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AIR QUALITY ASSESSMENT MODEL FOR AIR FORCE OPERATIONS - SHORT-T--ETC(U)
APR 77 D J BINGAMAN

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AIR QUALITY ASSESSMENT MODEL FOR AIR FORCE OPERATIONS—SHORT-TERM EMISSION/DISPERSION COMPUTER CODE DOCUMENTATION

ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

APRIL 1977

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FINAL REPORT FOR PERIOD
1 JULY 1975-1 JANUARY 1977

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CIVIL AND ENVIRONMENTAL
ENGINEERING DEVELOPMENT OFFICE
(AIR FORCE SYSTEMS COMMAND)
TYNDALL AIR FORCE BASE
FLORIDA 32403

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: CEEDO-TR-76-34	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): AIR QUALITY ASSESSMENT MODEL FOR AIR FORCE OPERATIONS - SHORT-TERM EMISSION/DISPERSION COMPUTER CODE DOCUMENTATION	5. TYPE OF REPORT & PERIOD COVERED: Final Report, 1 Jul 75 to 1 Jan 77
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Dorothy J. Bingaman CEEDO	8. CONTRACT OR GRANT NUMBER(s): ~~Project Order~~ 76-0003
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Argonne National Laboratory, 9700 South Cass Avenue, Argonne IL 60439	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 62601F 1900 5A03
11. CONTROLLING OFFICE NAME AND ADDRESS: Civil Environmental & Engineering Development Office, Det 1 HQ ADTC, Tyndall AFB FL 32403	12. REPORT DATE: April 1977
	13. NUMBER OF PAGES: 209
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*: 296p.	15. SECURITY CLASS. *(of this report)*: UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

Ed
mr Smith

DDC RECEIVED NOV 14 1977 B

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

9/312 739 9711 X 3826, Paul 8/970 2996

18. SUPPLEMENTARY NOTES

3029

Available in DDC.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Aircraft Assessment
Airport Models
Air Pollution
Dispersion Model
Computer Code

Mary Davis 872-~~2206~~ 4013

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The Air Force contracted with Argonne National Laboratory to develop a series of computer programs called the Air Quality Assessment Model (AQAM). The source emissions inventory routine of AQAM was designed to handle complex emission sources with emphasis on aircraft. A short term emission/dispersion model for hourly air quality predictions and a long term emission/dispersion model for monthly and annual predictions are also in AQAM.

This report documents only the short term model. Flow charts, computer

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listings, and brief descriptions of each subroutine are included. They are intended for readers with a computer background who wish to examine or alter the computer code.

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PREFACE

This report documents work performed during the period 1 July 1975 through December 1976 by Argonne National Laboratory. The technical work for this effort was performed under the auspices of the Air Force Civil Engineering Center (AFSC) which on 8 April 1977, reorganized into Detachment 1 (CEEDO) HQ ADTC, Tyndall Air Force Base, Florida, 32403. Captain Dennis F. Naugle, CEEDO/ECA, managed the program.

This report has been reviewed by the Information Officer and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

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SECTION I
INTRODUCTION

Argonne National Laboratory (ANL) has developed an Air Quality Assessment Model (AQAM) for airbase operations under contract to the U.S. Air Force Civil Engineering Center (AFCEC) designed to simulate the emission of pollutants from sources on an airbase and the dispersion of these emissions in the atmosphere so as to enable calculation of pollutant concentrations over a grid of ground level receptors. These models are comprised of four physically separate computer codes, of which three must be operated by the user. The fourth code prepares a magnetic tape containing long term stability-time-wind roses for use by the long term climatological type air pollution model. This code is operated on request by the USAF Environmental Technical Applications Center in Washington, D.C. and the resultant magnetic tapes containing the climatological information is shipped to the user. The other three codes, developed by ANL, consist of the

- Source Inventory Model (SRCINV)
- Short Term Emission/Dispersion Model
- Long Term Emission/Dispersion Model

This report constitutes the computer code documentation for the second of these - the Short Term Emission/Dispersion Model. A separate computer code documentation manual (Reference 1) is available for SRCINV. Documentation for the Long Term Emission/Dispersion Model is currently being prepared and will be available shortly. A companion document to these reports - Operator's Guide (Reference 2) of the Air Quality Assessment Model for airbase operations - consists of a detailed discussion of the various functional parts of the computer programs and the input/output requirements. A second companion report (Reference 3) discusses the technical and theoretical basis underlying AQAM and presents and describes equations and algorithms used in the various AQAM sub-models.

The intended purpose of the present document is to provide a computer programmer with sufficient information so that he can study the code and make changes or modifications to it where required.

Table 1 contains a list of all routines contained in the Short Term Model in alphabetical order together with a brief description. More detailed descriptions of each routine, together with flow charts and computer code listings with comments that are intended to link listings to flow charts, are given on subsequent pages. It is hoped that this information, when combined with that given in References 1, 2, and 3, will enable a programmer to understand and make changes to the code when desired.

