTA
100   3             MIX DATA FOR TEST CASE NO,7 --- TRACK 12
12   6 15 20,        12   5   5 30,

MAT
NEF PROGRAM TEST CASE
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,    10000,    -10000,      10   11
PTS
NEF PROGRAM TEST CASE
USE THESE POINTS TO CHECK CONTINUITY IN THE INSIDE AREA
    9
6000,      0,            1
```

```
6500,     500,          1
6000,     500,          1
5500,     500,          1
6000,     -500,         1
6500,     -500,         1
5500,     -500,         1
6500,     0,            1
5500,     0,            1
DTA
100   3          MIX DATA FOR TEST CASE NO, 8 --- TRACK 13
13   5  4 40,        13 150 16 10,        13 150  1 10,

MAT
NEF PROGRAM TEST CASE
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,   10000,   -10000,      10   11
PTS
NEF PROGRAM TEST CASE
USE THESE POINTS TO CHECK THE WIND CORRECTION AT ANGLE OF ATTACK
     6
8000,     13000,        1
15000,    20000,        1
25000,    30000,        1
35000,    40000,        1
55000,    60000,        1
17500,    22600,        1
DTA
100   3          MIX DATA FOR TEST CASE NO,9 --- TRACK 14
14  88 10 200,       14   5 15 50,        14   5 10 50,

MAT
NEF PROGRAM TEST CASE
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,   10000,   -10000,      10   11
PTS
NEF PROGRAM TEST CASE
USE THESE POINTS TO CHECK CONTINUOUS NOISE
   18
6000,     -3000,        1
6000,     -2000,        1
6000,     -4000,        1
7000,     -2000,        1
7000,     -3000,        1
7000,     -4000,        1
5000,     -2000,        1
5000,     -2100,        1
5000,     -2200,        1
5000,     -2300,        1
5000,     -2400,        1
5000,     -2500,        1
5000,     -2600,        1
5000,     -2700,        1
5000,     -2800,        1
5000,     -2900,        1
5000,     -3000,        1
5000,     -4000,        1
DTA
100   3          MIX DATA FOR TEST CASE NO, 10 --- TRACK 15
15   4 12 10,        15   4 11 10,        15   4 12 10,
```

```
MAT
NEF PROGRAM TEST CASE
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000.    10000.    -10000,      10   11
PTS
NEF PROGRAM TEST CASE
THE FIRST POINT IS AT THE END OF THE RUNWAY --USE OTHER POINTS TO CHECK CUTBACK
.   8
-6000,     5100,          1
-8000,     -4000,         1
-8000,     -8000.         1
-8000,     -12000,        1
-8000,     -16000,        1
-8000,     -24000,        1
4000,      -24000,        1

8000,      -24000,        1
DTA
100   3          MIX DATA FOR TEST CASE NO,11 --- TRACK 16
16 150 15 100,       16 101 15 100,      16 101  1 20,

MAT
NEF PROGRAM TEST CASE                                              TST 11
COARSE GRID -- TO BE USED WITH ALL RUNS
-40000,   40000,    10000,    -10000,      10   11
PTS
NEF PROGRAM TEST CASE
USE THESE POINTS TO CHECK CONTINUOUS NOISE
   11
-26000,    -10000,        1
-26000,    -10250,        1
-26000,    -10500,        1
-26000,    -10750,        1
-26000,    -11000,        1
-26000,    -11250,        1
-26000,    -11500,        1
-26000,    -11750,        1
-26000,    -12000,        1
-24000,    -10000,        1
-24000,    -12000,        1
END
```

```
START
PLOT30 10000,
100   1           **RUNWAYS AND TRACKS FOR THE TEST CASE**
0,         15,
  8                 *RUNWAYS FOR THE TEST CASE*
  1 -39900,  20000,              -39900,  30000,
  2 -39900,  30000,              -39900,  20000,
  3 -5000,    10100,             5000,    10100,
  4 5000,    10100,              -5000,   10100,
  5 6000,    5100,               -6000,   5100,
  6 -6000,   5100,               6000,    5100,
  7 -3000,   2100,               4000,    9100,
  8 4000,    9100,               -3000,   2100,

 16                  *GROUND TRACKS FOR THE TEST CASE*
 2 1 150,
 3 2 5,8229132, -1,652,4690,   5,   -,823150,  -1,5
 4 3 32,469270,01,65 50,0
 3 4 5,8229132, -1,652,4690,   5,   -,82350,
 3 5 4,8229132, -1,65131, ,823 50,
 3 6 42,46952,  -1,6555,  1,65 50,
 3 7 42,46952,  -1,65107, ,823 50,
 3 8 42,46952,  1,65 50,  -1,6550,
 3 9 3,8229129, 1,65 50,
 710150,   180, -,8231,65 0,   180, -,8231,65 0,   117, 1,65 1,81 0,   79,
 710 C-,82373,  ,823 1,4010,   90,  ,823 7,8170,   130, 3,29224,  1,65 50,
 511 92,304200, -,8231,1520,   110, ,823 160, -,823160, ,823 75,  -,82375,
 511 C,823 50,
 612 40,   161, ,823 109, 1,65 50,
 713 10,
 614 5,6583120, ,823 1,65 0,   120, ,823 50,
 515 6-,49490,  -,8233,6210,   162, -1,65157, -,82350,
 116110,   180, ,823 6,5830,   180, -,8231,65 0,   180, ,823 4,9370,   180,
 116 C,823 2,7980,  180, -,82350,
103   5               **ALTITUDE RESTRICTIONS FOR THE TEST CASE**
001  1          2,      10,        11
002  2          2000,   10,         3
003  3          2,      3000,      12    14    15
004  4          600,    3000,       4     5     6     7     8     9     2
005  5,05       1,65    10000,     13
   0    0    0    0    1    1    1    1    1    1    0    2    3    2    3    0
101 016              **PROFILES FOR THE TEST CASE**
0011                         PROFILE IN STANDARD FORM  (DEPARTURE)
0,       10000,  15000,  26500,  43000,  63000,  103000, 0,        0,       15785,
0,       0,      500,    1500,   3000,   4000,   6000,   0,        0,1045   40000,
80,      80,     160,    160,    160,    320,    320,    3,        ,0909    35000,
45000,   45000,  40000,  35000,  35000,  35000,  0,      570000,   ,0517    25000,
0022                         PROFILE IN STANDARD FORM  (DEPARTURE)
0,       12500,  18000,  30000,  40000,  68000,  108000, 0,        0,       16200,
0,       0,      400,    1500,   3000,   3500,   5500,   0,        ,0958    40000,
160,     160,    160,    160,    160,    160,    160,    3,        ,0833    35000,
45000,   45000,  40000,  35000,  35000,  35000,  35000,  610000,   ,0492    30000,
0033                      PROFILE WITH ABRUPT THRUST TRANSITION
0,       14750,  15250,  17000,  27000,  62000,  87000,  0,        0,       12650,
0,       0,      200,    1500,   3000,   5000,   7500,   0,        ,1575    40000,
32,      80,     80,     160,    160,    160,    160,    2,        ,1339    35000,
45000,   40000,  40000,  35000,  35000,  35000,  0,      290000,   ,1045    30320,
0044
0,       7000,   10000,  12000,  30000,  62000,  85000,  0,        0,       13540,
```

```
0,       0,       300,     600,     3000,    4500,    6500,    0,       ,1533    40000,
160,     160,     160,     160,     160,     160,     160,     2,       ,12      35000,
45000,   45000,   40000,   35000,   35000,   35000,   0,       300000,  ,1       30000,
0055
0,       8000,    12000,   24000,   44000,   70000,   90000,   0,       0,       13000,
0,       0,       300,     1500,    3000,    3700,    4800,    0,       ,1       30000,
160,     160,     160,     160,     160,     160,     160,     3,       ,0779    25000,
35000,   35000,   35000,   25000,   25000,   22000,            430000,  ,0779    25000,
0066
0,       4000,    6000,    13000,   28000,   62000,   75000,   0,       0,       2600,
0,       0,       300,     1500,    3000,    5200,    7000,    0,       ,1655    15000,
160,     160,     160,     160,     160,     160,     320,     4,       ,1       12000,
15000,   15000,   15000,   12000,   12000,   12000,   0,       215000,  ,0391    8400,
0077
0,       4500,    7250,    15000,   32000,   65000,   82000,   0,       0,       2700,
0,       0,       0,       1500,    3000,    4800,    7000,    0,       ,1548    15000,
160,     160,     160,     160,     160,     160,     160,     4,       ,087     12000,
15000,   15000,   15000,   12000,   12000,   12000,   0,       230000,  ,0373    8500,
0888                         TWO SEGMENT TAKE-OFF PROFILE
0,       1,       100000,
0,       0,       10000,
160,     160,     160,
10000,   10000,
0909                         TAKE-OFF PROFILE (NON-STANDARD FORM)
0,       10000,   12000,   32000,   36000,   136000,
0,       0,       100,     100,     5000,    10000,
160,     160,     160,     160,     160,     160,
15000,   15000,   12000,   15000,   15000,
101                      TWO SEGMENT APPROACH PROFILE
-1,      0,       10,
0,       0,       6076,115
-2,      -2,      -2,
-10,     -3,
103                    MAX SEGMENT APPROACH PROFILE
-,5      0,       1,       5,       6,       15,      16,      25,      27,      30,
0,       0,       200,     200,     2000,    2000,    4000,    4000,    4000,    8000,
160,     160,     160,     160,     160,     160,     160,     160,     160,     160,
20000,   4000,    8000,    2000,    8000,    4000,    8000,    4000,    2000,
104
-1,      0,       1,       2,
0,       0,       400,     1200,    1200,
-2,      -2,      -2,
-10,     -3,      -4,      -5,      -8,      -7,
105
-1,      0,       1,       5,       6,
0,       0,       400,     400,     2400,
-2,      -2,      -2,      -2,      -2,
-10,     -3,      -5,      -9,
107
-1,      0,       1,       2,       10,      11,
0,       0,       400,     800,     800,     1000,
-2,      -2,      -2,      -2,      -2,      -2,
-10,     -3,      -6,      -5,      -8,
110
-1,      -,165    1,       2,
0,       0,       400,     1200,
160,     -2,      -2,      160,
-10,     -3,      -4,
150                      APPROACH PROFILE -- NO INDICATORS
-1,5     0,       10,
```

```
0.        0.        6076,115
160,      160.      160.
15000,   6000,                                                                  100,
106    4            **APPROACH PARAMETERS FOR THE TEST CASE**
  1
AIRCRAFT 1  200000,    4.
 -4500, 127,09257500,   5000,    9000,    6000,    8000,    2500,    1000,    10000,
  2
AIRCRAFT 2  160000,    3.
 -3700, 127,09257500,   5000,    9000,    6000,    8000,    2500,    1000,    10000,
  3
AIRCRAFT 3  160000,    2.
 -3000, 100,953215000,  10000,   18000,   12000,   16000,   5000,    2000,    20000,
  4
AIRCRAFT 4  220000,    4.

 -4500, 201,42815625,   3750,    6750,    4500,    6000,    1875,    750,     7500,
102  96             **NOISE CURVES FOR THE TEST CASE**
 1 1 40000,0134,000128,000124,490120,068114,068108,068104,559100,137
 1 2 20000,0130,000124,000120,490116,068110,068104,068100,559 96,137
 1 3 10000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
 1 4  8000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
 1 5  4000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
 1 6  2000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
 2 1 30000,0133,000127,000123,490119,068113,068107,068103,559 99,137
 2 2 15000,0129,000123,000119,490115,068109,068103,068 99,559 95,137
 2 3  7500,0123,000117,000113,490109,068103,068 97,068 93,559 89,137
 2 4  6000,0119,000113,000109,490105,068 99,068 93,068 89,559 85,137
 2 5       ,0   ,000   ,000   ,000   ,000    ,000    ,000    ,000    ,000
 2 6       ,0   ,000   ,000   ,000   ,000    ,000    ,000    ,000    ,000
 3 1 40000,0132,000126,000122,490118,068112,068106,068102,559 98,137
 3 2 20000,0128,000122,000118,490114,068108,068102,068 98,559 94,137
 3 3 10000,0122,000116,000112,490108,068102,068 96,068 92,559 88,137
 3 4  8000,0118,000112,000108,490104,068 98,068 92,068 88,559 84,137
 3 5  4000,0115,000109,000105,490101,068 95,068 89,068 85,559 81,137
 3 6  2000,0114,000108,000104,490100,068 94,068 88,068 84,559 80,137
 4 1 30000,0131,000125,000121,490117,068111,068105,068101,559 97,137
 4 2 15000,0127,000121,000117,490113,068107,068101,068 97,559 93,137
 4 3  7500,0121,000115,000111,490107,068101,068 95,068 91,559 87,137
 4 4  6000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
 4 5       ,0   ,000   ,000   ,000   ,000    ,000    ,000    ,000    ,000
 4 6       ,0   ,000   ,000   ,000   ,000    ,000    ,000    ,000    ,000
 5 1 40000,0130,000124,000120,490116,068110,068104,068100,559 96,137
 5 2 20000,0126,000120,000116,490112,068106,068100,068 96,559 92,137
 5 3 10000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
 5 4  8000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
 5 5  4000,0113,000107,000103,490 99,068 93,068 87,068 83,559 79,137
 5 6  2000,0112,000106,000102,490 98,068 92,068 86,068 82,559 78,137
 6 1 30000,0129,000123,000119,490115,068109,068103,068 99,559 95,137
 6 2 15000,0125,000119,000115,490111,068105,068 99,068 95,559 91,137
 6 3  7500,0119,000113,000109,490105,068 99,068 93,068 89,559 85,137
 6 4  6000,0115,000109,000105,490101,068 95,068 89,068 85,559 81,137
 6 5       ,0   ,000   ,000   ,000   ,000    ,000    ,000    ,000    ,000
 6 6       ,0   ,000   ,000   ,000   ,000    ,000    ,000    ,000    ,000
 7 1 40000,0128,000122,000118,490114,068108,068102,068 98,559 94,137
 7 2 20000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
 7 3 10000,0118,000112,000108,490104,068 98,068 92,068 88,559 84,137
 7 4  8000,0114,000108,000104,490100,068 94,068 88,068 84,559 80,137
 7 5  4000,0111,000105,000101,490 97,068 91,068 85,068 81,559 77,137
 7 6  2000,0110,000104,000100,490 96,068 90,068 84,068 80,559 76,137
 8 1 30000,0127,000121,000117,490113,068107,068101,068 97,559 93,137
```

```
 8 2 15000,0123,000117,000113,490109,068103,068 97,068 93,559 89,137
 8 3  7500,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
 8 4  6000,0113,000107,000103,490 99,068 93,068 87,068 83,559 79,137
 8 5       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
 8 6       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
 9 1 40000,0126,000120,000116,490112,068106,068100,068 96,559 92,137
 9 2 20000,0122,000116,000112,490108,068102,068 94,068 92,559 88,137
 9 3 10000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
 9 4  8000,0112,000106,000102,490 98,068 92,068 86,068 82,559 78,137
 9 5  4000,0109,000103,000 99,490 95,068 89,068 83,068 79,559 75,137
 9 6  2000,0108,000102,000 98,490 94,068 88,068 82,068 78,559 74,137
10 1 30000,0125,000119,000115,490111,068105,068 99,068 95,559 91,137
10 2 15000,0121,000115,000111,490107,068101,068 95,068 91,559 87,137
10 3  7500,0115,000109,000105,490101,068 95,068 89,068 85,559 81,137
10 4  6000,0111,000105,000101,490 97,068 91,068 85,068 81,559 77,137
10 5       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
10 6       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
11 1 40000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
11 2 20000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
11 3 10000,0114,000108,000104,490100,068 94,068 88,068 84,559 80,137
11 4  8000,0110,000104,000100,490 96,068 90,068 84,068 80,559 76,137
11 5  4000,0107,000101,000 97,490 93,068 87,068 81,068 77,559 73,137
11 6  2000,0106,000100,000 96,490 92,068 86,068 80,068 76,559 72,137
12 1 30000,0123,000117,000113,490109,068103,068 97,068 93,559 89,137
12 2 15000,0119,000113,000109,490105,068 99,068 93,068 89,559 85,137
12 3  7500,0113,000107,000103,490 99,068 93,068 87,068 83,559 79,137
12 4  6000,0109,000103,000 99,490 95,068 89,068 83,068 79,559 75,137
12 5       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
12 6       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
13 1 40000,0122,000116,000112,490108,068102,068 96,068 92,559 88,137
13 2 20000,0118,000112,000108,490104,068 98,068 92,068 88,559 84,137
13 3 10000,0112,000106,000102,490 98,068 92,068 86,068 82,559 78,137
13 4  8000,0108,000102,000 98,490 94,068 88,068 82,068 78,559 74,137
13 5  4000,0105,000 99,000 95,490 91,068 85,068 79,068 75,559 71,137
13 6  2000,0104,000 98,000 94,490 90,068 84,068 78,068 74,559 70,137
14 1 30000,0121,000115,000111,490107,068101,068 95,068 91,559 87,137
14 2 15000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
14 3  7500,0111,000105,000101,490 97,068 91,068 85,068 81,559 77,137
14 4  6000,0107,000101,000 97,490 93,068 87,068 81,068 77,559 73,137
14 5       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
14 6       ,0    ,000    ,000    ,000    ,000    ,000    ,000    ,000    ,000
15 1 40000,0134,000128,000124,490120,068114,068108,068104,559100,137
15 2 20000,0130,000124,000120,490116,068110,068104,068100,559 96,137
15 3 10000,0124,000118,000114,490110,068104,068 98,068 94,559 90,137
15 4  8000,0120,000114,000110,490106,068100,068 94,068 90,559 86,137
15 5  4000,0117,000111,000107,490103,068 97,068 91,068 87,559 83,137
15 6  2000,0116,000110,000106,490102,068 96,068 90,068 86,559 82,137
16 1 30000, 135,0  132,0  129,0  124,0  114,0  100,0  95,0   91,0
16 2 15000, 131,0  127,0  123,0  115,0  102,0  95,0   91,0   88,0
16 3 7500,  123,0  117,0  112,0  107,0  97,0   90,0   85,0   81,0
16 4 6000,  115,0  108,0  105,0  100,0  93,0   83,0   80,0   75,0
16 5
16 6
105   3              **TRACK GROUP DATA**
 1 1,64       1
 2 1,6       10  13
 3 2,45       2   4   5   6   7   8   9
106   2                  **WIND DATA - TRACKS 1, 10, + 13**
  1 40,  180,     2 20,0 180,0
107              **NOISE CURVE APPROACH THRUST MATCH**
```

```
    1    1    1    1    2    2    2    2    3    3    3    3    4    4    4    4
100   3              ** MIX DATA FOR TEST CASE **
 1   88 13 16,7        1   5 14 10,          1   1 15 10,          1   5 16 1,
 1   90  9 100,        1 101 10 100,         1 101 11 100,         1 150 12 100,
 1    1  1 10,         1   2  2 20,          1   3  3 40,   10,    1   4  4 100,
 1    5  5 10,         1   6  6 1,           1   7  7 1,           1  88  8 10,
 5  105  1 100,        5 105  2 60,          6   6 12 10,          6   6 15 10,
 7  107  1 100,        7 107  2 60,          7 107  3 60,          7 107 16 100,
 8  105  1 10,         8   4  6 10,          8   4 12 10,          8   6 12 10,
08 006 15 1,0         08 004 13 1,0         01 088 13        1,0  03 005 01 60,0
03 088 10 200,0       10 088 04 20,0        10 002 12 10,0        10 005 04 40,0
11 088 04 40,0        11 005 05 40,0        11 006 16 60,0        12 006 15 20,0
12 005 05 30,0        13 005 04 40,0        13 150 16 10,0        13 150 01 10,0
14 088 10 200,0       14 005 15 50,0        14 005 10 50,0        15 004 12 10,0
15 004 11 10,0        15 004 12 10,0        16 150 15 100,0       16 101 15 100,0

16 101 01 20,0
100    4 -2,0        ** MIX FOR TRACKS 2 + 4 **
  2 0,0  0,50     4 1,0   0,50
     4  1 40,             4  5 100,             4 12 10,             4 13 20,


  1973 TEST CASE
  1973 **TEST CASE**            4000FT STEP  0,1DB TOL                NEF 35
35,        0,1        -20250,   -2300,     500,                       150,
35,        0,1        20000,    0,         4000,                      500,
-35,       0,1        -20000,   20000,     1000,                      30,
END
```

4.0 NEF PROGRAM USER'S GUIDE

This section contains information regarding the use of the NEF program. All control cards pertaining to the execution of the program are discussed. Methods for data entry, modification and replacement are presented along with the corresponding punched card formats. Brief explanations regarding input data are included as well as input restrictions and data input ordering rules. Program error messages and informative messages are listed and explained. Also, to aid data entry, a set of coding forms is provided.

4.1 Input Coding - NEF Contour Program

Deck Setup

A sample deck setup for the NEF contour program is shown in Figure 4.1-1. Additional data blocks not shown and their accompanying code cards may be inserted, without conflict, between the Noise Curve Definitions and Mix Code Cards shown in the figure.

System Control Cards

In general, these are necessary for setup of peripheral devices and allocation of core. The format of the system control cards varies depending on the type of machine used. Consequently, they will not be discussed here.

START Card

The first program card must contain the word START in card columns 1 through 5 as shown below. The remaining columns can be used for comments which will be printed on the first line of output.

```
START
```

PLOT Card

The second program card controls the plot output, if any. A sample is shown below. A blank card is used when no plots are desired. After this card the program proceeds automatically to the input data readin routine.

```
PLOT12 8000.
```

Field 1 - The first field must contain the word PLOT for contour plot output.

Field 2 - The 12 in this field indicates output onto 12 inch wide plotter paper. 30 inch paper can also be specified.

Field 3 - Format F6.0. This field contains the scale factor in feet/inch. If no scale is specified or if the contour is too large for the scale chosen, the program will automatically scale the contour to the smallest multiple of 2000 feet/inch that will fit the contour onto the plot paper.

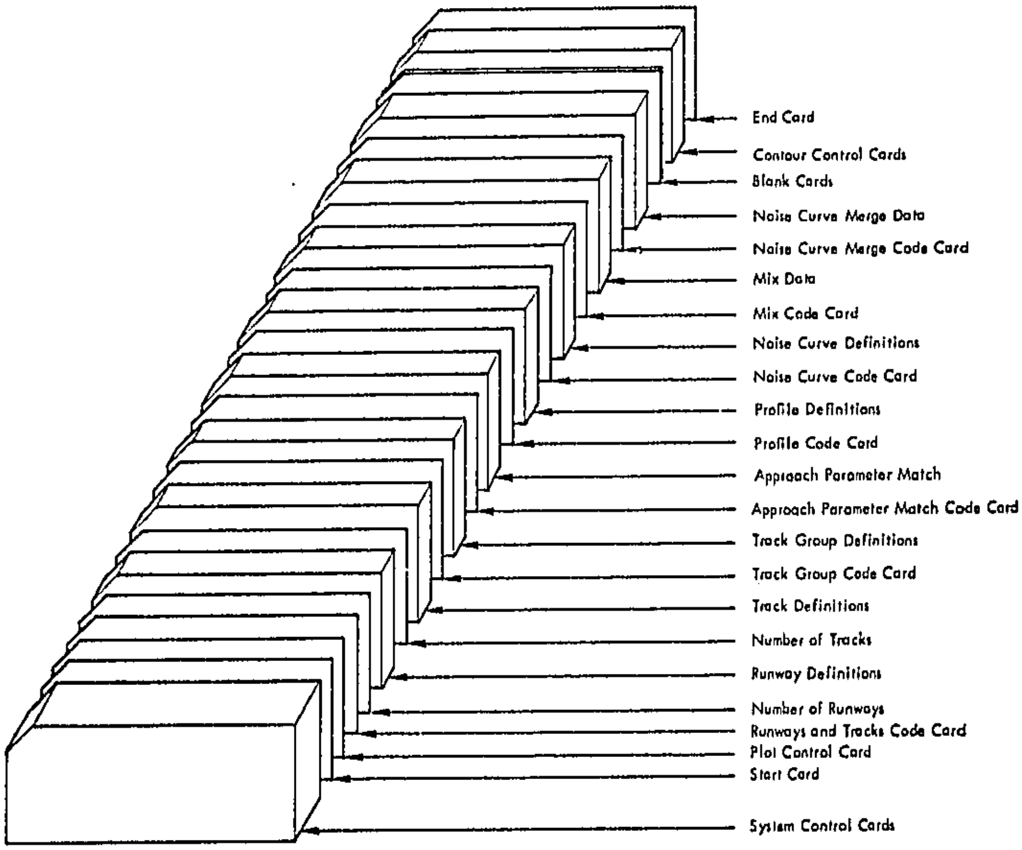
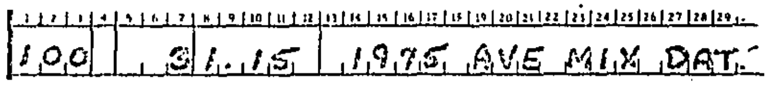


Figure 4.1-1 Sample Deck Setup

READIN Control Card

After the PLOT card, the program begins to read airport data. The first card is the READIN control card. This card precedes each separate block of input data. A code contained in the first fields transfers program control to the desired input subroutine. This code and other elements of the READIN control card are listed in Table 4.1-1. The sample card below is for mix data input.



Field 1 - Code for input data category (ICODE). See Table 4.1-1 for a complete listing. A zero returns control to main program.

Field 2 - Input dump indicator (IDUMP). A blank or zero in this field suppresses printout of intermediate calculations performed on input parameters.

Field 3 - Format I3. This field contains a count indicator (ICNT) for the block of data that follows. Table 4.1-1 lists specific definitions of this indicator for the various input categories.

Field 4 - Format F5.0. This field is used exclusively for mix data input. It contains a factor (FAC) that is described in the paragraph on mix data on page 4-15.

Field 5 - The remainder of the READIN control card is reserved for comments. These comments are printed above each set of input data as they are "echoed" in the printout. Use of this comment block is an easy way of documenting the data used to make a particular run.

Table 4.1-1

READIN Control Card

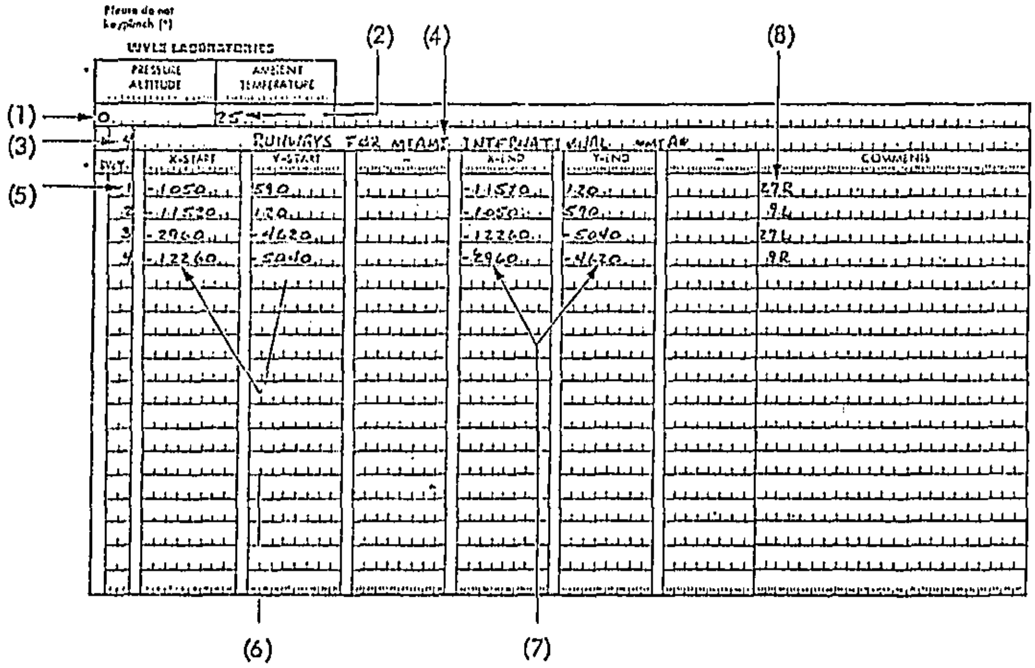
ICODE	ICNT	Input Category	Contents of Input Dump
000	–	Returns to main program	–
100	1	Runway, track data	Not used for runways
100	2	Track data (only)	Parameters stored for calculation of distance to each track segment
100	3	Mix data (long form)	Sorted, combined list of equivalent operations*
100	4	Track use percent, mix data	Same as above
100	5	Mix data (fixed percent format)	Same as above
101	# Profiles	Profile data	Not used
102	# Noise Curves	Noise data	Not used
103	# Takeoff Restrictions	Takeoff restriction data	Restriction start and end altitudes and distances for each takeoff profile
104	# Merges	Noise curve merge data	Resultant list of equivalent operations*
105	# Track Group	Track group data	Not used
106	# Wind Conditions	Wind data	Not used
107	–	Noise curve - approach parameter match	Not used
108	# Approach parameter sets	Approach parameter data	Not used
109	–	Tolerances for SIFT and Loop Check	Not used

*Equivalent Operations - the total number of operations in a 24-hour period (with night flights weighted by a factor of 16.7) for any given aircraft type on a particular profile and track.

Runway Data

For the purposes of the NEF program runways are defined in one direction only. The brake release point determines one end and the landing threshold (on the opposite end) the other. Ground tracks are appended to the threshold end. Ambient pressure and temperature are also defined in the set of runway input.

RUNWAY DEFINITION CODING FORM

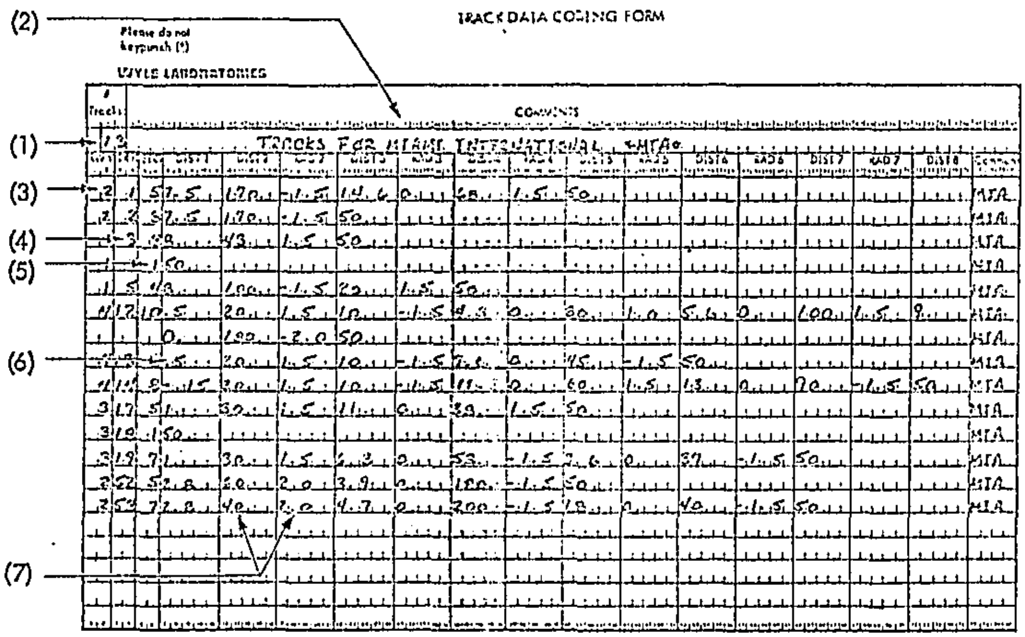


(1) Airport pressure altitude in feet above sea level. F format.
(2) Ambient airport temperature in degrees centigrade. F format.
(3) Number of runway definition cards to be input. I format.
(4) Comment.
(5) Runway number. I format. These numbers must form a set of consecutive integers starting from 1.
(6) x,y coordinates of the brake release end of the runway. F format.
(7) x,y coordinates of end of the runway to which the ground tracks are attached (threshold). F format.
(8) Space for comments.

Track Data

The reading of ground track data begins immediately after input of runway definitions with no READIN control card required. Tracks consist of up to 15 segments which are either straight lines or circular segments. Segments are defined by a length or turn angle and a radius of curvature. A radius of 0 designates a straight segment. The first segment must be straight, therefore, the radius of curvature input is unnecessary. Data for tracks with up to 8 segments may be input on one card. Additional segments require two cards. An example of such a track is track no. 12 below.

The direction of turns is denoted by the sign of the radius of curvature. Positive is to the right.

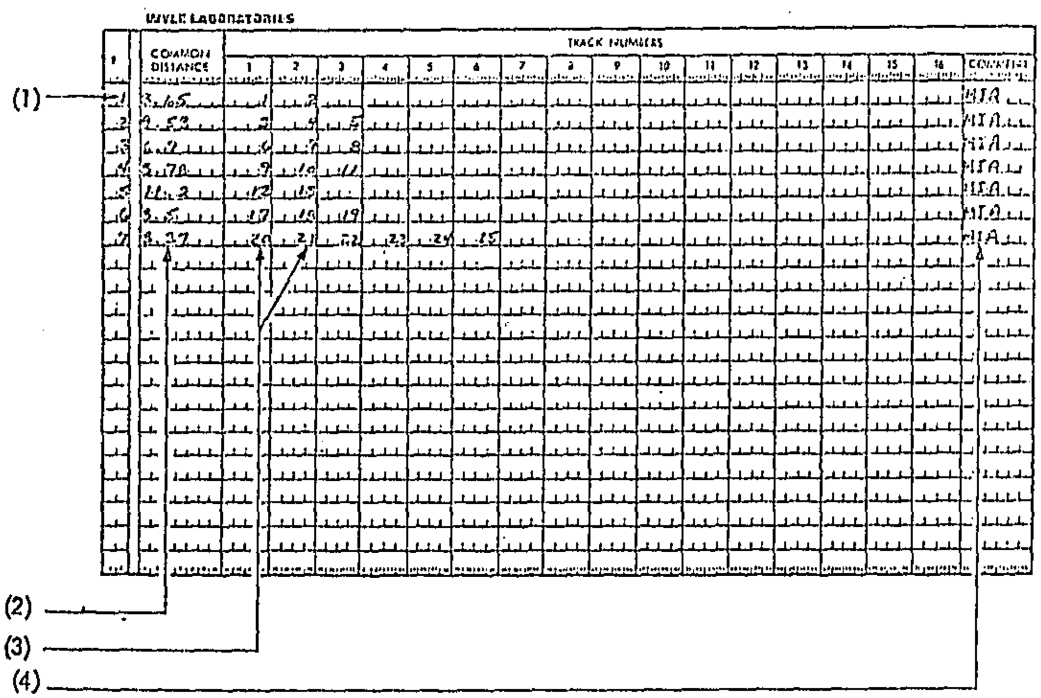


(1) Number of track data cards to follow. I format.
(2) Space for comment.
(3) Number of runway to which the track is appended. I format.
(4) Track number. I format.
(5) Number of segments in the track. I format.
(6) Length of the first segment in nautical miles. F format.
(7) Length or turn angle and radius of curvature of subsequent segments. Length and radii are in nautical miles and turn angles are in degrees.

Track Groups

The combining of tracks into groups is an efficiency measure that can be utilized whenever tracks coincide for a distance near the runway and operational restrictions along the common distance are identical for those tracks. A sample of the input coding is shown below. Following the READIN code card, one card must be input for each of the groups specified.

TRACK GROUP DATA CODING FORM



(1) Track group number. I format.
(2) Common distance in nautical miles from the far end of the runway from a point on the track. F format.
(3) Numbers of the tracks which are members of the group. If there are more than 16 tracks in a particular group they may be entered on a second card with elements (1) and (2) repeated. Format 16I5.
(4) Space for comment.

Noise Data

Any noise level information stored in the program may be replaced or altered. Either an entire data set may be replaced or a curve for an individual power setting may be changed. If changes are made at only a single power setting, care must be exercised to insure that proper ordering of thrust levels is maintained. The individual curves must be numbered consecutively with decreasing levels of power.

The indicator ICNT on the READIN code card contains the number of curves to be read in. One card for each curve follows in the format illustrated below. They may be input in any order.

(5)

NOISE DATA CODING FORM

WYLE LABORATORIES

A/C	P/T	THRUST	NOISE LEVELS ~ EPNdB								COMMENTS
			200 FEET	400 FEET	630 FEET	1000 FEET	2000 FEET	4000 FEET	6300 FEET	10,000 FEET	
11	1	12000	129	129	125	120	111	102	96	87	PHANTOM
11	2	10900	134	129	130	115	106	97	91	83	F-4
11	3	9250	139	119	115	110	101	92	86	78	M/
11	4	6200	130	112	104	99	91	83	77	70	AFTERBURNERS
11	5	0									
11	6	0									
14	1	11400	120	115	112	108	101	94	90	85	GULFSTREAM 2
14	2	7700	100	102	99	95	87	80	76	74	SPEY ENGIN.
14	3	0									GRUMMAN
14	4	0									TURBOFAN
14	5	0									
14	6	0									
13	1	33600	135.4	120.5	117.6	113.3	106.2	97.5	93	86.7	747-100
13	2	26900	123.6	119.7	116.5	112.3	105	96	90.4	84.7	JT9D-3A
13	3	21100	122.6	118.3	115.4	110.9	102	93.4	87.4	[illegible]	'A' NACELLE
13	4	12300	117.3	113.0	109.0	105.4	[illegible]	[illegible]	82	75.8	BOEING
13	5	9900	113.9	109.4	106.9	101.9	94.6	85.2	79	72.6	DATA
13	6	8000	112	107.3	104.3	99.8	92.3	83.4	77.4	70.9	9/73

(1) Aircraft type number. I format.
(2) Power setting curve number for that aircraft type. I format.
(3) Corrected net thrust corresponding to the following noise levels. F format.
(4) Effective perceived noise levels corresponding to the input aircraft type and power setting at the slant ranges specified in the heading. Format 8F7.
(5) Space for comment.

Profile Data

Performance data for a large number of takeoff operations are stored in the program. However, approach profiles are not. The required profile data consists of aircraft height, thrust setting and speed at up to 10 distances along the flight track. Sample input are shown below.

See Sections 2.2.1 and 2.4.2 for the standard takeoff profile format and description. See Section 2.4.3 for use of indicators for approach profiles.

(3)

PROFILE DEFINITION CODING FORM

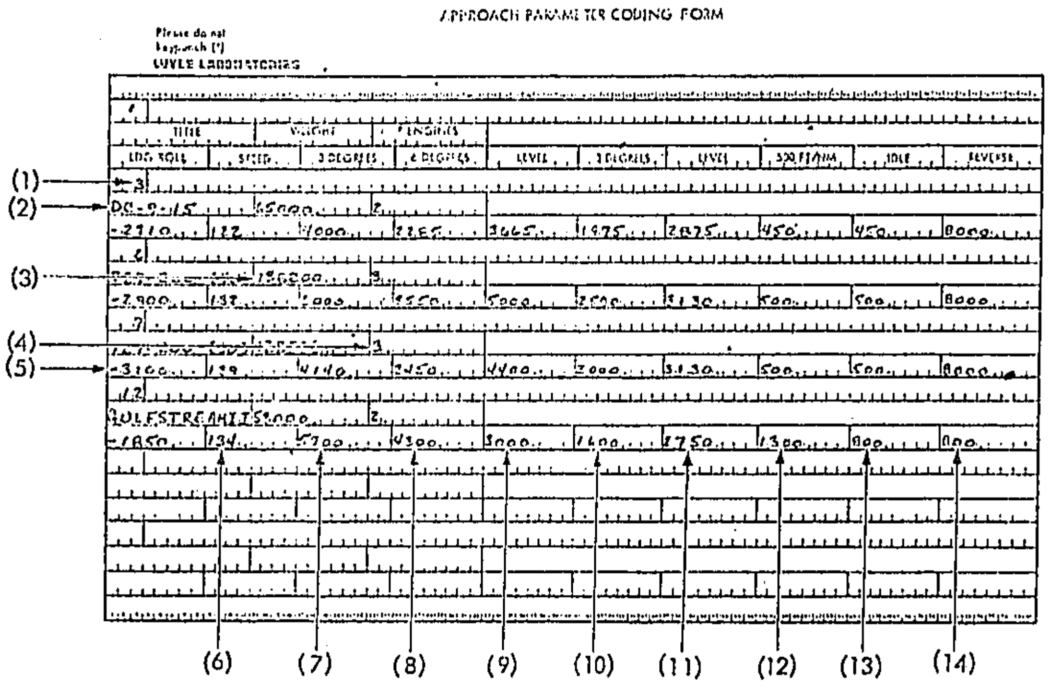
WYLE LABORATORIES

	SEGMENT 1	SEGMENT 2	SEGMENT 3	SEGMENT 4	SEGMENT 5	SEGMENT 6	SEGMENT 7	SEGMENT 8	SEGMENT 9	SEGMENT 10
(1)	90 1	F102 TAKE-OFF WITH AFTERBURNER								
(2)	0	4000	11000	40000						
	0	0	1360	3800						
	33	180	200	300						
	16000	16000	10200							
	92 1	GULFSTREAM II								
(4)	0	4000	6500	13000						
(5)	0	0	100	1000						
(6)	25	170	170	180						
(7)	11400	11400	11400							
	99	LANDING FOR ALL MILITARY FLIGHTS JETS AMIA4								
	-11.2	-0.157	5.6	9.5	9					
	0	0	2500	2500	3000					
	33	170	170	170	180					
	6500	6200	7000	5500						

(1) Profile number. I format.
(2) A code which determines the interpretation of the input ground track distances. A zero or blank implies that these distances will be input in nautical miles. Otherwise, input is in feet.
(3) Space for comment.
(4) Ground track distances. Format 10F8.x.
(5) Aircraft heights above the runway corresponding to the input track distances. Format 10F8.x.
(6) Aircraft speed in ktas.
(7) Corrected net thrust in pounds per engine.

Approach Parameter Input

The parameters which are stored for use with approach profiles may be replaced or changed in a manner illustrated below. The number of sets to be input is contained in the ICNT indicator on the READIN code card. 3 cards are input for each set.

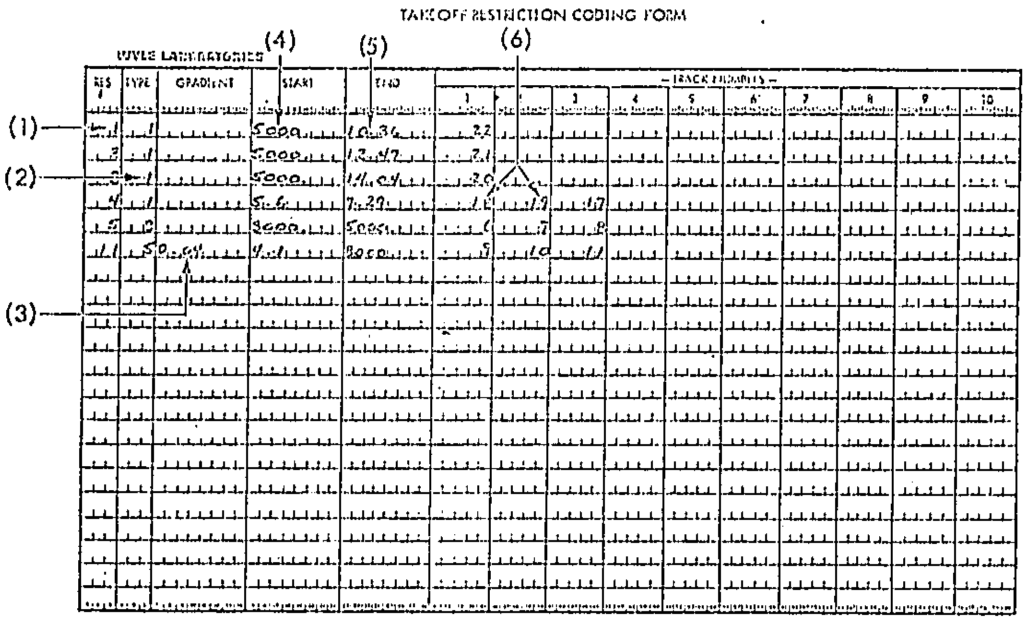


(1) Parameter set number. I format.
(2) Title information.
(3) Aircraft landing weight in pounds. F format.
(4) Number of engines. F format.
(5) Landing roll distance in feet from the threshold.
(6) Landing speed in knots.
(7) Net thrust required for approach on a 3° glide slope with landing flaps. Thrust is given in pounds per engine.
(8) Net thrust required for approach on a 6° glide slope with landing flaps.
(9) Thrust required for level flight with approach flaps.
(10) Thrust required for approach on a 3° glide slope with approach flaps set.
(11) Thrust required for level flight with maneuver flaps.
(12) Thrust required for a 500 foot/nm descent with maneuver flaps.
(13) Idle thrust.
(14) Thrust for reversal.

Takeoff Restriction Input

If the desired takeoff procedures do not correspond to the recommended ATA procedure, then segments may be added to the stored profiles so that they more closely approximate the desired operations. The 5 types of segments that may be added are listed in Table 4.1-2. Their position and length in the profile may be specified either by distances from brake release or airplane altitude. For obvious reasons the end of a restriction which places the aircraft in level flight must be specified by a distance from brake release. The input format is shown below.

After these cards an additional card is input in format 16I5 which allows the user to override the cutback option for any of the 16 possible aircraft types. The possible override modes are listed in Table 4.1-3.



(1) Restriction number. This number is selected by the user, but must be less than 25. I format.
(2) Code number for type of restriction. See Table 4.1-2. I format.
(3) Gradient for type 5 cutbacks only. F format.
(4) Start of restriction. If the input value is greater than 100, the program interprets it as an altitude in feet. Otherwise, it is taken to mean a distance from brake release in nautical miles. F format.
(5) End of restriction. The input convention is the same as for the beginning of the restriction.
(6) Track numbers.

Table 4.1-2

Takeoff Restriction Type Codes

0 - No restriction
1 - Level flight (maximum altitude restriction)
2 - Segment at takeoff power
3 - Segment at maximum climb power
4 - Cutback to thrust specified by FAR Part 36
5 - Cutback to a specified gradient

Table 4.1-3

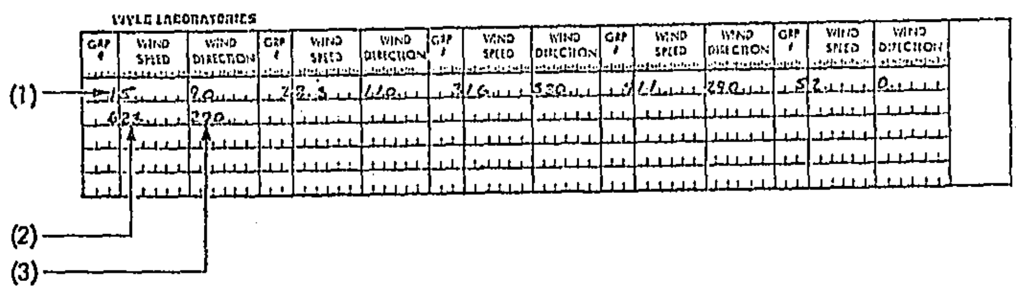
Restriction Override Codes

0 - Allow any type of restriction
1 - Do not allow any restrictions
2 - Allow FAR 36 type cutbacks only
3 - Allow insertion of takeoff or climb power segments only

Wind Data

Separate wind conditions may be input for each track group. This allows computation of performance corresponding to average wind conditions on each group of tracks when they are in use. Calm conditions are assumed when no data are given for a particular track group or when a track is not assigned to any group. The required input is shown below.

WIND DATA CODING FORM



(1) Number of the group for which the wind conditions apply. I Format.
(2) Wind speed in knots. Format F6.0.
(3) Direction from which wind is blowing in degrees from the positive y-direction. Format F6.0.

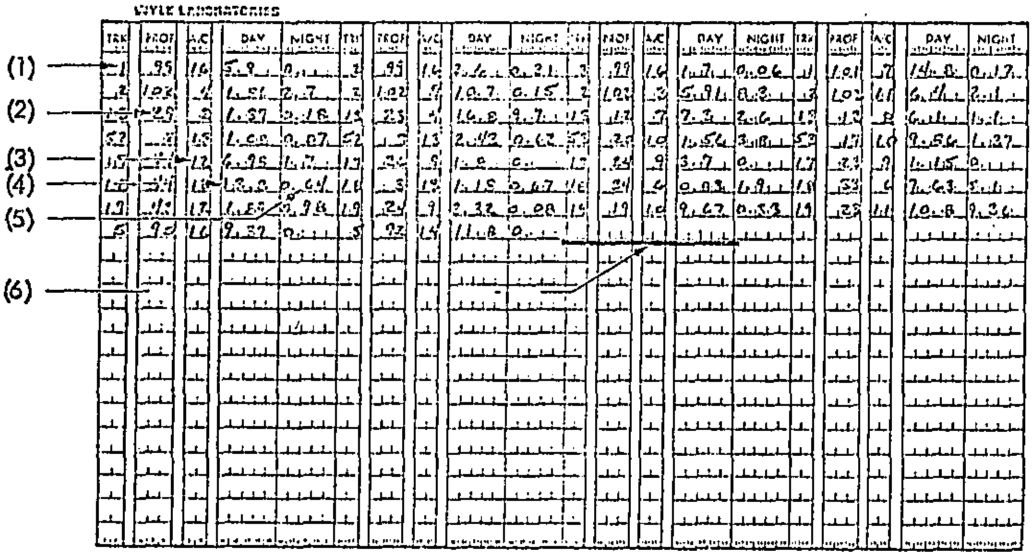
Mix Data Input

The aircraft fleet mix is a description of the type and magnitude of activity at an airport. The input consists of tabulations of the numbers of day and night operations for each flight into the airport. For the purposes of the program, a flight is defined as a combination of aircraft type, profile and ground track. Data for four flights are put on each card. Reading continues until the program hits a blank quarter of a card.

If data for a certain flight appears again, the operations are added.

The variable FAC on the READIN control card may be used to increase or decrease the mix quantity by a multiple. The default value is 1. A negative variable means that the present mix should be added to data already available to the machine. If FAC is positive, the previously read data will be replaced.

AIRCRAFT FLEET MIX DATA CODING FORM



(1) Track number. I format.
(2) Profile number. I format.
(3) Aircraft type (noise curve) number. I format.
(4) The number of daily daytime operations for the defined aircraft type on that particular profile and track. F format.
(5) The number of nighttime operations. F format.
(6) The first blank field. This signifies the end of the mix data.

Track Percent Usage

This type of input is used when the distribution of individual flights over all tracks is not known, but where the total percent usage for all aircraft types is known. In this case, the mix is input without assigned tracks. The program then automatically allocates the traffic to the track. If the approach profile number is not specified in the mix data, a profile number is assigned equal to the track number plus 100.

When used, this input must precede the mix data.

TRACK USAGE CODING FORM

WYLE LABORATORIES

TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	Comment
1	0.09	0.	2	0.	0.034	3	0.0235	0.	4	0.0225	0.	5	0.0242	0.	MIA
6	0.	0.1702	7	0.130	0.150	8	0.	0.1613	9	0.	0.0834	10	0.	0.0603	MIA
11	0.	0.0354	12	0.1627	0.	13	0.1301	0.	14	0.0115	0.	15	0.0557	0.	MIA
16	0.1525	0.	17	0.0645	0.0503	18	0.	0.0511	19	0.	0.0710	20	0.	0.0513	MIA
21	0.	0.0334	22	0.	0.010										

(1) Track number. I format.
(2) Percent of total airport landings made on that track.
(3) Percent takeoffs. F format.

Match Parameter Input

Some means is necessary for the program to correlate the stored approach parameters with the aircraft types that they describe. The match parameter input consists of a single card after the READIN code card. This card has 16 fields – one for each possible aircraft type. The number of the approach parameter set that applies to each noise curve is entered into the corresponding field. The card format is 16I5. This is a necessary input when approach profile indicators are used.

Noise Curve Merging

The merge option allows the user to change noise curve numbers defined in the mix data. This allows increased efficiency when two curves are defined identically and can be combined.

After the READIN control card, the merge input requires one card for each noise curve to be redefined. The card format is 2I3 with the first field containing the noise curve number to be changed and the second containing its new value. The remainder of the card is left for comment.

Tolerance Input

Due to unusual airport data, it may be desirable to change the tolerances used in the program for determining whether a flight produces significant noise and for determining whether the contour is caught in a loop. The loop tolerance and significance tolerances are read on a single card, Format 2F10.0, in that order. See Table 4.1-4.

Table 4.1-4

Tolerance Inputs

Variable	Card Columns	Default Value	Meaning
TOLLOP	1 - 10	0.1	Fraction of stepsize; minimum distance of contour from itself.
TOLSIG	11 - 20	2.0	Maximum number of standard deviations from the noise energy average allowed for significance.

Program Control Card

After a blank READIN control card has been read, the next input is a program control card. The available options are as follows: The first letter of each code word must be punched in card column 1.

- START – loops control back to the beginning of the program. Just as before, the card that follows must be a PLOT card.
- END – terminates the run.
- MOR – returns to the READIN routine for more input data.
- blank – procedes with the contour calculation.

Contour Title Cards

After a blank program control card, the program expects two title cards. Card columns 1 through 6 on the first are reserved for a user contour identification code. The last two digits of this code are assumed to designate the year for which the contour prediction will be made. 24 locations after the identification code are reserved for the airport name. This is printed at the top of each page of output. The remainder of the card is left for general purpose title information. It also is printed as a heading on each output page. The second card is a plot title card. However, it also is included in the printout heading.

Contour Control Card

Data to define an individual contour are contained on a single card. The format is 8F10.x, F9.x,I1. The parameters are described below.

40.	0.1	5000.	-5000.	1500.			250.	0

- Field 1 – The target NEF contour level. A negative value signified the last contour desired before returning to the program control card.
- Field 2 – Acceptable contour tolerance.
- Field 3 – X-coordinate of the start point.
- Field 4 – Y-coordinate of the start point.
- Field 5 – Stepsize in feet.
- Field 6 – X-coordinate of the last contour point if the user desires the contour to end at a different point than the start point. When using this option it must be known that the end point is on the contour. If fields 6 and 7 are blank, the end point is ignored.
- Field 7 – Y-coordinate of the end point.
- Field 8 – Maximum number of contour points you'll allow. Default is 250.
- Field 9 – IERROR – a dump indicator. See Table 4.1-5.

Table 4.1-5

Contour Dump Indicator – IERROR

0 -	Normal execution. The printed output consists only of calculated contour points. This indicator will be switched to 2, if the program for some reason fails to find the contour.
1 -	The output will list the coordinates and noise exposure at every point considered in the contour iterations.
2 -	The output will contain a tabulation of the noise from each individual flight at every point considered in the contour iteration. Execution will terminate when a point on the contour is found.
3 -	The output is identical to (2); however, execution does not automatically terminate when a point is found.

4.2 Input Coding – NEF Grid Program

Program Control Card

The first input card encountered by the NEF grid program is a program control card. The code options, which must be entered in card columns 1 – 3, are:

DTA – sends program control to READIN for input data.

END – terminates execution.

MAT – sends program control to a routine that reads coordinates of a matrix of points over which noise exposure levels are desired.

PTS – calls a routine that reads a set of descrete points for noise exposure evaluation.

The first card of the input deck must be a DTA card.

Data Input

Input routines are shared with the NEF contour program. Therefore, input formats and procedures are identical. Note, however, that the tolerance inputs are meaningless.

Matrix Definition

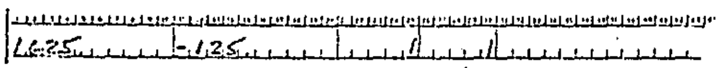
This program option allows calculation of noise exposure over a rectangular grid. After two title cards the grid is defined on a single card as follows. The format is 4F1–.x,4I5.

-10000.	5000.	1000.	1000.	21	11		1	

Field 1 – Minimum x-coordinate of the grid.
Field 2 – Maximum y-coordinate.
Field 3 – Distance between grid points in the x-direction in feet.
Field 4 – Distance between grid points in the y-direction in feet. (A negative quantity.)
Field 5 – Number of columns in the matrix. (x points)
Field 6 – Number of rows. (y points)
Field 7 – Dump indicator. If this variable is nonzero, information will be printed for each individual flight.
Field 8 – Contribution indicator. If this variable is nonzero, the component of the total exposure due to each individual noise type will be output.

Discrete Point Input

This is nearly identical to the matrix input except that the points are defined individually. The first card after the two title cards sets the number of point definition cards to be read in. The format for this card is I5. A separate card is required for each point at which the noise exposure calculation is desired. The format of these cards is 2F10.x,2I5. An example is shown below.



Field 1 - x-coordinate of the point.
Field 2 - y-coordinate.
Field 3 - Dump indicator.
Field 4 - Contribution indicator.

The indicators have identical meanings with those used in matrix definitions.

4.3 Coding Forms

The following is a set of coding forms which can be used for entering data into the NEF programs. The titles indicate the data to which the forms apply. Each form has been sectioned to indicate the fields where the program expects to find data.

RUNWAY DEFINITION CODING FORM

Please do not keypunch (*)

WYLE LABORATORIES

* PRESSURE ALTITUDE	AMBIENT TEMPERATURE *

* RWY	X-START	Y-START	–	X-END	Y-END	–	COMMENTS

TRACK DATA CODING FORM

Please do not
keypunch (*)

WYLE LABORATORIES

* # Tracks	COMMENTS

* RWY	TRN	SEC	DIST 1	DIST 2	RAD 2	DIST 3	RAD 3	DIST 4	RAD 4	DIST 5	RAD 5	DIST 6	RAD 6	DIST 7	RAD 7	DIST 8	Comment

TRACK GROUP DATA CODING FORM

WYLE LABORATORIES

			TRACK NUMBERS																
/		COMMON DISTANCE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	COMMENT

NOISE DATA CODING FORM

WYLE LABORATORIES

A/C #	F_n #		THRUST	NOISE LEVELS ~ EPNdB								COMMENTS
				200 FEET	400 FEET	600 FEET	1000 FEET	2000 FEET	4000 FEET	6000 FEET	10,000 FEET	

PROFILE DEFINITION CODING FORM

WYLE LABORATORIES

SEGMENT 1	SEGMENT 2	SEGMENT 3	SEGMENT 4	SEGMENT 5	SEGMENT 6	SEGMENT 7	SEGMENT 8	SEGMENT 9	SEGMENT 10

AIRCRAFT FLEET MIX DATA CODING FORM

WYLE LABORATORIES

TRK	PROF	A/C	DAY	NIGHT	TRK	PROF	A/C	DAY	NIGHT	TRK	PROF	A/C	DAY	NIGHT	TRK	PROF	A/C	DAY	NIGHT

TRACK USAGE CODING FORM

WYLE LABORATORIES

TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	TRK #	PERCENT ARRIVALS	PERCENT DEPARTURES	Comment

APPROACH PARAMETER CODING FORM

Please do not keypunch (*)

WYLE LABORATORIES

*	#									
*	TITLE	WEIGHT*	# ENGINES							
*	LDG ROLL	SPEED	3 DEGREES	6 DEGREES	LEVEL	3 DEGREES	LEVEL	500 FT/NM	IDLE	REVERSE

TAKEOFF RESTRICTION CODING FORM

WYLE LABORATORIES

RES #	TYPE	GRADIENT	START	END	– TRACK NUMBERS –									
					1	2	3	4	5	6	7	8	9	10

WIND DATA CODING FORM

WYLE LABORATORIES

GRP #	WIND SPEED	WIND DIRECTION	GRP #	WIND SPEED	WIND DIRECTION	GRP #	WIND SPEED	WIND DIRECTION	GRP #	WIND SPEED	WIND DIRECTION	GRP #	WIND SPEED	WIND DIRECTION	

4.4 Input Restrictions

Variable Array Size and Ordering Limitations

Runways – Program accepts a maximum of 15 runway definitions. (The program requires a separate definition for each direction.) Numbering must be sequential, starting from 1.

Tracks – Program accepts up to 88 tracks of a maximum of 15 segments each. The last segment is automatically set as a very long straight one. The first is also forced to be straight, but it can have any length – even negative. (The negative lengths only make sense for takeoffs where turns are made while the plane is still over the runway.) The program does not allow more than two consecutive curved segments that turn in the same direction, nor does it allow curve segments with turning angles over 270° or curves of over 180° not bound on both sides by straight segments. Numbering of tracks is arbitrary but between 1 and 88.

Track Groups – Up to 25 track groups are allowed. They may contain any number of tracks.

Noise Curves – The program accepts up to 16 different noise curve sets. The numbering of these sets is the choice of the user. (Noise curve 16 does not presently contain stored data and, therefore, is a logical choice for an additional curve.) Each set contains space for EPNL's at eight specific distances for up to six power settings. The power settings must be numbered consecutively in descending order. (The highest power setting is #1, the next highest #2, etc.) If six power settings are not used, the remainder of the array must be zeroed.

Profiles – Up to 149 profiles can be input into the program. Profile #100 must not be used, as it is used by the program to store intermediate calculations. Profiles numbered 1-85 are reserved for takeoff profiles in standard form (see Section 4.3 for format). This numbering convention must be observed when takeoff restrictions are used. Indicator-form approach profiles (see Section 2.4.3) must be numbered between 96 and 99 or 101 and 150. Any profiles numbered in this range must have match indicators defined for each of the aircraft types that use the particular profile. Numbers 86 through 99 are reserved for profiles in literal form. If the fixed percentage mix data option is used, takeoff profiles must be numbered 95 or below and approach profiles numbered above that.

Approach Parameters – Space is reserved for up to 12 sets of the 14 approach parameters.

Wind – A set of wind conditions may be defined for each track group.

Cut-back – Up to 25 takeoff procedure restrictions may be defined. A restriction may contain any number of tracks. All tracks in a track group must be covered by identical restrictions, if any, within the common distance.

Operations – The total number of flight operations, that is distinct track-profile-noise curve combinations, must not exceed 2000.

NOTE: If any variable is read into the program twice, the second definition will override the first.

Input Block Ordering Rules

The ordering of input data blocks is arbitrary, subject to the following restrictions:

1. Track input data must follow runway definition
2. Track group input must precede mix data and follow track input
3. Noise curve — approach thrust match (if used) must precede mix data
4. Track use percentages must come before mix data when fixed proportion format is used
5. Noise curve merging must follow mix data

4.5 Error Messages

Several types of errors may be detected by program checks. Discovery of an error normally terminates execution. However, this may be circumvented in some instances, by use of the word START on the program control card in front of a new case or by use of the IERROR indicator (see section 4.1) in the last column of the contour control card. The possible error messages are listed below:

ERROR IN INPUT DATA - This message appears whenever any of several types of input errors are detected. A list of possible error situations is contained in Table 4.5-1. After any error encounter the program searches the input deck for a START card to resume execution. If no START cards follow the error, execution terminates.

ILLEGAL TRACK DEFINITION - This message occurs when an improper track definition is read in. (See Section 4.4 for allowable track configurations.) The input error message follows.

CANNOT FIND THE FIRST POINT - After 26 iterations from the input start point, the program has not been able to find a point within tolerance of the specified contour level. Depending on the IERROR indicator on the contour code card, the program repeates the search and dumps intermediate calculations. The program proceeds to search for the next specified contour level, if any.

Table 4.5-1

Input Errors Causing Message — "ERROR IN INPUT DATA"

Type of Data Being Read	Possible Cause of Error Message
Noise Data	• Improper ordering of noise curves with respect to thrust
Takeoff Restrictions	• Restriction number greater than 25 • Profile numbered in range 1-89 that is not in standard form
Track Group Data	• Not all tracks in the group originate from the same runway
Approach Parameter Match Indicators	• Indicator out of range
Approach Parameters	• Indicator out of range • A positive ground roll distance • Zero engines specified
Runway Data	• Profile numbered in range 1-89 that is not in standard form
Mix Data	• Over 2000 flights specified • Total specified track usage percentages are not within 2 percent of 100 • Noise curve number out of range • Profile number out of range • Improper match indicator for noise curve specified on a profile numbered over 100 • Track number out of range

THE DERIVATIVE IS ZERO - During the search for the first contour point the program has reached a situation where the three points used for gradient calculation have identical noise levels. Since the gradient direction is then indeterminate, the program aborts the search for the present contour and goes on to the next.

MAXPTS EXCEEDED. THIS CONTOUR IS BEING DELETED - The number of points computed on the contour has exceeded the maximum specified.

AFTER -- ITERATIONS, THIS CONTOUR IS BEING DELETED - An internal check is made on the number of iterations needed to compute each contour point. If this number becomes excessive, the contour search is terminated. Depending on the IERROR indicator, the program repeats the unsuccessful search and dumps intermediate results before proceeding with the next contour.

4.6 Informative Messages

There are three messages of an informative nature that may occasionally appear on the far right side of the contour point printout. These messages and their meanings are:

SFT – If, at some time during the search for a contour point, a point is found that appears to be on the contour using only the significant flights but is not within tolerance using all flights, the table of significant flights is recomputed with a closer tolerance. When this occurs, this message is printed.

LOOP i – If a point is found on the contour in an area where points have already been found, this message is printed. i may have the values 1, 2, or 3, depending on the action taken as follows:

1. A valid point cannot be found, the contour will be deleted.
2. A point has been found that is not quite within tolerance; repeated interpolations will be performed until the point is within tolerance.
3. A point has been found within tolerance.

DISC – Points on each side of the contour have been found and are a very small distance apart (usually 25 times the contour tolerance in feet) but neither point is within tolerance of the contour. The stepsize will be increased by a factor of 1.5 and the search repeated. This situation is common when the contour comes very close to the runway and, if this is the case, the problem can be solved by using a smaller stepsize and tolerance.

5.0 SAMPLE PROGRAM EXECUTION

This section contains a sample of a program execution. The input data deck and output listings are presented.

5.1 Input Data Deck

The input data listing which follows is a listing of the 80-column punched cards that comprised the input data deck for this sample run.

```
START
PLOT30 8000.

100    1          RUNWAYS AND TRACKS FOR SEATTLE  * SEA *
428,        15,
  4               RUNWAYS * SEA *
  1 9950.    5100.                 9950.   -4324.            16R     9424
  2 9950.    -4324.                9950.   5100.             34L     9424
  3 10750.   5100.                 10750.  -6800.            16L     11900
  4 10750.   -6800.                10750.  4600.             34R     11400
 22               TRACKS  *SEA *
 1 1113.4  90,  1.5  4,6  0,   47,  1,5  1,4  0.   20,  1,5  4,2  0,   16,
   1 C1.5  8,1  0.   9,   1.5  50,
 3 5113.5  90,  1,5  4,6  0,   47,  1,5  1,4  0.   20,  1,5  4,2  0,   16,
   5 C1,5  6,1  0,   9,   1.5  50,
 3 4 55,3  58,  -1.5 1,8  0.   29,  -1,5 50.
 3 3 35,3  58,  -1.5 50,
 3 2 150,
 2 6135,1  31,  -1.5 3,4  0,   32,  -1,5 1,7  0.   30,  -1,5 1,8  0,   81,
  6 C-1,5 4,2  0,   57,  -1,5 6,2  0,   14.  -1,5 50,
 2 7 95,1  31,  -1.5 3,4  0,   32,  -1,5 1,7  0.   30,  -1,5 1,8  0,   81,
   7 C-1.5 50,
 2 8 95,1  31,  -1.5 3,4  0,   32,  -1,5 4,1  0.   63,  1,5  9,   0,   46,
   8 C-1.5 50,
 2 9 95,1  31,  -1.5 3,4  0,   32,  -1,5 4,1  0.   63,  1,5  7,7  0,   12,
   9 C-1.5 50,
 210115,1  31,  -1.5 3,4  0.   32,  -1,5 4,1  0.   63,  1,5  5,5  0,   52,
  10 C1,5  1,5  0,   38,  1,5  50,
 211 56,5  53,  1,5  2,5  0.   38,  1,5  50.
 212 96,5  53,  1,5  2,5  0,   38,  1,5  1,3  0,   19,  1,5  4,1  0,   24,
  12 C1,5  50,
 413113,5  29,  -1.5 33,  1,5  31,  -1,5 3,4  0.   32,  -1,5 1,7  0,   30,
  13 C-1,5 1,8  0,   81,  -1.5 50,
 315 150,
 314 59,6  44,  -1,5 2,6  0.   48,  -1,5 50,
 316 79,6  37,  1,5  1,2  0.   43,  1,5  2,4  0.   90,  1,5  50,
 117 150,
 218 77,3  72,  -1.5 4,4  0.   75,  -1,5 1,3  0.   24,  -1,5 50,
 219 57,3  72,  -1.5 6,2  0.   55,  1,5  50.
 220117,3  72,  -1.5 6,2  0.   55,  1,5  0,9  0.   38,  1,5  4,5  0,   50,
 220 C1,5  6,4  0,   21,  1,5  50,
 221 316,8 90,  1,5  50.
 422103,5  37,  -1.5 37.  1,5  3.1  0,   72,  -1,5 4,4  0,   75,  -1.5 1,3
 422 C0.   24,  -1.5 50,

105    4          * SEA *  TRACK GROUP DATA FOR SEATTLE
 1 3,5       2   3   4                                                SEA
 2 5,1       6   7   8   9  10  11  12                                SEA
 3 9,6       14  15  16
 4 7,3       18  19  20  21
```

```
107            MATCH PARAMETERS FOR POST-1973 TIME PERIODS (NO TURBOJETS)
   10    5     5   12    3    2    4    4    7    7    8    8    9    2   11    3
102  36        NOISE DATA FOR POST-1973 TIME PERIODS (RETROFIT DATA NOT INCLUDED)
1301 35500, 117.5  113.2  110.2  106.7  100.9  95.2   91.1   85.0   747-200B
1302 31100, 115.6  111.6  109.0  105.3   99.0  93.2   89.1   83.0   JT9D-7W DBO
1303 23700, 114.6  110.1  107.2  102.8   96.4  89.7   85.6   79.8    BOEING
1304 16500, 112.0  107.1  103.9   99.0   91.3  82.9   78.2   72.0   (POST 12-71)
1305 10250, 108.2  103.5  100.1   95.2   87.9  79.6   74.7   67.8
1306 8850.  107.0  102.1   98.8   93.8   86.1  77.9   72.9   65.9
0401 8600.  112.0  109.2  106.9  103.4  98.0   91.9   88.0   82.0   F-28-2000
0402 5900.  111.5  107.0  103.0   97.4  89.2   82.4   77.9   71.6   SPEY 555-15
0403 4250.  106.9  100.9   96.1   89.2  80.1   70.6   64.9   57.7    CURVES
0404 0.                                                              CONSTRUCTED
0405 0.                                                              TO AGREE W/
0406 0.                                                              CERT RESULTS
0301 13930, 117.7  113.6  111.2  107.4  102.2  96.2   92.1   86.3   707-320B/C
0302 11830, 114.3  110.   107.2  103.4  98.    91.4   86.8   80.2   QUIET NAC,
0303 8670.  112.2  107.   103.5  99.1   92.8   85.6   80.8   73.1    BOEING
0304 6130.  108.2  103.4  99.9   95.4   88.7   81.2   76.    68.8   FRESNO TEST
0305 3490.  103.2  98.1   94.4   90.    83.    75.6   70.4   62.4      DATA
0306 0.                                                              SUM. 1973
0901 12850, 121.0  116.7  114.2  110.8  106.2  101.3  98.1   93.8   727-200
0902 11900, 118.2  114.2  111.8  108.5  104.0   99.2  96.1   91.7   QUIET NAC,
0903 17000, 114.5  110.8  108.4  103.1  100.5   95.2  92.0   87.5    BOEING
0904 8250.  109.3  105.6  103.0   99.9   95.3   90.0  86.9   82.4   FRESNO TEST
0905 5950.  106.7  101.5   98.3   94.4   89.1   83.3  80.2   75.9      DATA
0906 3800.  102.9   97.5   94.3   90.3   84.7   78.9  75.3   70.8    MAY 1971
1101 13480, 118.7  114.7  112.1  108.5  103.0  96.9   93.0   86.8   737-200
1102 12550, 117.0  113.0  110.5  106.9  101.5  95.3   91.3   85.0   QUIET NAC
1103 8050.  113.7  108.2  104.1   98.5   91.7  85.3   80.9   74.7    BOEING
1104 6120.  113.0  107.0  102.4   95.6   87.6  80.8   76.1   68.8   FRESNO TEST
1105 5370.  112.7  106.5  102.0   95.2   86.7  79.0   74.7   67.1   CERT, DATA
1106 4180.  108.8  102.3   97.9   91.7   83.3  75.7   70.9   63.0
1601 12000, 118.9  115.5  112.7  108.6  102.2  95.4   91.4   86.0   DC-9-30
1602 10000, 114.8  111.5  108.3  104.0   97.6  90.7   86.2   80.1   JT8D-7
1603 8000.  110.1  106.9  104.0   99.7   92.9  85.2   80.5   74.1   QUIET NAC,
1604 6000.  108.8  104.5  100.8   95.0   87.6  79.8   74.6   67.8   (FROM BOEING
1605 4050.  105.5  100.8   96.9   91.0   84.1  76.5   71.4   64.8     ON DATA)
1606 0.

102   6        NOISE DATA FOR 727 REFAN (CONF 2)
0901 12650, 107.8  104.7  102.5   99.6  95.4    90.4   84.9   82.6   727-200
0902 9800.  105.3  101.8   99.3   95.9  91.1    85.4   81.6   77.0   JT8D-109
0903 8080.  103.2   99.5   96.8   93.2  88.0    82.3   78.5   73.9   CONFIG, 2
0904 6310.  101.1   96.5   93.3   89.2  83.3    77.1   72.9   67.7   BOEING DATA
0905 4300.   97.7   92.7   89.6   85.5  79.5    72.2   67.8   62.1    FOR NASA
0906 0.                                                                  10-73
101   7        PROFILES FOR 727 REFAN
0171       727-200,JT8D-109,FLAP 5,S/L,59 DEG    (REFAN)               TOGW=143500
0.         3950,    6775,    14235,   25265,   55125,   65125,   0,      0.       2920.
0.         0.       250.     1500.    3000.    5435.    6660.    0.      .1676    12995.
```

```
32,      163.5   163.5   166.5   166.5   250.    250,    3,        .1360   11400,
12995,   12995,  12995,  11400,  11400,  10825,  0.      143500,  .0448   6435,
0181     727-200,JT8D-109,FLAP 5,S/L,59 DEG     (REFAN)           TOGW=158500
0,       4975,   8210,   17220,  30330,  58630,  68630,  0,       0,      3280,
0,       0.      225,    1500,   3000.   5200,   6245,   0,       .1415   12915,
32,      170,    170,    173.    173.    250.    250,    3,       .1144   11400,
12915,   12915,  12915,  11400,  11400,  10825,  0.      158500,  .0450   7130,
0191     727-200,JT8D-109,FLAP 5,S/L,59 DEG     (REFAN)           TOGW=168500
0,       5730,   9105,   19360,  34035,  60545,  70545,  0,       0.      3510,
0,       0.      200,    1500.   3000.   4845,   5935,   0,       .1268   12860,
32,      174.5   174.5   177.    177.    250.    250,    3,       .1022   11400,
12860,   12860,  12860,  11400,  11400,  10825,  0.      168500,  .0450   7585,
0201     727-200,JT8D-109,FLAP 5,S/L,59 DEG     (REFAN)           TOGW=176000
0.       6290,   9665,   21025,  37000,  62775,  72775,  0,       0,      3700,
0.       0.      175,    1500.   3000.   4750.   5640,   0,       .1168   12820,
32,      178.    178,    179.7   179.7   250.    250,    3,       .0939   11400,
12820,   12820,  12820,  11400.  11400.  10825,  0.      176000,  .0451   7930,
0631     727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG                    TOGW=168500
0,       5340,   8020,   17135,  30210,  58050,  68050,  0,       0,      3520,
0,       0.      200,    1500,   3000.   5165,   6660,   0,       .1426   13800,
32,      174.5   174.5   177.    177,    250.    250,    3,       .1147   12145,
13800,   13800,  13800,  12145,  12145,  11615,  0.      168500,  .0450   7585,
0641     727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG                    TOGW=178500
0.       6040,   9370,   19665,  34200,  59950,  69950,  0,       0,      3705,
0,       0,      175,    1500,   3000.   4775,   6170,   0,       .1287   13750,
32,      179,    179,    180.5   180.5   250.    250,    3,       .1032   12145,
13750,   13750,  13750,  12145,  12145,  11615,  0.      178500,  .0451   8045,
0651     727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG                    TOGW=194000
0.       7115,   10640,  23175,  40300,  64450,  74450,  0,       0,      3845,
0.       0.      125,    1500.   3000.   4450.   6025,   0,       .1097   13655,
32,      186,    186,    186.3   186.3   250.    250,    3,       .0876   12145,
13655,   13655,  13655,  12145,  12145,  11615,  0,      194000,  .0451   8755,

102  .12      NOISE DATA FOR 737/DC9 REFAN
1101 13240, 107.4   101.3   97.3    92.3    86.2    80.5    76.0    69.3    737-200
1102 8380.  107.1   101.0   96.8    91.5    84.3    77.6    72.9    66.2    JT8D-109
1103 5450.  106.7   100.0   95.3    89.7    81.5    73.5    68.0    61.3    CONFIG. 2
1104 3720.  105.7    98.7   93.8    87.6    78.9    69.8    63.9    56.2    BOEING DATA
1105 0.                                                                      FOR NASA
1106 0.                                                                        10-73
1601 13530, 109.0   106.3   103.4   98.7    91.0    82.4    77.1    70.5    DC-9-30
1602 9625.  107.4   104.0   100.7   95.3    86.8    77.1    72.0    65.2    JT8D-107
1603 5410,  104.0   100.0    96.2   90.6    81.6    71.9    66.7    60.6    MIN. TREAT.
1604 2785,  103.3    98.9    95.0   89.0    79.8    70.0    65.0    58.9    DOUGLAS DATA
1605 0.                                                                        8-73
1606 0.
101   7       PROFILES FOR 737/DC9 REFAN
0431     737-200,JT8D-109,FLAP 1,S/L,59 DEG     (REFAN)           TOGW=105500
0.       4925,   7720,   14720.  26240.  35490.  60990.  0,       0,      3035,
0,       0,      300,    1500.   3000.   3545,   6045,   0,       .1714   13210,
32,      169,    169,    169,    169,    250.    250.    2,       .1302   11400,
13210,   13210,  13210,  11400,  11400,  10825,  0.      105500,  .0745   7860,
```

```
044I      737-200,JT8D-109,FLAP 1,S/L,59 DEG   (REFAN)                 TOGW=110500
0.        5375.   8055.   15750.   28165.   37665.   63700.   0.       0.       3205.
0.        0.      275.    1500.    3000.    3540.    6040.    0.       .1592    13150.
32.       173.    173.    173.     173.     250.     250.     2.       .1208    11400.
13150.    13150.  13150.  11400.   11400.   10825.   0.       110500.  .0746    8240.
045I      737-200,JT8D-109,FLAP 1,S/L,59 DEG   (REFAN)                 TOGW=117000
0.        6715.   9295.   17900.   31550.   41550.   70750.   0.       0.       3425.
0.        0.      250.    1500.    3000.    3430.    6030.    0.       .1453    13100.
32.       178.    178.    178.     178.     250.     250.     2.       .1099    11400.
13100.    13100.  13100.  11400.   11400.   10825.   0.       117000.  .0746    8730.
046I      DC-9-15,JT8D-109,FLAP 20,S/L,59 DEG   (REFAN)                TOGW= 85500
0.        4085.   5445.   11710.   20655.   55155.   59390.   0.       0.       1800.
0.        0.      200.    1500.    3000.    6950.    7650.    0.       .2075    13500.
32.       150.    150.    150.     150.     250.     250.     2.       .1677    11400.
13500.    13500.  13500.  11400.   11400.   10825.   0.       85500.   .1051    8990.
047I      DC-9-15,JT8D-109,FLAP 20,S/L,59 DEG   (REFAN)                TOGW= 92500
0.        4685.   6560.   13340.   22375.   53875.   64350.   0.       0.       2140.
0.        0.      200.    1500.    3000.    6040.    7620.    0.       .1918    13500.
32.       155.    155.    155.     155.     250.     250.     2.       .1660    11400.
13500.    13500.  13500.  11400.   11400.   10825.   0.       92500.   .0974    9010.
048I      DC-9-32,JT8D-109,FLAP 15,S/L,59 DEG   (REFAN) PITCH LTD      TOGW=102500
0.        4105.   6160.   15410.   28720.   64470.   79390.   0.       0.       2545.
0.        0.      280.    1500.    3000.    5640.    7640.    0.       .1679    13500.
32.       145.5   145.5   145.5    145.5    250.     250.     2.       .1218    11400.
13500.    13500.  11735.  11400.   11400.   10825.   0.       102500.  .0931    9545.
049I      DC-9-32,JT8D-109,FLAP 15,S/L,59 DEG   (REFAN) PITCH LTD      TOGW=110500
0.        5025.   6650.   17400.   30675.   69215.   85300.   0.       0.       2960.
0.        0.      220.    1500.    3000.    4600.    6600.    0.       .1558    13500.
32.       150.5   150.5   150.5    150.5    250.     250.     2.       .1130    11400.
13500.    13500.  10885.  11400.   11400.   10825.   0.       110500.  .0867    9575.

101     9          * SEA * APPROACH PROFILES FOR SEATTLE 6/3 D
114
-1.       -0.157  2.01    5.64     9.25     12.05    19.81    29.81
0.        0.      690.0   3000.    3000.    4400.    4400.    9400.
32.       -2.     -2.     160.     160.     180.     180.     200.
-10.      -3.     -4.     -5.      -8.      -7.      -8.
115
-1.       -0.157  2.01    5.64     8.10     10.90    15.40    19.40
0.        0.      690.0   3000.    3000.    4400.    4400.    9400.
32.       -2.     -2.     160.     160.     180.     180.     200.
-10.      -3.     -4.     -5.      -8.      -7.      -8.
116
-1.       -0.157  2.01    5.64     10.09    12.89    34.05    44.05
0.        0.      690.0   3000.    3000.    4400.    4400.    9400.
32.       -2.     -2.     160.     160.     180.     180.     200.
-10.      -3.     -4.     -5.      -8.      -7.      -8.
117
-1.       -0.157  2.01    5.64     10.17    12.97    17.47    21.47
0.        0.      690.0   3000.    3000.    4400.    4400.    9400.
32.       -2.     -2.     160.     160.     180.     180.     200.
-10.      -3.     -4.     -5.      -8.      -7.      -8.
```

```
118
-1,      -0,157  2,01     5,95     11,19    13,59    27,08    37,08
0,       0,      690,     3200,    3200,    4400,    4400,    9400,
32,      -2,     -2,      160,     160,     160,     180,     200,
-10,     -3,     -4,      -5,      -8,      -7,      -8,
119
-1,      -0,157  2,01     5,95     11,19    13,59    16,13    26,13
0,       0,      690,     3200,    3200,    4400,    4400,    9400,
32,      -2,     -2,      160,     160,     160,     180,     200,
-10,     -3,     -4,      -5,      -8,      -7,      -8,
120
-1,      -0,157  2,01     5,95     11,19    13,59    20,94    30,94
0,       0,      690,     3200,    3200,    4400,    4400,    9400,
32,      -2,     -2,      160,     160,     160,     180,     200,
-10,     -3,     -4,      -5,      -8,      -7,      -3,
121
-1,      -0,157  2,01     5,95     6,0      8,4      12,4     16,8     23,46    29,46
0,       0,      690,     3200,    3200,    4400,    4400,    6400,    6400,    9400,
32,      -2,     -2,      160,     160,     160,     180,     180,     180,     200,
-10,     -3,     -4,      -5,      -8,      -7,      -8,      -7,      -8,
122
-1,      -0,157  2,01     5,95     12,43    14,82    28,32    38,32
0,       0,      690,     3200,    3200,    4400,    4400,    9400,
32,      -2,     -2,      160,     160,     160,     180,     200,
-10,     -3,     -4,      -5,      -8,      -7,      -8,

100   4         * SEA * TRACK PERCENTAGES WITH 1981 MIX.
 1        ,12     2       ,26      3       ,07      4        ,12      5        ,03   SEA
 6        ,04     7       ,18      8       ,03      9        ,05      10       ,07   SEA
 11       ,005    12      ,005     13      ,02      20,10             21,08          SEA
 14,12            15,17            16,09            17,02             18,24          SEA
 19,15            22,03                                                              SEA
       15  7,    1,          54 15  4,   1,          55 15  3,    0,             7  9,    0,
    13  7  5,    0,          15  7  4,   0,              8  5,    0,          13  8  3,    0,
    15  8  2,    0,              7 15,   0,          56  7  8,    0,          58  7  7,    0,
       13 19,    5,           8 13  0,   5,           9 13 10,    0,          10 13  5,    0,
       12  7,    0,          43 12  3,   0,          44 12  4,    0,              5  8,    1,
    46  5  8,    1,             10 31,   6,          17 10 16,    3,          18 10  8,    1,
    19 10  4,    2,          20 10  3,   0,             10 31,8   4,8         17 10 20,4  4,8
    18 10  3,    0,          19 10  6,6  0,          20 10  1,8   0,              9 10,6  1,6
    17  9  6,8   1,6         18  9  1,0  0,          19  9  2,2   0,          20  9  ,6    0,
        9 10,6   1,6         63  9  7,8  1,6         64  9  2,2   0,          65  9  ,6    0,
        2  8,    2,          27  2  5,   0,          31  2  0,    2,          34  2  2,    0,
    36  2  1,    0,              6 14,   1,          30  6  1,    0,          32  6  7,    0,
    33  6  3,    0,          35  6  3,   1,          11 13  4,    0,

104   2       MERGE DATA FOR JT3D RETROFIT
  6   3                DC-8-61 -> 707-320B QN  (NOISE CHARACTERISTICS ONLY)
  2   3                707-320B-> 707-320B QN

104   1       MERGE DATA FOR 727 RETROFIT
 10   9                727 -> 727 QN
```

```
104   2      MERGE DATA FOR 737/DC9 RETROFIT
 12 11              737 -> 737 GN
  5 16              DC9 -> DC9 GN

186381 SEATTLE-TACOMA
186381  **SEA**  1981   6/3 GS SAM 3D REFAN 8D  30/40/45 NEF  6-7-74
30.0        0.1        08000.0    00000.0    1600.0     000.00     0000.00    350.0
40.0        0.1        08900.0    00000.0    1000.0     000.00     0000.00    300.0
*45.0       0.1        09400.0    00000.0    800.0      000.00     0000.00    300.0
END
```

5.2 Printed Output

The following pages present the printed output generated by the NEF program when the input data deck, described in Section 5.1, was submitted for execution. Operating system messages such as tape assignments and accounting information have been deleted. Only the actual NEF program printed output is shown.