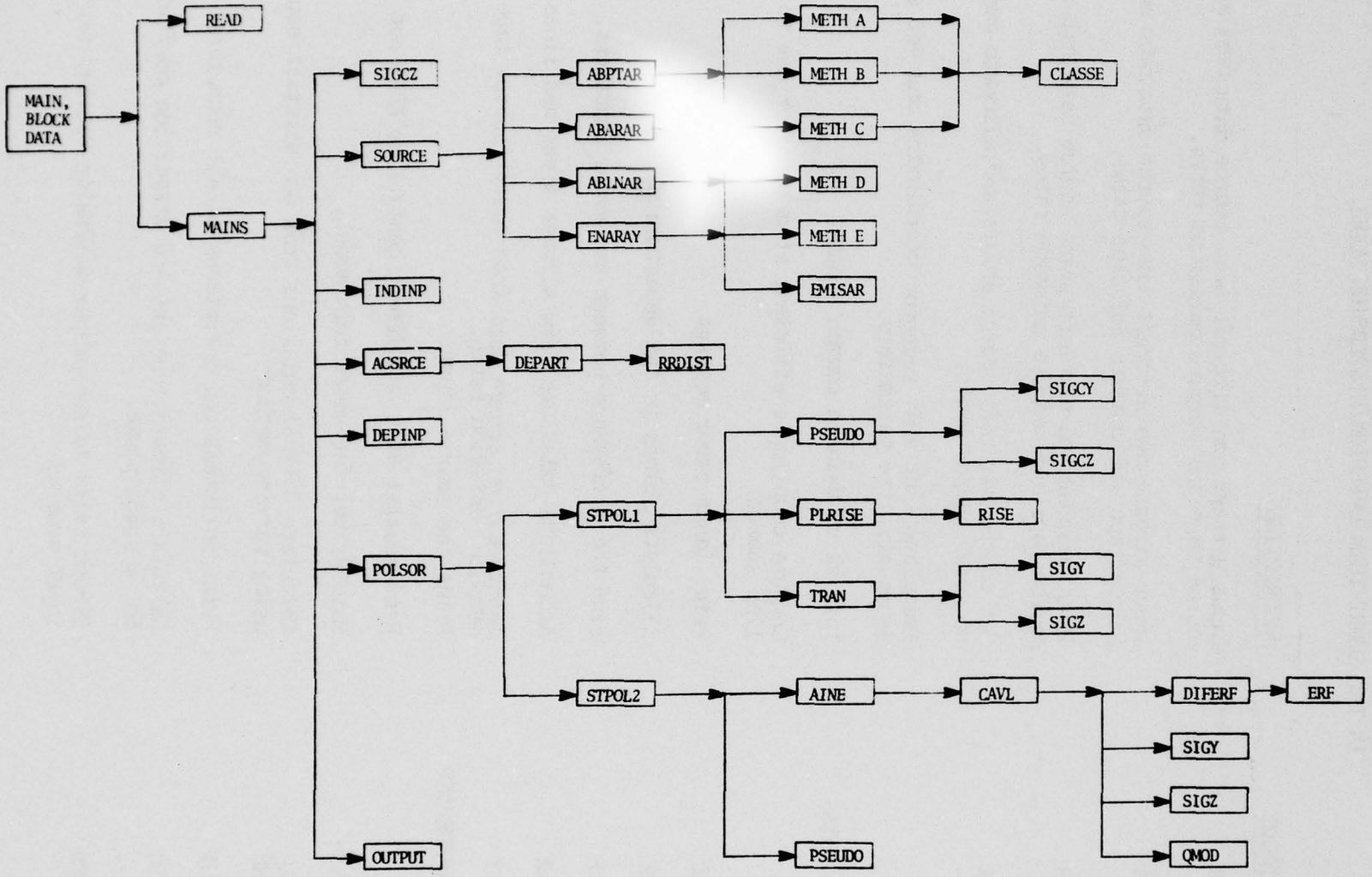


Figure 1. Schematic Flow Diagram of Short Term Model

TABLE 1. LIST OF ALL PROGRAMS AND SUBPROGRAMS IN THE SHORT TERM EMISSION/DISPERSION MODEL

SUBROUTINE	DESCRIPTION
ABARAR	Input airbase non-aircraft area source data from master source tape and compute emissions rates.
ABLNAR	Input airbase non-aircraft line source data from master source tape and compute emission rates.
ABPTAR	Input airbase non-aircraft point source data from master source tape and compute emission rates.
ACSRCE	Set up the aircraft source arrays and allocate emissions to areas and/or lines.
AINE	Translate line and receptor coordinates and set all necessary line parameters.
BLOCK DATA	Initialize data in common blocks.
CAVL	Compute coupling coefficient at a receptor due to a line source.
CLASSE	Print input error message.
DEPART	Calculate points in the departure path.
DIFERF	Find the difference between two error functions.
EMISAR	Accumulate emissions from airbase areas and lines.
ENARAY	Input environ source data from master source tape and compute emission rates.
INDINP/DEPINP	Print the source input.
MAIN	Read general data and direct control to READ and MAINS.
MAINS	Main driver for short term model.
METHA- METHE	Calculate diurnal emissions from non-aircraft sources using varying methods.
OUTPUT	Print pollutant concentrations at all receptors.
PLRISE	Calculate effective height and dispersion coefficients for a stack plume.
POLSOR	Direct calls to the proper diffusion routine for all input sources.

TABLE 1. LIST OF ALL PROGRAMS AND SUBPROGRAMS IN THE SHORT TERM EMISSION/DISPERSION MODEL (CONCLUDED)

PSEUDO	Call functions to find virtual distance from source to pseudo upwind point.
QMOD	Compute linear distribution of pollution along a runway.
READ	Read master source tape.
RISE	Calculate plume rise.
RRDIST	Calculate length of runway necessary for takeoff.
SIGY/SIGCY	Calculate horizontal dispersion or corresponding virtual distance.
SIGZ/SIGCZ	Calculate vertical dispersion or corresponding virtual distance.
SOURCE	Driver for non-aircraft emission routines.
STPOL1	Determine pollutant concentrations from point and area sources.
STPOL2	Determine pollutant concentrations from line sources.
TRAN	Calculate the coupling coefficient at a receptor due to a point or area source.

SUBROUTINE ABARAR

Purpose:

1. To read from the master source type all data needed to define airbase non-aircraft area sources.
2. To compute the emission rates due to evaporative hydrocarbons, space heating, off-road vehicles, and military and civilian vehicles.

Input:

If the diurnal distribution cards are input, an additional parameter, IOPT, is read here to choose the method of distribution of those evaporative hydrocarbons not using the default of a uniform distribution.