```
START
PLOT30 8000,

100- 1 -,000     RUNWAYS AND TRACKS FOR SEATTLE  - SEA -


                 AIRPORT ALTITUDE=  428, FT ABOVE MSL          AMBIENT TEMP= 15,DEG C

 4               RUNWAYS - SEA -
RUNWAY  1      9950,00    5100,00         -,00     9950,00    -4324,00        -,00     16R    9424
RUNWAY  2      9950,00   -4324,00         -,00     9950,00     5100,00        -,00     34L    9424
RUNWAY  3     10750,00    5100,00         -,00    10750,00    -6800,00        -,00     16L    11900
RUNWAY  4     10750,00   -6800,00         -,00    10750,00     4600,00        -,00     34R    11400
22               TRACKS  -SEA -
TRACK DATA  1 111   3,40  90,00   1,50   4,60    ,00  47,00   1.50   1.40    ,00  20,00   1.50   4,20    ,00  16,00
              1 C   1,50   8,10    ,00   9,00   1,50  50,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  3 511   3,50  90,00   1,50   4,60    ,00  47,00   1.50   1,40    ,00  20,00   1,50   4,20    ,00  16,00
              5 C   1,50   8,10    ,00   9,00   1,50  50.00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  3 4 5   5,30  58,00  -1,50   1,80    ,00  29.00  -1.50  50,00   -,00   -.00   -,00   -,00   -,00   -,00
TRACK DATA  3 3 3   5,30  58,00  -1,50  50,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  3 2 1  50,00   -,00   -,00   -,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  2 613   5,10  31,00  -1,50   3,40    ,00  32,00  -1.50   1,70    ,00  30,00  -1,50   1,80    ,00  81,00
              6 C  -1,50   4,20    ,00  57,00  -1,50   6,20    .00  14,00  -1,50  50,00   -,00   -,00   -,00   -,00
TRACK DATA  2 7 9   5,10  31,00  -1,50   3,40    ,00  32,00  -1.50   1.70    ,00  30.00  -1,50   1,80    ,00  81,00
              7 C  -1,50  50,00   -,00   -,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  2 8 9   5,10  31,00  -1,50   3,40    ,00  32,00  -1.50   4,10    ,00  63,00   1,50   4,00    ,00  46,00
              8 C  -1,50  50,00   -,00   -,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  2 9 9   5,10  31,00  -1,50   3,40    ,00  32,00  -1.50   4,10    ,00  63,00   1,50   7,70    ,00  12,00
              9 C  -1,50  50,00   -,00   -,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  21011   5,10  31,00  -1,50   3,40    ,00  32,00  -1.50   4,10    ,00  63,00   1,50   5,50    ,00  52,00
             10 C   1,50   1,50    ,00  38,00   1,50  50,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  211 5   6,50  53,00   1,50   2,50    ,00  38,00   1,50  50,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  212 9   6,50  53,00   1,50   2,50    ,00  38.00   1.50   1,30    ,00  19,00   1,50   4,10    ,00  24,00
             12 C   1,50  50,00   -,00   -,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  41311   3,50  29,00  -1,50  33,00   1,50  31,00  -1.50   3,40    ,00  32,00  -1,50   1,70    ,00  30,00
             13 C  -1,50   1,80    ,00  81,00  -1,50  50,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  315 1  50,00   -,00   -,00   -,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  314 5   9,60  44,00  -1,50   2,60    ,00  40,00  -1.50  50,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  316 7   9,60  37,00   1,50   1,20    ,00  43,00   1.50   2,40    ,00  90,00   1,50  50,00   -,00   -,00
TRACK DATA  117 1  50,00   -,00   -,00   -,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  218 7   7,30  72,00  -1,50   4,40    ,00  75,00  -1.50   1,30    ,00  24,00  -1,50  50,00   -,00   -,00
TRACK DATA  219 5   7,30  72,00  -1,50   6,20    ,00  55,00   1.50  50,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  22011   7,30  72,00  -1,50   6,20    ,00  55,00   1.50    ,90    ,00  38,00   1,50   4,50    ,00  50,00
            220 C   1,50   6,40    ,00  21,00   1,50  50,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  221 3  16,80  90,00   1,50  50,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00
TRACK DATA  42210   3,50  37,00  -1,50  37,00   1,50   3,10    ,00  72,00  -1,50   4,40    ,00  75,00  -1,50   1,30
            422 C    ,00  24,00  -1,50  50,00   -,00   -,00   -.00   -,00   -,00   -,00   -,00   -,00   -,00   -,00

105- 4 -,000     - SEA -  TRACK GROUP DATA FOR SEATTLE

TRACK GROUP DATA
TRACK GROUP NUMBER   1     3,50     2   3   4  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0
TRACK GROUP NUMBER   2     5,10     6   7   8   9  10  11  12  -0  -0  -0  -0  -0  -0  -0  -0  -0
TRACK GROUP NUMBER   3     9,60    14  15  16  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0
TRACK GROUP NUMBER   4     7,30    18  19  20  21  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0  -0

107- -0 -,000  MATCH PARAMETERS FOR POST-1973 TIME PERIODS (NO TURBOJETS)
```

MATCH INDICATORS
A/C TYPE 1= DC-9-15
A/C TYPE 2= 707-320B/C
A/C TYPE 3= 707-320B/C
A/C TYPE 4= F-28 MK2000
A/C TYPE 5= DC-9-32
A/C TYPE 6= DC-8-55,-61
A/C TYPE 7= DC-10-10,-30
A/C TYPE 8= DC-10-10,-30
A/C TYPE 9= 727-200 (3U)
A/C TYPE 10= 727-200 (3U)
A/C TYPE 11= 737-200
A/C TYPE 12= 737-200
A/C TYPE 13= 747-100/200B
A/C TYPE 14= DC-8-55,-61
A/C TYPE 15= A-300B
A/C TYPE 16= DC-9-32

102= 36 -.000 NOISE DATA FOR POST-1973 TIME PERIODS (RETROFIT DATA NOT INCLUDED)

NOISE CURVE 13 # 1	35500.00	117.50	113.20	110.20	106.70	100.90	95.20	91.10	85.00	747-200B
NOISE CURVE 13 # 2	31100.00	115.60	111.60	109.80	105.30	99.00	93.20	89.10	83.00	JT9D-7W DBP
NOISE CURVE 13 # 3	23700.00	114.60	110.10	107.20	102.80	96.40	89.70	85.60	79.80	BOEING
NOISE CURVE 13 # 4	16500.00	112.00	107.10	103.90	99.00	91.30	82.90	78.20	72.00	(POST 12-71)
NOISE CURVE 13 # 5	10250.00	108.20	103.50	100.10	95.20	87.90	79.60	74.70	67.80	
NOISE CURVE 13 # 6	8450.00	107.00	102.10	98.80	93.80	86.10	77.90	72.90	65.90	
NOISE CURVE 4 # 1	8600.00	112.00	109.20	106.90	103.40	98.00	91.90	88.00	82.00	F-28-2000
NOISE CURVE 4 # 2	5900.00	111.50	107.00	103.80	97.40	89.20	82.40	77.90	71.60	SPEY 555-15
NOISE CURVE 4 # 3	4200.00	106.90	100.90	96.10	89.20	80.10	70.60	64.90	57.70	CURVES
NOISE CURVE 4 # 4	.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	CONSTRUCTED
NOISE CURVE 4 # 5	.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	TO AGREE W/
NOISE CURVE 4 # 6	.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	CERT RESULTS
NOISE CURVE 3 # 1	13930.00	117.70	113.60	111.20	107.40	102.20	96.20	92.10	86.30	707-320B/C
NOISE CURVE 3 # 2	11830.00	114.30	110.00	107.20	103.40	98.00	91.40	86.80	80.20	QUIET NAC.
NOISE CURVE 3 # 3	8670.00	112.20	107.00	103.50	99.10	92.80	85.60	80.80	73.10	BOEING
NOISE CURVE 3 # 4	6130.00	108.20	103.40	99.90	95.40	88.70	81.20	76.00	68.80	FRESNO TEST
NOISE CURVE 3 # 5	3490.00	103.20	98.10	94.40	90.00	83.00	75.60	70.40	62.40	DATA
NOISE CURVE 3 # 6	.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	SUM, 1973
NOISE CURVE 9 # 1	12800.00	121.00	116.70	114.20	110.80	106.20	101.30	98.10	93.80	727-200
NOISE CURVE 9 # 2	11900.00	118.20	114.20	111.80	108.50	104.00	99.20	96.10	91.70	QUIET NAC.
NOISE CURVE 9 # 3	10000.00	114.50	110.80	108.40	105.10	100.50	95.20	92.00	87.50	BOEING
NOISE CURVE 9 # 4	8200.00	109.30	105.60	103.80	99.90	95.30	90.00	86.90	82.40	FRESNO TEST
NOISE CURVE 9 # 5	5900.00	106.70	101.50	98.30	94.40	89.10	83.30	80.20	75.90	DATA
NOISE CURVE 9 # 6	3900.00	102.90	97.50	94.30	90.30	84.70	78.90	75.30	70.80	MAY 1971
NOISE CURVE 11 # 1	13480.00	118.70	114.70	112.10	109.50	103.00	96.90	93.00	86.80	737-200
NOISE CURVE 11 # 2	12550.00	117.00	113.00	110.50	106.90	101.50	95.30	91.30	85.00	QUIET NAC
NOISE CURVE 11 # 3	8050.00	113.70	108.20	104.10	98.50	91.70	85.30	80.90	74.70	BOEING
NOISE CURVE 11 # 4	6120.00	113.00	107.00	102.40	95.60	87.60	80.80	76.10	68.80	FRESNO TEST
NOISE CURVE 11 # 5	5370.00	112.70	106.50	102.80	95.20	86.70	79.00	74.70	67.10	CERT, DATA
NOISE CURVE 11 # 6	4180.00	108.00	102.30	97.90	91.70	83.30	75.70	70.90	63.00	
NOISE CURVE 16 # 1	12000.00	118.90	115.50	112.70	108.60	102.20	95.40	91.40	86.00	DC-9-30
NOISE CURVE 16 # 2	10000.00	114.80	111.30	108.30	104.00	97.60	90.70	86.20	80.10	JT8D-7
NOISE CURVE 16 # 3	8000.00	110.10	106.90	104.80	99.70	92.90	85.20	80.50	74.10	QUIET NAC.
NOISE CURVE 16 # 4	6000.00	108.80	104.50	100.80	95.00	87.60	79.80	74.60	67.80	(FROM BOEING
NOISE CURVE 16 # 5	4000.00	105.50	100.80	96.90	91.00	84.10	76.50	71.40	64.80	ON DATA)
NOISE CURVE 16 # 6	.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	-.00	

102= 6 -.000 NOISE DATA FOR 727 REFAN (CONP 2)

NOISE CURVE 9 # 1	12660.00	107.80	104.70	102.50	99.60	95.40	90.40	86.90	82.60	727-200

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NOISE CURVE  9 # 2  9000.00   105.30   101.80    99.30    95.90    91.10    85.40    81.60    77.00  JT8D-109
NOISE CURVE  9 # 3  8000.00   103.20    99.50    96.80    93.20    88.00    82.30    78.50    73.90  CONFIG. 2
NOISE CURVE  9 # 4  6310.00   101.10    96.50    93.30    89.20    83.30    77.10    72.90    67.70  BOEING DATA
NOISE CURVE  9 # 5  4300.00    97.70    92.70    89.60    85.50    79.50    72.20    67.80    62.10   FOR NASA
NOISE CURVE  9 # 6      .00     -.00     -.00     -.00     -.00     -.00     -.00     -.00     -.00   10-73

101*  7  -.000  PROFILES FOR 727 REFAN

PROFILE  17 (FEET)        727-200,JT8D-109,FLAP 5,S/L,59 DEG   (REFAN)              TOGW=143500
      .00   3950.00   6775.00  14235.00  25265.00  55125.00  65125.00        .00    .00000   2920.00
      .00       .00    250.00   1500.00   3000.00   5435.00   6660.00        .00    .16760  12995.00
    32.00    163.50    163.50    166.50    166.50    250.00    250.00       3.00    .13600  11400.00
 12995.00  12995.00  12995.00  11400.00  11400.00  10825.00        .00 143500.00    .04480   6435.00
PROFILE  18 (FEET)        727-200,JT8D-109,FLAP 5,S/L,59 DEG   (REFAN)              TOGW=158500
      .00   4975.00   8210.00  17220.00  31330.00  58630.00  68630.00        .00    .00000   3200.00
      .00       .00    225.00   1500.00   3000.00   5200.00   6245.00        .00    .14150  12915.00
    32.00    170.00    170.00    173.00    173.00    250.00    250.00       3.00    .11440  11400.00
 12915.00  12915.00  12915.00  11400.00  11400.00  10825.00        .00 158500.00    .04500   7130.00
PROFILE  19 (FEET)        727-200,JT8D-109,FLAP 5,S/L,59 DEG   (REFAN)              TOGW=168500
      .00   5730.00   9105.00  19360.00  34035.00  60545.00  70545.00        .00    .00000   3510.00
      .00       .00    200.00   1500.00   3000.00   4845.00   5935.00        .00    .12660  12860.00
    32.00    174.50    174.50    177.00    177.00    250.00    250.00       3.00    .10220  11400.00
 12860.00  12860.00  12860.00  11400.00  11400.00  10825.00        .00 168500.00    .04500   7585.00
PROFILE  20 (FEET)        727-200,JT8D-109,FLAP 5,S/L,59 DEG   (REFAN)              TOGW=176000
      .00   6290.00   9685.00  21025.00  37000.00  62775.00  72775.00        .00    .00000   3700.00
      .00       .00    175.00   1500.00   3000.00   4750.00   5640.00        .00    .11680  12820.00
    32.00    178.00    178.00    179.70    179.70    250.00    250.00       3.00    .09390  11400.00
 12820.00  12820.00  12820.00  11400.00  11400.00  10825.00        .00 176000.00    .04510   7930.00
PROFILE  63 (FEET)        727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG                     TOGW=168500
      .00   5340.00   8020.00  17135.00  30210.00  58050.00  68050.00        .00    .00000   3520.00
      .00       .00    200.00   1500.00   3000.00   5165.00   6660.00        .00    .14260  13800.00
    32.00    174.50    174.50    177.00    177.00    250.00    250.00       3.00    .11470  12145.00
 13800.00  13800.00  13800.00  12145.00  12145.00  11615.00        .00 168500.00    .04500   7585.00
PROFILE  64 (FEET)        727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG                     TOGW=178500
      .00   6040.00   9370.00  19665.00  34200.00  59950.00  69950.00        .00    .00000   3705.00
      .00       .00    175.00   1500.00   3000.00   4775.00   6170.00        .00    .12870  13750.00
    32.00    179.00    179.00    180.50    180.50    250.00    250.00       3.00    .10320  12145.00
 13750.00  13750.00  13750.00  12145.00  12145.00  11615.00        .00 178500.00    .04510   8045.00
PROFILE  65 (FEET)        727-200ADV,JT8D-115,FLAP 5,S/L,59 DEG                     TOGW=194000
      .00   7115.00  10640.00  23175.00  40300.00  64450.00  74450.00        .00    .00000   3845.00
      .00       .00    125.00   1500.00   3000.00   4450.00   6025.00        .00    .10970  13655.00
    32.00    186.00    186.00    186.30    186.30    250.00    250.00       3.00    .08760  12145.00
 13655.00  13655.00  13655.00  12145.00  12145.00  11615.00        .00 194000.01    .04510   8755.00

102* 12  -.000  NOISE DATA FOR 737/DC9 REFAN

NOISE CURVE 11 # 1 13240.00   107.40   101.30    97.30    92.30    86.20    80.50    76.00    69.30  737-200
NOISE CURVE 11 # 2  8380.00   107.10   101.00    96.80    91.50    84.30    77.60    72.90    66.20  JT8D-109
NOISE CURVE 11 # 3  5450.00   106.70   100.00    95.30    89.70    81.50    73.50    68.00    61.30  CONFIG. 2
NOISE CURVE 11 # 4  3720.00   105.70    98.70    93.80    87.60    78.90    69.80    63.90    56.20  BOEING DATA
NOISE CURVE 11 # 5      .00     -.00     -.00     -.00     -.00     -.00     -.00     -.00     -.00   FOR NASA
NOISE CURVE 11 # 6      .00     -.00     -.00     -.00     -.00     -.00     -.00     -.00     -.00   10-73
NOISE CURVE 16 # 1 13530.00   109.00   106.30   103.40    93.70    91.00    82.40    77.10    70.50  DC-9-30
NOISE CURVE 16 # 2  9625.00   107.40   104.00   100.70    95.30    86.80    77.10    72.00    65.20  JT8D-107
NOISE CURVE 16 # 3  5410.00   104.70   100.00    96.20    90.60    81.60    71.90    66.70    60.60  MIN. THEAT.
NOISE CURVE 16 # 4  2785.00   103.30    98.90    95.00    89.00    79.80    70.00    65.00    58.90  DOUGLAS DATA
NOISE CURVE 16 # 5      .00     -.00     -.00     -.00     -.00     -.00     -.00     -.00     -.00   8-73
NOISE CURVE 16 # 6      .00     -.00     -.00     -.00     -.00     -.00     -.00     -.00     -.00

103*  7  -.000  PROFILES FOR 737/DC9 REFAN
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PROFILE  43 (FEET)       737-200,JT8D-109,FLAP 1,S/L,59 DEG    (REFAN)             TOGW=105500
       .00    4925.00    7720.00   14720.00   26240.00   35490.00   60990.00         .00     .00000    3035.00
       .00        .00     300.00    1500.00    3000.00    3545.00    6045.00         .00     .17140   13210.00
     32.00     169.00     169.00     169.00     169.00     250.00     250.00        2.00     .13020   11400.00
  13210.00   13210.00   13210.00   11400.00   11400.00   10825.00        .00   105500.00     .07450    7860.00
PROFILE  44 (FEET)       737-200,JT8D-109,FLAP 1,S/L,59 DEG    (REFAN)             TOGW=110500
       .00    5375.00    8055.00   15750.00   28165.00   37665.00   63700.00         .00     .00000    3205.00
       .00        .00     275.00    1500.00    3000.00    3540.00    6040.00         .00     .15920   13150.00
     32.00     173.00     173.00     173.00     173.00     250.00     250.00        2.00     .12080   11400.00
  13150.00   13150.00   13150.00   11400.00   11400.00   10825.00        .00   110500.00     .07460    8240.00
PROFILE  45 (FEET)       737-200,JT8D-109,FLAP 1,S/L,59 DEG    (REFAN)             TOGW=117000
       .00    6715.00    9295.00   17900.00   31550.00   41550.00   70750.00         .00     .00000    3425.00
       .00        .00     250.00    1500.00    3000.00    3430.00    6030.00         .00     .14530   13100.00
     32.00     178.00     178.00     178.00     178.00     250.00     250.00        2.00     .17990   11400.00
  13100.00   13100.00   13100.00   11400.00   11400.00   10825.00        .00   117000.00     .07460    8730.00
PROFILE  46 (FEET)       DC-9-15,JT8D-109,FLAP 20,S/L,59 DEG    (REFAN)            TOGW= 85500
       .00    4085.00    5445.00   11710.00   20655.00   55155.00   59390.00         .00     .00000    1800.00
       .00        .00     200.00    1500.00    3000.00    6950.00    7650.00         .00     .20750   13500.00
     32.00     150.00     150.00     150.00     150.00     250.00     250.00        2.00     .16770   11400.00
  13500.00   13500.00   13500.00   11400.00   11400.00   10825.00        .00    85500.00     .10510    8990.00
PROFILE  47 (FEET)       DC-9-15,JT8D-109,FLAP 20,S/L,59 DEG    (REFAN)            TOGW= 92500
       .00    4685.00    6560.00   13340.00   22375.00   63075.00   64350.00         .00     .00000    2140.00
       .00        .00     200.00    1500.00    3000.00    6040.00    7620.00         .00     .19180   13500.00
     32.00     155.00     155.00     155.00     155.00     250.00     250.00        2.00     .16600   11400.00
  13500.00   13500.00   13500.00   11400.00   11400.00   10825.00        .00    92500.00     .09740    9010.00
PROFILE  48 (FEET)       DC-9-32,JT8D-109,FLAP 15,S/L,59 DEG    (REFAN) PITCH LTD TOGW=102500
       .00    4105.00    6160.00   16410.00   28720.00   64470.00   79390.00         .00     .00000    2545.00
       .00        .00     280.00    1500.00    3000.00    5640.00    7640.00         .00     .16790   13500.00
     32.00     145.50     145.50     145.50     145.50     250.00     250.00        2.00     .12180   11400.00
  13500.00   13500.00   11735.00   11400.00   11400.00   10825.00        .00   102500.00     .09310    9545.00
PROFILE  49 (FEET)       DC-9-32,JT8D-109,FLAP 15,S/L,59 DEG    (REFAN) PITCH LTD TOGW=110500
       .00    5025.00    6650.00   17400.00   30675.00   69215.00   85300.00         .00     .00000    2960.00
       .00        .00     220.00    1500.00    3000.00    4600.00    6600.00         .00     .15580   13500.00
     32.00     150.50     150.50     150.50     150.50     250.00     250.00        2.00     .11300   11400.00
  13500.00   13500.00   10885.00   11400.00   11400.00   10825.00        .00   110500.00     .08670    9575.00

101-  9  -.000     * SEA * APPROACH PROFILES FOR SEATTLE 6/3 D

PROFILE 114 (N.M.)
     -1.00       -.16       2.01       5.64       9.25      12.05      19.81      29.81       -.00       -.00
       .00        .00     690.00    3000.00    3000.00    4400.00    4400.00    9400.00       -.00       -.00
     32.00      -2.00      -2.00     160.00     160.00     180.00     180.00     200.00       -.00       -.00
    -10.00      -3.00      -4.00      -5.00      -8.00      -7.00      -8.00       -.00       -.00       -.00
PROFILE 115 (N.M.)
     -1.00       -.16       2.31       5.64       8.10      10.90      15.40      19.40       -.00       -.00
       .00        .00     690.00    3000.00    3000.00    4400.00    4400.00    9400.00       -.00       -.00
     32.00      -2.00      -2.00     160.00     160.00     180.00     180.00     200.00       -.00       -.00
    -10.00      -3.00      -4.00      -5.00      -8.00      -7.00      -8.00       -.00       -.00       -.00
PROFILE 116 (N.M.)
     -1.00       -.16       2.31       5.64      10.09      12.89      34.05      44.05       -.00       -.00
       .00        .00     690.00    3000.00    3000.00    4400.00    4400.00    9400.00       -.00       -.00
     32.00      -2.00      -2.00     160.00     160.00     180.00     180.00     200.00       -.00       -.00
    -10.00      -3.00      -4.00      -5.00      -8.00      -7.00      -8.00       -.00       -.00       -.00
PROFILE 117 (N.M.)
     -1.00       -.16       2.31       5.64      10.17      12.97      17.47      21.47       -.00       -.00
       .00        .00     690.00    3000.00    3000.00    4400.00    4400.00    9400.00       -.00       -.00
     32.00      -2.00      -2.00     160.00     160.00     180.00     180.00     200.00       -.00       -.00
    -10.00      -3.00      -4.00      -5.00      -8.00      -7.00      -8.00       -.00       -.00       -.00
PROFILE 118 (N.M.)
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-1.00	-.16	2.01	5.95	11.19	13.59	27.08	37.08	-.00	-.00
.00	.00	690.00	3200.00	3200.00	4400.00	4400.00	9400.00	-.00	-.00
32.00	-2.00	-2.00	160.00	160.00	160.00	180.00	200.00	-.00	-.00
-10.00	-3.00	-4.00	-5.00	-8.00	-7.00	-8.00	-.00	-.00	-.00
PROFILE 119 (N.M.)									
-1.00	-.16	2.01	5.95	11.19	13.59	16.13	26.13	-.00	-.00
.00	.00	690.00	3200.00	3200.00	4400.00	4400.00	9400.00	-.00	-.00
32.00	-2.00	-2.00	160.00	160.00	160.00	180.00	200.00	-.00	-.00
-10.00	-3.00	-4.00	-5.00	-8.00	-7.00	-8.00	-.00	-.00	-.00
PROFILE 120 (N.M.)									
-1.00	-.16	2.01	5.95	11.19	13.59	20.94	30.94	-.00	-.00
.00	.00	690.00	3200.00	3200.00	4400.00	4400.00	9400.00	-.00	-.00
32.00	-2.00	-2.00	160.00	160.00	160.00	180.00	200.00	-.00	-.00
-10.00	-3.00	-4.00	-5.00	-8.00	-7.00	-8.00	-.00	-.00	-.00
PROFILE 121 (N.M.)									
-1.00	-.16	2.01	5.95	6.00	8.40	12.40	16.80	23.46	29.46
.00	.00	690.00	3200.00	3200.00	4400.00	4400.00	6400.00	6400.00	9400.00
32.00	-2.00	-2.00	160.00	160.00	160.00	180.00	180.00	180.00	200.00
-10.00	-3.00	-4.00	-5.00	-8.00	-7.00	-8.00	-7.00	-8.00	-.00
PROFILE 122 (N.M.)									
-1.00	-.16	2.01	5.95	12.43	14.82	28.32	38.32	-.00	-.00
.00	.00	690.00	3200.00	3200.00	4400.00	4400.00	9400.00	-.00	-.00
32.00	-2.00	-2.00	160.00	160.00	160.00	180.00	200.00	-.00	-.00
-10.00	-3.00	-4.00	-5.00	-8.00	-7.00	-8.00	-.00	-.00	-.00

100* 4 -.000 * SEA * TRACK PERCENTAGES WITH 1981 MIX

TRACK USE PERCENTAGES;

1	-.00000	.12000	2	-.00000	.26000	3	-.00000	.07000	4	-.00000	.12000	5	-.00000	.03000
6	-.00000	.04000	7	-.00000	.10000	8	-.00000	.03000	9	-.00000	.05000	10	-.00000	.07000
11	-.00000	.00500	12	-.00000	.01500	13	-.00000	.02000	20	.10000	-.00000	21	.08000	-.00000
14	.12000	-.00000	15	.17000	-.00000	16	.09000	-.00000	17	.02000	-.00000	18	.24000	-.00000
19	.15000	-.00000	22	.03000	-.00000	-0	-.00000	-.00000	-0	-.00000	-.00000	-0	-.00000	-.00000

MIX DATA

15	7.000	1.000	54015	4.000	1.000	55015	3.000	.000	7	9.000	.000
13007	5.000	.000	15007	4.000	.000	8	5.000	.000	13008	3.000	.000
15008	2.000	.000	7	15.000	.000	56007	8.000	.000	58007	7.000	.000
13	19.000	5.000	8013	.000	5.000	9013	10.000	.000	10013	5.000	.000
12	7.000	.000	43012	3.000	.000	44012	4.000	.000	5	8.000	1.000
46005	8.000	1.000	10	31.000	6.000	17010	16.000	3.000	18010	8.000	1.000
19010	4.000	2.000	20010	3.000	.000	10	31.800	4.800	17010	20.400	4.800
18010	3.000	.000	19010	6.600	.000	20010	1.800	.000	9	10.600	1.600
17009	6.800	1.600	18009	1.000	.000	19009	2.200	.000	20009	.600	.000
9	10.600	1.600	63009	7.800	1.600	64009	2.200	.000	65009	.600	.000
2	8.000	2.000	27002	5.000	.000	31002	.000	2.000	34002	2.000	.000
36002	1.000	.000	6	14.000	1.000	30006	1.000	.000	32006	7.000	.000
33006	3.000	.000	35006	3.000	1.000	11013	4.000	.000	-0	-.000	-.000

532 TOTAL FLIGHTS

400. TOTAL DAILY OPERATIONS
146100. TOTAL ANNUAL OPERATIONS

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104*  2  *,000  MERGE DATA FOR JT3D RETROFIT

FLIGHT MERGING INPUT DATA
MERGE A/C TYPE  6 INTO A/C TYPE  3,              DC-8-61 -> 707-320B QN  (NOISE CHARACTERISTICS ONLY)
MERGE A/C TYPE  2 INTO A/C TYPE  3,              707-320B-> 707-320B QN
MODIFIED FLIGHT DATA:  523 FLIGHTS

104*  1  *,000  MERGE DATA FOR 727 RETROFIT

FLIGHT MERGING INPUT DATA
MERGE A/C TYPE 10 INTO A/C TYPE  9,              727 -> 727 QN
MODIFIED FLIGHT DATA:  462 FLIGHTS

104*  2  *,000  MERGE DATA FOR 737/DC9 RETROFIT

FLIGHT MERGING INPUT DATA
MERGE A/C TYPE 12 INTO A/C TYPE 11,              737 -> 737 QN
MERGE A/C TYPE  5 INTO A/C TYPE 16,              DC9 -> DC9 QN
MODIFIED FLIGHT DATA:  462 FLIGHTS

20*  0  *,000
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30.00	.100	8000.00	.00	1600.00	.00	.00	350	-0

18638I **SEA** 1981 6/3 GS SAM 3D REFAN 8D 30/40/45 NEF 6-7-74

POINT	X	Y	NE	FLTS	%TOTL	ITERATIONS	AREA	
								SFT
1	8255,24	12.85	30.00	275	98,328	7	,00	SFT
2	8088,99	1595,42	29.95	275	98,325	7	-,23	SFT
3	7727,79	3141,94	29.99	279	98,610	7	-,47	SFT
4	7179,12	4637,99	29.97	262	98,528	7	-,71	SFT
5	6726,52	6159,72	30.01	249	98,822	7	-,94	SFT
6	6748,61	7746.17	30.01	250	98,912	7	-1,13	SFT
7	6660,40	9342,26	30.02	254	98,814	5	-1,31	SFT
8	6996,59	10931,71	30.00	245	98,696	7	-1,48	SFT
9	7092,80	12515,75	29.98	242	98,693	7	-1,66	SFT
10	7434,43	14066,67	29.99	236	98,707	7	-1,78	SFT
11	7799,22	15624,53	29.93	243	98,898	5	-1,90	SFT
12	8137,09	17175,87	29.98	252	99,077	7	-2,02	SFT
13	8302,02	18757,59	29.97	252	99,208	7	-2,20	SFT
14	8486,30	20344,43	30.03	250	99,287	5	-2,37	SFT
15	9065,51	21837,91	30.03	245	99,322	7	-2,39	SFT
16	9310.81	23418,99	29.94	260	99,486	5	-2,55	SFT
17	9489,35	24198,82	29.90	260	99,538	8	-2,61	SFT
18	10082,94	24735,14	29.93	261	99,559	9	-2,44	SFT
19	10482,03	24091,79	29.93	263	99,594	10	-2,14	SFT
20	10770,30	22462,93	30.03	263	99,565	7	-1.72	SFT
21	11324,70	20992,51	30.01	265	99,528	7	-1,21	SFT
22	11574,66	19425,71	30.03	256	99,397	8	-,79	SFT
23	11752,81	17840,07	30.03	253	99,285	7	-,40	SFT
24	12021,26	16276,44	30.03	255	99,222	7	,01	SFT
25	12287,53	14678,75	29.97	261	99,134	5	,43	SFT
26	12610,43	13197,24	30.03	256	98,940	7	,90	SFT
27	12932,54	11601,91	30.01	244	98,748	7	1,29	SFT
28	13162,89	10030,46	30.00	250	98,706	7	1,71	SFT
29	13374,33	8456,15	30.01	248	98,573	7	2,12	SFT
30	13682,86	6886,18	30.01	259	98,724	5	2,54	SFT
31	13708,35	5299,95	29.97	254	98,923	7	2,93	SFT
32	13036,72	3960,72	30.00	250	99,142	8	3,22	SFT
33	12508,53	2331,59	30.01	259	99,047	7	3,55	SFT
34	12422,35	752,10	29.97	266	98,676	7	3,90	SFT
35	12527,01	-830,89	29.94	277	98,669	7	4,25	SFT
36	13033,60	-2339,34	29.97	272	98,624	7	4,58	SFT
37	13572,45	-3834,41	29.93	244	93,508	7	4,91	SFT
38	14072,58	-5343,32	30.03	239	98,617	7	5,24	SFT
39	14268,85	-6919,31	29.97	229	98,783	7	5,62	SFT
40	14286,42	-8511,51	29.97	229	99,199	7	6,03	SFT
41	14186,86	-10102,93	29.97	222	99,247	7	6,45	SFT
42	14136,00	-11689,70	29.99	220	99,354	7	6.86	SFT
43	13775,98	-13290,33	29.97	210	99,377	7	7,33	SFT
44	13342,32	-14780,44	29.96	204	99,396	5	7,32	
45	13081,53	-16354,73	29.97	137	97,881	7	8,26	
46	12952,34	-17949,50	30.02	133	97,940	5	8,67	
47	12770,65	-19534,83	29.93	134	98,223	7	9,10	
48	12239,37	-21041,21	30.07	129	98,376	7	9,63	
49	12132,03	-22637,61	29.94	139	98,554	7	10,02	
50	11090,54	-24211,03	30.00	139	98,751	7	10,46	

186381 **SEA** 1981 6/3 GS SAM 3D REFAN 8D 30/40/45 NEF 6-7-74

POINT	X	Y	NE	FLTS	XTOTL	ITERATIONS	AREA	
51	11628,05	-25789.35	29.94	138	98.794	5	10,91	
52	11150,03	-27304.02	30.02	141	98.941	7	11,45	
53	10051,57	-28046.26	29.94	144	99.080	7	11,75	
54	10468,58	-28161.64	29.94	144	99.111	11	11,96	
55	10036,57	-27480.32	29.95	143	99.080	10	12,05	
56	9683,16	-25941.49	30.02	142	99.044	7	11,95	
57	9354,67	-24386.93	29.91	141	98.964	5	11,86	
58	9128,38	-22805.71	30.01	139	98.840	7	11,67	
59	8946,05	-21216.13	29.98	140	98.811	5	11,48	
60	8384,90	-19717.76	29.90	141	98.741	7	11,46	
61	8252,27	-18123.27	30.00	128	98.361	5	11,26	
62	8126,12	-16536.28	30.01	135	98.321	7	11,07	
63	7890.11	-14964.31	30.00	136	98.109	7	10,91	
64	7477,48	-13418.13	29.99	140	98.016	5	10,80	SFT
65	6987,96	-11894,86	29.91	207	99,425	7	10,72	SFT
66	6947,95	-10295,36	29.92	213	99,401	5	10,52	SFT
67	6830,69	-8708,85	30.01	218	99,278	7	10,35	SFT
68	6762,58	-7110,65	30.00	220	99,139	5	10,16	SFT
69	6849,27	-5524,79	30.02	228	99,060	7	9,96	SFT
70	7211,24	-3983,40	29.99	287	99,260	12	9,73	SFT
71	7785,74	-2496,46	30.01	287	99,270	7	9,50	SFT
72	8197,78	-962,50	29.98	250	98,286	7	9,27	SFT
73	8255,24	12,80	29.78	273	98,297	1	9,12	

PREVIOUS CONTOUR REQUIRED 168,73 SEC, TO COMPUTE

•45.00 .100 9400.00 .00 800.00 .00 .00 300 •0

185381 **SEA** 1981 6/3 GG SAM 3D REFAN 8D 30/40/45 NEF 6-7-74

POINT	X	Y	NE	FLTS	%TOTL	ITERATIONS	AREA	
								SFT
1	9625,21	3,47	45,06	255	98,832	7	,00	SFT
2	9538,14	792,16	44,55	257	98,005	7	-,14	SFT
3	9514,97	1585,32	44,93	245	98,629	7	-,27	SFT
4	9489,77	2384,92	45,02	253	98,876	5	-,41	SFT
5	9480,43	3182,13	44,96	262	99,002	7	-,55	SFT
6	9492,05	3979,73	44,98	273	99,070	7	-,68	SFT
7	9450,82	4775,85	44,97	285	99,173	7	-,82	SFT
8	9420,36	5170,48	44,98	292	99,276	10	-,89	SFT
9	9594,49	5944,69	44,95	291	99,265	7	-1,00	SFT
10	9690,18	6733,88	44,59	304	99,325	8	-1,13	SFT
11	9754,04	7531,32	45,04	277	99,206	5	-1,26	SFT
12	9830,12	8326,98	44,99	298	99,324	8	-1,39	SFT
13	9855,84	8524,42	44,97	241	99,389	8	-1,42	SFT
14	9888,26	8721,97	44,92	241	99,437	8	-1,45	SFT
15	10031,80	8582,70	45,00	239	99,454	13	-1,40	SFT
16	10125,35	7793,30	45,05	241	99,426	7	-1,25	SFT
17	10199,54	6996,75	44,95	258	99,340	9	-1,09	SFT
18	10395,10	6200,14	45,01	283	99,232	7	-,93	SFT
19	10543,86	5991,95	45,01	322	99,351	10	-,85	SFT
20	10922,57	5762,13	44,96	317	99,318	10	-,79	SFT
21	11242,22	5543,22	44,98	288	99,361	12	-,71	SFT
22	11397,43	5189,34	44,97	260	99,403	10	-,62	SFT
23	11301,97	4395,93	45,01	247	99,439	7	-,47	SFT
24	11225,30	3602,31	44,97	249	99,447	7	-,31	SFT
25	11169,56	2895,41	44,98	248	99,390	7	-,16	SFT
26	11123,23	2006,75	45,06	245	99,285	5	,00	SFT
27	11094,09	1208,07	44,99	241	99,244	7	,16	SFT
28	11089,37	411,80	44,97	235	99,172	7	,32	SFT
29	11071,63	-387,97	44,94	226	99,087	7	,48	SFT
30	11126,83	-1181,97	44,92	221	98,957	7	,64	SFT
31	11172,08	-1977,75	44,96	221	98,945	7	,79	SFT
32	11243,09	-2770,35	44,97	225	99,033	7	,95	SFT
33	11239,07	-3567,79	44,97	230	99,136	7	1,11	SFT
34	11223,64	-4365,53	44,99	259	99,314	7	1,27	SFT
35	11162,38	-5158,93	44,96	281	99,409	7	1,44	SFT
36	11169,76	-5953,57	45,05	274	99,442	5	1,60	
37	11068,75	-6750,02	44,93	173	97,836	7	1,76	
38	10962,77	-7536,57	44,93	164	98,304	8	1,93	
39	10988,12	-8332,38	45,07	160	98,703	5	2,10	
40	10854,56	-8731,17	45,01	144	98,931	7	2,18	
41	10332,92	-8929,99	44,98	141	99,006	8	2,22	
42	10806,25	-9128,21	44,93	141	99,075	8	2,27	
43	10785,74	-9226,79	44,90	138	99,043	13	2,29	
44	10717,67	-9153,97	45,05	138	99,070	18	2,28	
45	10603,64	-8362,14	45,04	137	99,025	7	2,15	
46	10532,15	-7565,34	45,04	146	98,920	5	2,01	
47	10397,91	-6782,03	44,98	164	98,735	7	1,88	
48	10365,43	-5985,51	45,03	173	98,302	7	1,74	SFT
49	10267,95	-5608,88	44,92	264	99,423	10	1,68	SFT
50	9895,36	-5468,81	44,96	286	99,402	12	1,69	SFT

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16038I **SEA** 1981 6/3 GS SAM 3D REFAN 8D 30/40/45 NEP 6-7-74

POINT	X	Y	NE	FLTS	XTOTL	ITERATIONS	AREA	
51	9768,44	-5091,86	45.02	267	99.221	11	1,63	SFT
52	9494,71	-4804,28	44.98	279	99.000	10	1,61	SFT
53	9328,75	-4440,33	44.97	281	99.217	11	1,56	SFT
54	9411,80	-3644,65	45.07	274	99.257	7	1,42	SFT
55	9471,90	-2849,69	44.97	272	99.201	7	1,28	SFT
56	9526,75	-2051,87	44.99	261	98.993	5	1,14	SFT
57	9574,97	-1253,03	44.95	257	98.920	5	1,01	SFT
58	9615,16	-455,62	44.98	254	98.827	7	,87	SFT
59	9625,21	3,47	44.98	253	98.747	1	,79	

PREVIOUS CONTOUR REQUIRED 153,94 SEC, TO COMPUTE

6.0 PROGRAM LISTINGS

This last section presents a punched card listing of the NEF program. The order of the listing conforms to the alphabetical order of the name of the function, subroutine or main program. Both the contour program and the grid program are listed.

```
      FUNCTION ACNOIS(ITAC,SLR,THR)
      COMMON /NOISE/  SLRNG(8),GRNDA(8),PWRS(6,16),ANOISE(8,6,16)
      DATA I/1/,J/1/
      DATA M/8/,N/6/
C        ACNOISE RETURNS NOISE LEVEL OF A/C TYPE ITAC AT SLANT RANGE
C        SLR AND THURST SETTING THR.
      SL=ALOG10(SLR)
C        DISTANCES ARE STORED IN LOGS IN SLRNG.
      ACNOIS=GENFN2(ANOISE(1,1,ITAC),SLRNG,PWRS(1,ITAC),SL,THR,M,N,I,J)
      RETURN
      END
```

```
      SUBROUTINE ALTRRD(*,NR,IDUMP)
      COMMON /RESALT/ NAR(88),ENDR(25,85),STR(25,85),ICBT(25),GCBN(25),
     1               ICBNCO(16),ENDALT(25,85),ORGSTR(25),ORGEND(25)
      COMMON /SCRACH/ ITR(30),   NRT,G,S,E
      WRITE (6,1001)
 1001 FORMAT( 34H ALTITUDE RESTRICTION/CUTBACK DATA )
C
C        READ RESTRICTION/CUTBACK DEFINITIONS
C
      IF(NR .GT. 25) GO TO 200
      DO 100 I=1,NR
      READ (5,1002) NRX,NRT,G,S,E,(ITR(J),J=1,10)
 1002 FORMAT (2I3,3F8.0,13I5)
      WRITE (6,1003) NRX,NRT,G,S,E,(ITR(J),J=1,10)
 1003 FORMAT (12H RESTRICTION,2(1X,I3),3(1X,F11.5),10(1X,I3))
      IF(       (E    .LE. 100.)
     1   .OR. ((NRT  .NE. 1    )
     2   .AND.((NRT  .NE. 5    )
     3   .OR.  (G    .GT. 0.   )))) GO TO 5
      WRITE (6,1009) NRX
 1009 FORMAT (12H0RESTRICTION,I3,11H IS INVALID )
      GO TO 100
 5    CONTINUE
      ICBT(NRX) = NRT
      GCBN(NRX) = G
      ORGSTR(NRX) = S
      ORGEND(NRX) = E
      DO 10 K=1,10
      IF(ITR(K) .EQ. 0) GO TO 20
      IT = ITR(K)
      NAR(IT) = NRX
 10   CONTINUE
 20   CONTINUE
      DO 90 L=1,85
      CALL SETRES(L,I,IDUMP)
      IF(IDUMP .EQ. -1) RETURN 1
 90   CONTINUE
 100  CONTINUE
C
C        READ CUTBACK MODE OVERRIDE ARRAY
C
C        CUTBACKS MUST CORRESPOND OVER TRACK GROUP LENGTH
C
      READ(5,1007)(ICBNCO(I),I=1,16)
 1007 FORMAT(16I5)
      WRITE(6,1008)(ICBNCO(I),I=1,16)
 1008 FORMAT(20H C/B OVERRIDE ARRAY ,16I5)
      RETURN
 200  WRITE (6,1004)
 1004 FORMAT (36H0MORE THAN 25 RESTRICTIONS SPECIFIED)
      RETURN 1
      END
```

```
      SUBROUTINE APPTRD(*,ICNT)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
C        READS APPROACH PARAMETERS
C        A BASIC SET OF PARAMETERS IS STORED IN BLOCK DATA
      WRITE(6,1)
 1    FORMAT( 20H APPROACH PARAMETERS /,50X,9H*THRUSTS* /,
     1 5H TYPE,2X,8HAIRCRAFT,3X,8HLDG ROLL,4X,5HSPEED,5X,5H3 DEG,5X,
     1    5H6 DEG,5X,5HLEVEL,5X,5H3 DEG,5X,
     2 5HLEVEL,3X,8H500FT/NM,5X,4HIDLE,4X,7HREVERSE,4X,10HWEIGHT  NE)
      DO 100 I=1,ICNT
      READ(5,2) K
 2    FORMAT(I3)
      IF(K.LE.0 .OR. K.GT.12) RETURN 1
      READ(5,3) APPTHR(12,K),APPTHR(13,K),APPTHR(11,K),APPTHR(14,K)
 3    FORMAT( 2A6,2F10.0 )
      READ(5,4) (APPTHR(J,K),J=1,10)
 4    FORMAT(10F8.0)
      IF(APPTHR(1,K) .GT. 0.) RETURN 1
      IF(APPTHR(14,K) .LE. 0.) RETURN 1
      WRITE(6,5) K,APPTHR(12,K),APPTHR(13,K),(APPTHR(J,K),J=1,11),
     1 APPTHR(14,K)
 5    FORMAT( 1H ,I3,1X,2A6,11F10.0,F3.0 )
100   CONTINUE
      RETURN
      END
```

```
      FUNCTION ATTENG(X,Z,ITAC,PWR,V)
C        COMPUTES GROUND ATTENUATION PER SAE AIR923 (SIMPLIFIED)
C        ALSO COMPUTES ENGINE SHIELDING AND VELOCITY CORRECTIONS,
C           X = HORIZONTAL DISTANCE TO FLIGHT GROUND TRACK,
C           Z = AIRCRAFT HEIGHT ABOVE RUNWAY
C        ITAC = AIRCRAFT TYPE
C         PWR = POWER SETTING
C           V = VELOCITY
      COMMON /NOISE/  SLRNG(8),GRNDA(8),PWRS(6,16),ANOISE(8,6,16)
      EQUIVALENCE (A,BETA)
      DATA M/8/,I/1/
      IF(V.LT.32.) V=32.
C        LIMIT VELOCITY CORRECTION TO APPROX +4 DB
      ATTENG=-10.*ALOG10(V/160.)
      IF(X.LE.1.) RETURN
C        COMPUTE ELEVATION ANGLE.
      BETA=ATAN2(Z,X)
C        SHIELDING CORRECTION
      ATTENG=ATTENG - 3.*(1.-SQRT(SIN(BETA)))
C     RETURN IF BETA IS GREATER THAN 10 DEGREES
      IF(BETA.GE.0.17453) RETURN
      A=0.5*(1.+COS(18.*BETA))
C        CHOOSE GROUND ATTENUATION CURVE.
      DX=ALOG10(X)
      GNDATN = GENFN1(GRNDA,SLRNG,DX,M,I)
      IF(GNDATN.LE.0.) RETURN
      ATTENG=ATTENG-GNDATN*A
      RETURN
      END
```

```
      BLOCK DATA
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1              TTD(88,14),DMIN(88)
      COMMON /CONST/ PI,NC
      COMMON /NOISE/  SLRNG(8),GRNDA(8),PWR(6,16),ANOISE(8,6,16)
      DATA PI /3.1415927/
      DATA SLRNG/200.,400.,600.,1000.,2000.,4000.,6000.,10000./
C       MASK CONTAINS BINARY MASKING CONSTANTS USED FOR GENERATING
C             & CHECKING ELEMENTS OF ITSEG,ID
      DATA (MASK(I),I=1,21)/
     1    O4000000000000,O2000000000000,O1000000000000,
     2    O0400000000000,O0200000000000,O0100000000000,
     3    O0040000000000,O0020000000000,O0010000000000,
     4    O0004000000000,O0002000000000,O0001000000000,
     5    O0000400000000,O0000200000000,O0000100000000,
     6    O0000040000000,O0000020000000,O0000000000017,
     7    O0000000007760,O0000001770000,O0000760000000
     8    /
C         THE FOLLOWING NOISE DATA ARE ESSENTIALLY AS  TRANSMITTED
C         BY THE MANUFACTURERS.  DATA FROM BOEING HAS BEEN ALTERED
C         TO REFLECT A DEFINITION OF EPNL THAT INCORPORATES A FULL
C         TIME HISTORY INTEGRATION.  EVERY ATTEMPT HAS BEEN MADE TO
C         KEEP THESE DATA SELF CONSISTENT.
C
C*01  BAC-111                                   DOT CAN DATA          6/71
      DATA (PWR(I,1),I=1,6)/12200.,6000.,4*0./
      DATA ((ANOISE(I,J,1),I=1,8),J=1,6)/
     1125.1,121.,118.6,115.8,112.,108.,105.7,102.6,
     2108.7,104.6,102.2,99.1,95.1,91.0,88.5,85.7,
     332*0./
C*02  707-320B/C    JT3D-3B                     BOEING AND DATA       9/73
      DATA (PWR(I,2),I=1,6)/15250.,11990.,8830.,5880.,3630.,0./
      DATA ((ANOISE(I,J,2),I=1,8),J=1,6)/
     1126.5,122.1,119.2,114.7,107.5,100.0,95.7,90.0,
     2124.7,120.4,117.3,112.7,104.9,96.5,91.3,84.8,
     3124.,119.6,116.6,111.6,103.4, 94.9,87.2,81.9,
     4120.2,115.6,112.2,107.9, 99.7, 90.8,85.0,77.4,
     5117.8,113.5,110.1,105.3, 96.8, 86.9,80.6,72.1,
     68*0./
C*03  CARAVELLE      DOT CAN DATA
      DATA (PWR(I,3),I=1,6)/12200.,8000.,6000.,3*0./
      DATA ((ANOISE(I,J,3),I=1,8),J=1,6)/
     1124.4,122.5,120.8,117.,110.5,102.,96.,87.3,
     2115.3,113.,111.,107.1,99.2,89.6,83.,75.,
     3112.7,110.3,108.1,104.7,96.7,86.6,79.,72.,
     424*0./
C*04  DC-8-30        JT4A                       DOUGLAS CAN DATA      3/71
      DATA (PWR(I,4),I=1,6)/14700.,10000.,6000.,4000.,2*0./
      DATA ((ANOISE(I,J,4),I=1,8),J=1,6)/
     1129.,125.,122.3,118.4,112.0,104.3,99.2,93.0,
     2123.2,118.5,115.4,111.,104.,96.5,91.7,85.2,
     3116.,112.1,109.2,105.,97.6,89.2,84.,77.,
     4113.,108.7,105.8,100.8,92.,81.4,73.5,63.,
     516*0./
C*05  DC-9-30        JT8D-7                     DOUGLAS AND DATA(MODIFIED) 5/73
      DATA (PWR(I,5),I=1,6)/12000.,10000.,8000.,6000.,5000.,4000./
      DATA ((ANOISE(I,J,5),I=1,8),J=1,6)/
```

```
     1119.2,115.6,113.0,108.8,102.4,95.6,91.5,86.1,
     2116.4,112.7,109.6,105.0, 98.2,90.8,86.3,80.2,
     3114.2,109.4,106.0,101.2, 93.8,85.5,80.8,74.3,
     4113.1,107.5,103.5, 97.9, 89.5,80.8,75.1,67.7,
     5112.6,106.9,102.7, 97.0, 88.6,79.7,74.0,66.6,
     6111.9,106.2,102.0, 96.0, 87.5,78.5,73.0,65.5/
C*06  DC-8-61        JT3D-3B                         DOUGLAS AND DATA            5/73
      DATA (PWR(I,6),I=1,6)/15000.,12000.,10000.,8000.,6000.,4000./
      DATA ((ANOISE(I,J,6),I=1,8),J=1,6)/
     1126.2,122.2,119.3,115.3,109.1,102.2,98.0,92.4,
     2125.0,121.2,118.3,113.8,106.0, 98.5,94.0,88.3,
     3124.3,120.0,117.0,112.1,103.9, 95.0,90.0,83.4,
     4123.3,119.0,115.7,110.5,102.6,93.6,87.9,80.7,
     5121.4,116.9,113.4,108.3,100.3, 91.2,85.6,78.1,
     6118.4,114.6,111.5,106.6, 98.6, 89.1,83.3,75.8/
C*07  DC-10-10       CF6-6D                          DOUGLAS AND DATA            5/73
      DATA (PWR(I,7),I=1,6)/30800.,20600.,14600.,11900.,9200.,0./
      DATA ((ANOISE(I,J,7),I=1,8),J=1,6)/
     1115.0,110.0,106.7,101.9,94.8,85.8,80.8,75.1,
     2114.0,108.3,104.3, 98.9,90.6,80.4,75.0,69.0,
     3111.6,105.6,101.2,95.1,86.0,75.6,70.0,63.7,
     4109.0,102.8, 98.3, 92.2,83.4,73.4,67.7,61.2,
     5106.7,100.1, 95.9, 89.9,81.0,70.9,65.0,58.5,
     68*0./
C*08  L-1011         RB.211                          LOCKHEED CAN DATA          10/71
      DATA (PWR(I,8),I=1,6)/30600.,24000.,19800.,12200.,0.,0./
      DATA ((ANOISE(I,J,8),I=1,8),J=1,6)/
     1120.5,115.0,112.0,107.5,100.5,90.5,82.5,77.0,
     2115.3,109.5,106.0,101.5, 95.0,85.5,78.5,71.5,
     3113.0,107.5,104.0, 99.8, 93.5,84.5,77.0,70.0,
     4107.0,101.5, 98.0, 93.7, 87.0,78.0,72.0,65.0,
     516*0./
C*09  707-320        JT4A-11/12 (9 TUBE SUP.)        BOEING CAN DATA             2/71
      DATA (PWR(I,9),I=1,6)/14750.,12000.,8000.,3500.,0.,0./
      DATA ((ANOISE(I,J,9),I=1,8),J=1,6)/
     1130.0,124.6,121.2,116.7,110.3,103.4,99.4,94.,
     2125.0,119.5,116.0,111.4,105.0, 98.5,94.8,90.,
     3118.0,112.4,108.9,104.4, 97.9,91.2,87.3,82.,
     4113.1,107.4,103.8, 98.8, 92.0, 84.5,80.1,74.,
     516*0./
C*10  727-200        JT8D-9                          BOEING AND DATA             9/73
      DATA (PWR(I,10),I=1,6)/13050.,9800.,7600.,5300.,4300.,3500./
      DATA ((ANOISE(I,J,10),I=1,8),J=1,6)/
     1122.2,118.3,115.7,112.3,107.6,102.4,99.0,94.4,
     2116.7,112.6,110.0,106.4,101.4, 95.9,92.3,87.9,
     3112.6,108.2,105.4,101.6, 96.0, 90.2,86.8,82.0,
     4111.2,106.2,102.9, 98.6, 92.0, 85.6,81.7,76.6,
     5110.8,105.8,102.5, 98.2, 91.4, 83.4,79.3,73.8,
     6109.5,104.7,101.2, 96.1, 88.4, 80.6,76.4,70.9/
C*11  720            JT3C-7 (9 TUBE SUPPRESSORS)     BOEING CAN DATA             2/71
      DATA (PWR(I,11),I=1,6)/10700.,8000.,6000.,4000.,0.,0./
      DATA ((ANOISE(I,J,11),I=1,8),J=1,6)/
     1127.0,121.9,118.7,114.4,108.2,101.8,97.8,92.8,
     2121.6,116.9,113.9,109.6,103.8, 97.4,93.5,88.3,
     3116.3,111.8,108.8,104.5, 98.2, 91.4,87.2,81.9,
     4112.2,107.4,104.0, 99.3, 92.6, 85.3,80.8,74.7,
     516*0./
C*12  737-200        JT8D-9                          BOEING AND DATA             9/73
      DATA (PWR(I,12),I=1,6)/13480.,12770.,8220.,6120.,5370.,4180./
      DATA ((ANOISE(I,J,12),I=1,8),J=1,6)/
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     1118.6,114.8,112.3,108.7,103.4,97.0,92.9,86.7,
     2117.1,113.2,110.6,107.1,101.7,95.5,91.1,85.1,
     3116.3,111.2,106.7,100.0, 92.0,85.5,80.9,74.6,
     4115.9,110.4,105.8, 99.0, 89.9,81.5,76.3,69.0,
     5115.6,110.1,105.5, 98.7, 89.5,80.5,75.0,67.5,
     6112.9,107.4,102.6, 95.8, 86.6,77.6,71.8,63.8/
C*13  747-100         JT9D-3A ('A' NACELLE)               BOEING AND DATA          9/73
      DATA (PWR(I,13),I=1,6)/33600.,26900.,21100.,12300.,9900.,8000./
      DATA ((ANOISE(I,J,13),I=1,8),J=1,6)/
     1124.4,120.5,117.6,113.3,106.2,97.5,92.0,86.7,
     2123.6,119.7,116.5,112.3,105.0,96.0,90.1,84.7,
     3122.6,118.3,115.1,110.9,103.0,93.4,87.1,81.4,
     4117.3,113.0,109.8,105.4, 98.1,88.0,82.0,75.8,
     5113.9,109.4,106.3,101.9, 94.6,85.2,79.0,72.6,
     6112.0,107.3,104.3, 99.8, 92.3,83.4,77.4,70.9/
C*14  VC-10                                               DOT CAN DATA             2/71
      DATA (PWR(I,14),I=1,6)/14600.,6000.,4*0./
      DATA ((ANOISE(I,J,14),I=1,8),J=1,6)/
     1126.1,124.7,123.,120.5,115.4,110.,106.7,103.,
     2116.5,114.7,112.5,108.8,102.5,96.5,93.0,88.0,
     332*0./
C*15  A-300B          CF6-6D                              FROM DOUGLAS AND DATA    5/73
      DATA (PWR(I,15),I=1,6)/30800.,20600.,14600.,11900.,9200.,0./
      DATA ((ANOISE(I,J,15),I=1,8),J=1,6)/
     1113.2,108.2,104.9,100.1,93.0,84.0,79.0,73.3,
     2112.2,106.5,102.5, 97.1,88.8,78.6,73.2,67.2,
     3109.8,103.6, 99.4, 93.3,84.2,73.8,68.2,61.9,
     4107.2,101.0, 96.5, 90.4,81.6,71.6,65.9,59.4,
     5104.2, 98.3, 94.1, 88.1,79.2,69.1,63.2,56.7,
     68*0./
C
C     ************************************************************
C
C        THE FOLLOWING TAKE-OFF PROFILES ARE BASED ON MANUFACTURER
C        SUPPLIED DATA. IN MOST CASES EXTRAPOLATIONS WERE MADE FOR
C        PERFORMANCE BEYOND THE 2ND SEGMENT. ALL THRUSTS ARE GIVEN
C        IN LBS/ENG. PRESSURE ALTITUDE CORRECTIONS WILL BE MADE IN
C        ANOTHER SECTION OF THE PROGRAM. PROFILE DATA IS STORED IN
C        THE FOLLOWING MANNER:
C             PROF(I,J,NP) AS J GOES FROM 1-3, FOR THE NP-TH PROFILE
C                    I=1   TRACK DISTANCE,HEIGHT,VELOCITY AT BRAKE RELEASE
C                    I=2   TRACK DISTANCE,HEIGHT,VELOCITY AT LIFTOFF
C                    I=3   TRACK DISTANCE,HEIGHT,VELOCITY AT GEAR UP
C                    I=4   TRACK DISTANCE,HEIGHT,VELOCITY AT 1500 FT
C                    I=5   TRACK DISTANCE,HEIGHT,VELOCITY AT 3000 FT
C                    I=6   TRACK DISTANCE,HEIGHT,VELOCITY AT END OF ACCELERATION
C                    I=7   TRACK DISTANCE,HEIGHT,VELOCITY DURING CLIMBOUT
C             PROF(I,4,NP) AS I GOES FROM 1-6 CONTAINS POWER SETTINGS
C         FOR THESE SIX SEGMENTS. ALL PROFILES CORRESPOND TO STANDARD
C         ATA PROCEDURES. OTHER PARAMETERS ARE PROVIDED IN PROF TO BE
C         USED WHEN DIFFERENT PROCEDURES ARE DESIRED. THESE ADDITIONAL
C         PARAMETERS ARE:
C             PROF( 8,4,NP)- AIRCRAFT WEIGHT
C             PROF(10,1,NP)- THRUST REQUIRED FOR LEVEL FLIGHT (FLAPS UP)
C             PROF( 9,2,NP)- GRADIENT @ TAKE-OFF POWER, TAKE-OFF CONFIGURATION
C             PROF(10,2,NP)- TAKE-OFF THRUST
C             PROF( 9,3,NP)- GRADIENT @ CLIMB POWER, TAKE-OFF CONFIGURATION
C             PROF(10,3,NP)- CLIMB THRUST
C             PROF( 9,4,NP)- GRADIENT FOR FAR36 CUT-BACK
C             PROF(10,4,NP)- THRUST REQ'D FOR ENGINE-OUT LEVEL FLIGHT,
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C                               TAKE-OFF CONFIGURATION
C
C
C 747-100,JT9D-3A(DRY),FLAP 10, S/L, 59 DEG,                          TOGW=555000
       DATA ((PROF(I,J, 1),I=1,10),J=1,4)/
     1 0.,5500.,7500.,16250.,30700.,60950.,86100.,  0., 0.0,     8030.,
     2 0.,   0., 375., 1500., 3000., 4525., 6950.,  0., 0.1333, 33900.,
     332.,4*163.5,                    2*250.,         .4., 0.1038, 28300.,
     43*33900.,        2*28300.,25160.,  0.,    551000., 0.0302, 16665./
C
C 747-100,JT9D-3A(DRY),FLAP 10, S/L, 59 DEG,                          TOGW=580000
       DATA ((PROF(I,J, 2),I=1,10),J=1,4)/
     1 0.,5500.,8000.,17700.,33350.,62100.,97750.,  0., 0.0,     8790.,
     2 0.,   0., 300., 1500., 3000., 3950.,  7150., 0., 0.1237, 33700.,
     332.,4*168.,                     2*250.,          4., 0.0958, 28300.,
     43*33700.,        2*28300.,25160.,  0.,    576000., 0.0301, 17335./
C
C 747-100,JT9D-3A(DRY),FLAP 10, S/L, 59 DEG,                          TOGW=620000
       DATA ((PROF(I,J, 3),I=1,10),J=1,4)/
     1 0.,7000.,9500.,20250.,38025.,65000.,101900., 0., 0.0,    10000.,
     2 0.,   0., 250., 1500., 3000., 3875.,  6700., 0., 0.1163, 33500.,
     332.,4*174.,                     2*250.,          4., 0.0844, 28300.,
     43*33500.,        2*28300.,25160.,   0.,   616000., 0.0299, 18400./
C
C 747-100,JT9D-3A(DRY),FLAP 10, S/L, 59 DEG,                          TOGW=680000
       DATA ((PROF(I,J, 4),I=1,10),J=1,4)/
     1 0.,8000.,10250.,24250.,45925.,71175.,105270.,0., 0.0,    11830.,
     2 0.,   0.,  200., 1500., 3000., 3500.,  5575.,0., 0.0929, 33200.,
     332.,4*181.,                      2*250.,         4., 0.0692, 28300.,
     43*33200.,         2*28300.,25160.,  0.,   676000., 0.0298, 20135./
C
C 747-100,JT9D-3A(DRY),FLAP 10, S/L, 59 DEG,                          TOGW=712000
       DATA ((PROF(I,J, 5),I=1,10),J=1,4)/
     1 0.,9500.,12250.,27500.,51615.,75365.,107075.,0., 0.0,    12800.,
     2 0.,   0.,  200., 1500., 3000., 3325.,  5025.,0., 0.0852, 33050.,
     332.,4*185.,                      2*250.,         4., 0.0622, 28300.,
     43*33050.,         2*28300.,25160.,  0.,   708000., 0.0298, 21065./
C
C 747-200,JT9D-7(WET),FLAP 10, S/L, 59 DEG, 'B' NACELLES              TOGW=550000
       DATA ((PROF(I,J, 6),I=1,10),J=1,4)/
     1 0.,5500.,8000.,15000.,29220.,59200.,82175.,  0., 0.0,     8160.,
     2 0.,   0., 400., 1500., 3000., 4800., 7000.,  0., 0.1571, 36800.,
     332.,4*164.,                     2*250.,          4., 0.1055, 28300.,
     43*36000.,        2*28300.,25160.,  0.,    546000., 0.0303, 16535./
C
C 747-200,JT9D-7(WET),FLAP 10, S/L, 59 DEG, 'B' NACELLES              TOGW=575000
       DATA ((PROF(I,J, 7),I=1,10),J=1,4)/
     1 0.,5800.,8250.,15750.,31150.,61900.,95325.,  0., 0.0,     8975.,
     2 0.,   0., 375., 1500., 3000., 4550., 7450.,  0., 0.1500, 36700.,
     332.,4*167.,                     2*250.,          4., 0.0974, 28300.,
     43*36700.,        2*28300.,25160.,  0.,    571000., 0.0301, 17200./
C
C 747-200,JT9D-7(WET),FLAP 10, S/L, 59 DEG, 'B' NACELLES              TOGW=600000
       DATA ((PROF(I,J, 8),I=1,10),J=1,4)/
     1 0.,6000.,8500.,17000.,33740.,65700.,96550.,  0., 0.0,     9790.,
     2 0.,   0., 300., 1500., 3000., 4400., 6800.,  0., 0.1412, 36500.,
     332.,4*169.,                     2*250.,          4., 0.0896, 28300.,
     43*36500.,        2*28300.,25160.,  0.,    596000., 0.0301, 17935./
C
C 747-200,JT9D-7(WET),FLAP 10, S/L, 59 DEG, 'B' NACELLES              TOGW=640000
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      DATA ((PROF(I,J, 9),I=1,10),J=1,4)/
     1 0.,7000.,9500.,19250.,38330.,65800.,101900., 0., 0.0,     11100.,
     2 0.,    0., 275., 1500., 3000., 3800., 6250.,  0., 0.1256, 36300.,
     332.,4*174.5,                       2*250.,            4., 0.0786, 28300.,
     43*36300.,          2*28300.,25160., 0.,    636000., 0.0300, 19065./
C
C 747-200,JT9D-7(WET),FLAP 10, S/L, 59 DEG, 'B' NACELLES            TOGW=700000
      DATA ((PROF(I,J,10),I=1,10),J=1,4)/
     1 0.,9000.,11500.,23250.,46470.,75675.,99150., 0., 0.0,      13050.,
     2 0.,    0.,  250., 1500., 3000., 3700., 4900., 0., 0.1064, 36050.,
     332.,4*182.,                        2*250.,            4., 0.0646, 28300.,
     43*36050.,          2*28300.,25160., 0.,    696000., 0.0298, 20735./
C
C 747-200,JT9D-7(WET),FLAP 10, S/L, 59 DEG, 'B' NACELLES            TOGW=775000
      DATA ((PROF(I,J,11),I=1,10),J=1,4)/
     1 0.,10500.,13750.,29250.,59070.,79570.,104700.,0, 0.0,      15500.,
     2 0.,     0.,  200., 1500., 3000., 3225., 4125.,0., 0.0839, 35600.,
     332.,4*195.,                        2*250.,            4., 0.0503, 28300.,
     43*35600.,           2*28300.,25160., 0.,  771000., 0.0296, 22800.,
C
C DC-10-10,CF6-6D,FLAP 15, S/L, 59 DEG,                              TOGW=360000
      DATA ((PROF(I,J,12),I=1,10),J=1,4)/
     1 0.,4500.,8750.,16000.,28750.,61000.,90000.,  0., 0.0,      11845.,
     2 0.,    0., 500., 1500., 3000., 5000., 7250.,  0., 0.1379, 31000.,
     332.,4*155.,                      2*250.,          3., 0.1176, 27400.,
     435300.,2*31000.,2*27400.,        25800.,0., 360000., 0.0602, 21680./
C
C DC-10-10,CF6-6D,FLAP 15, S/L, 59 DEG,                              TOGW=375000
      DATA ((PROF(I,J,13),I=1,10),J=1,4)/
     1 0.,5500.,9000.,17250.,31500.,63000.,90000.,  0., 0.0,      12340.,
     2 0.,    0., 450., 1500., 3000., 4800., 6700.,  0., 0.1273, 31000.,
     332.,4*158.,                      2*250.,          3., 0.1053, 27400.,
     435300.,2*31000.,2*27400.,        25800.,0., 375000., 0.0604, 22650./
C
C DC-10-10,CF6-6D,FLAP 15, S/L, 59 DEG,                              TOGW=400000
      DATA ((PROF(I,J,14),I=1,10),J=1,4)/
     1 0.,6500.,10500.,20000.,37500.,66750.,90000., 0., 0.0,      12780.,
     2 0.,    0.,  425., 1500., 3000., 4150., 5600., 0., 0.1132, 31000.,
     332.,4*162.5,                      2*250.,          3., 0.0857, 27400.,
     435300.,2*31000.,2*27400.,        25800.,0.,400000., 0.0597, 23860./
C
C DC-10-10,CF6-6D,FLAP 11, S/L, 59 DEG,                              TOGW=420000
      DATA ((PROF(I,J,15),I=1,10),J=1,4)/
     1 0.,7250.,11000.,22000.,41000.,69250.,90000., 0., 0.0,      12995.,
     2 0.,    0.,  350., 1500., 3000., 3900., 5225., 0., 0.1045, 31000.,
     332.,4*170.,                       2*250.,          3., 0.0789, 27400.,
     435300.,2*31000.,2*27400.,        25800.,0.,420000., 0.0585, 24555./
C
C DC-10-10,CF6-6D,FLAP  8, S/L, 59 DEG,                              TOGW=430000
      DATA ((PROF(I,J,16),I=1,10),J=1,4)/
     1 0.,7750.,11250.,23250.,42500.,69500.,90000., 0., 0.0,      13155.,
     2 0.,    0.,  300., 1500., 3000., 3625., 4775., 0., 0.1000, 31000.,
     332.,4*176.,                       2*250.,          3., 0.0779, 27400.,
     435300.,2*31000.,2*27400.,        25800.,0.,430000., 0.0581, 25000./
C
C 727-200,JT8D-9,FLAP 15, S/L, 59 DEG,                               TOGW=140000
      DATA ((PROF(I,J,17),I=1,10),J=1,4)/
     1 0.,4500.,6250.,14250.,25000.,57500.,71825.,  0., 0.0,       2835.,
     2 0.,    0., 200., 1500., 3000., 5550., 7250.,  0., 0.1625, 12300.,
     332.,4*157.,                      2*250.,          3., 0.1395, 10700.,
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     43*12300.,       2*10700.,       10250.,0., 140000., 0.0505,  6925./
C
C 727-200,JT8D-9,FLAPS 15, S/L, 59 DEG,                              TOGW=155000
      DATA ((PROF(I,J,18),I=1,10),J=1,4)/
     1 0.,5500.,7250.,17000.,30000.,61500.,73350.,  0., 0.0,     3195.,
     2 0.,    0., 150., 1500., 3000., 5350., 6550.,  0., 0.1385, 12300.,
     332.,4*162.,                    2*250.,            3., 0.1154, 10700.,
     43*12300.,       2*10700.,       10250.,0., 155000., 0.0498,  7565./
C
C 727-200,JT8D-9,FLAPS 15, S/L, 59 DEG,                              TOGW=165000
      DATA ((PROF(I,J,19),I=1,10),J=1,4)/
     1 0.,6000.,8000.,18750.,34000.,64000.,80250.,  0., 0.0,     3435.,
     2 0.,    0., 150., 1500., 3000., 5000., 6500.,  0., 0.1256, 12300.,
     332.,4*165.,                    2*250.,            3., 0.0984, 10700.,
     43*12300.,       2*10700.,       10250.,0., 165000., 0.0490,  7940./
C
C 727-200,JT8D-9,FLAPS 15, S/L, 59 DEG,                              TOGW=173000
      DATA ((PROF(I,J,20),I=1,10),J=1,4)/
     1 0.,7000.,9000.,20500.,37000.,66250.,79040.,  0., 0.0,     3615.,
     2 0.,    0., 150., 1500., 3000., 4900., 6000.,  0., 0.1174, 12300.,
     332.,4*168.,                    2*250.,            3., 0.0938, 10700.,
     43*12300.,       2*10700.,       10250.,0., 172500., 0.0479,  8150./
C
C DC-8-33,JT4A-9/10,FLAP 25, S/L, 59 DEG,                            TOGW=215000
      DATA ((PROF(I,J,21),I=1,10),J=1,4)/
     1 0.,4000.,6000.,13250.,26300.,60550.,73050.,  0., 0.0,     2595.,
     2 0.,    0., 300., 1500., 3000., 5200., 6950.,  0., 0.1655, 15200.,
     332.,4*147.,                    2*250.,            4., 0.1150, 12100.,
     43*15200.,        3*12100.,          0.,    215000., 0.0328,  7040./
C
C DC-8-33,JT4A-9/10,FLAP 25, S/L, 59 DEG,                            TOGW=228000
      DATA ((PROF(I,J,22),I=1,10),J=1,4)/
     1 0.,4500.,7250.,15000.,29620.,62870.,79400.,  0., 0.0,     2710.,
     2 0.,    0., 300., 1500., 3000., 4850., 7000.,  0., 0.1548, 15200.,
     332.,4*150.,                    2*250.,            4., 0.1026, 12100.,
     43*15200.,        3*12100.,          0.,    228000., 0.0328,  7480./
C
C DC-8-33,JT4A-9/10,FLAP 25, S/L, 59 DEG,                            TOGW=243000
      DATA ((PROF(I,J,23),I=1,10),J=1,4)/
     1 0.,5000.,8000.,16750.,33500.,66500.,88000.,  0., 0.0,     2960.,
     2 0.,    0., 275., 1500., 3000., 4400., 7000.,  0., 0.1400, 15200.,
     332.,4*154.,                    2*250.,            4., 0.0896, 12100.,
     43*15200.,        3*12100.,          0.,    243000., 0.0330,  8020./
C
C DC-8-33,JT4A-9/10,FLAP 25, S/L, 59 DEG,                            TOGW=267000
      DATA ((PROF(I,J,24),I=1,10),J=1,4)/
     1 0.,6000.,9000.,19750.,40550.,71550.,99550.,  0., 0.0,     3295.,
     2 0.,    0., 225., 1500., 3000., 3950.,  7000., 0., 0.1186, 15200.,
     332.,4*160.,                    2*250.,            4., 0.0721, 12100.,
     43*15200.,        3*12100.,          0.,    267000., 0.0332,  8860./
C
C DC-8-33,JT4A-9/10,FLAP 25, S/L, 59 DEG,                            TOGW=303000
      DATA ((PROF(I,J,25),I=1,10),J=1,4)/
     1 0.,7250.,11250.,25500.,51000.,80000.,100000.,0., 0.0,     3745.,
     2 0.,    0.,  200., 1500., 3000., 3250.,  5000.,0., 0.0912, 15200.,
     332.,4*169.,                    2*250.,            4., 0.0516, 12100.,
     43*15200.,        13075.,2*12100., 0.,    303000., 0.0332, 10065./
C
C DC-8-33,JT4A-9/10,FLAP 25, S/L, 59 DEG,                            TOGW=315000
      DATA ((PROF(I,J,26),I=1,10),J=1,4)/
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     1 0.,8000.,12000.,27000.,52750.,81000.,103750.,0., 0.0,     3885.,
     2 0.,   0.,  200., 1500., 3000., 3200.,  5000.,0., 0.0867, 15200.,
     332.,4*171.5,                    2*250.,          4., 0.0455, 12100.,
     43*15200.,          13300.,2*12100.,  0.,    315000., 0.0333, 10500./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=215000
      DATA ((PROF(I,J,27),I=1,10),J=1,4)/
     1 0.,4250.,6500.,13000.,24200.,58400.,65750.,   0., 0.0,     3190.,
     2 0.,   0., 330., 1500., 3000., 6050., 7000.,   0., 0.1800, 15200.,
     332.,4*148.,                     2*250.,          4., 0.1342, 12600.,
     43*15200.,        2*12600.,       12300.,0., 215000., 0.0343,  6350./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=225000
      DATA ((PROF(I,J,28),I=1,10),J=1,4)/
     1 0.,4500.,7000.,14000.,26600.,58500.,70600.,   0., 0.0,     3370.,
     2 0.,   0., 325., 1500., 3000., 5650., 7000.,   0., 0.1678, 15200.,
     332.,4*154.,                     2*250.,          4., 0.1240, 12600.,
     43*15200.,        2*12600.,       12300.,0., 225000., 0.0341,  6700./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=240000
      DATA ((PROF(I,J,29),I=1,10),J=1,4)/
     1 0.,5000.,7700.,15500.,28940.,60700.,76700.,   0., 0.0,     3630.,
     2 0.,   0., 310., 1500., 3000., 5225., 7000.,   0., 0.1526, 15200.,
     332.,4*158.,                     2*250.,          4., 0.1116, 12600.,
     43*15200.,        2*12600.,       12300.,0., 240000., 0.0337,  7100./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=250000
      DATA ((PROF(I,J,30),I=1,10),J=1,4)/
     1 0.,5250.,8500.,16950.,31570.,62570.,83570.,   0., 0.0,     3795.,
     2 0.,   0., 300., 1500., 3000., 4825., 7000.,   0., 0.1420, 15200.,
     332.,4*161.,                     2*250.,          4., 0.1026, 12600.,
     43*15200.,        2*12600.,       12300.,0., 250000., 0.0336,  7300./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=260000
      DATA ((PROF(I,J,31),I=1,10),J=1,4)/
     1 0.,5500.,9000.,18000.,33700.,63950.,88200.,   0., 0.0,     3995.,
     2 0.,   0., 300., 1500., 3000., 4550., 7000.,   0., 0.1335, 15200.,
     332.,4*163.,                     2*250.,          4., 0.0956, 12600.,
     43*15200.,        2*12600.,       12300.,0., 260000., 0.0335,  7650./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=270000
      DATA ((PROF(I,J,32),I=1,10),J=1,4)/
     1 0.,6000.,9580.,19500.,36450.,66200.,94950.,   0., 0.0,     4160.,
     2 0.,   0., 260., 1500., 3000., 4350., 7000.,   0., 0.1250, 15200.,
     332.,4*165.,                     2*250.,          4., 0.0885, 12600.,
     43*15250.,        2*12600.,       12300.,0., 270000., 0.0334,  8000./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=280000
      DATA ((PROF(I,J,33),I=1,10),J=1,4)/
     1 0.,6500.,10000.,20500.,38600.,67350.,102100.,0., 0.0,     4350.,
     2 0.,   0.,  260., 1500., 3000., 4125., 7000., 0., 0.1181, 15200.,
     332.,4*168.,                     2*250.,          4., 0.0830, 12600.,
     43*15200.,        2*12600.,       12300.,0.,280000., 0.0330,  8300./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                            TOGW=290000
      DATA ((PROF(I,J,34),I=1,10),J=1,4)/
     1 0.,7500.,10500.,22000.,41500.,69750.,102500.,0., 0.0,     4505.,
     2 0.,   0.,  225., 1500., 3000., 3375.,  6450.,0., 0.1109, 15200.,
     332.,4*170.,                     2*250.,          4., 0.0769, 12600.,
     43*15200.,        2*12600.,       12300.,0.,290000., 0.0329,  8550./
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C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                                  TOGW=305000
      DATA ((PROF(I,J,35),I=1,10),J=1,4)/
     1 0.,8000.,11500.,24500.,46000.,73000.,103000.,0., 0.0,      4825.,
     2 0.,    0.,  175., 1500., 3000., 3600.,  5750.,0., 0.1019, 15200.,
     332.,4*174.,                     2*250.,           4., 0.0696, 12600.,
     43*15200.,          2*12600.,         12300.,0.,305000., 0.0325,  9000./
C
C DC-8-61,JT3D-3B,FLAP 15, S/L, 59 DEG,                                  TOGW=325000
      DATA ((PROF(I,J,36),I=1,10),J=1,4)/
     1 0.,9000.,13000.,28000.,53125.,79875.,104125.,0., 0.0,      5195.,
     2 0.,    0.,  150., 1500., 3000., 3400.,  4875.,0., 0.0900, 15200.,
     332.,4*176.,                     2*250.,           4., 0.0714, 12600.,
     43*15200.,          2*12600.,         12300.,0.,325000., 0.0324,  9600./
C
C 720B,JT3D-1,FLAP 30, S/L, 59 DEG,                                      TOGW=170000
      DATA ((PROF(I,J,37),I=1,10),J=1,4)/
     1 0.,3500.,6000.,11000.,20000.,56000.,60500.,   0., 0.0,      2420.,
     2 0.,    0., 400., 1500., 3000., 6850., 7500.,   0., 0.2200, 13200.,
     332.,4*150.,                   2*250.,            4., 0.1667, 10940.,
     43*13200.,         2*10940.,        10680.,0., 170000., 0.0302,  5135./
C
C 707-120B,JT3D-3,FLAP 30, S/L, 59 DEG,  (ALSO 720B,JT3D-1@185K)       TOGW=195000
      DATA ((PROF(I,J,38),I=1,10),J=1,4)/
     1 0.,4000.,6250.,12500.,22250.,57750.,67500.,   0., 0.0,      2825.,
     2 0.,    0., 340., 1500., 3000., 6250., 7500.,   0., 0.1856, 14100.,
     332.,4*155.,                  2*250.,             4., 0.1538, 11700.,
     43*14100.,        2*11700.,        11400.,0., 195000., 0.0345,  6735./
C
C 707-120B,JT3D-3,FLAP 30, S/L, 59 DEG,  (ALSO 720B,JT3D-1@195K)       TOGW=210000
      DATA ((PROF(I,J,39),I=1,10),J=1,4)/
     1 0.,4500.,7000.,14000.,25000.,60000.,78000.,   0., 0.0,      3145.,
     2 0.,    0., 325., 1500., 3000., 5750., 7500.,   0., 0.1679, 14000.,
     332.,4*163.,                  2*250.,             4., 0.1364, 11600.,
     43*14000.,        2*11600.,        11310.,0., 210000., 0.0329,  6915./
C
C 707-120B,JT3D-3,FLAP 30, S/L, 59 DEG,  (ALSO 720B,JT3D-1@215K)       TOGW=220000
      DATA ((PROF(I,J,40),I=1,10),J=1,4)/
     1 0.,5000.,7500.,15250.,27250.,60500.,83000.,   0., 0.0,      3330.,
     2 0.,    0., 300., 1500., 3000., 5150., 7500.,   0., 0.1546, 13900.,
     332.,4*166.,                  2*250.,             4., 0.1250, 11500.,
     43*13900.,        2*11500.,        11250.,0., 220000., 0.0326,  7180./
C
C 707-120B,JT3D-3,FLAP 30, S/L, 59 DEG,                                  TOGW=240000
      DATA ((PROF(I,J,41),I=1,10),J=1,4)/
     1 0.,5500.,8750.,18000.,32250.,64500.,94000.,   0., 0.0,      3685.,
     2 0.,    0., 275., 1500., 3000., 4600., 7500.,   0., 0.1324, 13810.,
     332.,4*170.,                  2*250.,             4., 0.1053, 11440.,
     43*13810.,        2*11440.,        11170.,0., 240000., 0.0325,  7820./
C
C 707-120B,JT3D-3,FLAP 30, S/L, 59 DEG,  (ALSO 720B,JT3D-1@235K)       TOGW=255000
      DATA ((PROF(I,J,42),I=1,10),J=1,4)/
     1 0.,6000.,9250.,19750.,34500.,66000.,100000., 0., 0.0,      3945.,
     2 0.,    0., 250., 1500., 3000., 4400.,  7500., 0., 0.1190, 13715.,
     332.,4*175.,                  2*250.,             4., 0.1017, 11350.,
     43*13715.,        2*11350.,        11090.,0., 255000., 0.0320,  8170./
C
C 737-200,JT8D-9,FLAP 5, S/L, 59 DEG,                                    TOGW=103000
      DATA ((PROF(I,J,43),I=1,10),J=1,4)/
     1 0.,5500.,7000.,15250.,26750.,36000.,61500.,   0., 0.0,      2950.,
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      2 0.,    0., 200., 1500., 3000., 3500., 6000.,   0., 0.1576, 12500.,
      332.,4*167.,                     2*250.,          2., 0.1304, 10750.,
      43*12500.,       2*10750.,        10300.,0., 103000., 0.0851,  8770./
C
C 737-200,JT8D-9,FLAP 5, S/L, 59 DEG,                                TOGW=108000
       DATA ((PROF(I,J,44),I=1,10),J=1,4)/
      1 0.,6500.,8000.,17000.,29750.,39250.,66000.,   0., 0.0,      3120.,
      2 0.,    0., 175., 1500., 3000., 3500., 6000.,   0., 0.1472, 12500.,
      332.,4*171.,                     2*250.,          2., 0.1176, 10750.,
      43*12500.,       2*10750.,        10300.,0., 108000., 0.0843,  9100./
C
C 737-200,JT8D-9,FLAP 5, S/L, 59 DEG,                                TOGW=114500
       DATA ((PROF(I,J,45),I=1,10),J=1,4)/
      1 0.,7500.,9250.,19250.,34000.,44000.,74000.,   0., 0.0,      3340.,
      2 0.,    0., 150., 1500., 3000., 3400., 6000.,   0., 0.1350, 12500.,
      332.,4*176.,                     2*250.,          2., 0.1017, 10750.,
      43*12500.,       2*10750.,        10300.,0., 114500., 0.0833,  9540./
C
C DC-9-15,JT8D-7,FLAP 20, S/L, 59 DEG,                               TOGW= 83000
       DATA ((PROF(I,J,46),I=1,10),J=1,4)/
      1 0.,4500.,6000.,13000.,22300.,56800.,61200.,   0., 0.0,      1680.,
      2 0.,    0., 200., 1500., 3000., 6800., 7500.,   0., 0.1857, 12200.,
      332.,4*148.,                     2*250.,          2., 0.1613, 10800.,
      43*12200.,       2*10800.,        10600.,0.,  83000., 0.1083,  8985./
C
C DC-9-15,JT8D-7,FLAP 20, S/L, 59 DEG,                               TOGW= 90000
       DATA ((PROF(I,J,47),I=1,10),J=1,4)/
      1 0.,5000.,7000.,14600.,25000.,56500.,67400.,   0., 0.0,      2020.,
      2 0.,    0., 200., 1500., 3000., 5920., 7500.,   0., 0.1710, 12200.,
      332.,4*153.,                     2*250.,          2., 0.1595, 10800.,
      43*12200.,       2*10800.,        10600.,0.,  90000., 0.1000,  9005./
C
C DC-9-32,JT8D-7,FLAP 15, S/L, 59 DEG, 15DEG PITCH LIMIT,            TOGW=100000
       DATA ((PROF(I,J,48),I=1,10),J=1,4)/
      1 0.,4500.,6750.,17000.,30000.,65750.,81500.,   0., 0.0,      2415.,
      2 0.,    0., 280., 1500., 3000., 5500., 7500.,   0., 0.1485, 12200.,
      332.,4*143.5,                    2*250.,          2., 0.1154, 10800.,
      42*12200.,11450.,2*10800.,        10600.,0., 100000., 0.0954,  9540./
C
C DC-9-32,JT8D-7,FLAP 5, S/L, 59 DEG, NO OVERSPEED, PITCH LIMITED   TOGW=108000
       DATA ((PROF(I,J,49),I=1,10),J=1,4)/
      1 0.,6200.,8200.,20800.,34940.,66400.,90900.,   0., 0.0,      2830.,
      2 0.,    0., 220., 1500., 3000., 4550., 7200.,   0., 0.1368, 12200.,
      332.,4*158.,                     2*250.,          2., 0.1061, 10800.,
      42*12200.,11250.,2*10800.,        10600.,0., 108000., 0.0880,  9250./
C
       DATA (((PROF(I,J,K),I=1,10),J=1,4),K=50,53)/
      1 160*0./
C
C A-300B,CF6-50A, S/L, 59 DEG,                                       TOGW=290000
       DATA ((PROF(I,J,54),I=1,10),J=1,4)/
      1 0.,6500.,9500.,16800.,28000.,60500.,85000.,   0., 0.0,     12660.,
      2 0.,    0., 350., 1500., 3000., 4950., 7300.,   0., 0.1575, 38000.,
      332.,4*154.,                     2*250.,          2., 0.1339, 33600.,
      443250.,2*38000.,2*33600.,        31600.,0., 290000., 0.1045, 30315./
C
C A-300B,CF6-50A, S/L, 59 DEG,                                       TOGW=300000
       DATA ((PROF(I,J,55),I=1,10),J=1,4)/
      1 0.,7000.,10000.,17500.,30000.,62000.,85000.,  0., 0.0,     13540.,
      2 0.,    0., 350., 1500., 3000., 4550., 6470.,   0., 0.1533, 38000.,
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     332.,4*157.,                      2*250.,          2., 0.1200, 33600.,
     443250.,2*38000.,2*33600.,        31600.,0., 300000., 0.1000, 30000./
C
C DC-10-30,CF6-50A,FLAP 15, S/L, 59 DEG,                               TOGW=420000
      DATA ((PROF(I,J,56),I=1,10),J=1,4)/
     1 0.,4800.,7250.,14500.,25500.,58800.,75000.,  0., 0.0,    12290.,
     2 0.,   0., 400., 1500., 3000., 5100., 6650.,  0., 0.1517, 38000.,
     332.,4*151.,                      2*250.,          3., 0.1364, 33600.,
     44320.,2*38000.,2*33600.,         31600.,0., 420000., 0.0598, 25140./
C
C DC-10-30,CF6-50A,FLAP 15, S/L, 59 DEG,                               TOGW=450000
      DATA ((PROF(I,J,57),I=1,10),J=1,4)/
     1 0.,5800.,8250.,16800.,29200.,61000.,95000.,  0., 0.0,    13690.,
     2 0.,   0., 350., 1500., 3000., 4650., 7450.,  0., 0.1345, 38000.,
     332.,4*157.,                      2*250.,          3., 0.1210, 33600.,
     44320.,2*38000.,2*33600.,         31600.,0., 450000., 0.0594, 26735./
C
C DC-10-30,CF6-50A,FLAP 15, S/L, 59 DEG,                               TOGW=480000
      DATA ((PROF(I,J,58),I=1,10),J=1,4)/
     1 0.,6500.,9000.,16800.,32800.,64000.,100000., 0., 0.0,    13810.,
     2 0.,   0., 300., 1500., 3000., 4250., 7000., 0., 0.1224, 38000.,
     332.,4*161.,                      2*250.,          3., 0.1071, 33600.,
     44320.,2*38000.,2*33600.,         31600.,0., 480000., 0.0575, 27610./
C
C DC-10-30,CF6-50A,FLAP 10, S/L, 59 DEG,                               TOGW=520000
      DATA ((PROF(I,J,59),I=1,10),J=1,4)/
     1 0.,7500.,10500.,22600.,39000.,65500.,105000.,0., 0.0,    14675.,
     2 0.,   0., 250., 1500., 3000., 3675., 6125.,0., 0.1033, 38000.,
     332.,4*172.,                      2*250.,          3., 0.0915, 33600.,
     44320.,2*38000.,2*33600.,         31600.,0.,520000., 0.0579, 30140./
C
C DC-10-30,CF6-50A,FLAP  2, S/L, 59 DEG,                               TOGW=550000
      DATA ((PROF(I,J,60),I=1,10),J=1,4)/
     1 0.,11200.,16500.,29000.,47000.,65500.,110000.,0.,0.0,    15525.,
     2 0.,   0., 250., 1500., 3000., 3300., 5750.,0.,0.1000, 38000.,
     332.,4*190.,                      2*250.,          3.,0.0833, 33600.,
     44320.,2*38000.,2*33600.,         31600.,0.,550000.,0.0536, 29500./
C
C F-28 MK2000,SPEY MK555-15, S/L, 59 DEG,                              TOGW= 50000
      DATA ((PROF(I,J,61),I=1,10),J=1,4)/
     1 0.,3000.,5000.,10200.,17000.,55000.,93000.,  0., 0.0,     1645.,
     2 0.,   0., 300., 1500., 3000., 8500.,14000.,  0., 0.2308,   8600.,
     332.,4*136.,                      2*250.,          2., 0.2206,   8250.,
     43*8600.,           3*8250.,           0.,     50000., 0.1132,   5660./
C
C F-28 MK2000,SPEY MK555-15, S/L, 59 DEG,                              TOGW= 65000
      DATA ((PROF(I,J,62),I=1,10),J=1,4)/
     1 0.,4500.,7000.,14500.,25000.,56500.,67500.,  0., 0.0,     2140.,
     2 0.,   0., 200., 1500., 3000., 5900., 7500.,  0., 0.1733,   8600.,
     332.,4*153.,                      2*250.,          2., 0.1429,   8250.,
     43*8600.,           3*8250.,           0.,     65000., 0.0913,   5935./
C
C 727-200ADV,JT8D-15,FLAP 15, S/L, 59 DEG,                             TOGW=165000
      DATA ((PROF(I,J,63),I=1,10),J=1,4)/
     1 0.,5000.,7300.,16750.,30000.,61500.,75000.,  0., 0.0,     3435.,
     2 0.,   0., 150., 1500., 3000., 5350., 7300.,  0., 0.1429, 13200.,
     332.,4*165.,                      2*250.,          3., 0.1132, 11400.,
     43*13200.,          2*11400.,         11000.,0., 165000., 0.0486,  8015./
C
C 727-200ADV,JT8D-15,FLAP 15, S/L, 59 DEG,                             TOGW=175000
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      DATA ((PROF(I,J,64),I=1,10),J=1,4)/
     1 0.,6000.,8250.,18500.,34000.,63500.,75000.,  0., 0.0,     3620.,
     2 0.,    0., 140., 1500., 3000., 4950., 6500.,  0., 0.1327, 13200.,
     332.,4*166.,                       2*250.,       3., 0.0968, 11400.,
     43*13200.,          2*11400.,      11000.,0., 175000., 0.0468,  8190./
C
C 727-200ADV,JT8D-15,FLAP.15, S/L, 59 DEG,                         TOGW=190500
      DATA ((PROF(I,J,65),I=1,10),J=1,4)/
     1 0.,7500.,10250.,22500.,40000.,68000.,82500., 0., 0.0,      3760.,
     2 0.,    0.,  130., 1500., 3000., 4550., 6750., 0., 0.1118, 13200.,
     332.,4*174.,                       2*250.,        3., 0.0857, 11400.,
     43*13200.,          2*11400.,      11000.,0.,190500., 0.0480,  9150./
C
      DATA (((PROF(I,J,K),I=1,10),J=1,4),K=66,78)/
     1 520*0./
C
C 747 STRETCH,JT9D-XX(50000# SLST),FLAP 10, S/L, 59 DEG,           TOGW=655000
      DATA ((PROF(I,J,79),I=1,10),J=1,4)/
     1 0.,6250.,8550.,16500.,33590.,62100.,88600.,  0., 0.0,     11585.,
     2 0.,    0., 430., 1500., 3000., 4450., 7050.,  0., 0.1375, 38000.,
     332.,4*176.,                     2*250.,          4., 0.0878, 30500.,
     43*38000.,         3*30500.,          0.,     651000., 0.0299, 19465./
C
C 747 STRETCH,JT9D-XX(50000# SLST),FLAP 10, S/L, 59 DEG,           TOGW=680000
      DATA ((PROF(I,J,80),I=1,10),J=1,4)/
     1 0.,6800.,9250.,17900.,35650.,65250.,83250.,  0., 0.0,     11830.,
     2 0.,    0., 375., 1500., 3000., 4300., 6000.,  0., 0.1300, 38000.,
     332.,4*181.,                     2*250.,          4., 0.0845, 30500.,
     43*38000.,         3*30500.,          0.,     676000., 0.0298, 20135./
C
C 747 STRETCH,JT9D-XX(50000# SLST),FLAP 10, S/L, 59 DEG,           TOGW=720000
      DATA ((PROF(I,J,81),I=1,10),J=1,4)/
     1 0.,7800.,10000.,20250.,41100.,66900.,101400.,0., 0.0,     13705.,
     2 0.,    0.,  275., 1500., 3000., 3850., 6500., 0., 0.1195, 38000.,
     332.,4*188.,                      2*250.,         4., 0.0720, 30500.,
     43*38000.,          3*30500.,         0.,     716000., 0.0298, 21335./
C
C 747 STRETCH,JT9D-XX(50000# SLST),FLAP 10, S/L, 59 DEG,           TOGW=775000
      DATA ((PROF(I,J,82),I=1,10),J=1,4)/
     1 0.,7500.,12500.,24300.,48850.,75850.,115300.,0., 0.0,     15500.,
     2 0.,    0.,  250., 1500., 3000., 3650.,  6250.,0., 0.1060, 38000.,
     332.,4*195.,                     2*250.,          4., 0.0611, 30500.,
     43*38000.,          3*30500.,         0.,     771000., 0.0296, 22800./
C
C 747 STRETCH,JT9D-XX(50000# SLST),FLAP 10, S/L, 59 DEG,           TOGW=850000
      DATA ((PROF(I,J,83),I=1,10),J=1,4)/
     1 0.,11200.,15800.,30000.,61200.,79300.,101300.,0, 0.0,     17950.,
     2 0.,     0.,  200., 1500., 3000., 3175., 4500.,0., 0.0915, 38000.,
     332.,4*205.,                      2*250.,         4., 0.0481, 30500.,
     43*38000.,          3*30500.,         0.,     846000., 0.0295, 24935./
C
C DC-10 LONG RANGE STRETCH,CF6-50C, S/L, 59 DEG,                   TOGW=570000
      DATA ((PROF(I,J,84),I=1,10),J=1,4)/
     1 0.,10400.,15500.,26500.,43000.,65000.,105000.,0.,0.0,     15785.,
     2 0.,     0.,  350., 1500., 3000., 3700.,  6000.,0.,0.1045, 39500.,
     332.,4*190.,                      2*250.,         3.,0.0909, 34900.,
     445000.,2*39500.,  2*34900.,      32900.,0.,570000.,0.0517, 29450./
C
C DC-10 LONG RANGE STRETCH,CF6-50C, S/L, 59 DEG,                   TOGW=610000
      DATA ((PROF(I,J,85),I=1,10),J=1,4)/
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     1 0.,12500.,18000.,30000.,48000.,67000.,107500.,0.,0.0,     16200.,
     2 0.,     0.,  350., 1500., 3000., 3300.,  5500.,0.,0.0958, 39500.,
     332.,4*200.,                      2*250.,          3.,0.0833, 34900.,
     445000.,2*39500.,  2*34900.,       32900.,0.,610000.,0.0492, 30020./
C
C     ************************************************************
C
C        THE ARRAY APPTHR CONTAINS APPROACH PARAMETERS FOR 10 AIRCRAFT
C        TYPES, THESE PARAMETERS ARE MATCHED TO THE APPROPRIATE NOISE
C        CURVE (A/C TYPE) THROUGH INPUT ELEMENTS OF ARRAY MATCH. ALL
C        PARAMETERS CORRESPOND TO A TYPICAL LANDING WEIGHT, FOR THE
C        JTH AIRPLANE APPTHR(I,J) CONTAINS:
C             I=1        LANDING FIELD LENGTH (FT)
C             I=2        LANDING SPEED (KTS)
C             I=3        THRUST REQ'D FOR 3 DEG GLIDE SLOPE, LANDING FLAP
C             I=4        THRUST REQ'D FOR 6 DEG GLIDE SLOPE, LANDING FLAP
C             I=5        THRUST REQ'D FOR LEVEL FLIGHT,     APPROACH FLAP
C             I=6        THRUST REQ'D FOR 3 DEG GLIDE SLOPE,APPROACH FLAP
C             I=7        THRUST REQ'D FOR LEVEL FLIGHT,     MANEUVER FLAP
C             I=8        THRUST REQ'D FOR 500FT/NM SINK ,   MANEUVER FLAP
C             I=9        IDLE THRUST
C             I=10       THRUST AT THRUST REVERSAL
C             I=11       LANDING WEIGHT (LBS)
C             I=12,13    LABELS
C             I=14       NUMBER OF ENGINES
C       ALL POWER SETTINGS ARE GIVEN IN TERMS OF NET THRUST-LBS/ENG,
C       NOISE IS CORRELATED TO CORRECTED NET THRUST-THE PRESSURE
C       ALTITUDE CORRECTION BEING MADE IN ANOTHER PART OF THIS
C       PROGRAM, FLAP SETTINGS IN THE FOLLOWING COMMENTS ARE
C       GIVEN AS MANEUVER,APPROACH,LANDING SETTINGS RESPECTIVELY.
C
C*01  DC-8-33       FLAPS 30,35,50                               LDG WT=180000
      DATA (APPTHR(I,1),I=1,14)/
     1 -4100.,140.,4400.,2045.,5150.,2790.,4700.,1000.,500.,
     2 8500.,180000.,6HDC-8-3,6H3      ,4./
C*02  DC-8-61       FLAPS 25,35,50                               LDG WT=197500
      DATA (APPTHR(I,2),I=1,14)/
     1 -3000.,140.,5450.,3120.,5750.,3200.,4600.,1000.,700.,
     2 8500.,197500.,6HDC-8-5,6H5,-61 ,4./
C*03  DC-9-32       FLAPS 15,20,50                               LDG WT= 75000
      DATA (APPTHR(I,3),I=1,14)/
     1 -2640.,122.,6000.,4025.,4230.,2200.,3320.,450.,450.,
     2 8000.,75000.,6HDC-9-3,6H2      ,2./
C*04  DC-10-10      FLAPS 5,18,35                                LDG WT=300000
      DATA (APPTHR(I,4),I=1,14)/
     1 -3945.,138.,8535.,3265.,11000.,5760.,9800.,1800.,1800.,
     2 20000.,300000.,6HDC-10-,6H10,-30,3./
C*05  707-320B/C    FLAPS 14,30,40                               LDG WT=190000
      DATA (APPTHR(I,5),I=1,14)/
     1 -4100.,135.,3885.,1380.,4790.,2365.,3980.,700.,700.,
     2 8500.,190000.,6H707-32,6H0B/C  ,4./
C*06  727-200       FLAPS 5,25,40                                LDG WT=138200
      DATA (APPTHR(I,6),I=1,14)/
     1 -2800.,132.,6000.,3550.,5000.,2590.,3130.,500.,500.,
     2 8000.,138200.,6H727-20,6H0 (40),3./
C*07  727-200       FLAPS 5,15,30                                LDG WT=138200
      DATA (APPTHR(I,7),I=1,14)/
     1 -3100.,139.,4140.,2450.,4400.,2000.,3130.,500.,500.,
     2 8000.,138200.,6H727-20,6H0 (30),3./
C*08  737-200       FLAPS 5,25,40                                LDG WT= 88000
```