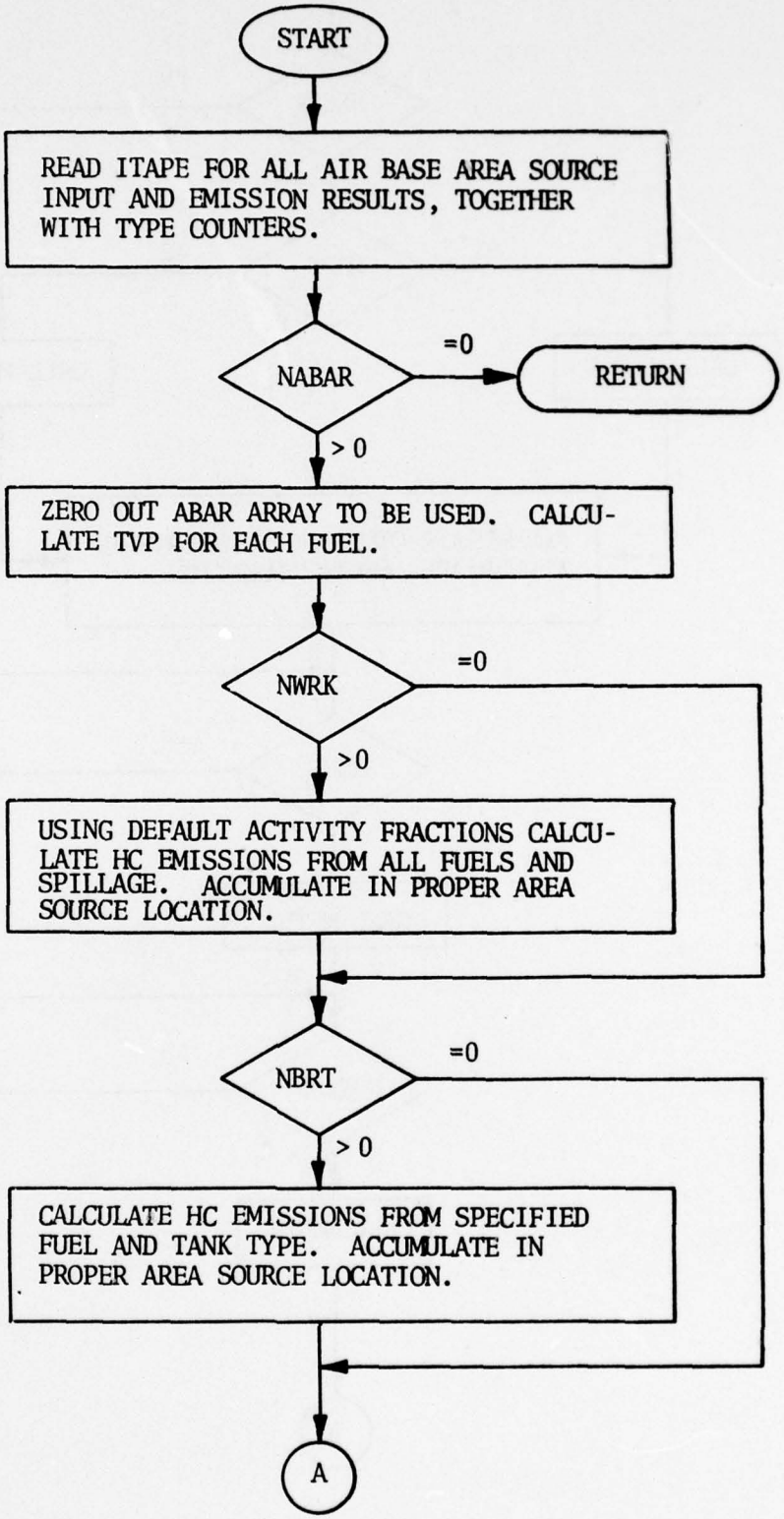
Output:

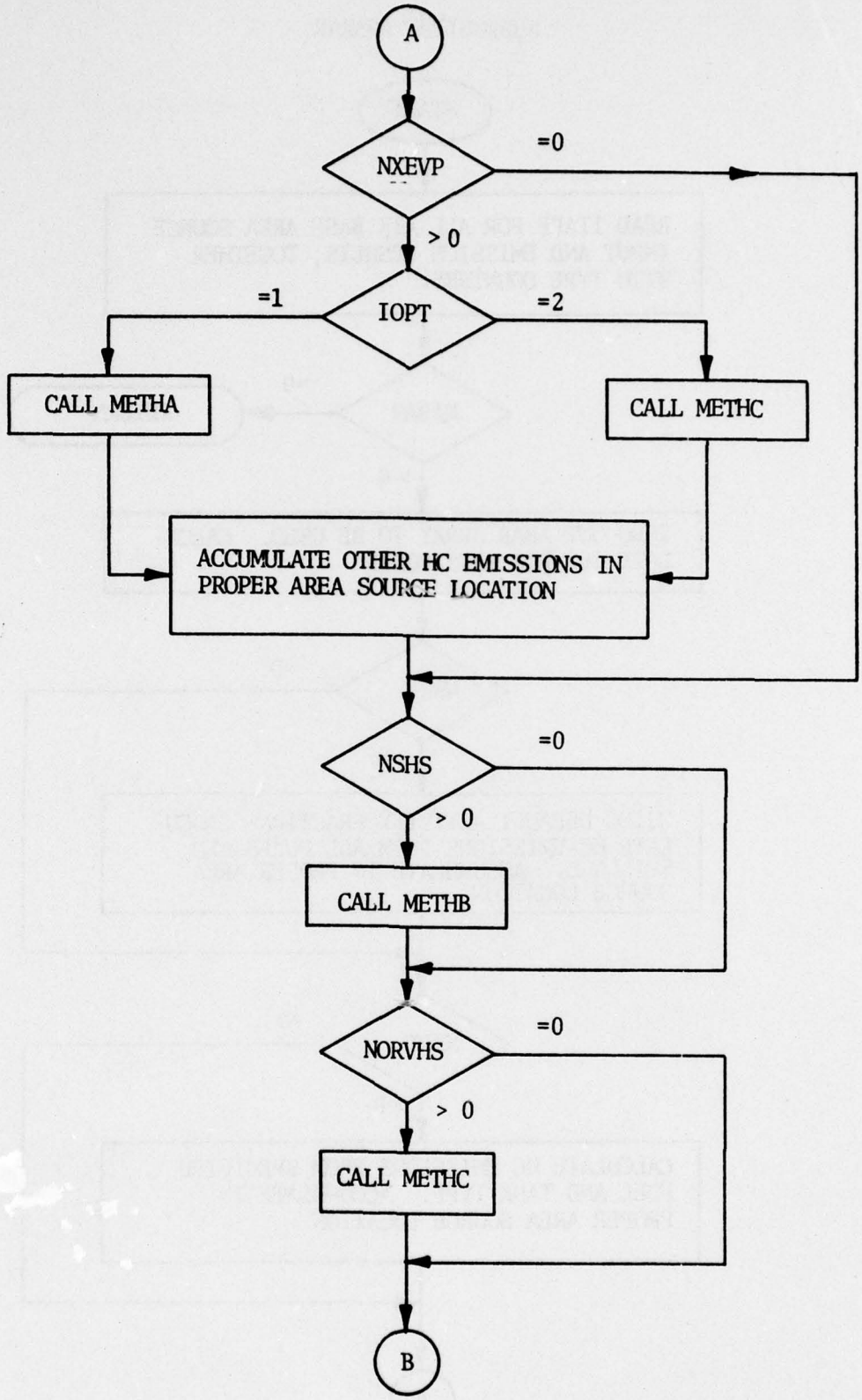
The array, ABAR, is filled with geometry and emission data for airbase non-aircraft area sources.