```
      DATA (APPTHR(I,8),I=1,14)/
     1 -2750.,133.,4825.,2400.,4930.,2640.,4820.,1220.,500.,
     2 8000.,88000.,6H737-20,6H0      ,2./
C*09  747-100/200B FLAPS 10,25,30                              LDG WT=500000
      DATA (APPTHR(I,9),I=1,14)/
     1 -4000.,146.,11800.,5230.,14950.,8400.,11380.,2790.,2790.,
     2 20000.,500000.,6H747-10,6H0/200B,4./
C*10  DC-9-15        FLAPS 15,20,50                            LDG WT= 65000
      DATA (APPTHR(I,10),I=1,14)/
     1 -2910.,122.,4000.,2285.,3665.,1975.,2875.,450.,450.,
     2 8000.,65000.,6HDC-9-1,6H5      ,2./
C*11  A-300B         FLAPS 5,18,35   (USE DC-10 DATA)          LDG WT=225000
      DATA (APPTHR(I,11),I=1,14)/
     1 -3210.,141.,9600.,3675.,12375.,6480.,11025.,2025.,1800.,
     2 20000.,225000.,6HA-300B,6H       ,2./
C*12  F-28-2000                      (USE SCALED DC-9 DATA)    LDG WT= 55000
      DATA (APPTHR(I,12),I=1,14)/
     1 -2125.,119.,4400.,2950.,3100.,1675.,2435.,330.,300.,
     2 6000.,55000.,6HF-28 M,6HK2000 ,2./
C
      DATA (GRNDA(I),I=1,8) / 2.0,2.5,3.5,6.0,8.5,9.8,10.0,10.0 /
      DATA NC/2/
      END
```

```
      FUNCTION CONTF(A)
      COMMON /CONST/ PI,NC
      CONTF=AMIN1(3.,6.*A/PI)
      RETURN
      END
```

```
      FUNCTION CONTG(D,NT)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TTD(88,14),DMIN(88)
C       DMIN CONTAINS THE SMALLER OF 1/2 THE MINIMUM TURN
C       RADIUS OR THE SHORTEST SEGMENT LENGTH FOR EACH TRACK
      R=D/DMIN(NT)
      CONTG=R*R
      RETURN
      END
```

```
      SUBROUTINE CURVE(*,*,R0,P,D,TAU,DB,IE)
      COMMON /CONST/ PI,NC
      DIMENSION P(5),R0(3),S(3)
C        COMPUTES DISTANCE TO A CURVED SEGMENT  (D)
C        COMPUTES DISTANCE ALONG THAT SEGMENT TO POINT OF CLOSEST APPROACH (TAU)
C        IE=0  IF MAXSEG IS KNOWN
C        P(1),P(2) ARE CENTER COORDINATES
C        P(3) IS RADIUS OF CURVATURE (SIGNED)
C        P(4) CONTAINS NUMBER OF RADIANS IN THE TURN
C        P(5) IS ANGLE BETWEEN THE CENTER,START OF THE TURN,AND POS, X-DIRECTION
C        ANGLE RANGES FROM -PI TO PI
      DB = 0.
      A=P(3)
      W=SGNR(A)
C        W IS NEGATIVE FOR RIGHT-HAND TURNS
      ALPHA=ATAN2(R0(2)-P(2),R0(1)-P(1))
      TAUX=(ALPHA-P(5))*W
C        REQUIRE TAUX TO BE IN THE RANGE 0-2PI
      IF(TAUX .LT. 0.) TAUX = TAUX+PI+PI
      THETA=P(4)
      IF(IE.NE.0) GO TO 20
 10   IF(TAUX .GT. THETA) RETURN 1
 20   CALL VSUB(S,P,R0)
      A=A*W
      TAU=A*TAUX
      D=VMAG(S)-A
      IF(D.GE.0.) GO TO 50
C        R0 IS ON THE INSIDE OF TURN
      D=-D
      DB=(D/A)*CONTF(THETA)
C        REQUIRE DB=0. @ BOUNDARIES OF SECTOR
      IF(TAUX.GE.THETA*.2) GO TO 40
      DB=DB*5.*TAUX/THETA
      GO TO 50
 40   IF(TAUX.LE.THETA*.8) GO TO 50
      DB=DB*5.*(1.-TAUX/THETA)
 50   IF(THETA.GT. PI ) RETURN 2
      RETURN
      END
```

```
      FUNCTION DELTA(A)
C        NOISE IS ASSUMED TO BE A FUNCTION OF CORRECTED NET THRUST,
C        GIVEN: AIRPLANE HEIGHT(A IN FT), DELTA RETURNS A PRESS ALT CORRECTION
C        FOR EFFICIENCY A SECOND ORDER BINOMIAL APPROXIMATION IS MADE
C            FOR THE EXPRESSION:
C
C                 DELTA=P/P0
C                      = (1. - (6.9406E-6)*A)**5.2044
C
      COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      Z=APALT+A
      DELTA=1.+((-3.64161E-5)+(5.36888E-10)*Z)*Z
      RETURN
      END
```

```
      FUNCTION DGTRD(DG)
      DATA CONST/0.017453/
      DGTRD=DG*CONST
      RETURN
      END
```

```
      SUBROUTINE ERRRIT
      DIMENSION STUFF(22)
      ENDFILE 3
      REWIND 3
 1001 FORMAT (22A6)
 10   READ (3,1001,END=100) STUFF
      WRITE (6,1001) STUFF
      GO TO 10
 100  REWIND 3
      RETURN
      END
```

```
      FUNCTION EXPOSD(RO)
      REAL NOPS
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TTD(88,14),DMIN(88)
      COMMON /DGNSTC/ TNEY1,NYS,IERROR,CONTRB(16),ICON
      COMMON /TRAFIK/ NFTT,ITT,ITPRAC(2000),NOPS(2000)
      COMMON /TGROUP/ DCOM(25),ITRG(88)
      DIMENSION ANOIS(16,100),RO(3)
      DATA NTST /0/
C
      IF(IERROR .NE. 0) WRITE (3,2047)
 2047 FORMAT (5H1 FLT,5X,2HID,6X,6HEPNL 1,3X,6HEPNL 2,2X,9HCOR. EPNL,
     1   3X,7HNEF SUM,2X,6HMAXSEG,2X,8HD TO TRK,2X,11HD ALONG TRK,3X,
     2   6H(2ND,),2X,10HGRND ATTEN,1X,8HALTITUDE,3X,4HFN/A,2X,8HVELOCITY
     3   )
      ASSIGN 72 TO ICX
      CALL ZERO(CONTRB,16)
      IF(ICON .NE. 1) GO TO 10
      ASSIGN 71 TO ICX
 10   CONTINUE
      AXE=0.
      NT=0
      IPRCF=0
      NGT = 0
      DO 100 KX=1,NFTT
      NTRK = AND(ITPRAC(KX),MASK(20))/4096
      NPRF = AND(ITPRAC(KX),MASK(19))/16
      NTG = AND(ITPRAC(KX),MASK(21))/524288
      MPRF = NPRF
      NONSTD=0
      IF(NPRF .GT. 100 .AND. PROF(10,4,NPRF) .NE. 0.) NONSTD = 1
C        LANDING PROFILES MUST BE NUMBERED .GT. 100
      IF(MPRF .GT. 100) MPRF = 100
      ITAC=AND(ITPRAC(KX),MASK(18)) +1
      IF(NTRK.EQ.NT)GO TO 40
      NT=NTRK
      IF(NTG.EQ.NGT)GO TO 35
      NGT=NTG
      NEWT=1
C        NEWT = 0, IFF DCOM .GT. DAT & DST FOR A PREVIOUS FLIGHT IN THE GROUP
 35   CONTINUE
      CALL WBT(RO,NT,NTST,MAXS,MAXT,DTA,DAT,DA,DTB,DST,DB)
 40   IF(NTG.EQ.0) GO TO 50
      IF(DAT .GT. DCOM(NTG) .OR. DST .GT. DCOM(NTG)) GO TO 50
      IF(NEWT.EQ.1) GO TO 49
      IF(NONSTD.EQ.1) GO TO 50
 41   ZLV=ANOIS(ITAC,MPRF)
      IF(ZLV .EQ. 0.) GO TO 50
      GO TO 65
 49   CALL ZERO(ANOIS,1600)
      NEWT=0
 50   I=ITR(NT)
      RWL=RL(I)
C        RWL WILL BE CHANGED IN PROFDA
      MPRF=NPRF
      CALL PREFR(MPRF,DAT,RWL,HT,TH,V,ITAC,NT,MAXS)
```

```
      DT=DTA
      IF(RWL.GT.,01)DT=SQRT(DT*DT+RWL*RWL)
      SLR=SQRT(DT*DT+HT*HT)
      IF(SLR .LE. 0.) GO TO 200
60    GA = ATTENG(DT,HT,ITAC,TH,V)
      XLV = ACNOIS(ITAC,SLR,TH) + GA + DA
      IF(XLV .GT. 300.) GO TO 200
      ZLV = XLV
      IF(MAXT    .EQ.0) GO TO 63
      RWL = RL(I)
      CALL PREPR(MPRF,DST,RWL,ALT,PWR,VV,ITAC,NT,MAXT)
      DS=DTB
      IF(RWL.GT.,01)DS=SQRT(DS*DS+RWL*RWL)
      SLR=SQRT(DS*DS+ALT*ALT)
      IF(SLR .LE. 0.) GO TO 200
      YLV = ACNOIS(ITAC,SLR,PWR) + ATTENG(DS,ALT,ITAC,PWR,VV) + DB
      IF(YLV .GT. 300.) GO TO 200
      ZLV = 10. * ALOG10(10.**(XLV/10.) + 10.**(YLV/10.))
   63 IF(NONSTD.EQ.1) GO TO 65
      IF(NTG.NE.0.AND.DCOM(NTG).GE.DAT.AND.DCOM(NTG).GE.DST)
     1   ANOIS(ITAC,MPRF) = ZLV
65    ZLV = ZLV + NOPS(KX)
      GO TO ICX,(71,72)
71    CONTRB(ITAC) = CONTRB(ITAC) + 10.**(ZLV/10.)
72    CONTINUE
      AXE = AXE + 10.**(ZLV/10.)
      IF( IERROR .EQ. 0 ) GO TO 100
C
      XLC = 0.
      IF(CONTRB(ITAC) .NE. 0.) XLC = 10. * ALOG10(CONTRB(ITAC))
      XLL=10.*ALOG10(AXE)-88.01
      ST=1H
      IF(NTG.EQ.0) GO TO 75
      IF(DCOM(NTG) .LT. DAT .OR. DCOM(NTG) .LT. DST) GO TO 75
      ST = 1H*
      IF(NONSTD.EQ.1) ST=1HN
C
75    IF(MAXT     .EQ. 0) YLV = 0.
80    WRITE (3,2048) KX,NTG,NT,MPRF,ITAC,XLV,YLV,ZLV,XLL,MAXS,
     1   ST,MAXT     ,DT,DAT,DST,GA,HT,TH,V
 2048 FORMAT (1X,I4,1X,2I2,I3,I2,1X,2E9.4,2E11.6,I3,A1,I2,E12.6,2E11.6,
     1   E10.4,2E9.4,E8.3)
      IF(DA.EQ.0. .AND. DB.EQ.0.) GO TO 100
      WRITE(3,2046) DA,DB,ALT,PWR,VV
 2046 FORMAT(62X,12H  DA=; DB=; ,2E11.6,10X,2E9.4,E8.3)
  100 CONTINUE
C
  101 XTN=10.*ALOG10(AXE)
      TNEY1 = XTN - 88.01
      EXPCS7 = TNEY1
      IF(IERROR .NE. 0) WRITE (3,2049) NYS,TNEY1,XTN,RO(1),RO(2)
 2049 FORMAT(/,I3,11X,2E12.6,64X,2E12.6,/)
      IF(ICON .NE. 1) RETURN
      DO 150 I=1,16
      IF(CONTRB(I) .EQ. 0.) GO TO 150
      CONTRB(I) = 10. * ALOG10(CONTRB(I))
150   CONTINUE
      RETURN
200   WRITE(3,2050) KX,RO(1),RO(2),SLR
2050  FORMAT( /,1X,I4,8X,3HRO=,2E9.4,7X,4HSLR=,E11.6)
      EXPCS3=100000000.
      RETURN
      END
```

```
      FUNCTION EXPOSE(RO,NTST1)
      REAL NOPS
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /BK/ TOL,TOL2,VAL,XVAL,TNEY1,NYS,IERROR,TOLLOP,TOLSIG
      COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TTD(88,14),DMIN(88)
      COMMON /TRAFIK/ NFTT,ITT,ITPRAC(2000),NOPS(2000)
      COMMON /TGROUP/ DCOM(25),ITRG(88)
      DATA NTST /3/
      DIMENSION ANOIS(16,100),TABLE(2000)
      DIMENSION RO(3),IRRAY(2000)
C
C        NTST=1  USE ALL FLIGHTS TO COMPUTE NOISE EXPOSURE
C        NTST=2  USE SIGNIFICANT FLIGHTS FROM LAST CALL TO COMPUTE EXPOSURE
C
      NYS=NYS+1
C
      IF(IERROR .GT. 1) WRITE(6,2047)
 2047 FORMAT (2X,3HFLT,5X,2HID,6X,6HEPNL 1,3X,6HEPNL 2,2X,9HCOR. EPNL,
     1   3X,7HNEF SUM,2X,6HMAXSEG,2X,8HD TO TRK,2X,11HD ALONG TRK,3X,
     2   6H(2ND.),2X,10HGRND ATTEN,1X,8HALTITUDE,3X,4HFN/A,2X,8HVELOCITY
     3   )
      IF(NTST1 .EQ. 1) GO TO 10
      IF(NTST.NE.1) GO TO 10
C        CHOOSE SIGNIFICANT FLIGHTS ON NEXT CALL AFTER CALL WITH NTST=1
      CALL SIFT(TABLE,IRRAY,NFTT,ITT,XTN,TNEY1,TOL2)
      XVAL=VAL-XTN+TNEY1
      TNEY1=TNEY1-88.01
 10   NTST=NTST1
      AXE=0.
      NT = 0
      IPROF=0
      NGT = 0
      ND=ITT
      IF(NTST.EQ.1) ND=NFTT
      DO 100 KY=1,ND
      KX=KY
      IF(NTST.NE.1) KX=IRRAY(KY)
      NTRK = AND(ITPRAC(KX),MASK(20))/4096
      NPRF = AND(ITPRAC(KX),MASK(19))/16
      NTG = AND(ITPRAC(KX),MASK(21))/524288
      MPRF = NPRF
      NONSTD=0
      IF(NPRF .GT. 100 .AND. PROF(10,4,NPRF) .NE. 0.) NONSTD = 1
C        LANDING PROFILES MUST BE NUMBERED .GT. 100
      IF(MPRF .GT. 100) MPRF = 100.
      ITAC=AND(ITPRAC(KX),MASK(18)) +1
      IF(NTRK .EQ. NT) GO TO 40
      NT = NTRK
      IF(NTG .EQ. NGT) GO TO 35
      NGT=NTG
      NEWT=1
C        NEWT = 0, IFF DCOM .GT. DAT & DST FOR A PREVIOUS FLIGHT IN THE GROUP
 35   CALL HBT(RO,NT,NTST,MAXS,MAXT,DTA,DAT,DA,DTB,DST,DB)

 40   IF(NTG.EQ.0) GO TO 50
      IF(DAT .GT. DCOM(NTG) .OR. DST .GT. DCOM(NTG)) GO TO 50
      IF(NEWT.EQ.1) GO TO 49
```

```
      IF(NONSTD.EQ.1) GO TO 50
   41 ZLV=ANOIS(ITAC,MPRF)
      IF(ZLV .EQ. 0.) GO TO 50
      GO TO 65
   49 CALL ZERO(ANOIS,1600)
      NEWT=0
   50 I=ITR(NT)
      RWL=RL(I)
C        RWL WILL BE CHANGED IN PROFDA
      MPRF=NPRF
      CALL PREPR(MPRF,DAT,RWL,HT,TH,V,ITAC,NT,MAXS)
      DT=DTA
      IF(RWL.GT..01)DT=SQRT(DT*DT+RWL*RWL)
      SLR=SQRT(DT*DT+HT*HT)
      ST = 1HA
      IF(SLR .LE. 0.) GO TO 200
   60 GA = ATTENG(DT,HT,ITAC,TH,V)
      XLV = ACNOIS(ITAC,SLR,TH) + GA + DA
      ST = 1HB
      IF(XLV .GT. 300.) GO TO 200
      ZLV = XLV
      IF(MAXT .EQ. 0) GO TO 63
      RWL = RL(I)
      CALL PREPR(MPRF,DST,RWL,ALT,PWR,VV,ITAC,NT,MAXT)
      DS=DTB
      IF(RWL.GT..01)DS=SQRT(DS*DS+RWL*RWL)
      SLR = SQRT(DS*DS + ALT*ALT)
      ST = 1HC
      IF(SLR .LE. 0.) GO TO 200
      YLV = ACNOIS(ITAC,SLR,PWR) + ATTENG(DS,ALT,ITAC,PWR,VV) + DB
      ST = 1HD
      IF(YLV .GT. 300.) GO TO 200
      ZLV = 10. * ALOG10(10.**(XLV/10.) + 10.**(YLV/10.))
   63 IF(NONSTD.EQ.1) GO TO 65
      IF(NTG.NE.0.AND.DCOM(NTG).GE.DAT.AND.DCOM(NTG).GE.DST)
     1   ANOIS(ITAC,MPRF) = ZLV
   65 ZLV = ZLV + NOPS(KX)
      TABLE(KX) = ZLV
      AXE = AXE + 10.**(ZLV/10.)
      IF(IERROR .LT. 2) GO TO 100
C
C        ERROR DUMP FOR DIAGNOSTIC EVALUATION
C
      XLL=10.*ALOG10(AXE)-88.01
      ST=1H
      IF(NTG.EQ.0) GO TO 75
      IF(DCOM(NTG) .LT. DAT .OR. DCOM(NTG) .LT. DST) GO TO 75
      ST = 1H*
      IF(NONSTD.EQ.1) ST=1HN
C
   75 IF(MAXT .EQ. 0) YLV = 0.
   80 WRITE(6,2048) KX,NTG,NT,NPRF,ITAC,XLV,YLV,ZLV,XLL,
     1 MAXS,ST,MAXT,DT,DAT,DST,GA,HT,TH,V
 2048 FORMAT (1X,I4,1X,2I2,I3,I2,1X,2E9.4,2E11.6,I3,A1,I2,E12.6,2E11.6,
     1    E10.4,2E9.4,E8.3)
      IF(DA.EQ.0. .AND. DB.EQ.0.) GO TO 100
      WRITE(6,2046) DA,DB,ALT,PWR,VV
 2046 FORMAT(62X,12H  DA=( DB=) ,2E11.6,10X,2E9.4,E8.3)
  100 CONTINUE
C
```

```
 101 XTN=10.*ALOG10(AXE)
     EXPOSE=XTN-88.01
     IF(IERROR .NE. 0) WRITE(6,2049) NYS,EXPOSE,TNEY1,RO(1),RO(2)
2049 FORMAT(/,I3,11X,2E12.6,64X,2E12.6,/)
     RETURN
200  EXPOSE=300.
     IF(IERROR .LT. 1) RETURN
     WRITE (6,2049) NYS,EXPOSE,TNEY1,RO(1),RO(2)
     IF(IERROR .LT. 2) RETURN
     WRITE (6,2048) KX,NTG,NT,NPRF,ITAC,XLV,YLV,ZLV,XLL,
    1               MAXS,ST,MAXT,DT,DAT,DST,GA,HT,TH,V
     IF(     (DA .NE. 0.0)
    1   .OR.(DB .NE. 0.0)) WRITE (6,2046) DA,DB,ALT,PWR,VV
     RETURN
     END
```

```
      SUBROUTINE FIRST(RO,NEY1)
      REAL NEY1
      COMMON /GRADNT/ GRADU(3),DERIV
      COMMON /BK/ TOL,TOL2,VAL,XVAL,TNEY1,NYS,IERROR
      DIMENSION RO(3),RA(3)
C
C        INITIALIZE ITERATIONS COUNTER (NYS) AND START PT VECTOR (RA)
C
      CALL VTRN(RA,RO)
   10 NYS=0
C        RA IS THE INPUT START POINT
      CALL VTRN(RO,RA)
C
C        THE FOLLOWING IS A NORMAL LOOP POINT WHEN ITERATING TO FIND
C        A POINT ON THE CONTOUR. (NYS) COUNTS THE NO. OF ITERATIONS.
C
C        THE FOLLOWING CALL OBTAINS THE NOISE EXPOSURE AT A POINT (RO),
C        THE MAGNITUDE OF THE GRADIENT (DERIV) AT THE POINT, AND A
C        UNIT GRADIENT VECTOR (GRADU)
C
 80   NEY1=EXPOSE(RO,1)
C
C        THE FOLLOWING CHECKS TO SEE IF THE NOISE EXPOSURE (NEY1) IS
C        ON THE CONTOUR (VAL).
C
      IF(ABS(NEY1-VAL).LE.TOL) RETURN
C
C        IF 26 ITERATIONS FAIL, PRINT A MESSAGE AND DELETE THE CONTOUR.
C
      IF(NYS .GT. 75) GO TO 86
      CALL GRADIE(RO)
C
C        DO SAME IF THE MAGNITUDE OF THE GRADIENT IS ZERO.
C
      IF(DERIV.GT.0.) GO TO 90
      WRITE(6,85)
   85 FORMAT(23H THE DERIVATIVE IS ZERO ,/)
   86 WRITE(6,87)
   87 FORMAT(/,29H CANNOT FIND THE FIRST POINT,,/)
      IF(IERROR-2) 83,82,81
 81   IERROR=2
 82   RETURN
 83   IERROR=2
      GO TO 10
C
C        THE FOLLOWING IS THE NORMAL CONTINUATION WHEN ANOTHER
C        ITERATION IS NEEDED TO FIND A POINT ON THE CONTOUR.
C
   90 CONTINUE
C
C                                         . CALCULATE THE APPROXIMATE
C        NECESSARY DISTANCE TO MOVE THE POINT (H) FOR THE NEXT GUESS,
C        AND ADJUST THE X- AND Y-COORDINATES (RO(1) AND RO(2)) ALONG
C        THE GRADIENT VECTOR IN THE APPROPRIATE DIRECTION (SIGN OF H).
C
      H=(VAL-NEY1)/DERIV
      RO(1)=RO(1)+H*GRADU(1)
      RO(2)=RO(2)+H*GRADU(2)
      GO TO 80
      END
```

```
      FUNCTION GENFN1(Y,X,XX,N,I)
C         GENFN1 PERFORMS A LINEAR INTERPOLATION ON A TABLE Y
C            X CONTAINS TABLE VALUES OF INDEPENDENT VARIABLE
C           XX IS THE POINT AT WHICH THE FUNCTION VALUE IS DESIRED,
C            Y MUST BE STORED IN ASCENDING VALUES OF X.
C            I RETURNS THE INDEX OF THE LAST ELEMENT OF X NOT .GT. XX
C             NO TWO NUMBERS OF X MAY BE EQUAL,
C         I RANGES FROM 1 TO N-1
      DIMENSION Y(N),X(N)
      IF(I .GE. N) I = N-1
      IF(X(I).LT.XX) GO TO 10
      IF(I.EQ.1) GO TO 25
      KK = I
      DO 5 J=3,KK
      I = I-1
      IF(X(I).LE.XX) GO TO 25
 5    CONTINUE
      I=1
      GO TO 25
 10   KK=I+1
      NN=N-1
      DO 20 J=KK,NN
      IF(X(J).GE.XX) GO TO 25
      I = J
 20   CONTINUE
      I=NN
 25   GENFN1=Y(I)+(Y(I+1)-Y(I))*(XX-X(I))/(X(I+1)-X(I))
      RETURN
      END
```

```
      FUNCTION GENFN2(Z,X,Y,XX,YY,M,N,I,J)
C         GENFN2 DOES A 2-D LINEAR INTERPOLATION ON MATRIX Z
C             X  CONTAINS VALUES OF 1ST INDEP. VAR. DIMEM M
C             Y  CONTAINS VALUES OF 2ND INDEP. VAR. DIMEN N
C           XX,YY  POINT AT WHICH FUNCTIONAL VALUE IS DESIRED,
C         ZERO VALUES OF Y ARE IGNORED
C         I RANGES FROM 1 TO M-1
C         J RANGES FROM 1 TO N-1
C         NO TWO VALS OF X OR Y MAY BE EQUAL.
      DIMENSION Z(M,N),X(M),Y(N)
      IF(X(I).LT.XX) GO TO 10
      IF(I.EQ.1) GO TO 30
      KK = I
      DO 5 K=3,KK
      I = I-1
      IF(X(I).LE.XX) GO TO 30
 5    CONTINUE
      I=1
      GO TO 30
 10   KK=I+1
      MM=M-1
      DO 20 K=KK,MM
      IF(X(K).GE.XX) GO TO 30
      I = K
 20   CONTINUE
      I=MM
 30   IF(Y(J) .LE. 0.) J = 1
      IF(Y(J) .GT. YY) GO TO 40
      IF(J.EQ.1) GO TO 50
      KK = J
      DO 35 K=3,KK
      J = J-1
      IF(Y(J).GE.YY) GO TO 50
 35   CONTINUE
      J=1
      GO TO 50
 40   KK=J+1
      NN=N-1
      J=J-1
      DO 45 K=KK,NN
      IF(Y(K).EQ.0.) GO TO 50
      J=K-1
      IF(Y(K).LE.YY) GO TO 50
 45   CONTINUE
      IF(Y(N).NE.0.) J=NN
 50   XGRAD=(XX-X(I))/(X(I+1)-X(I))
      ZY1=Z(I,J)+(Z(I+1,J)-Z(I,J))*XGRAD
      ZY2=Z(I,J+1)+(Z(I+1,J+1)-Z(I,J+1))*XGRAD
      YGRAD=(YY-Y(J))/(Y(J+1)-Y(J))
      GENFN2=ZY1+(ZY2-ZY1)*YGRAD
      RETURN
      END
```

```
      SUBROUTINE GRADIE(A)
      COMMON /GRADNT/ GRADU(3),GRADMG
C
C        SUBROUTINE GRADIE COMPUTES THE GRADIENT OF THE NOISE EXPOSURE
C        FUNCTION AT POINT 'A'. IT DOES THIS BY COMPUTING NOISE AT TWO
C        POINTS 5FT FROM 'A' IN MUTUALLY PERPENDICULAR DIRECTIONS. THE
C        CONTOUR IS COMPUTED SO THAT THE GRADIENT IS ALWAYS ON THE RIGHT
C        AS THE CONTOUR IS TRAVERSED.
C        OUTPUTS:
C             GRADU =UNIT VECTOR IN DIRECTION OF GRADIENT
C             GRADMG=GRADIENT MAGNITUDE
C
      DIMENSION A(3)
      COMMON /BK/ TOL,TOL2,VAL,XVAL,TNEY1,NYS,IERROR
      REAL NEY2,NEY3
      DATA M2/2/
      A(1)=A(1)+5.
      NEY2=EXPOSE(A,M2)
      A(1)=A(1)-5.
      A(2)=A(2)+5.
      NEY3=EXPOSE(A,M2)
      A(2)=A(2)-5.
      GRADU(1) = (NEY2-TNEY1)/5.
      GRADU(2) = (NEY3-TNEY1)/5.
      GRADMG = VMAG(GRADU)
      IF(GRADMG .EQ. 0.) RETURN
      GRADU(1) = GRADU(1)/GRADMG
      GRADU(2) = GRADU(2)/GRADMG
      RETURN
      END
```

```
C          MAIN PROGRAM                              ** GRID **
       COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
       COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
      1               TTD(88,14),DMIN(88)
       COMMON /DGNSTC/ TNEY1,NYS,IERROR,CONTRB(16),ICON
       COMMON /TRAFIK/ NFTT,ITT,ITPRAC(2000),NOPS(2000)
       COMMON /RESALT/ NAR(88),ENDR(25,85),STR(25,85),ICBT(25),GCBN(25),
      1               ICBNCO(16),ENDALT(25,85),ORGSTR(25),ORGEND(25)
       COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
       COMMON /SCRACH/ BUF(30)
       COMMON /TITLE/ ATITLE(23),APT(4),ID,ITP
       COMMON /NOISE/  SLRNG(8),GRNDA(8),PWRS(6,16),ANOISE(8,6,16)
       COMMON /CONST/ PI,NC
       COMMON /TGROUP/ DCOM(25),ITRG(88)
       COMMON /WIND/ VEL(25),DIR(25)
       INTEGER PLT ,PTS,POP,    DTA,BLANK,END
       DATA PLT /4HPLOT/,MAT/4HMAT /,PTS/4HPTS /,POP/4HPOP /,
      1   DTA/4HDTA /,BLANK/4H    /,END/4HEND /
       DATA IPLT /0/,ICON/0/,ATITLE/23*6H      /
       IERROR=0
C
C         STORE LOGS OF SLANT RANGES IN SLRNG
       DO 3 I=1,8
3      SLRNG(I)=ALOG10(SLRNG(I))
C
C         SET TRACK GROUP NUMBERS TO ZERO
C         SET WIND VELOCITY TO ZERO
C         SET ALTITUDE RESTRICTION NUMBERS TO ZERO
C         INITIALIZE AIRPORT ALTITUDE TO ZERO AND TEMPERATURE TO 288 DEG K.
       APALT=0.
       APTEMP=288.
       CALL ZERO(NAR,88)
       CALL ZERO(ITR,88)
       CALL ZERO(ITRG,88)
       CALL ZERO(VEL,25)
1      READ (5,10) IST,IPSIZ,PSCALE,(BUF(I),I=1,12)
   10 FORMAT(A4,I2,F6.0,11A6,A2)
      WRITE (6,12) IST,IPSIZ,PSCALE,(BUF(I),I=1,12)
   12 FORMAT(1X,A4,I2,F6.0,11A6,A2)
13    IF(IST .NE. DTA) GO TO 15
      CALL READIN(NRW)
      IF(NRW .NE. 0) GO TO 1
      WRITE (6,1003)
1003  FORMAT (15H0ERROR IN INPUT
      CALL EXIT
15    IF(IST .EQ. BLANK) GO TO 1
      IF(IST .EQ. END) GO TO 110
      READ (5,100) ID,ITP,(APT(I),I=1,4),(ATITLE(I),I=1,23)
100   FORMAT (A4,A2,12A6,A2,/,13A6,A2)
      WRITE (6,1001) ID,ITP,(APT(I),I=1,4),(ATITLE(I),I=1,23)
1001  FORMAT (1X,A4,A2,12A6,A2,/,1X,13A6,A2)
      IF(IST .NE. MAT) GO TO 120
      CALL MATRIX
      WRITE (6,1002)
1002  FORMAT (1H1)
      GO TO 1
120   IF(IST .NE. PTS) GO TO 130
      CALL POINTS
      WRITE (6,1002)
      GO TO 1
130   GO TO 1
110   CALL EXIT
      END
```

```
      SUBROUTINE GRPRD(*,ICNT)
      COMMON /TGROUP/ DCOM(25),ITRG(88)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TTD(88,14),DMIN(88)
      COMMON /SCRACH/ ICMT(30)
C
C        READS TRACK GROUP INFORMATION
C        THIS DATA MUST PRECEDE ANY MIX DATA
C
      WRITE(6,720)
 720  FORMAT(17H TRACK GROUP DATA )
      DO 725 J=1,88
 725  ITRG(J) = 0
      DO 750 I=1,ICNT
      READ(5,727)NG,D,(ICMT(K),K=1,16)
 727  FORMAT (I2,1X,F7.0,16I4)
      WRITE(6,728)NG,D,(ICMT(K),K=1,16)
 728  FORMAT(19H TRACK GROUP NUMBER ,I4,F8.2,3X,16I4)
      DCOM(NG) = D*6076.115
      J=ICMT(1)
      IR=ITR(J)
      DO 740 J=1,16
      IF(ICMT(J) .EQ. 0) GO TO 750
      JJ=ICMT(J)
C        CHECK TO BE SURE ALL TRACKS IN GROUP ARE ON SAME RUNWAY
      IF(ITR(JJ) .NE. IR) RETURN 1
 740  ITRG(JJ)=NG
 750  CONTINUE
      RETURN
      END
```

```
      SUBROUTINE HBT(RO,NT,NTST,MAX1,MAX2,DT,DAT,DA,DS,DAS,DB)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TTD(88,14),DMIN(88)
      COMMON /CONST/ PI,NC
      DATA BIG/0377777777777/
      DIMENSION SA(3),RO(3)
      DIMENSION MAXS(88),MAXT(88)
      DA=0.
      DB=0.
      DAB = 0.
      DAS=0.
      DT=BIG
      DS=BIG
      DM=DMIN(NT)
      IF(NTST .EQ. 2) GO TO 2000
C        FIND CLOSEST & NEXT TO CLOSEST SEGMENTS
      NS=AND(MASK(18),ITSEG(NT))
      MAX2=0
      K=1
      CALL STRAIT($50,RO,PARAM(1,K,NT),D,X,0)
      IF(PARAM(4,2,NT).LE.PI) K=2
      MAX1=1
      GO TO 660
 50   IF(X.GT.0.) GO TO 800
      IF(PARAM(4,2,NT).LE.PI) K=2
      MAX1=1
      DAT=0.
      CALL VSUB(SA,PARAM(1,1,NT),RO)
      DT=VMAG(SA)
      GO TO 800
 100  K=K+1
      M=K
      IF(AND(MASK(K),ITSEG(NT)).NE.0) GO TO 300
      DAB = 0.
      CALL STRAIT($800,RO,PARAM(1,K,NT),D,X,0)
      IF(PARAM(4,K+1,NT).LE.PI) K=K+1
      GO TO 450
 300  CALL CURVE($800,$450,RO,PARAM(1,K,NT),D,X,DAB,0)
 400  K=K+1
 450  IF(D.LT.DT) GO TO 600
      IF(D.GE.DS) GO TO 800
      DS=D
      MAX2=M
      DAS=X
      DB = DAB
      GO TO 800
 600  IF(MAX1.EQ.0) GO TO 650
      DS=DT
      DB = DA
      MAX2=MAX1
      DAS=DAT
 650  MAX1=M
 660  DT=D
      DA = DAB
      DAT=X
 800  IF(K.LT.NS) GO TO 100
      IF(MAX2.EQ.0) GO TO 9900
      IF(DS-DT .LT. DM) GO TO 3500
```

```
      MAX2=0
      DAS=0.
      GO TO 9900
C        CLOSEST SEGMENT IS KNOWN
 2000 MAX1 = MAXS(NT)
      MAX2 = MAXT(NT)
      IF(AND(ITSEG(NT),MASK(MAX1)) .EQ. 0) GO TO 2400
      CALL CURVE($3000,$3000,RO,PARAM(1,MAX1,NT),DT,DAT,DA,1)
      GO TO 3000
 2400 CALL STRAIT($3000,RO,PARAM(1,MAX1,NT),DT,DAT,1)
 3000 IF(MAX2.EQ.0) GO TO 9900
C        NOISE FROM A FARTHER SEGMENT IS SIGNIFICANT
 3001 IF(AND(ITSEG(NT),MASK(MAX2)).EQ.0) GO TO 3400
      CALL CURVE($3500,$3500,RO,PARAM(1,MAX2,NT),DS,DAS,DB,1)
      GO TO 3500
 3400 CALL STRAIT($3500,RO,PARAM(1,MAX2,NT),DS,DAS,1)
C        DEFINE D AS THE DIFFERENCE BETWEEN THE NEXT TO CLOSEST
C        AND CLOSEST DISTANCES TO THE TRACK
 3500 D=DS-DT
      XI=0.
C        USE G TO SMOOTH NOISE FUNCTION AT BOUNDARY OF
C        ZONE WHERE NOISE FROM TWO SEGMENTS IS CONSIDERED
      G=CONTG(D,NT)
      IF(ABS(MAX1-MAX2).LE.2) GO TO 4000
C        THERE ARE SEVERAL SEGMENTS BETWEEN THE TWO CLOSEST SEGMENTS
C        ADD NOISE LEVELS FROM THESE TWO SEGMENTS
 3600 DB=DB-20.*G
      GO TO 9800
C        DA AND DB = ZERO ONLY FOR STRAIGHT SEGMENTS  & OUTSIDE TURNS
 4000 IF(DA.GT.0. .AND. DB.GT.0.) GO TO 3600
C        COMPUTE LENGTH OF CLOSEST SEGMENT
      XL1=PARAM(3,MAX1,NT)
      IF(AND(MASK(MAX1),ITSEG(NT)) .NE. 0) XL1=ABS(XL1)*PARAM(4,MAX1,NT)
C        COMPUTE THE LEGNTH OF SECONDARY SEGMENT
      XL2=PARAM(3,MAX2,NT)
      IF(AND(MASK(MAX2),ITSEG(NT)).NE.0) XL2=ABS(XL2)*PARAM(4,MAX2,NT)
C        INFLUENCE OF SECOND SEGMENT MUST DISAPPEAR NEAR
C        BOUNDARY OF CURVED SEGMENT
      DX=DM*0.333
      YY=DAT
      IF(MAX1.LT.MAX2) YY=XL1-YY
      XX=DAS
      IF(MAX2.LT.MAX1) XX=XL2-DAS
      IF(ABS(MAX1-MAX2).EQ.2) GO TO 4500
C        THE TWO CLOSEST SEGMENTS ARE ADJACENT, THEREFORE,
C        THE CLOSEST SEGMENT IS A TURN OF OVER 180 DEGREES
      IF(XX.GT.DX) GO TO 3600
      XI=1.
      F=0.
      GO TO 4800
C        THERE IS EXACTLY 1 SEGMENT BETWEEN THE CLOSEST TWO
 4500 MID=(MAX1+MAX2)/2
C        XI=0 UNLESS CLOSEST SEGMENT IS A CURVE
      IF(DA.GT.0.) XI=1.
C        FUNCTION F DETERMINES MAGNITUDE OF NOISE ALONG ANGLE BISECTOR
      F=3.-CONTF(PARAM(4,MID,NT))
      IF(XX.GE.DX) GO TO 5000
      F=F*XX/DX
C        INFLUENCE OF SECOND SEGMENT MUST NOT DISSAPPEAR AT BISECTOR.
 4800 RX = AMAX1(XI,D/(D+YY),D/(D+XX))
```

```
      DB=DB-20.*RX*(DX-XX)/DX
      GO TO 8000
C         SMOOTH NOISE FUNCTION FOR CONTINUITY NEAR FIRST
C         TURN TO EITHER SIDE OF CENTER TURN
 5000 IF(AND(MASK(MID),ITSEG(NT)).EQ.0) GO TO 3600
      IF(PARAM(4,MID,NT).GE.PI/2.) GO TO 3600
      IF(XL1.GT.XL2) GO TO 5500
C         LEGNTH OF THE CLOSEST SEGMENT IS SHORTER
      IF(MAX1 .GT. MAX2) GO TO 5200
      IF(DAT .LT. DX) F=F*DAT/DX
      GO TO 8000
 5200 XX=XL1-DAT
      IF(XX .LT. DX) F=F*XX/DX
      GO TO 8000
C         LEGNTH OF THE FARTHER SEGMENT IS SHORTER
 5500 IF(MAX2 .GT. MAX1) GO TO 5800
      IF(XL2 .LT. DX) F=F*DAS/DX
      GO TO 8000
 5800 XX=XL2-DAS
      IF(XX .LT.DX) F=F*XX/DX
 8000 DA=DA-F*(1-G)
      DB=DB-20*G*F
C
C         CALCULATION OF DISTANCE ALONG TRACK FROM FAR END OF THE
C         RUNWAY TO POINT OF CLOSEST APPROACH
C
 9800 IF(MAX2.EQ.1) GO TO 9900
      DAS=DAS+TTD(NT,MAX2-1)
 9900 IF(NTST .NE. 1) GO TO 9901
      MAXS(NT) = MAX1
      MAXT(NT) = MAX2
 9901 IF(MAX1 .EQ. 1) RETURN
      DAT=DAT+TTD(NT,MAX1-1)
      RETURN
      END
```

```
      SUBROUTINE HELG(KXX,NSX,XLX,UNIT,XR1,A)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1                TTD(88,14),DMIN(88)
      DIMENSION RC(3),UNIT(3),XR1(3)
C        A   = RADIUS OF CURVATURE
C        RC  = CENTER COORDINATES
C        XLX= ARC LENGTH
C        ALP= RADIANS OF ARC
      W = -SGNR(A)
      A=-W*A
      X=UNIT(1)*W
      Y=UNIT(2)*W
      DELT=ATAN2(-X,Y)
      RC(1)=XR1(1)-A*Y
      RC(2)=XR1(2)+A*X
      ALP=XLX/A
      PARAM(1,NSX,KXX)=RC(1)
      PARAM(2,NSX,KXX)=RC(2)
      PARAM(3,NSX,KXX)=A*W
      PARAM(4,NSX,KXX)=ALP
      PARAM(5,NSX,KXX)=DELT
      Q1=COS(W*ALP+DELT)
      Q2=SIN(W*ALP+DELT)
      XR1(1)=RC(1)+A*Q1
      XR1(2)=RC(2)+A*Q2
      XR1(3)=0.
      UNIT(1)=-W*Q2
      UNIT(2)=W*Q1
      RETURN
      END
```

```
      SUBROUTINE MACHRD(*)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
C        READS INDICATORS INTO MATCH
C        CORRELATES NOISE CURVES WITH PARAMETERS IN APPTHR
      WRITE(6,10)
 10   FORMAT(17H MATCH INDICATORS)
      READ(5,11)(MATCH(I),I=1,16)
 11   FORMAT(16I5)
      DO 100 I=1,16
      K=MATCH(I)
      IF(K.EQ.0) GO TO 100
      IF(K.LT.0 .OR. K.GT.12) RETURN 1
      WRITE(6,12) I,APPTHR(12,K),APPTHR(13,K)
 12   FORMAT(9H A/C TYPE,I3,1H=,1X,2A6)
 100  CONTINUE
      RETURN
      END
```

```
      SUBROUTINE MATRIX
      COMMON /DGNSTC/ TNEY1,NYS,IERROR,CONTRB(16),ICON
      DIMENSION PTS(3,10),ESION(10)
      READ (5,1001) XS,YS,STEPX,STEPY,NX,NY,IERROR,ICON
 1001 FORMAT (4F10.0,4I5)
      WRITE (6,1004) XS,YS,STEPX,STEPY,NX,NY,IERROR,ICON
 1004 FORMAT (13H MATRIX DATA ,4(1X,E12.6),4(5X,I5))
C
C        INITIALIZATION
C
      X = XS
      MX = 10
      LINE = 51
      KX = 10
      IF(KX .GT. NX) MX = MOD(NX,10)
C
C        START COMPUTATIIN
C
 10   DO 100 IY=1,NY
      Y = YS + STEPY*(IY-1)
      DO 15 J=1,MX
 15   PTS(2,J) = Y
      IF(LINE .LT. 50) GO TO 30
      LINE = 4
      DO 20 J=1,MX
      PTS(1,J) = X + STEPX*(J-1)
      PTS(3,J) = 0.
 20   CONTINUE
      WRITE (6,1002) (PTS(1,I),I=1,MX)
      WRITE (6,1005)
 1002 FORMAT (1H1,13X,10(1X,F10.2),/)
 1005 FORMAT                            (12X,111(1H*),/,12X,1H*)
 30   CONTINUE
      DO 40 J=1,MX
      ESION(J) = EXPOSD(PTS(1,J))
      IF(ICON .NE. 1) GO TO 40
      EPNLS = ESION(J) + 88.01
      WRITE(4) PTS(1,J),PTS(2,J),EPNLS,(CONTRB(I),I=1,16)
 40   CONTINUE
      WRITE (6,1003) Y,(ESION(I),I=1,MX)
 1003 FORMAT (1X,F10.2,3H * ,10(2X,F8.3,1X))
      WRITE (6,1006)
 1006 FORMAT (12X,1H*)
      LINE = LINE + 2
 100  CONTINUE
      CALL ERRRIT
 150  CONTINUE
      IF(ICON .NE. 1) GO TO 200
      CALL RITCON
 200  IF(KX .GE. NX) RETURN
      KX = KX + 10
      IF(KX .GT. NX) MX = MOD(NX,10)
      X = X + STEPX*10.
      LINE = 51
      GO TO 10
      END
```

```
      SUBROUTINE MIXRD(*,FAC,IDUMP)
      REAL NOPS
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1                TTD(88,14),DMIN(88)
      COMMON /TGROUP/ DCOM(25),ITRG(88)
      COMMON /TRAFIK/ NFTT,ITT,ITPRAC(2000),NOPS(2000)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /SCRACH/ICMT(25),IV(4),OPS(8),DOMT(25),NDOMT(25),
     1 DUF(5),BUF(5)
      DIMENSION TPER(88),PERL(88)
C
C        READS RAW MIX DATA
C
      WRITE(6,211)
  211 FORMAT(/,9H MIX DATA,/)
      IF(FAC.EQ.0.) FAC=1.
      IF(FAC.LT.0.) GO TO 219
      K=0
      TOPS=0.
      GO TO 220
 219  K=NFTT
C
C         UNLOG NOPS TO ADD EXTRA STUFF
      DO 218 I=1,K
 218  NOPS(I) = 10.**(NOPS(I)/10.)
      FAC=-FAC
  220 READ(5,230) IV(1),OPS(1),OPS(2),IV(2),OPS(3),OPS(4),IV(3),OPS(5),
     1               OPS(6),IV(4),OPS(7),OPS(8)
  230 FORMAT(4(I9,1X,2F5.0))
      WRITE(6,231) IV(1),OPS(1),OPS(2),IV(2),OPS(3),OPS(4),
     1               IV(3),OPS(5),OPS(6),IV(4),OPS(7),OPS(8)
  231 FORMAT(1X,4(I9,1X,2F8.3,2X))
      DO 260 I=1,4
      IF(IV(I).EQ.0) GO TO 270
      NT=IV(I)/10000000
      ITAC=MOD(IV(I),100) -1
      NP=MOD(IV(I),10000000)/1000
      IV(I)=ITAC+NP*16+NT*4096+ITRG(NT)*524288
      L=I+I-1
      TOPS=TOPS+(OPS(L)+OPS(L+1))*FAC
      K=K+1
      IF(K.EQ.1) GO TO 250
      IK=K-1
      DO 240 J=1,IK
      IF((OPS(L)+OPS(L+1)).LT.0.001) GO TO 239
      IF(IV(I).NE.ITPRAC(J)) GO TO 240
      NOPS(J)=(OPS(L)+16.7*OPS(L+1))*FAC+NOPS(J)
  239 K=K-1
      GO TO 260
  240 CONTINUE
  250 ITPRAC(K)=IV(I)
      NOPS(K)=(OPS(L)+16.7*OPS(L+1))*FAC
      IF(K.GT.2000) GO TO 251
  260 CONTINUE
      GO TO 220
  251 WRITE(6,255) IV(1),OPS(1),OPS(2)
  255 FORMAT(1H1,//,1X,60H2000 FLIGHT COMBINATIONS EXCEEDED AT MIX CARD
     1BEGINNING WITH ,//,1X,I9,1X,2F5.1)
```

```
      RETURN 1
  270 NFTT=K
      DO 280 I=1,K
  280 NOPS(I)=10.*ALOG10(NOPS(I))
      YOPS=TOPS*365.25
      WRITE (6,1003) NFTT
 1003 FORMAT (//1H0,I8,14H TOTAL FLIGHTS )
      WRITE(6,1002) TOPS,YOPS
 1002 FORMAT(//1H0,F8.0,23H TOTAL DAILY OPERATIONS,/,
     1  1X,F8.0,24H TOTAL ANNUAL OPERATIONS,//)
      GO TO 282
C
      ENTRY PCNTRD(*,FAC,IDUMP)
C
      WRITE(6,8000)
 8000 FORMAT(23H TRACK USE PERCENTAGES:)
C         TPER(J)=% TOTAL DEPARTURES ON TRACK J
C         PERL(J)=% TOTAL ARRIVALS ON TRACK J
C         READ LANDING, THEN TAKEOFF PERCENTAGES
      CALL ZERO(TPER,88)
      CALL ZERO(PERL,88)
      SUMT = 0.
      SUML = 0.
      DO 810 I=1,18
      READ (5,8001) (ICMT(J),BUF(J),DUF(J),J=1,5)
 8001 FORMAT (5(I3,2F6.5))
      WRITE (6,8003) (ICMT(J),BUF(J),DUF(J),J=1,5)
 8003 FORMAT (5(1X,I3,2(1X,F8.5)))
      DO 810 J=1,5
      JJ = ICMT(J)
      IF(JJ.GT.88) GO TO 815
      IF(JJ .EQ. 0) GO TO 820
      TPER(JJ) = DUF(J)
      PERL(JJ) = BUF(J)
      SUMT = SUMT+TPER(JJ)
      SUML = SUML + PERL(JJ)
 810  CONTINUE
 815  WRITE (6,8002)
 8002 FORMAT (29H0ERROR IN PERCENT USAGE INPUT  )
      RETURN 1
 820  CONTINUE
      IF(ABS(SUMT-1.) .GT. 0.02) WRITE (6,8004) SUMT
      IF(ABS(SUML-1.) .GT. 0.02) WRITE (6,8005) SUML
 8004 FORMAT (27H0SUM OF T/O PERCENTAGES IS ,F5.2)
 8005 FORMAT (27H0SUM OF LDG PERCENTAGES IS ,F5.2)
C
      ENTRY NEWMIX(*,FAC,IDUMP)
C
      IF(FAC .EQ. 0.) FAC = 1.
      IF(FAC.LT.0.) GO TO 821
      TOPS=0.
      K=0
      WRITE (6,211)
      GO TO 825
 821  K=NFTT
C
C         UNLOG NOPS TO ADD EXTRA STUFF
      DO 822 I=1,K
 822  NOPS(I) = 10.**(NOPS(I)/10.)
      FAC=-FAC
```

```
 825  READ (5,230) IV(1),OPS(1),OPS(2),IV(2),OPS(3),OPS(4),IV(3),OPS(5),
     1    OPS(6),IV(4),OPS(7),OPS(8)
      WRITE(6,231) IV(1),OPS(1),OPS(2),IV(2),OPS(3),OPS(4),IV(3),OPS(5),
     1    OPS(6),IV(4),OPS(7),OPS(8)
      DO 860 I=1,4
      NP=IV(I)/1000
      ITAC=MOD(IV(I),100) -1
      IF(IV(I) .EQ. 0) GO TO 270
      L = I+I-1
      TOPS = TOPS + (OPS(L)+OPS(L+1))*FAC
      ASSIGN 828 TO IVX
      IF(IV(I).LE.100) ASSIGN 829 TO IVX
      IF(NP.GT.95) ASSIGN 830 TO IVX
      DO 855 J=1,88
      K = K+1
      IF(K.GT.2000) GO TO 251
      GO TO IVX
C        TAKEOFF TRACKS
 828  ITPRAC(K)=ITAC+NP*16+J*4096+ITRG(J)*524288
      NOPS(K)=(OPS(L)+16.7*OPS(L+1))*FAC*TPER(J)
      GO TO 840
C        LANDING TRACKS
 829  NP=J+100
 830  ITPRAC(K)=ITAC+NP*16+J*4096+ITRG(J)*524288
      NOPS(K)=(OPS(L)+16.7*OPS(L+1))*FAC*PERL(J)
 840  CONTINUE
      IF(NOPS(K) .GE. 0.001) GO TO 845
      K = K-1
      GO TO 850
 845  IF(K .LE. 1) GO TO 850
      IK = K-1
      DO 847 JK=1,IK
      IF(ITPRAC(K) .NE. ITPRAC(JK)) GO TO 847
      NOPS(JK) = NOPS(JK) + NOPS(K)
      K = IK
      GO TO 850
 847  CONTINUE
 850  CONTINUE
 860  CONTINUE
      GO TO 825
C
      ENTRY MERGRD(ICNT,IDUMP)
C
      WRITE(6,605)
 605  FORMAT(/,26H FLIGHT MERGING INPUT DATA,)
      DO 620 I=1,ICNT
      READ(5,610) J,K,(ICMT(L),L=1,13)
 610  FORMAT(2I3,12A6,A2)
      WRITE(6,615) J,K,(ICMT(L),L=1,13)
 615  FORMAT(15H MERGE A/C TYPE,I3,14H INTO A/C TYPE,I3,3H,   ,12A6,A2)
C        ITAC IS RETAINED IN THE ID AS 1 LESS THAN THE INPUT A/C TYPE
      J=J-1
      K=K-1
      DO 630 M=1,NFTT
      ITAC=AND(ITPRAC(M),MASK(18))
      IF(ITAC.EQ.J) ITPRAC(M)=(ITPRAC(M)/16)*16+K
 630  CONTINUE
 620  CONTINUE
 621  K=0
      M=0
```

```
  640 K=K+1
      J=K+1
      ID=ITPRAC(K)
      IF(K.EQ.NFTT) GO TO 660
      IF(ID.EQ.0) GO TO 640
      DO 650 I=J,NFTT
      IF(ID.NE.ITPRAC(I)) GO TO 650
     .NOPS(K)=10.*ALOG10(10.**(NOPS(K)/10.)+10.**(NOPS(I)/10.))
      ITPRAC(I)=0
  650 CONTINUE
      M=M+1
      ITPRAC(M)=ID
      NOPS(M)=NOPS(K)
      GO TO 640
  660 IF(ID.EQ.0) GO TO 670
      M=M+1
      ITPRAC(M)=ID
      NOPS(M)=NOPS(K)
  670 NFTT=M
      WRITE(6,680) NFTT
  680 FORMAT(22H MODIFIED FLIGHT DATA/,I5,8H FLIGHTS)
      CALL SORT2(ITPRAC,NOPS,NFTT)
      IF(IDUMP .EQ. 0 .OR. IDUMP .EQ. 2) RETURN
      DO 690 I=1,NFTT
      N    =AND(ITPRAC(I),MASK(18)) +1
      NP   =AND(ITPRAC(I),MASK(19))/16
      JTRK =AND(ITPRAC(I),MASK(20))/4096
      ITG  =AND(ITPRAC(I),MASK(21))/524288
  690 WRITE(6,1001) I,ITG,JTRK,NP,N,NOPS(I)
      RETURN
C
C        SORT AND SUM EQUIVALENT FLIGHTS
C
C        DOMT(K) = NUMBER OF EQUIVALENT FLIGHTS ON DOM. TRACK, TRACK GROUP K
C        NDOMT(K) = TRACK NUMBER OF DOMINANT TRACK IN GROUP K
C
  282 CALL SORT2(ITPRAC,NOPS,K)
      CALL ZERO(DOMT,25)
      ACCUM=0.
      ITRK=AND(ITPRAC(1),MASK(20))/4096
      DO 1000 I=1,NFTT
      NTRK=AND(ITPRAC(I),MASK(20))/4096
      IF(NTRK.EQ.ITRK) GO TO 285
      IF(ITG.EQ.0) GO TO 283
      IF(ACCUM .LT. DOMT(ITG)) GO TO 283
      DOMT(ITG) = ACCUM
      NDOMT(ITG)=ITRK
  283 IF(IDUMP .NE. 0) WRITE(6,281) ACCUM,ITRK,ITG
  281 FORMAT (1H ,F10.3,20H EQUIVALENT FLIGHTS ON TRACK,I4,
     1    13H; TRACK GROUP,I4)
      ITG = AND(ITPRAC(I),MASK(21))/524288
      ITRK=NTRK
      ACCUM=0.
  285 ACCUM=ACCUM+10.**(NOPS(I)/10.)
      FLAG=6H
      IF(NOPS(I).GT.20.) FLAG=6H***
      IF(NOPS(I).GT.25.) FLAG=6H*****
      N     =AND(ITPRAC(I),MASK(18)) +1
      NP    =AND(ITPRAC(I),MASK(19))/16
      JTRK  =AND(ITPRAC(I),MASK(20))/4096
      ITG   =AND(ITPRAC(I),MASK(21))/524288
```

```
      IF(IDUMP .NE. 0) WRITE(6,1001) I,ITG,JTRK,NP,N,NOPS(I),FLAG
 1001 FORMAT(8H FLIGHT ,I4,6H  ID  ,I2,1H ,I2,1H ,I3,1H ,I2,
     1 7H  OPS  ,E11,6,A6)
      IF(N.GT.16 .OR. N.LT.1) RETURN 1
      IF(NP.GT.150 .OR. NP.LT.1) RETURN 1
      IF((MATCH(N).GT.12 .OR. MATCH(N).LT.1).AND. NP.GT.100) RETURN 1
      IF(JTR<.GT.88 .OR. JTRK.LT.1) RETURN 1
 1000 CONTI VUE
      IF(ITG.EQ.0) GO TO 286
      IF(ACCUM .LT. DOMT(ITG)) GO TO 286
      DOMT(ITG) = ACCUM
      NDOMT(ITG) = JTRK
 286  IF(IDUMP .NE. 0) WRITE(6,281) ACCUM,ITRK,ITG
      IF(IDUMP .LT. 2) RETURN
C
C        ASSIGN LOW DENSITY TRAFFIC TO DOMINANT TRACKS
C
      KK = 1
      DO 1111 K=1,NFTT
C        REASSIGN FLIGHTS WHOSE EQUIVALENT OPERATIONS
C        FREQUENCY IS LESS THAN 1/10 PERCENT OF TOTAL TRAFFIC
      EQIF=10.**(NOPS(K)/10.)
      IF(EQIF .GE. TOPS/1000.) GO TO 1111
      IDR=AND(ITPRAC(K),OR(MASK(18),MASK(19)))
      NT =AND(ITPRAC(K),MASK(20))/4096
      NG =AND(ITPRAC(K),MASK(21))/524288
      IF(NG.EQ.0) GO TO 1111
      IF(NT.EQ.NDOMT(NG)) GO TO 1111
      ITAC=AND(IDR,MASK(18))+1
      NP  =AND(IDR,MASK(19))/16
      WRITE(6,285)KK,EQIF,NG,NT,NP,ITAC,NT,NDOMT(NG)
 288  FORMAT(1H ,I4,7H ASSIGN,E9,2,17H EQIV FLIGHTS,ID=,2I2,I3,I2,
     1 9H ON TRACK ,I3,9H TO TRACK,I3)
      NKLUTZ = NDOMT(NG) + 100
      IF(      (NP .GT. 100)
     1   .AND.(NKLUTZ .LE. 150)
     2   .AND.(PROF(1,M,NKLUTZ) .NE. 0.) ) NP = NKLUTZ
      ITPRAC(K)=ITAC-1+NP*16+NDOMT(NG)*4096+NG*524288
      KK = K<+1
 1111 CONTI VUE
      GO TO 621
      END
```

```
      SUBROUTINE NEWPNT(*,NPTS)
      COMMON /BK/ TOL2,TOL,XVAL,VAL,TNEY1,NYS,IERROR
      COMMON /LOOPS/ RO,RIN,RWK,W,VAL1,VAL2,D
      COMMON /SCRACH/ X(700),Y(700),NEY1
      COMMON /PLOTR/ IPSIZ,DELS,NPLOT,XAR,PZ,PSCAL
      COMMON /GRADNT/ GRADU(3),DERIV
      DIMENSION RIN(3),RWK(3),RY(3)
      DIMENSION NCYS(24),RG(3),RO(3),PZ(3),XZZ(3)
      DIMENSION RPTS(2,25)
      EQUIVALENCE (RO(1),XX),(RO(2),YY),(RQ(1),X2),(RQ(2),Y2)
      REAL NOYC,NCYS,NOYZ,NEY1
      DIMENSION RP(3),RR(3),PR(3),NSRCH(5)
      DATA NSRCH /2,2,4,12,24/
      DATA RP(3)/0./,PR(3)/0./,RR(3)/0./,RQ(3)/0./
      D = DELS
      DCHK = AMIN1(25.*TOL2,50.)
      NEY1 = EXPOSE(RO,3)
 201  IF(ABS(VAL-NEY1) .LE. TOL) GO TO 750
C
C        FIRST GUESS WAS NOT ON CONTOUR. ITERATE FOR NEXT POINT.
C
      W=SGNR(NEY1-VAL)
      KK=1
      OMEGA = 0.26177994 * W
C
C        BEGIN ITERATION
C
 209  DO 505 IJK=1,5
      VAL1=NEY1
      CALL VTRN(RIN,RO)
      N=NSRCH(IJK)*KK
      DO 500 I=1,N
      ANGLE=ATAN2(RIN(2)-PZ(2),RIN(1)-PZ(1)) + OMEGA
      RWK(1)=PZ (1)+D*COS(ANGLE)
      RWK(2)= PZ(2)+D*SIN(ANGLE)
      VAL2=EXPOSE(RWK,3)
      Z=W*(VAL2-VAL)
      IF(ABS(Z).LE.TOL) GO TO 600
      IF(Z.LT.0.) GO TO 700
      IF(W*(VAL2-VAL1).GT.0..AND.IJK.LT.3)  GO TO 501
      VAL1=VAL2
      CALL VTRN(RIN,RWK)
  500 CONTINUE
C
 501  OMEGA = 0.5235988
      D=D/2.
      RO(1) = PZ(1) - D*GRADU(2)
      RO(2) = PZ(2) + D*GRADU(1)
      NEY1=EXPOSE(RO,3)
      IF(ABS(VAL-NEY1).LE.TOL) GO TO 750
      W=SGNR(NEY1-VAL)
      OMEGA=OMEGA*W
      IF(IJK .EQ. 4) OMEGA=OMEGA*0.5
  505 CONTINUE
C
C        IF THE ABOVE FAILS DELETE THE CONTOUR
C
      RETURN 1
```

```
C
C        CHECK IF THE VALUE ON THE CONTOUR IS IN THE CORRECT DIRECTION.
C
 600  CALL VSUB(RY,RIN,RWK)
      ANGLE = ATAN2(RY(2),RY(1))
      DD=VMAG(RY)/100.
      RY(1)=RWK(1)+DD*COS(ANGLE)
      RY(2)=RWK(2)+DD*SIN(ANGLE)
      G=EXPOSE(RY,3)
      IF(W*(G-VAL2) .GE. 0.) GO TO 730
C        YOU'VE JUMPED OVER A FINGER OR INLET OF THE CONTOUR
      CALL VTRN(RWK,RY)
      VAL2=G
      IF(W*(G-VAL).LT.0.) GO TO 700
C        RWK IS STILL ACROSS THE FINGER OR INLET
       IF(NYS .GT. 65) RETURN 1
      OMEGA=OMEGA/3.
      KK=3
      GO TO 209
C
C        THE CONTOUR IS BETWEEN POINTS 'RIN' AND 'RWK'. FIND IT.
C
 700  CALL VSUB(RY,RIN,RWK)
      ANGLE = ATAN2(RY(2),RY(1))
      DD = VMAG(RY)
      DD=DD*((VAL2-VAL)/(VAL2-VAL1))
      RO(1)=RWK(1)+DD*COS(ANGLE)
      RO(2)=RWK(2)+DD*SIN(ANGLE)
      NEY1 = EXPOSE(RO,3)
      IF(ABS(NEY1-VAL) .LT. TOL) GO TO 750
      IF(NYS .GT. 75) RETURN 1
      IF(W*(NEY1-VAL) .LT. 0.) GO TO 720
      CALL VTRN(RIN,RO)
      VAL1=NEY1
      GO TO 725
  720 CALL VTRN(RWK,RO)
      VAL2=NEY1
 725  IF(DD .GT. DCHK) GO TO 700
C        INTERPOLATION HAS FAILED
      WRITE(6,888)
 888  FORMAT(1H+,110X,4HDISC)
      D=D*1.5
      RO(1) = PZ(1) + 1.5*(RO(1)-PZ(1))
      RO(2) = PZ(2) + 1.5*(RO(2)-PZ(2))
      GO TO 764
C
  730 CALL VTRN(RO,RWK)
C
C        RO IS WITHIN TOLERANCE - MAKE ADDITIONAL CHECKS
C
  750 CALL VSUB(XZZ,RO,PZ)
      IF(D .LT. DELS*0.5) GO TO 760
C        CHECK HALF-WAY POINT FOR PROXIMITY TO CONTOUR
      ANGLE=ATAN2(XZZ(2),XZZ(1))
      XZZ(1)=PZ(1) + 0.5*D*COS(ANGLE)
      XZZ(2)=PZ(2) + 0.5*D*SIN(ANGLE)
      NEY1=EXPOSE(XZZ,3)
      IF(ABS(NEY1-VAL) .LE. 5.*TOL2) GO TO 760
      D = D*0.5
      CALL VTRN(RO,XZZ)
```

```
      GO TO 765
C         CHECK POINT TOLERANCE WITH ALL FLIGHTS
  760 NEY1=EXPOSE(RO,1)
      IF(ABS(NEY1-XVAL) .LE. TOL2) GO TO 100
C         TIGHTEN TOLERANCE AND REDIRECT GRADIENT
      TOL = TOL*0.8
 764  NEY1=EXPOSE(RO,3)
 765  GRADU(1)=RO(2) - PZ(2)
      GRADU(2)=PZ(1) - RO(1)
      CALL VUNT(GRADU,GRADU)
      IF(NYS .GT. 80) RETURN 1
      GO TO 201
C
C         ENTER LOOP CHECK ROUTINE
C
 100  IF(NPTS .LT. 6) RETURN
      MPTS=NPTS-3
      DLIM = DELS*AMIN1(TOL2,0.1)
C
C         CHECK NEW POINT TO MAKE SURE IT DOESN'T FALL ON A LINE
C         CONNECTING TWO EXISTING ADJACENT POINTS
      DO 10 I=2,MPTS
      RP(1)=Y(I+1)-Y(I)
      PR(1)=X(I+1)-X(I)
      RR(1)=XX-X(I)
      RP(2)=X(I)-X(I+1)
      RR(2)=YY-Y(I)
      PR(2)=Y(I+1)-Y(I)
      PRMAG=VMAG(RP)
      PD=VDOT(RR,PR)/PRMAG
      IF(PD.LT.0..OR.PD.GT.PRMAG) GO TO 10
      PD=VDOT(RP,RR)/PRMAG
      IF(ABS(PD).LT.DLIM) GO TO 20
 10   CONTINUE
      RETURN
 20   CONTINUE
C
C         LOOP FOUND
C
      AINC = DGTRD(15.)
      XX = X(NPTS)
      YY = Y(NPTS)
C     RO=(XX,YY)
      CALL VTRN(PZ,RO)
      RQ(1) = X(NPTS-1)
      RQ(2) = Y(NPTS-1)
      ANGLE = ATAN2(X(NPTS-1)-XX,Y(NPTS-1)-YY)
C     RO=(XX,YY)
      NOYC = EXPOSE(RO,1)
C
C         SEARCH FOR NEW CONTOUR POINT IN A CIRCULAR PATTERN
C         AROUND LAST GOOD POINT (PZ)
      D = D*1.5
 22   DO 24 I=1,24
      X2 = XX + D*COS(ANGLE)
      Y2 = YY + D*SIN(ANGLE)
C     RQ=(X2,Y2)
      NOYS(I) = EXPOSE(RQ,3)
      CALL VTRN(RPTS(1,I),RQ)
      ANGLE = ANGLE - AINC
```