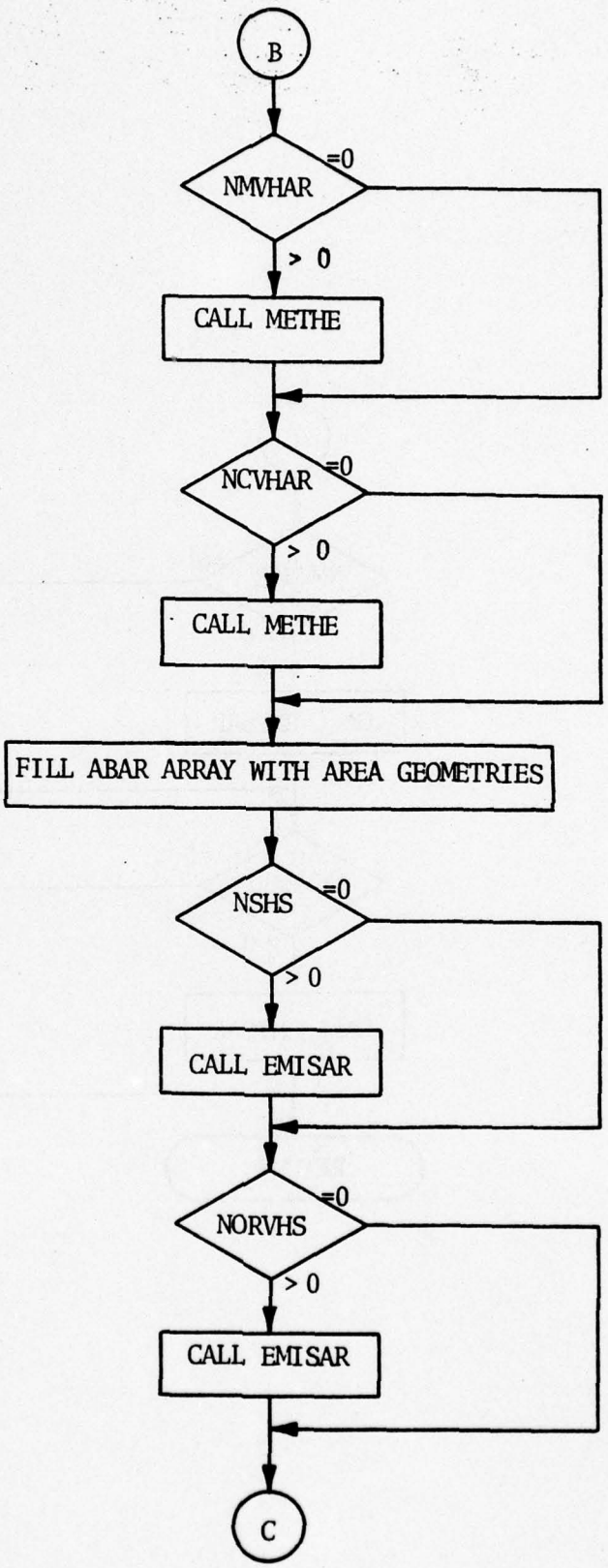
Subroutines Called:

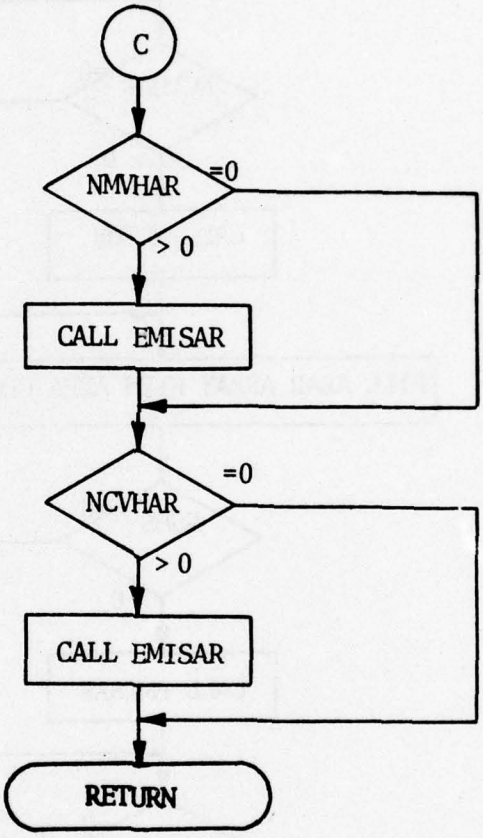
METHA, METHB, METHC, METHE, EMISAR

SUBROUTINE ABARAR




A
NXEVP
=0
> 0
IOPT
=1
=2
CALL METHA
CALL METHC
ACCUMULATE OTHER HC EMISSIONS IN PROPER AREA SOURCE LOCATION
NSHS
=0
> 0
CALL METHB
NORVHS
=0
> 0
CALL METHC
B


B
NMVHAR
=0
> 0
CALL METHE
NCVHAR
=0
> 0
CALL METHE
FILL ABAR ARRAY WITH AREA GEOMETRIES
NSHS
=0
> 0
CALL EMISAR
NORVHS
=0
> 0
CALL EMISAR
C


C
NMVHAR
=0
> 0
CALL EMISAR
NCVHAR
=0
> 0
CALL EMISAR
RETURN

```
      SUBROUTINE ABARAR                                                 ABARR000
C                                                                       ABARR001
C     THIS ROUTINE COMPUTES THE EMISSION RATES FOR                      ABARR002
C     ALL AIRBASE AREAS                                                 ABARR003
C        NWRK   = NO. OF HYDROCARBON WORKING LOSSES                     ABARR004
C        NBRT   = NO. OF HYDROCARBON BREATHING LOSSES                   ABARR005
C        NXEVP  = NO. OF OTHER EVAPORATIVE HYDROCARBON SOURCES          ABARR006
C        NSHS   = NO. OF SPACE HEATING SOURCES                          ABARR007
C        NORVHS = NO. OF OFF-ROAD VEHICLE SOURCES                       ABARR008
C        NMVHAR = NO. OF MILITARY VEHICLE AREA SOURCES                  ABARR009
C        NCVHAR = NO. OF CIVILIAN VEHICLE AREA SOURCES                  ABARR010
C                                                                       ABARR011
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG          ABARR012
      COMMON / DEFALT /  ITAPE,ACLNDY,ACLNDZ,ALPHA(7),BETA(7),FLDENS(7) ABARR013
      COMMON /DSTRBT/ ACMO(13,8),ACDY(2,8),ACHR(24,8),VHMLMO(13),       ABARR014
     . VHMLDY(2),VHMLHR(24),CVABMO(13),CVABDY(2),CVABHR(24),CVENMO(13), ABARR015
     . CVENDY(2),CVENHR(24),FLMO(13,7),FLDY(2,7),FLHR(24,7),NC1         ABARR016
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)          ABARR017
     . ,LCC1,LCC2,NGECM,IPT                                             ABARR018
      COMMON/MONMET/TMBAR,WSMBAR,AMDMBR,DTMBAR                          ABARR019
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,          ABARR020
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         ABARR021
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)         ABARR022
      DIMENSION ABARGM(7,100),HCWRK(10,50),HCBRT(5,100),HCEVP(3,50),    ABARR023
     . FLHOUR(7),TVP(7)                                                 ABARR024
      EQUIVALENCE (SORGM(1),ABARGM(1)),(SORGM( 701),HCWRK(1)),          ABARR025
     .     (SORGM(1201),HCBRT(1)), (SORGM(1701),HCEVP(1))               ABARR026
      LCC1=2                                                            ABARR027
      LCC2=2                                                            ABARR028
      NGECM=0                                                           ABARR029
      IPT=0                                                             ABARR030
      NSRCE=0                                                           ABARR031
      I1=17                                                             ABARR032
      I2=300                                                            ABARR033
C                                                                       ABARR034
      READ(ITAPE) NABAR,NTOT,NWRK,NBRT,NXEVP,NSHS,NORVHS,               ABARR035
     .   NMVHAR,NCVHAR,NABARS,((ABARGM(I,N),I=1,7),N=1,NABAR),          ABARR036
     . ((HCWRK(I,N),I=1,10),N=1,NWRK),                                  ABARR037
     .  ((HCBRT(I,N),I=1,5),N=1,NBRT),                                  ABARR038
     .  ((HCEVP(I,N),I=1,3),N=1,NXEVP),                                 ABARR039
     .  ((SORCE(I,N),I=1,NTOT),N=1,NABARS)                              ABARR040
C                                                                       ABARR041
      IF (NABAR.EQ.0) GO TO 1100                                        ABARR042
C                                                                       ABARR043
      NHI=IHR2                                                          ABARR044
      IF(IHR1.GT.IHR2) NHI=24+IHR2                                      ABARR045
      HRS=NHI-IHR1+1                                                    ABARR046
      DO 10 N=1,NABAR                                                   ABARR047
      DO 10 I=1,NPLTS                                                   ABARR048
      ABAR(I+5,N)=0.0                                                   ABARR049
   10 CONTINUE                                                          ABARR050
      T=5./9.*(TMBAR-32.0)+273.                                         ABARR051
      DO 20 J=1,7                                                       ABARR052
      TVP(J)=EXP(ALPHA(J)-BETA(J)/T)                                    ABARR053
   20 CONTINUE                                                          ABARR054
C                                                                       ABARR055
      IF (NWRK.EQ.0) GO TO 100                                          ABARR056
C     USING DEFAULT ACTIVITY FRACTIONS CALCULATE HC                     ABARR057
C     EMISSIONS FROM ALL FUELS AND SPILLAGE.                            ABARR058
C     ACCUMULATE IN ABAR ARRAY                                          ABARR059
C                                                                       ABARR060
      DO 50 N=1,NWRK                                                    ABARR061
```

```
      HC=0.                                                                  ABARR062
      FRC=0.                                                                 ABARR063
      DO 40 J=1,7                                                            ABARR064
      FLHOUR(J)=0.                                                           ABARR065
      DO 30 I=IHR1,NHI                                                       ABARR066
      II=I                                                                   ABARR067
      IF(I.GT.24) II=I-24                                                    ABARR068
   30 FLHOUR(J)=FLHOUR(J)+FLHR(II,J)                                         ABARR069
      FLHOUR(J)=FLHOUR(J)/HRS                                                ABARR070
      FRC=FRC+FLHOUR(J)*FLMO(IMONTH,J)*FLDY(IDAY,J)                          ABARR071
      HC=HC+HCWRK(J+2,N)*TVP(J)*FLMO(IMONTH,J)*FLDY(IDAY,J)                  ABARR072
     .  *FLHOUR(J)*7./DAYS                                                   ABARR073
   40 CONTINUE                                                               ABARR074
      FRC=FRC/4.*7./DAYS                                                     ABARR075
C                                                                            ABARR076
      J=HCWRK(2,N)                                                           ABARR077
      ABAR(7,J)=ABAR(7,J) + (HC + HCWRK(10,N) * FRC) *(1.E+6/3.6)            ABARR078
   50 CONTINUE                                                               ABARR079
C                                                                            ABARR080
  100 IF (NBRT.EQ.0) GO TO 200                                               ABARR081
C     CALCULATE HC EMISSIONS FROM SPECIFIED FUEL AND                         ABARR082
C     TANK TYPES.  ACCUMULATE IN ABAR ARRAY                                  ABARR083
C                                                                            ABARR084
      DO 110 N=1,NBRT                                                        ABARR085
      J=HCBRT(3,N)                                                           ABARR086
      EX=0.68                                                                ABARR087
      IF (HCBRT(4,N).EQ.2.) EX=0.70                                          ABARR088
      HC=HCBRT(5,N)*(TVP(J)/(14.7-TVP(J)))**EX*(1.E+6/(3.6*24.*365.))        ABARR089
C                                                                            ABARR090
      J=HCBRT(2,N)                                                           ABARR091
      ABAR(7,J)=ABAR(7,J)+HC                                                 ABARR092
  110 CONTINUE                                                               ABARR093
C                                                                            ABARR094
  200 IF (NXEVP.EQ.0) GO TO 300                                              ABARR095
      ICLASS=110                                                             ABARR096
      NTEMP=NPLTS                                                            ABARR097
      NPLTS=1                                                                ABARR098
      LOC1=3                                                                 ABARR099
      NSRCE=NABARS                                                           ABARR100
      DO 210 N=1,NXEVP                                                       ABARR101
      DO 210 I=1,3                                                           ABARR102
      SORCE(I,NABARS+N)=HCEVP(I,N)                                           ABARR103
  210 CONTINUE                                                               ABARR104
      ICPT=1                                                                 ABARR105
      IF (JFLAG.EQ.0) READ 2,IOPT                                            ABARR106
    2 FORMAT(I4)                                                             ABARR107
      GO TO (220,230),IOPT                                                   ABARR108
C                                                                            ABARR109
  220 CALL METHA(NXEVP,SORCE,I1,I2,ICLASS)                                   ABARR110
      GO TO 240                                                              ABARR111
  230 CALL METHC(NXEVP,SORCE,I1,I2,ICLASS)                                   ABARR112
C                                                                            ABARR113
  240 DO 250 N=1,NXEVP                                                       ABARR114
C                                                                            ABARR115
C     ACCUMULATE OTHER EVAPORATIVE HC EMISSIONS IN ABAR ARRAY                ABARR116
C                                                                            ABARR117
      J=HCEVP(2,N)                                                           ABARR118
      ABAR(7,J)=ABAR(7,J)+SORCE(3,NABARS+N)                                  ABARR119
  250 CONTINUE                                                               ABARR120
C                                                                            ABARR121
      NPLTS=NTEMP                                                            ABARR122
      NSRCE=0                                                                ABARR123
```

```
      LCC1=2                                                          ABARR124
C                                                                     ABARR125
  300 IF (NSHS.EQ.0) GO TO 400                                        ABARR126
      ICLASS=111                                                      ABARR127
      CALL METHB(NSHS,SORCE,I1,I2,ICLASS)                             ABARR128
C                                                                     ABARR129
  400 IF (NORVHS.EQ.0) GO TO 500                                      ABARR130
      ICLASS=112                                                      ABARR131
      CALL METHC(NORVHS,SORCE,I1,I2,ICLASS)                           ABARR132
C                                                                     ABARR133
  500 IF (NMVHAR.EQ.0) GO TO 600                                      ABARR134
      CALL METHE(NMVHAR,SORCE,VHMLMO,VHMLDY,VHMLHR,I1,I2)             ABARR135
C                                                                     ABARR136
  600 IF (NCVHAR.EQ.0) GO TO 700                                      ABARR137
      CALL METHE(NCVHAR,SORCE,CVABMO,CVABDY,CVABHR,I1,I2)             ABARR138
C                                                                     ABARR139
C****EMISSIONS ARE NOW IN MICROGRAMS/SEC                              ABARR140
C     FILL ABAR ARRAY WITH AREA GEOMETRIES                            ABARR141
C                                                                     ABARR142
  700 DO 710 N=1,NABAR                                                ABARR143
      DO 710 I=1,5                                                    ABARR144
      ABAR(I,N)=ABARGM(I+2,N)                                         ABARR145
  710 CONTINUE                                                        ABARR146
C                                                                     ABARR147
C     FILL ABAR ARRAY WITH THE NON-EVAP HC EMISSION DATA              ABARR148
C                                                                     ABARR149
      I1=11                                                           ABARR150
      I2=100                                                          ABARR151
      NSRCE=0                                                         ABARR152
      LCC1=5                                                          ABARR153
      IF (NSHS.EQ.0) GO TO 800                                        ABARR154
      CALL EMISAR(NSHS,ABAR,I1,I2)                                    ABARR155
C                                                                     ABARR156
  800 IF (NORVHS.EQ.0) GO TO 900                                      ABARR157
      CALL EMISAR(NORVHS,ABAR,I1,I2)                                  ABARR158
C                                                                     ABARR159
  900 IF (NMVHAR.EQ.0) GO TO 1000                                     ABARR160
      CALL EMISAR(NMVHAR,ABAR,I1,I2)                                  ABARR161
C                                                                     ABARR162
 1000 IF (NCVHAR.EQ.0) GO TO 1100                                     ABARR163
      CALL EMISAR(NCVHAR,ABAR,I1,I2)                                  ABARR164
C                                                                     ABARR165
 1100 CONTINUE                                                        ABARR166
      RETURN                                                          ABARR167
      END                                                             ABARR168
```