```
 24     CONTINUE
        CALL VTRN(RPTS(1,25),RPTS(1,1))
        NOYS(25)= NOYS(1)
        J = 0
C
C          CHECK FOR CONTOUR CROSSING BETWEEN POINTS ON CIRCLE AROUND RO
        DO 30 I=2,25
        IF(SGNR(NOYS(I-1)-XVAL) .EQ. SGNR(NOYS(I)-XVAL)) GO TO 30
        Q = (XVAL-NOYS(I-1))/(NOYS(I)-NOYS(I-1))
        X2 = (RPTS(1,I)-RPTS(1,I-1))*Q + RPTS(1,I-1)
        Y2 = (RPTS(2,I)-RPTS(2,I-1))*Q + RPTS(2,I-1)
        DO 25 K=2,MPTS
        KK = MPTS-K+2
        RP(1) = Y(KK+1) - Y(KK)
        PR(1) = X(KK+1) - X(KK)
        RR(1) = X2 - X(KK)
        RP(2) = X(KK) - X(KK+1)
        RR(2) = Y2 - Y(KK)
        PR(2) = Y(KK+1) - Y(KK)
        PRMAG = VMAG(PR)
        PD = VDOT(RR,PR)/PRMAG
        IF(PD .LT. 0. .OR. PD .GT. PRMAG) GO TO 25
        PD = VDOT(RP,RR)/PRMAG
        IF(ABS(PD) .GT. DLIM) GO TO 25
        GO TO 30
 25     CONTINUE
        J = I
        CALL VTRN(RO,RQ)
 30     CONTINUE
        IF(J .GT. 0) GO TO 40
        IF(D .GE. DELS) GO TO 35
        D = DELS
        GO TO 22
 35     WRITE(6,1005)
 1005 FORMAT (54H0I AM CAUGHT IN A LOOP. THIS CONTOUR IS BEING DELETED.)
C          RETURN TO 86
        JJ = 1
        WRITE (6,1001) JJ
        RETURN 1
C
C          A POINT ON A NEW SECTION OF THE CONTOUR EXISTS ON THE CIRCLE
 40     NOYZ = EXPOSE(RO,1)
        IF(ABS(NOYZ-XVAL) .GT. TOL) GO TO 50
        JJ = 3
        WRITE (6,1001) JJ
        GO TO 750
C
C          RETURN TO FIRST SECTION OF ROUTINE AND
C          INTERPOLATE TO FIND CONTOUR POINT
 50     W = SGNR(NOYZ-XVAL)
        CALL VTRN(RIN,RPTS(1,J))
        CALL VTRN(RWK,RPTS(1,J-1))
        VAL2 = NOYS(J-1)
        VAL1 = NOYS(J)
C          RETURN TO 700
        JJ = 2
        WRITE (6,1001) JJ
        GO TO 700
 1001   FORMAT(1H+,120X,4HLOOP,I2)
        END
```

```
      REAL NEY1
C   MAIN PROGRAM                                ***NOISE1***
      INTEGER AP,AALT,OALT,TPD
C          TOL2,XVAL    REMAIN AS READIN
      COMMON /BK/ TOL2,TOL,XVAL,VAL,TNEY1,NYS,IERROR,TOLLOP,TOLSIG
      COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TD(88,14),DMIN(88)
      COMMON /TRAFIK/ NFTT,ITT,ITPRAC(2000),NOPS(2000)
      COMMON /LOOPS/ R0,RIN,RWK,W,VAL1,VAL2,D
      COMMON /RESALT/ NTAR(88),ENDR(25,85),STR(25,85),ICBT(25),CCBN(25),
     1               ICBNCO(16),ENDALT(25,85),ORGSTR(25),ORGEND(25)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /SCRACH/ X(700),Y(700),NEY1
      COMMON/TITLE/GTITLE,ATITLE,AP,AALT,OALT,TPD
      COMMON /PLOTR/ IPSIZ,DELS,NPLOT,XAR,PZ,PSCALE
      COMMON /GRADNT/ GRADU(3),DERIV
      COMMON /NOISE/  SLRNG(8),GRNDA(8),PWRS(6,16),ANOISE(8,6,16)
      COMMON /CONST/ PI,NC
      COMMON /TGROUP/ DCOM(25),ITRG(88)
      COMMON /WIND/ VEL(25),DIR(25)
      DIMENSION ICMT(14),ATITLE(14),GTITLE(14),APT(4)
      DIMENSION IBUF(500)
      DIMENSION R0(3),RA(3),PZ(3),PZ0(3),XZZ(3)
      DIMENSION RX(3),PZX(3)
      EQUIVALENCE (RA(1),R0(1)),(PZX(1),RX(1))
      DATA ISTRT/5HSTART/,ISTOP/5HEND  /,MOR/5HMOR  /,IPLT/4HPLOT/
      DATA IPIND/0/
      DATA (ATITLE(I),I=1,14)/14*6H      /
C         THE FIRST CARD OF EACH DISTINCT RUN SHOULD HAVE THE
C         WORD START IN CARD COLUMNS 1-5, IF AN ABNORMAL TERMINATION
C         OCCURS IN THE SUBROUTINE READIN, ALL DATA CARDS UP TO THE
C         NEXT START CARD OR END CARD WILL BE IGNORED, THIS WAS DONE
C         SO THAT SEVERAL JOBS COULD BE RUN BACK-TO-BACK AND AN ERROR
C         IN THE BEGINNING WOULD NOT PREVENT THE REST OF THE RUNS
C         FROM BEING EXECUTED,
C         CARD COLUMNS 6-80 CAN BE COMMENTS AND WILL BE PRINTED,
C         READ THE NEXT CARD IN LINE, IF 1ST CRD, SHOULD BE START,
C
C         STORE LOGS OF SLANT RANGES IN SLRNG
      DO 3 I=1,8
3     SLRNG(I)=ALOG10(SLRNG(I))
C
C         SET TRACK GROUP NUMBERS TO ZERO
C         SET WIND VELOCITY TO ZERO
C         SET ALTITUDE RESTRICTION NUMBERS TO ZERO
C         INITIALIZE AIRPORT ALTITUDE TO ZERO AND TEMPERATURE TO 288 DEG K
      APALT=0,
      APTEMP=288,
      DO 4 I=1,88
      NTAR(I)=0
      ITR(I)=0
    4 ITRG(I)=0
      CALL ZERO(VEL,25)
      CALL POSIT(2)
    1 READ(5,5) IST,(ICMT(I),I=1,13)
    5 FORMAT(A5,12A6,A3)
C
```

```
C         IF IT WAS AN END CARD (END IN CC1-3 AND BLANKS IN CC4-5),
C         TERMINATE THE PROGRAM AND EXIT GRACEFULLY,
C
      IF(IST,EQ,ISTOP) GO TO 150
C
C         IF NOT A START OR END CARD, TRY THE NEXT ONE,
C
      IF(IST,NE,ISTRT) GO TO 1
C
C         PRINT THE START CARD AND THE COMMENTS,
C
    6 WRITE(6,7) IST,(ICMT(I),I=1,13)
    7 FORMAT(1H1,1X,A5,12A6,A3)
C
C         THE NEXT CARD SHOULD BE A PLOT INDICATOR CARD, IF A PLOTTED

C         OUTPUT IS DESIRED, THE WORD PLOT MUST APPEAR IN CC1-4, IF
C         ANYTHING ELSE A PLOT WILL NOT BE PRODUCED, ADDITIONALLY,
C         IF PLOT IS IN CC1-4, THE SIZE INDICATOR MUST BE IN CC5-6,
C         THIS WILL BE 30 IF A 30 INCH PLOT IS DESIRED OR 12 IF A
C         12 INCH PLOT, THE PLOTTING PROGRAM WILL DEFAULT TO 12 INCH,
C         CC7-80 CAN BE COMMENTS AND WILL BE PRINTED,
      READ(5,10) NPLOT,IPSIZ,PSCALE,(ICMT(I),I=1,12)
   10 FORMAT(A4,I2,F6,0,11A6,A2)
      WRITE(6,12) NPLOT,IPSIZ,PSCALE,(ICMT(I),I=1,12)
   12 FORMAT(1X,A4,I2,F6,0,11A6,A2)
C
C         THE FOLLOWING CHECK WILL DETERMINE WHETHER OR NOT THE PLOTTING
C         SUBROUTINES NEED INITIALIZATION, IT MAY BE NOTED THAT IT IS
C         POSSIBLE TO HAVE SOME RUNS PLOT WHILE OTHERS DON'T AND THESE
C         RUNS CAN BE INTERMIXED AS LONG AS START CARDS ARE USED,
C
      IF(NPLOT,NE,IPLT,OR,IPIND,NE,0) GO TO 20
C
C         INITIALIZE THE PLOT SUBROUTINES, THIS MUST BE DONE ONLY ONCE
C         FOR EACH ENTIRE BATCH RUN, LOGICAL UNIT 8 IS USED,
C
      IPIND=1
      CALL PLOTS(IBUF,500,8)
   20 CONTINUE
C
C         NOW READ THE INPUT DATA (I,E, RUNWAY, FLIGHT TRACK, AND MIX
C         DEFINITIONS, RETROFITTING COMMANDS, NOISE CURVES, PROFILES ETC)
C         IF AN ABNORMAL TERMINATION OCCURS, NRW WILL EQUAL 0 ON RETURN,
C         IN THAT CASE DELETE THIS JOB AND SEARCH FOR THE NEXT ONE,
C
      CALL READIN(NRW)
      IF(NRW,EQ,0) GO TO 1
   25 CONTINUE
C
C         THE NEXT CARD SHOULD BE A CONTROL CARD WITH CONTROL
C         INFORMATION IN CC1-5 AS FOLLOWS
C             1, CC1-3=MOR AND CC4-5 BLANK ALLOWS A DATA BASE CHANGE
C                (I,E, DIFFERENT MIX, NEW NOISE CURVES, ETC,)
C             2, CC1-3=END AND CC4-5 BLANK TERMINATES THE COMPUTER RUN,
C             3, CC1-5=START RESTARTS THE PROGRAM AT THE BEGINNING,
C             4, ANYTHING ELSE ALLOWS THE PROGRAM TO PROCESS THE
C                PRESENTLY DEFINED JOB,
C
C         CC6-80 CAN BE USED FOR COMMENTS AND WILL BE PRINTED,
C
      READ(5,5) IST,(ICMT(I),I=1,13)
```

```
      IF(IST.EQ.ISTRT) GO TO 6
      WRITE(6,30) IST,(ICMT(I),I=1,13)
   30 FORMAT(1H1,1X,A5,12A6,A3)
      IF(IST.EQ.MCR) GO TO 20
      IF(IST.EQ.ISTOP) GO TO 150
C
C        READ TWO TITLE CARDS. BOTH WILL FORM A HEADING FOR THE
C        PRINTOUT WHILE THE SECOND WILL BE THE TITLE FOR THE GRAPH.
C
      READ(5,35) AP,AALT,OALT,TPD,(APT(I),I=1,4),(ATITLE(I),I=1,9),
     1  (GTITLE(I),I=1,14)
   35 FORMAT(I2,2I1,I2,12A6,A2,/,13A6,A2)
C
C        INITIALIZE THE PLOT COUNTER. THIS IS ALSO A RESTART POINT
C        FOR THE PROGRAM IF SOMETHING IS WRONG WITH THE FIRST CONTOUR
C        IN A SET OF CONTOURS.
C
   40 NPLT=0
C
C        THE FOLLOWING IS THE NORMAL LOOPING POINT WHEN THE PROGRAM
C        STEPS FROM ONE CONTOUR VALUE TO THE NEXT AND THE BASE DATA
C        IS THE SAME.
C
   45 CONTINUE
C
C        UPDATE THE CONTOUR COUNTER, INITIALIZE THE POINT COUNTER
C        (IXPGT), THE LAST POINT INDICATOR (LPT), THE AREA ACCUMULATOR
C        (XAR), AND THE LAST CONTOUR INDICATOR (LPLT).
C
      NPLT=NPLT+1
      IXPGT=0
      LPT=0
      XAR=0.
      LPLT=0
C
C        THE FOLLOWING CARD WILL GIVE THE PROGRAM THE FOLLOWING INFO.
C          1. CC1-6 (VAL) GIVES THE NUMERIC VALUE OF THE CONTOUR TO
C             BE CALCULATED. IF (VAL) IS POSITIVE, THE PROGRAM WILL
C             EXPECT MORE CONTOURS TO BE INCLUDED IN THIS SET AND WILL
C             READ THEIR VALUE(S) FROM CARD(S) OF THIS TYPE THAT
C             FOLLOW THIS ONE. IF (VAL) IS NEGATIVE THE PROGRAM WILL
C             ASSUME THAT THIS IS THE LAST CONTOUR IN THE SET AND THE
C             NEXT CARD IS A CONTROL CARD (SEE COMMENTS FOLLOWING
C             STATEMENT 25). CAUTION *** A DECIMAL POINT MUST FOLLOW
C             THE LAST NON-FRACTIONAL DIGIT.
C
C          2. CC7-13 (TOL) GIVES THE TOLERABLE ERROR FOR THE COMPU-
C             TATION OF POINTS ON THE CONTOUR. MUST HAVE A DECIMAL PT.
C
C          3. CC14-22 (RA(1)) GIVES THE USER'S GUESS AT THE FIRST
C             X-COORDINATE. MUST HAVE A DECIMAL POINT.
C
C          4. CC23-31 (RA(2)) GIVES THE USER'S GUESS AT THE FIRST
C             Y-COORDINATE, MUST HAVE A DECIMAL POINT.
C
C          5. CC32-38 (DELS) GIVES THE STEP SIZE BETWEEN POINTS ON
C             THE CONTOUR. MUST HAVE A DECIMAL POINT.
C
C
      READ(5,50) VAL,TOL,RA(1),RA(2),DELS,RX(1),RX(2),AMAXPT,IERROR
```

```
 50    FORMAT(7F10.0,F9.0,I1)
C
C          IERROR MAY HAVE THE FOLLOWING VALUES;
C            0   => NO DUMP - NORMAL EXECUTION
C            1   => SHORT DUMP & CONTINUE
C            2   => FULL DUMP & EXIT
C            3   => FULL DUMP & CONTINUE
C
       MAXPTS = AMAXPT + 0.5
       IF(MAXPTS .GT. 0) GO TO 51
       MAXPTS = 250
       GO TO 52
 51    IF(MAXPTS .GT. 698) MAXPTS = 698
 52    CONTINUE
       WRITE(6,55) VAL,TOL,RA(1),RA(2),DELS,RX(1),RX(2),MAXPTS,IERROR
 55    FORMAT(///,1X,F6.2,F5.3,5F11.2,2I5)
       CALL KLOCK
       RX(3)=0.
C
C          INITIALIZE THE PAGE COUNTER (IPAGE), THE Z-COMPONENT OF THE
C          FIRST GUESS (RA(3)), CHECK IF THIS IS THE LAST PLOT (NEGATIVE
C          VAL) AND IF IT IS, SET (VAL) POSITIVE AND SET THE LAST
C          CONTOUR INDICATOR (LPLT), OTHERWISE CONTINUE.
C
       IPAGE=0
       RA(3)=0.
C          VAL WILL BE ALTERED IN EXPOSE TO
C          CORRECT FOR ERROR INCURRED BY USING ONLY SIGNIFICANT FLIGHTS
       XVAL=ABS(VAL)
       IF(VAL.GE.0.) GO TO 60
       VAL=-VAL
       LPLT=1
C
C          UPDATE PAGE AND LINE COUNTERS AND PRINT THE PRINTOUT HEADERS.
C          THIS IS A NORMAL LOOP POINT AFTER 50 POINTS PRINTED PER PAGE.
   60  LINCNT=1
       IPAGE=IPAGE+1
       WRITE(6,64) (APT(I),I=1,4),TPD,IPAGE
  64   FORMAT(1H1,1X,10H AIRPORT -,4A6,57X,14HTIME PERIOD 19,I2,3X,
     1    4HPAGE,I4,/)
       WRITE(6,65) (ATITLE(I),I=1,13)       ,(GTITLE(J),J=1,14)
  65   FORMAT(    1X,12A6,A2,6X              ,/,1X,13A6,A2,/,1X,14(6H******),
     1 /,1X,5HPOINT,6X,1HX,12X,1HY,12X,2HNE,4X,4HFLTS,4X,6H XTOTL,4X,
     2 10HITERATIONS,5X,4HAREA,/)
C
C          THE FOLLOWING IS A NORMAL LOOP POINT BETWEEN CONTOUR POINTS.
C
   75  CONTINUE
C
C          IF THIS IS NOT THE FIRST POINT ON THE CONTOUR, GO ITERATE TO
C          FIND THE NEXT ONE. ALSO, INITIALIZE VECTORS AND COUNTERS.
C
       IF(IXPOT.NE.0) GO TO 400
       TOL2=TOL
       ITT=NFTT
C
       CALL FIRST(RO,NEY1)
C
       IF(IERROR .EQ. 2) GO TO 99
C          PZO CONTAINS THE FIRST POINT FOUND ON THE CONTOUR
```

```
      CALL VTRN(PZO,RO)
      CALL VTRN(PZ,RO)
      GO TO 100
 400  TOL=TOL2
C
C                            SEARCH FOR NEXT POINT
C
      CALL NEWPNT($86,IXPOT)
C
C        THE FOLLOWING IS THE NORMAL CONTINUATION WHEN A CONTOUR
C        POINT IS FOUND. UPDATE POINT COUNTER AND SET STARTING POINT
C        (PZO) IF THIS IS THE FIRST POINT.
C
C
 100  CONTINUE
      IXPOT=IXPOT+1
      IF(IXPOT .GT. MAXPTS) GO TO 96
C
C        CALCULATE AREA (XAR) AND NO. OF FLIGHTS USED (ICB) THEN PRINT
C        OUT THE PERTINENT INFO. (I.E. PT. NO., X, Y, NE, NO. FLIGHTS,
C        NO. OF ITERATIONS AND AREA IN SQ. MILES.)
C
C
      XAR=XAR+(PZ(2)*RO(1)-PZ(1)*RO(2))/55756800.
      PCNT=100.*10.**((VAL-XVAL)/10.)
      WRITE(6,106) IXPOT,RO(1),RO(2),NEY1,ITT,PCNT,NYS,XAR
 106  FORMAT(2X,I3,1X,3F12.2,2X,I4,4X,F7.3,5X,I3,1X,F12.2)
C
C        UPDATE PLOT CONTROL VARIABLE (MORE) AND CALL PLOT PROGRAM TO
C
      NYS=0
      MORE=0
      IF(LPLT.NE.0) MORE=NRW
      CALL PPGRM(RO(1),RO(2),IXPOT,LPT,MORE,NPLT,NRW)
C
C        IF THIS IS THE LAST CONTOUR AND THE LAST POINT GO GET NEW DATA.
C        IF THIS IS THE LAST POINT ON THIS CONTOUR BUT NOT THE LAST
C        CONTOUR THEN GO GET THE NEXT CONTOUR.
C        IF NEITHER OF THE ABOVE CALCULATE WHERE THE NEXT POINT WILL BE.
C
C
      IF(LPT .NE. 1) GO TO 111
      CALL KLOCK(T)
      WRITE(6,107) T
 107  FORMAT (//,26H PREVIOUS CONTOUR REQUIRED,F8.2,16H SEC. TO COMPUTE,
     1 /,1H1)
      IF(LPLT .NE. 0) GO TO 25
      GO TO 45
C        CHECK FOR CLOSURE. POINT MUST BE WITHIN A STEP OF THE
C        FIRST POINT AND, IN ADDITION, THE POINT HALFWAY IN BE-
C        TWEEN MUST BE WITHIN 5 TOLERANCES OF THE CONTOUR LEVEL.
 111  CALL VTRN(PZ,RO)
      IF(IXPOT .LE. 6) GO TO 115
      CALL VSUB(XZZ,PZ,PZO)
      XX=VMAG(XZZ)
      IF(XX .GT. DELS) GO TO 112
      IX = 0
      IF(XX .LT. DELS*0.5) GO TO 114
      CALL VADD(XZZ,PZ,PZO)
      GO TO 113
C        CHECK FOR CLOSURE AT END POINT (IF INPUT)
 112  IF(ABS(RX(1))+ABS(RX(2)) .LT. 1.) GO TO 115
      CALL VSUB(XZZ,PZ,PZX)
```

```
      XX=VMAG(XZZ)
      IF(XX .GT. DELS) GO TO 115
      IX = 1
      IF(XX .LT. DELS*0.5) GO TO 114
      CALL VADD(XZZ,PZ,PZO)
 113  CALL VSCL(XZZ,0.5,XZZ)
      IF(ABS(EXPOSE(XZZ,3)- VAL) .GT. 5.*TOL2) GO TO 115
 114  CALL VTRN(RO,PZO)
      IF(IX .EQ. 1) CALL VTRN(RO,PZX)
      LPT=1
      GO TO 100
C        PREPARE FOR CALCULATION OF NEW POINT BY COMPUTING GRADIENT
 115  CONTINUE
      CALL GRADIE(RO)
      RO(1) = RO(1) -DELS*GRADU(2)
      RO(2) = RO(2) + DELS*GRADU(1)
 120  RO(3) = 0.
      LINCNT=LINCNT+1
      IF(LINCNT.LE.50) GO TO 75
      GO TO 60
C
C        IN CASE OF ERROR, REITERATE SEARCH FOR LAST POINT WITH DUMP
C
   86 WRITE(6,87) NYS
   87 FORMAT(6H AFTER,I3,43H ITERATIONS , THIS CONTOUR IS BEING DELETED
     1,/)
      IF(IERROR .GT. 1) GO TO 98
      IERROR=2
      CALL VTRN(RO,PZ)
      NYS=0
      NEY1=EXPOSE(RO,1)
      GO TO 115
 96   WRITE(6,97)
 97   FORMAT(/,48H MAXPTS EXCEEDED, THIS CONTOUR IS BEING DELETED, ,/)
 98   CONTINUE
C
C        IF THIS WAS THE LAST CONTOUR (LPLT=1) GO GET A CONTROL CARD,
C        IF THIS WAS THE FIRST CONTOUR (NPLT=1) CALL THE NEXT ONE
C        THE FIRST CONTOUR, OTHERWISE JUST GO GET THE NEXT CONTOUR,
C
      MORE = 0
      IF(     (LPLT .NE. 0)
     1   .OR.(NPLT .EQ. 1)) MORE = NRW
      LPT = 1
      CALL PPGRM(PZ(1),PZ(2),IXPQT,LPT,MORE,NPLT,NRW)
 99   CONTINUE
      IF(LPLT.EQ.1) GO TO 25
      IF(NPLT.EQ.1) GO TO 40
      GO TO 45
 150  IF(IPIND.EQ.0) CALL EXIT
      CALL PLOT(0.,0.,999)
      CALL EXIT
      END
```

```
      SUBROUTINE NOISRD(*,ICNT)
      COMMON /NOISE/  SLRNG(8),GRNDA(8),PWR(6,16),ANOISE(8,6,16)
      COMMON /SCRACH/ BUF(30),A
C
C        READS NOISE DATA
C
      DO 420 M=1,ICNT
      READ(5,401) K,J,A,(BUF(I),I=1,10)
 401  FORMAT(2I2,1X,9F7.0,2A6)
      WRITE(6,402) K,J,A,(BUF(I),I=1,10)
 402  FORMAT(12H NOISE CURVE,I3,3H # I1,9F9.2,2X,2A6)
      PWR(J,K)=A
      DO 410 I=1,8
  410 ANOISE(I,J,K)=BUF(I)
  420 CONTINUE
C        CHECK TO INSURE THAT THRUSTS ARE ORDERED PROPERLY
      DO 500 I=1,16
      DO 500 M=2,6
      IF(PWR(M,I) .GT. PWR(M-1,I)) RETURN 1
 500  CONTINUE
      RETURN
      END
```

```
      SUBROUTINE POINTS
      COMMON /DGNSTC/ TNEY1,NYS,IERROR,CONTRB(16),ICON
      DIMENSION P(3)
      DATA P(3)/0./
      LINE = 55
      READ (5,1001) NPTS
 1001 FORMAT (I5)
      DO 100 I=1,NPTS
      READ (5,1002) P(1),P(2),IERROR,ICON
 1002 FORMAT (2F10.0,2I5)
      IF(LINE .LE. 50) GO TO 10
      LINE = 0
      WRITE (6,1003)
 1003 FORMAT (1H1,10X,1HX,15X,1HY,14X,3HNEF,/)
 10   CONTINUE
      ESION = EXPCSD(P)
      WRITE (6,1004) P(1),P(2),ESION
 1004 FORMAT (2(5X,E12.6),5X,F8.3)
      IF(ICON .NE. 1) GO TO 100
 60   EPNLS = ESION + 88.01
      WRITE (4) P(1),P(2),EPNLS,(CONTRB(J),J=1,16)
 100  CONTINUE
      CALL RITCON
      CALL ERRRIT
      RETURN
      END


      SUBROUTINE POSIT(LUNIT)
C          TAPE POSITIONING SUBROUTINE
    1 CALL SKFIL(LUNIT,1,LSTAT)
      READ(LUNIT,10,END=100) X
   10 FORMAT(A6)
      GO TO 1
  100 CALL SKFIL(LUNIT,-1,LSTAT)
      RETURN
      END


      FUNCTION POSMUT(PWR1,PWR2,DISTS,DISTE,DISTA)
C
C        THIS FUNCTION SMOOTHS THRUST CHANGES OVER THE FIRST
C        1000 FEET OF THE NEW PROFILE SEGMENT
C
C        PWR1 IS THE OLD THRUST
C        PWR2 IS THE NEW THRUST
C        DISTS IS THE START OF THE NEW SEGMENT
C        DISTE IS THE END OF THE NEW SEGMENT
C        DISTA IS THE POINT AT WHICH THE THRUST IS DESIRED
C
C        ABOVE STATEMENTS APPLY TO TAKEOFFS ONLY
C        FOR LANDINGS REVERSE INPUT START-END DINTANCES AND POWER SETTINGS
      IF(ABS(DISTS-DISTA) .GE. 1000.) GO TO 11
C
      POSMUT = PWR1 + (PWR2-PWR1) * ABS(DISTA-DISTS)/
     1   AMIN1(1000.,ABS(DISTE-DISTS))
      RETURN
C
C        THE POINT WHERE THE THRUST IS DESIRED IS MORE THAN
C        1000 FT PAST THE START OF THE SEGMENT
 11   POSMUT = PWR2
      RETURN
      END
```

```
      SUBROUTINE PPGRM(XX,YY,NPTS,LAST,MORE,NPLT,NRW)
C
C        PLOTTING SUBROUTINE.      PROGRAMMER  CARROLL BARTEL
C                                              WYLE LABORATORIES
C                                   ORIGINAL   SEPT. 20,1972
C                                   REVISED    DEC.  18,1972
C        ARGUMENT  DEFINITION
C
C          XX      X-COORDINATE
C          YY      Y-COORDINATE
C          NPTS    NUMBER OF POINTS CALCULATED THUS FAR.
C          LAST    LAST POINT INDICATOR =1 IMPLIES LAST POINT.
C          MORE    INDICATES WHEN THE LAST PLOT OF A SET HAS BEEN DONE.
C          NPLT    NUMBER OF PLOT PRESENTLY BEING PROCESSED.
C
C        THE SUBROUTINE WILL ACCUMULATE AND PLOT UP TO 997 POINTS/PLOT.
C        THE PLOT WILL BE SCALED TO FIT EITHER A 12 INCH OR 30 INCH
C        CALCOMP DRUM PLOTTER. THE PLOTTER PEN MUST BE INITIALLY
C        POSITIONED TO THE MOST NEGATIVE Y. TITLE AND SCALING MARKS ARE
C        ALSO PLOTTED. STANDARD CALCOMP SUBROUTINES ARE USED.
C
      INTEGER AP,AALT,OALT,TPD
      COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      COMMON/TITLE/GTITLE,ATITLE,AP,AALT,OALT,TPD
      COMMON /PLOTR/ IPSIZ,DELS,NPLOT,XAR,PZ,PSCALE
      COMMON /SK/ TOL,TOL2,VAL,XVAL,TNEY1,NYS,IERROR
      COMMON /SCRACH/ X,Y
C
      DIMENSION ATITLE(14),GTITLE(14),PZ(3),X(700),Y(700)
      DATA IPLT/4HPLOT/,IBAD/0/,ITER/0/
C
C        BEGIN PROGRAM.
C
      IF(NPTS.NE.1) GO TO 10
C
C        INITIALIZE REFERENCE VALUES WITH FIRST POINT.
C
      XLG=XX
      XSM=XX
      YLG=YY
      YSM=YY
      GO TO 20
C
C        RECORD MAXIMUM AND MINIMUM VALUES OF X AND Y.
C
   10 IF(XX.GT.XLG) XLG=XX
      IF(XX.LT.XSM) XSM=XX
      IF(YY.GT.YLG) YLG=YY
      IF(YY.LT.YSM) YSM=YY
C
C        ACCUMULATE SUCCESSIVE CONTOUR POINTS.
C
   20 X(NPTS)=XX
      Y(NPTS)=YY
   30 IF(LAST.NE.0) GO TO 60
      RETURN
C
C        BEGIN PLOTTING SECTION
```

```
C
 60   IF(NPLOT .NE. IPLT) GO TO 80
C
C        IF NO PLOT REQUESTED, RETURN. IF PLOTTING, SCALING FACTOR WILL
C        BE BASED ON VALUES OF FIRST CONTOUR.
C
      IF(NPLT.NE.1) GO TO 80
C
C        SET UP FOR 12 INCH PLOT. IF 30 INCH REQUESTED, THEN MODIFY.
C
      YMX=5.25
      CENTER=5.5
      H1=0.07
      H2=0.14
      TTL=-5.4
      XL=XLG
      XS=XSM
      YL=YLG
      YS=YSM
      IF(IPSIZ .NE.30) GO TO 65
C
C        30 INCH PARAMETERS.
C
      YMX=14.0
      CENTER=14.6
      H1=0.14
      H2=0.21
      TTL=-14.4
C
C        SCALE TO THE APPROPRIATE PLOT SIZE.
C
   65 FCT=PSCALE
      IF(FCT.GT.0.) GO TO 75
      FCT=2000.
      DO 70 I=1,10
      IF(ABS(YL/FCT).LT.YMX.AND.ABS(YS/FCT).LT.YMX) GO TO 75
   70 FCT=FCT+FCT
      WRITE(6,72) NPLT,CTITLE
   72 FORMAT(///,27H CONTOUR EXCEEDS SIZE LIMIT ,//,1X,13A6,A2)
      NPTS=0
      RETURN
C
C        FCT IS NOW THE SCALING FACTOR. THE FOLLOWING DRAWS A VERTICAL
C        LINE AND A HORIZONTAL LINE CROSSING. IF THESE PLOTS ARE TO BE
C        PHOTO-REPRODUCED, THEN THESE LINES CAN BE USED TO CALIBRATE
C        THE CAMERA. WHEN THE LINES ARE EACH 6 INCHES LONG, THE SCALE
C        IS 1 INCH EQUALS 2000 FEET.
C
   75 X2=6000./FCT
      X1=CENTER-X2
      Y1=-X2
      Y2=X2
      X2=CENTER+X2
      CALL SYMBOL(0.,X1,H1,13,90.,-1)
      CALL SYMBOL(0.,X2,H1,13,90.,-2)
      CALL SYMBOL(Y1,CENTER,H1,13,0.,-1)
      CALL SYMBOL(Y2,CENTER,H1,13,0.,-2)
C
C        NOW MOVE TO NEW ORIGIN FOR THIS SET OF PLOTS.
C
```

```
      A=ABS(XS/FCT)+6.
      CALL PLOT(A,CENTER,-3)
C
C        THE FOLLOWING SECTION PLOTS THE RUNWAYS
C
      DO 90 I=1,NRW
      ANGLE=ATAN2((XA(2,I)-XD(2,I)),(XA(1,I)-XD(1,I)))*57.2598
      X1=XA(1,I)/FCT
      X2=XD(1,I)/FCT
      Y1=XA(2,I)/FCT
      Y2=XD(2,I)/FCT
      CALL SYMBOL(X1,Y1,H1,13,ANGLE,-1)
      CALL SYMBOL(X2,Y2,H1,13,ANGLE,-2)
   90 CONTINUE
C
C        THE FOLLOWING SECTION WRITES THE XY-VALUES AND IDENT. INFO ON
C       LOGICAL UNIT 2 (PRESUMABLY A MAGNETIC TAPE). THIS WILL BE READ
C        LATER BY THE NOISE IMPACT PROGRAM FOR LAND USE AND PCP. ANAL.
C
   80 IIN=NPTS
      INI=IIN/10+4
      WRITE(2,1000) AP,AALT,DALT,TPD,INI,IIN,VAL,XLG,XSM,YLG,YSM,XAR
 1000 FORMAT(12A6)
      WRITE(2,1001) ATITLE,GTITLE
 1001 FORMAT(13A6,A2)
      WRITE(2,1002) (X(I),I=1,IIN)
 1002 FORMAT(20A6)
      WRITE(2,1002) (Y(I),I=1,IIN)
      ENDFILE 2
      ENDFILE 2
      CALL SKFIL(2,-1,LSTAT)
      CALL SKREC(2,-1,LSTAT)
      IF(MORE.NE.0) CALL SKFIL(2,1,LSTAT)
      IF(NPLOT .NE. IPLT) RETURN
C
C        THE FOLLOWING PLACES THE SCALE FACTOR AND PLOTS THE CONTOUR.
C
      X(NPTS+1)=0.
      Y(NPTS+1)=0.
      X(NPTS+2)=FCT
      Y(NPTS+2)=FCT
      N=-NPTS
      CALL FLINE(X,Y,N,1,0,0)
      CALL PLOT(0.,0.,-3)
C
      IF(MORE.EQ.0) RETURN
C
C        PLOT TITLES AND SCALE FACTOR.
C
      X1=XS/FCT
      CALL SYMBOL(X1,TTL,H2,GTITLE,0.,80)
      CALL SYMBOL(999.,999.,H2,12H SCALE 1 TO ,0.,12)
      A=FCT*12.
      CALL NUMBER(999.,999.,H2,A,0.,-1)
C
C        ADVANCE TO INITIAL POINT FOR NEXT PLOT SET.
C
      CALL WHERE(RX,RY,RF)
      A=AMAX1(RX+6.,XL/FCT+6.)
      CALL PLOT(A,-CENTER,-3)
      RETURN
C              THAT'S IT FOLKS.
      END
```

```
      SUBROUTINE PREPR(NP,D,RL,H,PWR,V,ITAC,NTRK,MAXSEG)
      COMMON /RUNWAY/ APA,APTEMP,GARBAG(75)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TD(88,14),DMIN(88)
      COMMON /TGROUP/ DCOM(25),ITRG(88)
      COMMON /WIND/ VEL(25),DIR(25)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /RESALT/ NAR(88),ENDR(25,85),STR(25,85),ICBT(25),GCBN(25),
     1               ICBNCO(16),ENDALT(25,85),ORGSTR(25),ORGEND(25)
      COMMON /CONST/ PI
      LOGICAL CBTYP1,CBTYP5
      DATA K/2/
C
C         THIS PORTION OF SUBROUTINE PREPR HANDLES THE WIND CORRECTION
C         BY ALTERING INPUT DISTANCE D BY A FACTOR VA/(VA+V)
C         WHERE
C                  V = COMPONENT OF WIND VELOCITY IN DIRECTION OF TRACK SEGMENT
C                  VA = AIRPLANE SPEED
C
      V=0.
      DD=D
      NR=NAR(NTRK)
      NG=ITRG(NTRK)
      IF(NG .EQ. 0 .OR. VEL(NG) .EQ. 0.) GO TO 50
      IF(AND(MASK(MAXSEG),ITSEG(NTRK)).NE.0) GO TO 20
C         WIND DIRECTION IS MEASURED CLOCKWISE FROM THE POSITIVE X-AXIS
C         FIND COMPONENT IN THE DIRECTION OF TRACK SEGMENT
      X1=PARAM(4,MAXSEG,NTRK)
      Y1=PARAM(5,MAXSEG,NTRK)
      ANG = ATAN2(Y1,X1)
      V = -VEL(NG) * COS(ANG+DIR(NG))
      GO TO 25
C         FOR A CURVED SEGMENT INTERPOLATE BETWEEN ENDS
 20   SIGN=SGNR(PARAM(3,MAXSEG,NTRK))
C         SIGN NEGATIVE FOR RIGHT HAND-TURNS
      ANG=PI/2.+PARAM(5,MAXSEG,NTRK)
      V1=-VEL(NG)*COS(ANG+DIR(NG))*SIGN
      ANG=ANG+SIGN*PARAM(4,MAXSEG,NTRK)
      V2=-VEL(NG)*COS(ANG+DIR(NG))*SIGN
      V=V1+(V2-V1)*(D-TD(NTRK,MAXSEG-1))/ABS(PARAM(3,MAXSEG,NTRK)
     1    * PARAM(4,MAXSEG,NTRK))
C         FOR TAKEOFFS, V POSITIVE IMPLIES A TAIL WIND
C         ALTITUDE PROFILES ARE NOT ADJUSTED FOR APPROACHES
 25   IF(PROF(1,1,NP) .GE. 0.) GO TO 30
C         VW IS THE WIND COMPONENT IN THE AIRPLANES DIRECTION OF TRAVEL
      V=-V
      VW=V
      GO TO 999
C         RECOMPUTE GROUND TRACK DIST DD TO EFFECTIVELY COMPRESS OR
C         STRETCH TAKE-OFF PROFILES TO ACCOUNT FOR WIND
 30   VA=PROF(3,3,NP)
      IF(MAXSEG.EQ.1) GO TO 40
      MXS=MAXSEG-1
      DD=DD-TD(NTRK,MXS)
      IF(AND(MASK(MAXSEG),ITSEG(NTRK)) .EQ. 0) DD=DD*VA/(VA+V)
      DO 35 I=1,MXS
      IF(AND(MASK(I),ITSEG(NTRK)).NE.0) GO TO 34
C         STRAIGHT SEGMENTS
```

```
      X1=PARAM(4,I,NTRK)
      Y1=PARAM(5,I,NTRK)
      ANG=ATAN2(Y1,X1)
C        COMPUTE COMPONENT WIND VELOCITY ALONG SEGMENT
      VW = -VEL(NG)*COS(ANG+DIR(NG))
C        PARAM(3,I,NTRK) IS THE SEGMENT LENGTH
      DD=DD+PARAM(3,I,NTRK)*VA/(VA+VW)
      GO TO 35
C        FOR A CURVE, PARAM(3,I,NTRK)*PARAM(4,I,NTRK) IS THE SEGMENT ARC LENGTH
 34   DD=DD+ABS(PARAM(3,I,NTRK)*PARAM(4,I,NTRK))
 35   CONTINUE
      GO TO 50
   40 DD=DD*VA/(VA+V)
 50   IF(NR .LE. 0 .OR. NP .GT. 85) GO TO 999
C
C
C          THIS PORTION OF SUBROUTINE PREPR COMPUTES THE ALTITUDE,
C          VELOCITY AND THRUST FOR DEPARTURES AFFECTED BY ALTITUDE
C          RESTRICTIONS AND/OR POWER CUTBACKS
C
C          TWO METHODS ARE USED TO INSERT CUTBACK SEGMENTS INTO A PROFILE
C               1. IF C/B STARTS DURING OR BEFORE THE MAX CLIMB SEGMENT
C                  (UP TO PROF(5,X,NP)), THE C/B WILL BE FOLLOWED BY THE
C                  STANDARD PROFILE SEGMENTS OCCURRING AFTER THE CUTBACK
C                  TO MAX CLIMB POWER FROM MAX POWER.
C               2. IF C/B STARTS AFTER THIS POINT, THE C/B SEGMENT WILL
C                  BE FOLLOWED BY THE REMAINING PORTION OF THE PROFILE
C
C          DATA REQUIRED FOR FOUR TYPES OF CUTBACK ARE STORED IN THE
C          PROF ARRAY AS FOLLOWS
C               PROF(10,X,NP) = THRUST
C               PROF(9,X,NP) = CLIMB GRADIENT
C                    PROF(X,1,NP) IS LEVEL FLIGHT (ALTITUDE RESTRICTION)
C                    PROF(X,2,NP) IS TAKE-OFF
C                    PROF(X,3,NP) IS MAX CLIMB
C                    PROF(X,4,NP) IS FAR 36 CUTBACK
C          OTHER CUTBACKS MAY BE MADE BY SPECIFYING A CLIMB GRADIENT AS
C          INPUT AND SETTING THE C/B TYPE CODE = 5
C          IF THE C/B TYPE CODE = 0, THERE IS NO C/B
C
C          OTHER INPUTS ARE; (THESE ARE SETUP IN SUBROUTINES ALTRRD & SETRES)
C               NAR - C/B NUMBERS BY TRACK NUMBER
C               ENDR - C/B END POINTS BY C/B AND PROFILE
C               STR - C/B START POINTS BY C/B AND PROFILE
C               ICBT - C/B TYPE CODES BY C/B
C               GCBN - CLIMB GRADIENTS FOR TYPE 5 CUTBACKS BY C/B
C               ICBNCO - C/B OVERRIDE MODE BY NOISE CURVE
C               ENDALT - C/B ENDING ALTITUDES BY C/B AND PROFILE
C               ORGSTR - C/B START POINTS AS INPUT BY C/B
C               ORGSTR - C/B END POINTS AS INPUT BY C/B
C               APA - AIRPORT ALTITUDE
C
C          PASSED PARAMETERS -
C               NP - PROFILE NUMBER
C               D - DISTANCE FROM BRAKE RELEASE ALONG TRACK
C               RL - RUNWAY LENGTH
C               H - ALTITUDE
C               PWR - THRUST
C               V - VELOCITY
C               ITAC - AIRCRAFT (NOISE CURVE) TYPE CODE
```