SUBROUTINE ABLNAR

Purpose:

1. To read from the master source tape all data needed to define airbase non-aircraft line sources.
2. To compute the emission rates due to military and civilian vehicle line and other airbase line activities.

Input:

If the diurnal distribution cards are input, an additional parameter, IMETH, is input here to choose the method of distribution of emissions from those other airbase line activities not using the default of a uniform distribution.

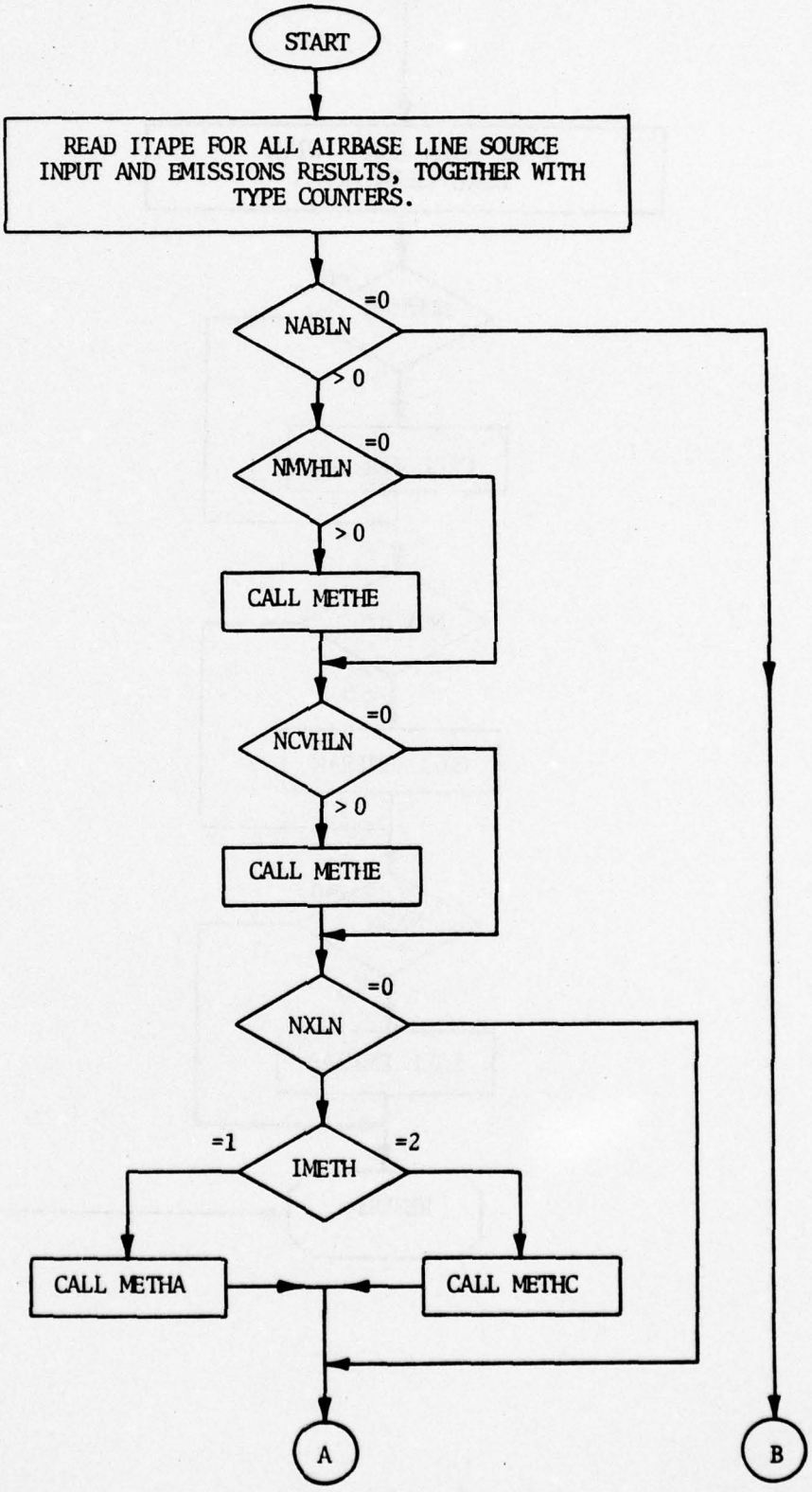
Output:

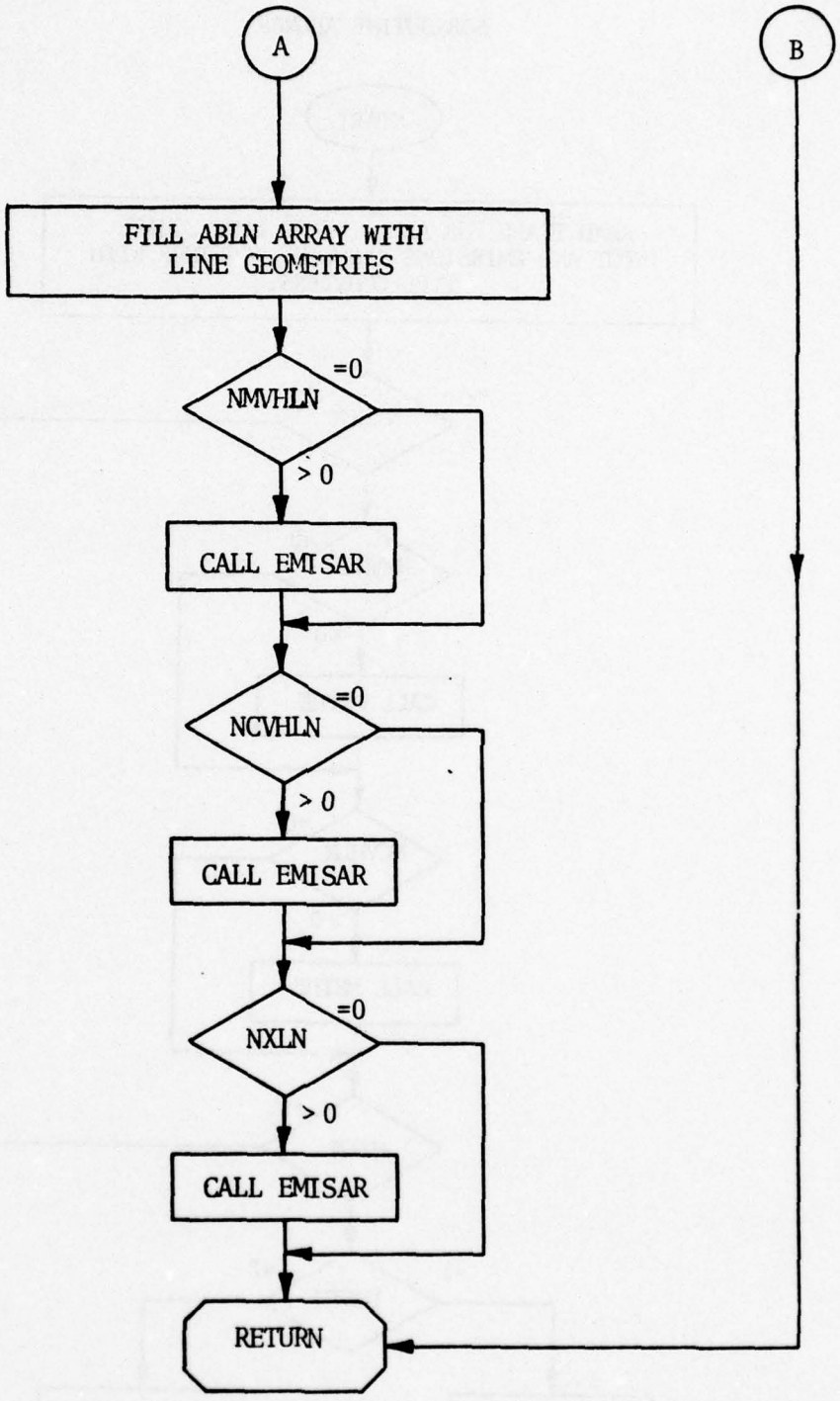
The array, ABLN, is filled with geometry and emission data for non-aircraft line sources.

Subroutines Called:

METHA, METHC, METHE, EMISAR

SUBROUTINE ABLNAR




A
B
FILL ABLN ARRAY WITH
LINE GEOMETRIES
NMVHLN
=0
> 0
CALL EMISAR
NCVHLN
=0
> 0
CALL EMISAR
NXLN
=0
> 0
CALL EMISAR
RETURN

```
      SUBROUTINE ABLNAR                                                 ABLNR000
C                                                                       ABLNR001
C     THIS ROUTINE COMPUTES THE EMISSION RATES FOR ALL                  ABLNR002
C     AIRBASE LINES                                                     ABLNR003
C        NMVHLN = NO. OF MILITARY LINE ACTIVITIES                       ABLNR004
C        NCVHLN = NO. OF CIVILIAN LINE ACTIVITIES                       ABLNR005
C        NXLN   = NO. OF OTHER AIR BASE LINE ACTIVITIES                 ABLNR006
C                                                                       ABLNR007
      COMMON / DEFALT /  ITAPE,ACLNDY,ACLNDZ,ALPHA(7),BETA(7),FLDENS(7) ABLNR008
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG          ABLNR009
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)          ABLNR010
     . ,LOC1,LOC2,NGEOM,IPT                                             ABLNR011
      COMMON /DSTRBT/ ACMO(13,8),ACDY(2,8),ACHR(24,8),VHMLMO(13),       ABLNR012
     . VHMLDY(2),VHMLHR(24),CVABMO(13),CVABDY(2),CVABHR(24),CVENMO(13), ABLNR013
     . CVENDY(2),CVENHR(24),FLMO(13,7),FLDY(2,7),FLHR(24,7),NC1         ABLNR014
      COMMON /SPCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,          ABLNR015
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         ABLNR016
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)         ABLNR017
      LOC1=2                                                            ABLNR018
      LOC2=2                                                            ABLNR019
      I1=17                                                             ABLNR020
      I2=300                                                            ABLNR021
      NGEOM=0                                                           ABLNR022
      IPT=0                                                             ABLNR023
      NSRCE=0                                                           ABLNR024
      READ(ITAPE) NABLN,NTOT,NMVHLN,NCVHLN,NXLN,NABLNS,                 ABLNR025
     .   ((SORGM(I,N),I=1,10),N=1,NABLN),                               ABLNR026
     .   ((SORCE(I,N),I=1,NTOT),N=1,NABLNS)                             ABLNR027
C                                                                       ABLNR028
      IF (NABLN.EQ.0) GO TO 600                                         ABLNR029
      IF (NMVHLN.EQ.0) GO TO 100                                        ABLNR030
C                                                                       ABLNR031
      CALL METHE(NMVHLN,SORCE,VHMLMO,VHMLDY,VHMLHR,I1,I2)               ABLNR032
C                                                                       ABLNR033
  100 IF (NCVHLN.EQ.0) GO TO 200                                        ABLNR034
C                                                                       ABLNR035
      CALL METHE(NCVHLN,SORCE,CVABMO,CVABDY,CVABHR,I1,I2)               ABLNR036
C                                                                       ABLNR037
  200 IF (NXLN.EQ.0) GO TO 300                                          ABLNR038
      ICLASS=117                                                        ABLNR039
C                                                                       ABLNR040
      IMETH=1                                                           ABLNR041
      IF (JFLAG.EQ.0) READ 1,IMETH                                      ABLNR042
    1 FORMAT(I4)                                                        ABLNR043
      GO TO (210,220),IMETH                                             ABLNR044
C                                                                       ABLNR045
  210 CALL METHA(NXLN,SORCE,I1,I2,ICLASS)                               ABLNR046
      GO TO 300                                                         ABLNR047
C                                                                       ABLNR048
  220 CALL METHC(NXLN,SORCE,I1,I2,ICLASS)                               ABLNR049
C                                                                       ABLNR050
C****EMISSIONS ARE NOW IN MICROGRAMS/SEC                                ABLNR051
C     FILL ABLN ARRAY WITH LINE GEOMETRIES                              ABLNR052
C                                                                       ABLNR053
  300 DO 320 N=1,NABLN                                                  ABLNR054
      DO 310 I=1,8                                                      ABLNR055
      ABLN(I,N)=SORGM (I+2,N)                                           ABLNR056
  310 CONTINUE                                                          ABLNR057
      DO 320 I=1,NPLTS                                                  ABLNR058
      ABLN(I+8,N)=0.0                                                   ABLNR059
  320 CONTINUE                                                          ABLNR060
C                                                                       ABLNR061
```

```
C     FILL ABLN ARRAY WITH LINE EMISSION DATA                    ABLNR062
C                                                                ABLNR063
      NSRCE=0                                                    APLNR064
      LOC1=8                                                     ABLNR065
      I1=14                                                      ABLNR066
      I2=100                                                     ABLNR067
      IF (NMVHLN.EQ.0) GO TO 400                                 ABLNR068
      CALL EMISAR(NMVHLN,ABLN,I1,I2)                             ABLNR069
C                                                                ABLNP070
  400 IF (NCVHLN.EQ.0) GO TO 500                                 ABLNP071
      CALL EMISAR(NCVHLN,ABLN,I1,I2)                             ABLNP072
C                                                                ABLNR073
  500 IF (NXLN.EQ.0) GO TO 600                                   ABLNP074
      CALL EMISAR(NXLN,ABLN,I1,I2)                               ABLNP075
C                                                                ABLNP076
  600 CONTINUE                                                   ABLNP077
      RETURN                                                     APLNR078
      END                                                        ABLNP079
```