```
C              NTRK - TRACK NUMBER
C              MAXSEG - CLOSEST SEGMENT NUMBER OF TRACK
C
C
C        THE C/B OVERRIDE MODE ARRAY ALLOWS CERTAIN AIRCRAFT TYPES
C        TO IGNORE CUTBACKS. THE CODES ARE
C              0 - TAKE C/B AS DEFINED
C              1 - NO C/B OF ANY TYPE
C              2 - FAR 36 C/B ONLY
C              3 - TAKE OFF AND CLIMB ONLY
C
C
C        EXTERNAL REFERENCES
C              DELTA - FUNCTION TO COMPUTE THE PRESSURE-ALTITUDE CORRECTION
C              POSMUT - FUNTION TO SMOOTH POWER OVER THE FIRST 1000 FT OF
C                       ANY THRUST CHANGE
C              GENFN1 - 1-DIMENSIONAL LINEAR INTERPOLATION ROUTINE
C              PROFDA - COMPUTES ALTITUDE,VELOCITY AND THRUST FOR
C                       UNRESTRICTED PROFILES
C        OUTPUTS -
C              V - AIRCRAFT VELOCITY
C              H - AIRCRAFT ALTITUDE
C              PWR - AIRCRAFT THRUST
C              PRINTED DIAGNOSTICS
C
C        INITIALIZE RESTRICTION START AND END POINTS
      STRT=STR(NR,NP)
      STP =ENDR(NR,NP)
C
C        DETERMINE IF C/B MUST BE CONSIDERED
C
      IF(     (    DD     .LE. STRT )
     1   .OR.(STP-STRT .LT. 2000.)) GO TO 999
C
C        INITIALIZE TEMPORARY VARIABLES
      RL = 0.
      NRT = ICBT(NR)
C
C        CHECK C/B OVERRIDE ARRAY
      ICBMOD = ICONCC(ITAC) + 1
      IF(ICBMOD .LT. 5) GO TO 110
      WRITE (6,8001) ITAC
      ICBMOD = 1
 110  GO TO (140,999,120,130),ICBMOD
 120  IF(NRT .NE. 4) GO TO 999
      GO TO 140
 130  IF(     (NRT .LT. 2)
     1   .OR. (NRT .GT. 3)) GO TO 999
C
 140  JNT=7
C
C        GAMMA IS THE C/B CLIMB GRADIENT
 170  IF(NRT .EQ. 5) GO TO 180
      GAMMA = PROF(9,NRT,NP)
      CBTYP5 = .FALSE.
      CBTYP1= .FALSE.
      IF(NRT.EQ.1 .OR. NRT.EQ.4) CBTYP1= .TRUE.
      GO TO 190
 180  GAMMA = GCBN(NR)
      CBTYP5 = .TRUE.
```

```
C
C         STALT IS THE C/B START ALTITUDE
 190   STALT = ENDALT(NR,NP) - (STP-STRT)*GAMMA
C
C         DETERMINE WHICH TYPE OF C/B INSERTION IS INVOLVED
       IF(DD .LE. STP) GO TO 200
C         THE TYPE OF INSERTION DOES NOT MATTER BEFORE THE END OF THE C/B
       IF(STRT .LE. PROF(5,1,NP)) GO TO 300
       GO TO 400
C
C         IN THE C/B SEGMENT
C
 200   V = V + GENFN1(PROF(1,3,NP),PROF(1,1,NP),STRT,JNT,K)
C         V IS ASSUMED CONSTANT DURING C/B
       IF(K .GT. 1) GO TO 210
       WRITE (6,8002) NR,NP
 210   H = STALT + (DD-STRT)*GAMMA
C
C         POWER CHAGES ARE SMOOTHED FOR 1000 FT
       IF(      (DD - 1000.           .GT. STRT )
     1   .OR. (STRT-PROF(K,1,NP)    .GT. 1000.)
     2   .OR. (K                    .LE. 1     )) GO TO 220
       PWR1 = POSMUT(PROF(K-1,4,NP),PROF(K,4,NP),PROF(K,1,NP),
     1               PROF(K+1,1,NP),DD)
       GO TO 230
 220   PWR1 = PROF(K,4,NP)
 230   IF( CBTYP5 ) GO TO 240
       PWR2=PROF(10,NRT,NP)
       IF(CBTYP1) PWR2=PWR2/DELTA(H)
       GO TO 250
 240   PWR2 = (GAMMA*PROF(8,4,NP) + PROF(10,4,NP)*(PROF(8,3,NP)-1.))/
     1   (PROF(8,3,NP) * DELTA(H))
 250   PWR = POSMUT(PWR1,PWR2,STRT,STP,DD)
       RETURN
C
C         AFTER A C/B THAT STARTED DURING TAKE OFF AND CLIMB
C
C         THE DISTANCE ALONG THE TRACK BEYOND THE CUT-BACK
C         ZONE IS DECREASED BY A FACTOR OF DELTA AS A CRUDE
C         CORRECTION TO ACCOUNT FOR PERFORMANCE CHANGES WITH
C         ALTITUDE
C
 300   DEL = DELTA(ENDALT(NR,NP)-1500.-APA)
       D2 = PROF(4,1,NP) + (DD-STP)*DEL
C         DIVIDE BY DEL TO PREVENT DISCONTINUITIES
       IF(DD .GT. STP+1000./DEL) GO TO 350
       H = ENDALT(NR,NP) + GENFN1(PROF(1,2,NP),PROF(1,1,NP),D2,JNT,K)
       H = H - PROF(4,2,NP)
       IF( CBTYP5 ) GO TO 310
       PWR1=PROF(10,NRT,NP)
       IF(CBTYP1) PWR1=PWR1/DELTA(H)
       GO TO 320
 310   PWR1 = (GAMMA*PROF(8,4,NP) + PROF(10,4,NP)*(PROF(8,3,NP)-1.))/
     1   (PROF(8,3,NP) * DELTA(H))
 320   PWR = POSMUT(PWR1,PROF(4,4,NP),PROF(4,1,NP),PROF(5,1,NP),D2)
       V = V + GENFN1(PROF(1,3,NP),PROF(1,1,NP),D2,JNT,K)
       RETURN
C
C         BEYOND C/B AFFECTED AREA
 350   HINC = ENDALT(NR,NP) - PROF(4,2,NP)
```

```
C        COMPUTE ALTITUDE AND DISTANCE SHIFTS
      CALL PROFDA(NP,D2,R1,H,PWR,V,ITAC,K)
      H = H + HINC
      RETURN
C
C        AFTER C/B STARTING AFTER TAKE OFF AND CLIMB
 400  HINC = (STP-STRT)*GAMMA
      DEL = DELTA(HINC-APA)
C        DIVIDE BY DEL TO PREVENT DISCONTINUITIES
      IF(DD .GT. STP+1000./DEL) GO TO 500
      D2 = STRT + (DD-STP)*DEL
      H = HINC + GENFN1(PROF(1,2,NP),PROF(1,1,NP),D2,JNT,K)
      IF( CBTYP5 ) GO TO 410
      PWR1=PROF(10,NRT,NP)
      IF(CBTYP1) PWR1=PWR1/DELTA(H)
      GO TO 420
 410  PWR1 = (GAMMA*PROF(8,4,NP) + PROF(10,4,NP)*(PROF(8,3,NP)-1.))/
     1  (PROF(8,3,NP) * DELTA(H))
 420  CONTINUE
C
      V = V + GENFN1(PROF(1,3,NP),PROF(1,1,NP),D2,JNT,K)
      IF(D2 .LT. PROF(6,1,NP)-500.) GO TO 430
      PWR2 = PROF(6,4,NP)
      DISTE = STRT+1000.0
      GO TO 440
 430  PWR2 = PROF(5,4,NP)
      DISTE = PROF(6,1,NP)
 440  PWR = POSMUT(PWR1,PWR2,STRT,DISTE,D2)
      RETURN
C
C        BEYOND C/B THAT STARTED AFTER TAKE OFF AND CLIMB
C
 500  D2 = STRT + (DD-STP)*DEL
      CALL PROFDA(NP,D2,RL,H,PWR,V,ITAC,K)
      H = H + HINC
      RETURN
C
C        FORMATS
C
 8001 FORMAT (44H0INVALID C/B OVERRIDE MODE FOR AIRCRAFT TYPE,I3)
 8002 FORMAT (28H0C/B OCCURS BEFORE LIFT OFF., 4H C/B,I3, 8H PROFILE,I3)
C     NORMAL PROFILE CALCULATION
C
 999  CALL PROFDA(NP,DD,RL,H,PWR,V,ITAC,K)
C
      IF(    (PROF(1,1,NP).GE.0.)
     1   .OR.(NG            .EQ. 0 )
     2   .OR.(VEL(NG)       .EQ. 0.)) RETURN
C
C        COMPUTE THRUST INCREASE FOR APPROACH INTO A HEADWIND
C        ASSUME CONSTANT AIRSPEED APPROACHES
      GAMMA=(PROF(K,2,NP)-PROF(K+1,2,NP))/
     1(PROF(K+1,1,NP)-PROF(K,1,NP))
      I=MATCH(ITAC)
C        CORRECTION ACCOUNTS FOR ALTITUDE AND NUMBER OF ENGINES
C        APPTHR(11) & APPTHR(14) CONTAIN WEIGHT AND # ENGINES RESPECTIVELY
      PWR=PWR+APPTHR(11,I)*GAMMA*VW/((V-VW)*DELTA(H)*APPTHR(14,I))
      RETURN
      END
```

```
      SUBROUTINE PROFDA(NP,D,RL,H,PWR,V,ITAC,I)
C         GIVEN DISTANCE ALONG FLIGHT TRACK, PROFDA COMPUTES THE
C.        AIRCRAFT HEIGHT, THRUST SETTING AND VELOCITY.
C            NP - PROFILE INDICATOR
C            D  - DISTANCE ALONG FLIGHT TRACK FROM CLOSEST POINT TO
C                 THE FAR END OF THE RUNWAY.
C            RL - RUNWAY LENGTH
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      DIMENSION GTD(10)
      EQUIVALENCE(GTD(1),PROF(1,1,100))
C         PROF(I,J,K) = DATA AS FOLLOWS FOR ITH SEGMENT OF KTH PROFILE.
C         PROF(I,1,K) - GROUND TRACK DISTANCES (FROM BRK. REL/THRESHOLD)
C         PROF(I,2,K) - ELEVATIONS ABOVE RUNWAY
C         PROF(I,3,K) - VELOCITIES
C         PROF(I,4,K) - POWER SETTINGS
      IF(NP .EQ. 100) GO TO 31
      JOINT = 3
      DO 8 L=4,10
      IF(PROF(L,1,NP).LE.0.) GO TO 10
 8    JOINT=L
 10   DO 11 L=1,JOINT
 11   GTD(L)=PROF(L,1,NP)
C         JOINT CONTAINS THE NUMBER OF SEGMENT DATA POINTS.
      KK=0
      IF(PROF(1,4,NP).GE.0.) GO TO 31
      L = MATCH(ITAC)
      GTD(1) = APPTHR(1,L)
      CALL PROSET(NP,ITAC,JOINT)
C         NP WILL BE SET TO 100 IN PROSET
 31   DT = D
      IF(GTD(1) .LT. 0.) DT = DT-RL
C         GTD(1) POSITIVE IMPLIES A TAKEOFF
      RL = 0.
      H=GENFN1(PROF(1,2,NP),GTD,DT,JOINT,I)
      IF(H.LT.0.) H=0.
C         COMPUTE AIRCRAFT VELOCITY
      IF(DT.GE.GTD(1)) GO TO 12
      V=PROF(1,3,NP)+V
      GO TO 15
 12   IF(DT.LT.GTD(JOINT)) GO TO 14
      V=V+PROF(JOINT,3,NP)
      GO TO 15
 14   V=V+PROF(I,3,NP)+(PROF(I+1,3,NP)-PROF(I,3,NP))*
     1 (DT-GTD(I))/(GTD(I+1)-GTD(I))
C         COMPUTE THRUST SETTING (INCLUDE SPOOLDOWN)
 15   IF(DT.GE.GTD(1)) GO TO 25
C         THE CASE WHERE LISTENER IS BEYOND THE STOPPING POINT.
      RL=GTD(1)-DT
      PWR=PROF(1,4,NP)
      IF(GTD(1) .LT. 0.) PWR = PWR/DELTA(0.)
      RETURN
C         ACCOUNT FOR SPINDOWN (SPOOLUP)
 25   IF(GTD(1) .LT. 0.) GO TO 50
      IF(I .EQ. 1) GO TO 40
      PWR = POSMUT(PROF(I-1,4,NP),PROF(I,4,NP),GTD(I),GTD(I+1),DT)
      RETURN
 40   PWR = PROF(1,4,NP)
      RETURN
C         A LANDING
 50   PWR = POSMUT(PROF(I+1,4,NP),PROF(I,4,NP),GTD(I+1),GTD(I),DT)
C         FOR LANDINGS CORRECT THRUST FOR PRESS ALTITUDE
      PWR = PWR/DELTA(H)
      RETURN
      END
```

```
      SUBROUTINE PROFRD(ICNT,IDUMP)
      COMMON /PROFIL/ PROF(10,4,150), APPTHR(14,12),MATCH(16)
      COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      COMMON /SCRACH/ ICMT(20),CI,IT,A,T
C
C        READS PROFILE DATA
C        IF PROFILE IS ON A TRACK THAT IS IN A TRACK-GROUP  OR
C        IS SUBJECT TO TAKE-OFF ALTITUDE RESTRICTIONS; IT MUST FOLLOW THE
C        CONVENTION THAT LANDINGS ARE NUMBERED OVER 100
C        PROFILE 100 IS RESERVED FOR GROUND RUNUP
C
      DIMENSION  IFMT(4)
      DATA  IFMT/6H(1X,8F,6H10.2, ,1H  ,6HF10.2)/,
     1        IFM2/6HF10.2,/,IFM1/6HF10.5,/
      DATA FT/6H(FEET)/,DNM/6H(N.M.)/
      DO 380 M=1,ICNT
      READ(5,301) K,II,(ICMT(I),I=1,13)
 301  FORMAT(2I3,12A6,A2)
      IFMT(3)=IFM1
      IF(K .GT. 85) IFMT(3)=IFM2
      CI=DNM
      IF(II .NE. 0) CI=FT
      WRITE(6,302) K,CI,(ICMT(I),I=1,13)
 302  FORMAT(8H PROFILE,I4,1X,A6,4X,12A6,A2)
      DO 345 J=1,4
      READ(5,340) (PROF(I,J,K),I=1,10)
  340 FORMAT(10F8.0)
      WRITE(6,IFMT)  (PROF(I,J,K),I=1,10)
  345 CONTINUE
      IF(II.NE.0) GO TO 360
      DO 350 I=1,10
      IF(PROF(I,1,K).EQ.0. .AND. I.GT.3) GO TO 360
      PROF(I,1,K)=PROF(I,1,K)*6076.115
  350 CONTINUE
 360  IF(K .GT. 99) GO TO 380
C        PROFILES ARE INPUT AT MSL CONDITIONS
C        CORRECT PROFILES FOR AIRPORT ALTITUDE AND TEMPERATURE
      A=0.
      T=288.
      CALL TPROF(APALT,A,APTEMP,T,K)
C
C        COMPUTES TAKE-OFF ALTITUDE RESTRICTIONS IF ANY
 369  DO 370 I=1,25
 370  CALL SETRES(K,I,IDUMP)
  380 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE PROSET(NP,ITAC,KK)
C     SUBSTITUTES PROFILE PARAMETERS INTO APPROACH PROFILES
C       AS INDICATED BY NEGATIVE NUMBERS STORED IN PROF
C        PARAMETERS WILL BE PLACED INTO PROFILE 100
C
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
C        PROF(I,J,K) = AP(I+10*(J-1)+40*(K-1))
      ITYP=MATCH(ITAC)
      DO 100 I=1,KK
      PROF(I,2,100) = PROF(I,2,NP)
      PROF(I,3,100) = PROF(I,3,NP)
  100 PROF(I,4,100) = PROF(I,4,NP)
C        THRUST SUBSTITUTIONS ARE MADE IN ALL POSITIONS
C
      NP=100
C
      DO 210 I=1,KK
      IF(PROF(I,3,100) .GE. 0.) GO TO 205
C        REPLACE VELOCITY INDICATOR WITH VELOCITY FROM APPTHR
      PROF(I,3,100) = APPTHR(2,ITYP)
  205 K = ABS(PROF(I,4,100)) + 0.5
      IF(K .EQ. 0) GO TO 206
C        REPLACE ANY THRUST INDICATORS WITH THRUSTS FROM APPTHR
C        THRUSTS MAY NOT BE GIVEN EXPLICITLY
      PROF(I,4,100) = APPTHR(K,ITYP)
      GO TO 210
  206 PROF(I,4,100) = 0.0
  210 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE READIN(NRW)
      COMMON /SCRACH/ ICMT(30)
C
 1000 READ(5,5) ICODE,IDUMP,ICNT,FAC,(ICMT(I),I=1,12)
 5    FORMAT(I3,I1,I3,F5.0,11A6,A2)
      WRITE(6,6) ICODE,IDUMP,ICNT,FAC,(ICMT(I),I=1,12)
 6    FORMAT( /,1X,I3,I1,I3,F7.3,2X,11A6,A2,/)
CODE 000        RETURN TO NOISE1
CODE 100=1      READ RUNWAYS AND TRACKS
CODE 100=2      READ TRACKS ONLY          (MUST FOLLOW RUNWAY DATA)
CODE 100=3      READ MIX DATA
CODE 100=4      READ TRACK PERCENTAGES (THEN MIX DATA)
CODE 100=5      READ MIX DATA - FIXED PROPORTION FORMAT
CODE 101        READ PROFILES
CODE 102        READ NOISE CURVES
CODE 103        READ TRACK ALTITUDE RESTRICTIONS
CODE 104        READ NOISE CURVE MERGE DATA    (MUST FOLLOW MIX DATA)
CODE 105        READ TRACK GROUP DATA     (MUST PRECEED MIX DATA)
CODE 106        READ WIND DATA
CODE 107        READ NOISE CURVE-APP THRUST MATCH
CODE 108        READ APPROACH PARAMETERS
      IF(ICODE.EQ.0) RETURN
      IF(ICODE.EQ.100) GO TO 5000
 2000 ICODE=ICODE-100
      GO TO (100,200,300,400,500,600,700,800),ICODE
C
C        READ PROFILE DATA
C
 100  CALL PROFRD(ICNT,IDUMP)
      GO TO 1000
C
C        READ NOISE DATA
C
 200  CALL NOISRD($8866,ICNT)
      GO TO 1000
C
C   READ T/O ALTITUDE RESTRICTIONS
C
 300  CALL ALTRRD($8866,ICNT,IDUMP)
      GO TO 1000
C
C        READ NOISE CURVE MERGE DATA
C
 400  CALL MERGRD(ICNT,IDUMP)
      GO TO 1000
C
C        READ TRACK GROUP DATA
C
 500  CALL GRPRD($8866,ICNT)
      GO TO 1000
C
C        READ WIND DATA
C
 600  CALL WINDRD(ICNT)
      GO TO 1000
C
C        READ NOISE TYPE - APPTHR MATCH
C
```

```
 700  CALL MACHRD($8866)
      GO TO 1000
C
C        READ APPROACH PARAMETERS
C
 800  CALL APPTRD($8866,ICNT)
      GO TO 1000
C
5000  GO TO (1100,1200,1300,1400,1500),ICNT
C
C        READ RUNWAY DATA
C
 1100 CALL RWYRD($8866,NRW,FAC,IDUMP)
      GO TO 1000
C
C        READ TRACK DATA
C
 1200 CALL TRAKRD($8866,IDUMP)
      GO TO 1000
C
C        READ MIX DATA
C
 1300 CALL MIXRD($8866,FAC,IDUMP)
      GO TO 1000
C
C     READ TRACK USE PERCENTAGES
C
 1400 CALL PCNTRD($8866,FAC,IDUMP)
      GO TO 1000
C
C        READ MIX DATA - NEW FORMAT
C
 1500 CALL NEWMIX($8866,FAC,IDUMP)
      GO TO 1000
8866  NRW=0
      WRITE(6,9001)
 9001 FORMAT( /,20H ERROR IN INPUT DATA )
      RETURN
      END
```

```
      SUBROUTINE RITCON
      DIMENSION CONTRB(16)
      LINE = 55
      ENDFILE 4
      REWIND 4
110   READ(4,END=150) PX,PY,EPNLS,(CONTRB(I),I=1,16)
      IF(LINE .LT. 50) GO TO 105
      LINE = 0
      WRITE(6,1008) (I,I=1,16)
1008  FORMAT(1H1,55X,10HCOMPONENTS,//,6X,1HX,12X,1HY,6X,
     1 7HEPNLSUM,I4,15I6)
105   CONTINUE
      WRITE(6,1007) PX,PY,EPNLS,(CONTRB(I),I=1,16)
1007  FORMAT(2(1X,E12.6),F7.2,16F6.1)
      GO TO 110
150   REWIND 4
      RETURN
      END
```

```
      SUBROUTINE RWYRD(*,NRW,FAC,IDUMP)
      COMMON /RUNWAY/APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TTD(88,14),DMIN(88)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /SCRACH/ BUF(30),V1(3),V2(3),UNIT(3),XR1(3),ALT,TEMP,MRW
      DATA XLONG/O377777777777/
C        READS RUNWAY DATA
C
C        ALT,TEMP CONTAIN ORIGINAL AIRPORT ALTITUDE & TEMPERATURE
      ALT = APALT
      TEMP=APTEMP
      READ(5,5) APALT,APTEMP
 5    FORMAT(2F10.0)
      WRITE(6,6) APALT,APTEMP
 6    FORMAT(//,20X,17HAIRPORT ALTITUDE=,F7.0,13H FT ABOVE MSL,10X,
     1 13HAMBIENT TEMP=,F4.0,5HDEG C,//)
C        CONVERT STORED TEMP TO ABSOLUTE SCALE
      APTEMP=APTEMP + 273.
C
C        CORRECT TAKEOFF PROFILES FOR NEW AIRPORT ALTITUDE
C
      DO 8 I=1,99
      CALL TPROF(APALT,ALT,APTEMP,TEMP,I)
      DO 8 J=1,25
      CALL SETRES(I,J,IDUMP)
      IF(IDUMP .EQ. -1) RETURN 1
 8    CONTINUE
C
      READ(5,10) MRW,(BUF(I),I=1,13)
   10 FORMAT(1X,I2,12A6,A5)
      IF(MRW .EQ. 0) RETURN
      NRW=MRW
      WRITE(6,10) NRW,( BUF(I),I=1,13)
      DO 30 I=1,NRW
      READ(5,20) IRWY,(BUF(J),J=1,10)
 20   FORMAT(1X,I2,6(1X,F8.0),3A6,A5)
      WRITE(6,21) IRWY,(BUF(J),J=1,10)
 21   FORMAT(7H RUNWAY,I3,6F11.2,5X,3A6,A5)
      DO 25 K=1,2
      XA(K,IRWY)=BUF(K)
      XD(K,IRWY)=BUF(K+3)
      V1(K)=BUF(K)
      V2(K)=BUF(K+3)
   25 CONTINUE
      CALL VSUB(V1,V2,V1)
      RL(IRWY)=VMAG(V1)
   30 CONTINUE
C        AUTOMATICALLY PROCEDES TO READ TRACK DATA
C
      ENTRY TRAKRD(*,IDUMP)
C
      READ(5,10) MRW,(BUF(I),I=1,13)
      IF(MRW .EQ. 0) RETURN
      NTR=MRW
      WRITE(6,10)  NTR,( BUF(I),I=1,13)
      DO 200 I=1,NTR
      READ(5,40) NTRWY,NT,NS,(BUF(J),J=1,14)
```

```
   40 FORMAT(3I2,14F5.0)
      WRITE(6,41) NTRWY,NT,NS,(BUF(J),J=1,14)
   41 FORMAT(11H TRACK DATA,I3,2I2,14F7.2)
      IF(NS.LE.8) GO TO 45
      READ(5,43)  DUM    ,(BUF(J),J=15,28)
   43 FORMAT(A6,14F5.0)
      WRITE(6,44)  DUM    ,(BUF(J),J=15,28)
   44 FORMAT(12X,A6,14F7.2)
 45   IF(NS.EQ.1) GO TO 48
      K=2*NS-1
      BUF(K)=0.
      BUF(K-1) = XLONG
C        FORCE LAST SEGMENT TO BE A LONG STRAIGHT ONE
      IF(BUF(3).EQ.0.) GO TO 500
 48   ITR(NT)=NTRWY
      ITSEG(NT)=NS
      K=NS+NS-2
      XL=BUF(1)*6076.115 + RL(NTRWY)
      IF(NS.EQ.1) XL=XLONG
      DMIN(NT)=XL
      BUF(1)=0.
      DO 50 J=1,2
      UNIT(J)=XD(J,NTRWY)-XA(J,NTRWY)
      XR1(J)=XA(J,NTRWY)
   50 CONTINUE
      CALL VUNT(UNIT,UNIT)
      CALL XLINE(NT,1,XL,UNIT,XR1)
      IF(NS.EQ.1) GO TO 200
      L=1
      DO 100 J=2,K,2
      L=L+1
      IF(BUF(J+1).NE.0.) GO TO 60
      XL=BUF(J)*6076.115
      IF(XL.LT.DMIN(NT)) DMIN(NT)=XL
      CALL XLINE(NT,L,XL,UNIT,XR1)
      GO TO 100
 60   A=BUF(J+1)*6076.115
      THETA=BUF(J)
      XL=DGTRD(THETA)*ABS(A)
      IF(XL.LT.DMIN(NT)) DMIN(NT)=XL
      ITSEG(NT)=OR(MASK(L),ITSEG(NT))
      CALL HELG(NT,L,XL,UNIT,XR1,A)
      RM=ABS(A)*0.5
      IF(DMIN(NT) .GT. RM) DMIN(NT)=RM
C        DISALLOW TURNS OVER 270 DEGREES
      IF(THETA .GT. 270.) GO TO 500
      IF(L .EQ. 2) GO TO 100
      SI = SGNR(BUF(J+1))
      CTHETA=THETA+BUF(J-2)
      IF(SI*BUF(J-1).GT.0. .AND. CTHETA.GT.270.) GO TO 500
      IF(THETA.GT.180. .AND. (BUF(J-1).NE.0. .OR. BUF(J+3).NE.0.))
     1 GO TO 500
C        DISALLOW TURNS GT 180 DEGREES NOT BOUNDED BY STRAIGHT SEGMENTS
      IF(L.LT.4) GO TO 100
      IF(SI*BUF(J-1).GT.0. .AND. SI*BUF(J-3).GT.0.) GO TO 500
C        DISALLOW 3 CONSECUTIVE TURNS IN THE SAME DIRECTION
  100 CONTINUE
      TTD(NT,1)=PARAM(3,1,NT)
      NS=NS-1
      DO 105 KNK=2,NS
```

```
      IF(AND(ITSEG(NT),MASK(KNK)).NE.0.) GO TO 102
      TTD(NT,KNK)=TTD(NT,KNK-1)+PARAM(3,KNK,NT)
      GO TO 105
102   TTD(NT,KNK)=TTD(NT,KNK-1)+ABS(PARAM(3,KNK,NT)*
     1   PARAM(4,KNK,NT))
105   CONTINUE
200   CONTINUE
      IF(IDUMP .EQ. 0) RETURN
      DO 300 I=1,88
      IF(ITR(I) .EQ. 0) GO TO 300
      WRITE(6,301) I,((PARAM(K,J,I),J=1,8),K=1,5),
     1 ((PARAM(K,J,I),J=9,15),K=1,5),(TTD(I,J),J=1,14),
     2 DMIN(I),ITSEG(I)
301   FORMAT(6H0TRACK,I3,/,
     1 5(5X,5HPARAM,3X,8E14.6/),/,5(5X,5HPARAM,3X,7E14.6/),/,5X,
     2 18H CUMULATIVE LENGTH,5X,7E14.6,/,14X,7E14.6//,5X,
     3 6H DMIN=,E12.6,5X,6HITSEG=,O12)
300   CONTINUE
      RETURN
500   WRITE(6,888)
888   FORMAT(1X,24HILLEGAL TRACK DEFINITION   )
      RETURN 1
      END
```

```
      SUBROUTINE SETRES(NP,NR,IDUMP)
      COMMON /RESALT/ NAR(88),ENDR(25,85),STR(25,85),ICBT(25),GCBN(25),
     1                ICBNCO(16),ENDALT(25,85),ORGSTR(25),ORGEND(25)
      COMMON /RUNWAY/ APALT,APTEMP,XA(2,15),XD(2,15),RL(15)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      DATA II/1/
C        CUTBACK RESTRICTIONS MAY ONLY APPLY TO PROFILES NUMBERED 1-85
      IF(NP .GT. 85) RETURN
C        CHECK TO INSURE THAT PROFILE EXISTS
      IF(PROF(1,1,NP).GE.PROF(2,1,NP)) RETURN
      STRT = ORGSTR(NR)
      END = ORGEND(NR)
      IF(END .LE. 0.) RETURN
      NRT = ICBT(NR)
      IF(NRT .EQ. 5) GO TO 5
      GCBN(NR) = PROF(9,NRT,NP)
 5    CONTINUE
C        GCBN(NR) CONTAINS THE GRADIENT MAINTAINED DURING CUT-BACK
C
C        CHECK TO BE SURE PROFILE IS IN STANDARD FORM
      DO 7 I=4,10
      IF(PROF(I,1,NP) .GT. 0.) GO TO 7
      JNT= I-1
      GO TO 8
 7    CONTINUE
 8    IF(JNT .EQ. 7) GO TO 9
      IDUMP=-1
      WRITE(6,1001) NP,(PROF(I,1,NP),I=1,10)
 1001 FORMAT(8H PROFILE,I3,3X,11HGRND DISTS=,10F10.2)
      RETURN
 9    IF(STRT .LE. 100.) GO TO 10
      IF(STRT .LT. 700.) STRT = 700.
      STALT = STRT
      STR(NR,NP) = GENFN1(PROF(1,1,NP),PROF(1,2,NP),STRT,JNT,II)
      GO TO 20
 10   STR(NR,NP) = STRT*6076.115
      STALT = GENFN1(PROF(1,2,NP),PROF(1,1,NP),STR(NR,NP),JNT,II)
      IF(STALT .GE. 700.) GO TO 20
      STALT = 700.
      STR(NR,NP) = GENFN1(PROF(1,1,NP),PROF(1,2,NP),STALT,JNT,II)
 20   IF(END .LE. 100.) GO TO 50
      ENDALT(NR,NP) = END
      ENDR(NR,NP) = STR(NR,NP) + (END-STALT)/GCBN(NR)
      GO TO 60
 50   ENDR(NR,NP) = END*6076.115
      ENDALT(NR,NP) = STALT + (ENDR(NR,NP)-STR(NR,NP))*GCBN(NR)
 60   CONTINUE
      IF(ICBT(NR) .LT. 4) GO TO 100
      PWR = (GCBN(NR)*PROF(8,4,NP) + PROF(10,4,NP)*(PROF(8,3,NP)-1.))/
     1   PROF(8,3,NP)
      DELT = PWR/PROF(10,3,NP)
C        Z IS THE ALTITUDE AT WHICH FN/* EXCEEDS CLIMB POWER
      Z = 0.144831E+6 * (1.-DELT**0.192145)
C        CONVERT Z TO A HT. ABOVE RUNWAY LEVEL
      Z=Z-APALT
      IF(ENDALT(NR,NP) .LE. Z) GO TO 100
      IF(STALT .GT. Z) GO TO 110
      ENDALT(NR,NP) = Z
      ENDR(NR,NP) = STR(NR,NP) + (Z-STALT)/GCBN(NR)
 100  IF(ENDR(NR,NP) .GE. STR(NR,NP)) GO TO 200
 110  ENDR(NR,NP) = STR(NR,NP)
      ENDALT(NR,NP) = STALT
 200  IF(IDUMP .EQ. 0) RETURN
      WRITE(6,201) NR,NP,STR(NR,NP),ENDR(NR,NP),STALT,ENDALT(NR,NP)
 201  FORMAT(12H RESTRICTION,I3,8H PROFILE,I3,3X,8HSTARTS @,E14.6,3X,
     1 8HENDS @,E14.6,3X,12HSTRT HEIGHT=,E14.6,3X,12H END HEIGHT=,
     2 E14.6)
      RETURN
      END
```

```
      FUNCTION SGNI(I)
      SGNI=1.
      IF(I.LT.0) SGNI=-1.
      RETURN
      END
```

```
      FUNCTION SGNR(R)
      SGNR=1.
      IF(R.LT.0.) SGNR=-1.
      RETURN
      END
```

```
      SUBROUTINE SIFT(TABN,IRRAY,NF,NSF,TN,SN,TOL)
C        TN= TOTAL NOISE
C        SN= NOISE FROM SIGNIFICANT FLIGHTS ONLY
C        NF= TOTAL # OF FLIGHTS
C        NSF= # OF SIGNIFICANT FLIGHTS
C        TABN  CONTAINS NOISE DATA
C        IRRAY RETURNS FLIGHT NUMBERS OF SIGNIFICANT FLIGHTS
      DIMENSION TABN(1),IRRAY(1)
C        COMPUTE MEAN OF DB LEVELS
      FN=NF
      SUM=TABN(1)
      DO 1 J=2,NF
    1 SUM=SUM+TABN(J)
      DBAV=SUM/FN
C        COMPUTE STANDARD DEVIATION OF DB LEVELS
      SUM=(DBAV-TABN(1))*(DBAV-TABN(1))
      DO 10 J=2,NF
   10 SUM=SUM+(DBAV-TABN(J))*(DBAV-TABN(J))
      SIGM=SQRT(SUM/FN)
C        COMPUTE ENERGY AVE OF TABN
      EAV=TN-10.*ALOG10(FN)
C        COMPUTE LEVEL OF SIGNIFICANCE (EMPIRICAL)
   15 XLIM=EAV-2.*SIGM*.025745/TOL
      NSF=0
      SUM=0.
      DO 20 I=1,NF
      IF(TABN(I).LT.XLIM) GO TO 20
      NSF=NSF+1
      IRRAY(NSF)=I
      SUM=SUM+10.**(TABN(I)/10.)
   20 CONTINUE
      SN=10.*ALOG10(SUM)
      IF(TN-SN.LE.TOL) RETURN
      SIGM=2.*SIGM
      WRITE(6,100)
  100 FORMAT(1H+,90X,3HSFT)
      GO TO 15
      END
```

```
      SUBROUTINE SORT2(IT,Z,IK)
      DIMENSION IT(1),Z(1)
      IF(IK.LT.3) RETURN
      JK=IK-1
      DO 10 I=1,JK
      KK=I+1
      DO 10 J=KK,IK
      IF(IT(I).GE.IT(J)) GO TO 10
      IX=IT(I)
      IT(I)=IT(J)
      IT(J)=IX
      XX=Z(I)
      Z(I)=Z(J)
      Z(J)=XX
   10 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE STRAIT(*,RO,P,D,X,IE)
      DIMENSION P(5),RO(3),S(3),R(3)
C         COMPUTES DISTANCE FROM A POINT (RO) TO & ALONG A STRAIGHT TRACK SEG,
C         IE=0  IF MAXSEG IS KNOWN
C         P(1),P(2) ARE COORDINATES OF THE SEGMENT START
C         P(3) IS THE SEGMENT LENGTH
C         P(4),P(5) IS A UNIT VECTOR ALONG THE SEGMENT
      CALL VSUB(S,P,RO)
      X=-VDOT(S,P(4))
      IF(IE.NE.0) GO TO 20
   10 IF(X.LE.0. .OR. X.GE.P(3)) RETURN 1
   20 IF(X.LT.0.) X=0.
      CALL VSCL(R,X,P(4))
      CALL VADD(R,S,R)
      D=VMAG(R)
      RETURN
      END
```

```
      SUBROUTINE TPROF(A2,A1,T2,T1,NP)
      COMMON /PROFIL/ PROF(10,4,150),APPTHR(14,12),MATCH(16)
      COMMON /SCRACH/ DELT,THETA,RD1,RD2,DIF,WT,EN,GAMMA,DH,DS
C
C        TPROF CORRECTS TAKE-OFF PROFILES FOR EFFECTS
C        OF PRESS ALTITUDE AND AMBIENT TEMPERATURE
C             T1 = ORIGINAL TEMP
C             T2 = NEW AMBIENT TEMPERATURE
C             A1 = ORIGINAL PRESSURE ALTITUDE
C             A2 = NEW AIRPORT PRESS ALT
C        PROFILES MUST BE IN STANDARD FORM TO CORRECT
C        ANYTHING EXCEPT TAKE-OFF ROLL DISTANCE
C
      IF(NP .GT. 99) RETURN
      IF(PROF(1,1,NP) .LT. 0.) RETURN
C        DELTA FUNCTION ALREADY ACCOUNTS FOR PRESENT AIRPORT ALTITUDE
      DELT=DELTA(0.)/DELTA(A1-A2)
      THETA=T2/T1
C
C        CORRECT TAKE-OFF ROLL DISTANCE
      RD1=PROF(2,1,NP)-PROF(1,1,NP)
      RD2=RD1*THETA/(DELT*DELT)
      DIF=RD2-RD1
      DO 10 I=2,10
      JNT=I-1
      IF(PROF(I,1,NP) .EQ. 0.) GO TO 11
 10   PROF(I,1,NP)=PROF(I,1,NP)+DIF
C
C        RETURN IF PROFILE ISN'T IN STANDARD FORM
 11   IF(JNT .NE. 7) RETURN
C
C        CORRECT ACCELERATION SEGMENT BY SAME FACTOR
      RD1= PROF(6,1,NP)-PROF(5,1,NP)
      RD2= RD1*THETA/(DELT*DELT)
      DIF= RD2-RD1
      PROF(6,1,NP)= PROF(6,1,NP)+DIF
      PROF(7,1,NP)= PROF(7,1,NP)+DIF
C
C        CORRECT CLIMB GRADIENTS BY FORMULA:
C
C             GAMMA' = GAMMA + (THRUST/WT)*(DELTA-1)
C
      EN=PROF(8,3,NP)
      WT=PROF(8,4,NP)
      EN=EN/WT
C
C        IGNORE CORRECTION TO LIFTOFF-GEARUP SEGMENT(UNRELIABLE GRADIENT)
      DO 25 I=4,7
      IF(I .EQ. 6) GO TO 25
      DH=PROF(I,2,NP)-PROF(I-1,2,NP)
      IF(DH .EQ. 0.) GO TO 25
      DS=PROF(I,1,NP)-PROF(I-1,1,NP)
C
      GAMMA=DH/DS+EN*PROF(I-1,4,NP)*(DELT-1.)*DELTA(A1-A2)
C
      IF(GAMMA .GT. 0.) GO TO 19
      WRITE(6,1001) NP,(PROF(K,1,NP),K=1,10),(PROF(K,2,NP),K=1,10)
 1001 FORMAT(26H NEGATIVE GRADIENT PROFILE,I3,/,10F10.1,/,10F10.1,/)
      GO TO 25
 19   DIF=DH/GAMMA - DS
      DO 20 J=I,7
      PROF(J,1,NP)=PROF(J,1,NP)+DIF
 20   CONTINUE
 25   CONTINUE
C
C        CORRECT TAKE-OFF AND CLIMB GRADIENTS
      DO 30 I=2,3
C
      PROF(9,I,NP)=PROF(9,I,NP)+EN*PROF(10,I,NP)*(DELT-1.)*DELTA(A1-A2)
C
 30   CONTINUE
      RETURN
      END
```

```
      SUBROUTINE VADD(C,A,B)
      COMMON /CONST/ PI,NC
      DIMENSION A(1),B(1),C(1)
      DO 10 I=1,NC
   10 C(I)=A(I)+B(I)
      RETURN
      END
```

```
      FUNCTION VDOT(A,B)
      COMMON /CONST/ PI,NC
      DIMENSION A(1),B(1)
      VDOT=0.
      DO 10 I=1,NC
   10 VDOT=VDOT+A(I)*B(I)
      RETURN
      END
```

```
      FUNCTION VMAG(A)
      COMMON /CONST/ PI,NC
      DIMENSION A(1)
      VMAG =SQRT(VDOT(A,A))
      RETURN
      END
```

```
      SUBROUTINE VSCL(C,F,A)
      COMMON /CONST/ PI,NC
      DIMENSION C(1),A(1)
      DO 10 I=1,NC
   10 C(I)=F*A(I)
      RETURN
      END
```

```
      SUBROUTINE VSUB(C,A,B)
      COMMON /CONST/ PI,NC
      DIMENSION A(1),B(1),C(1)
      DO 10 I=1,NC
      C(I)=A(I)-B(I)
   10 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE VTRN(C,A)
      COMMON /CONST/ PI,NC
      DIMENSION C(1),A(1)
      DO 10 I=1,NC
   10 C(I)=A(I)
      RETURN
      END
```

```
      SUBROUTINE VUNT(C,A)
      COMMON /CONST/ PI,NC
      DIMENSION C(1),A(1)
      VM=VMAG(A)
      IF(VM.EQ.0.) GO TO 20
      DO 10 I=1,NC
      C(I)=A(I)/VM
   10 CONTINUE
      RETURN
   20 DO 30 I=1,NC
   30 C(I)=A(I)
      RETURN
      END


      SUBROUTINE WINDRD(ICNT)
      COMMON /WIND/ VEL(25),DIR(25)
      COMMON /SCRACH/ IG(25),TV(25),TDIR(25),NG,J,K
C        READ WIND SPEED AND DIRECTION FOR EACH TRACK GROUP
C        SPEED ARRAY IS ZEROED IN NOISE1
      READ(5,10) (IG(K),TV(K),TDIR(K),K=1,ICNT)
 10   FORMAT(5(I3,2F6.5))
      DO 20 K=1,ICNT
      NG=IG(K)
      VEL(NG)=TV(K)
      DIR(NG)=TDIR(K)
 15   WRITE(6,16) NG,VEL(NG),DIR(NG)
 16   FORMAT(24H TR GROUP,WIND VEL,DIR: ,2X,I4,2F8.1)
C        WIND DIRECTION IS INPUT IN DEGREES (0-360) FROM POS Y-AXIS
C        WIND IS **FROM** THAT DIRECTION
      DIR(NG)=DGTRD(DIR(NG)-90.)
 20   CONTINUE
      RETURN
      END


      SUBROUTINE XLINE(KXX,NSX,XLX,UNIT,XR1)
      COMMON /TRACK/ ITR(88),ITSEG(88),MASK(21),PARAM(5,15,88),
     1               TTD(88,14),DMIN(88)
      DIMENSION UNIT(3),XR1(3),V(3)
      CALL VTRN(V,UNIT)
      V(3)=0.
      CALL VUNT(V,V)
      PARAM(1,NSX,KXX)=XR1(1)
      PARAM(2,NSX,KXX)=XR1(2)
      PARAM(3,NSX,KXX)=XLX
      PARAM(4,NSX,KXX)=V(1)
      PARAM(5,NSX,KXX)=V(2)
      CALL VSCL(V,XLX,V)
      CALL VADD(XR1,XR1,V)
      RETURN
      END


      SUBROUTINE ZERO(A,N)
      DIMENSION A(N)
      DO 1 I=1,N
 1    A(I) = 0.
      RETURN
      END
```

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