SUBROUTINE ABPTAR

Purpose:

1. To read from the master source tape all data needed to define airbase non-aircraft point sources.
2. To compute the emission rates due to training fires, test cells, run-up stands, power plants, incinerators, storage tanks and other airbase point source activities.

Input:

None

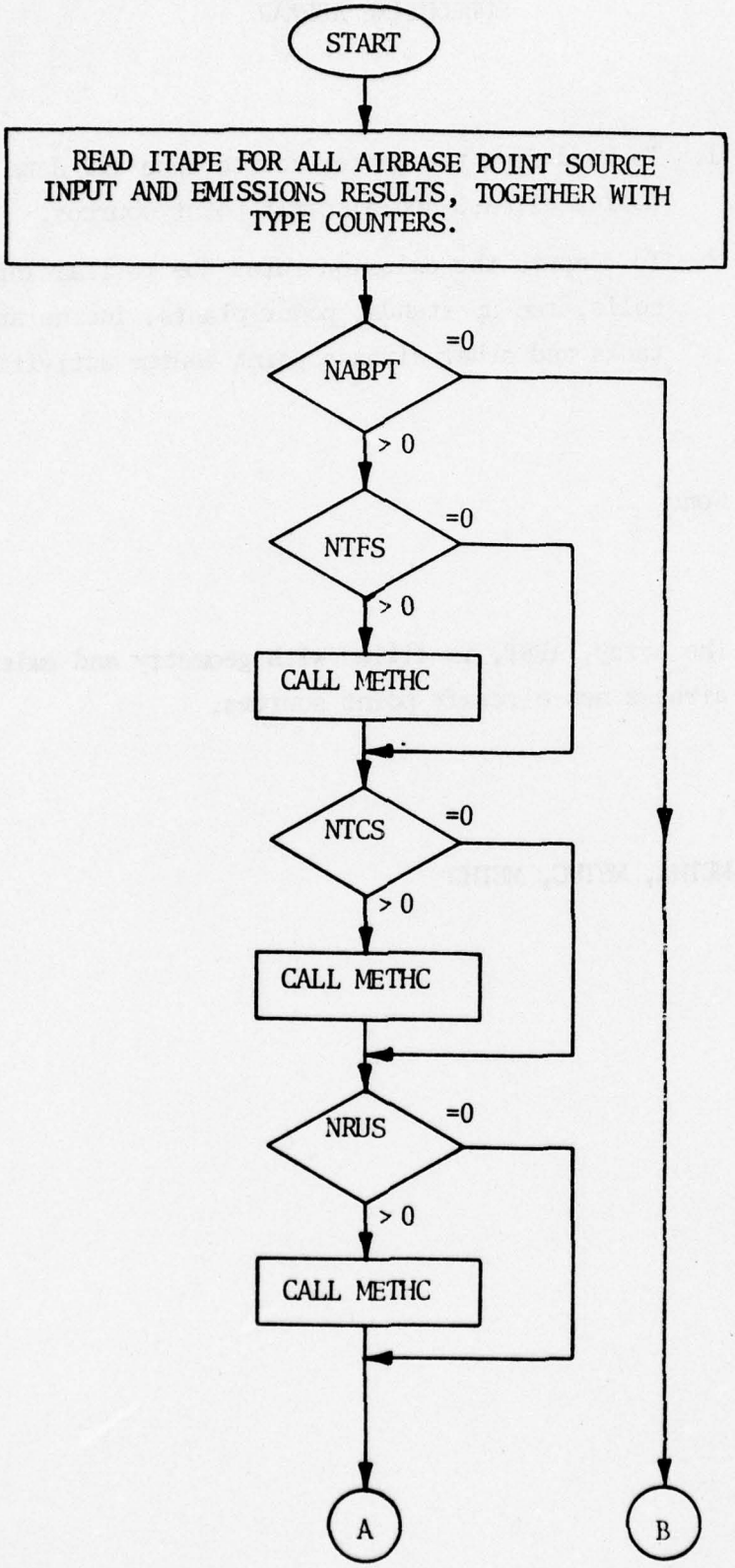
Output:

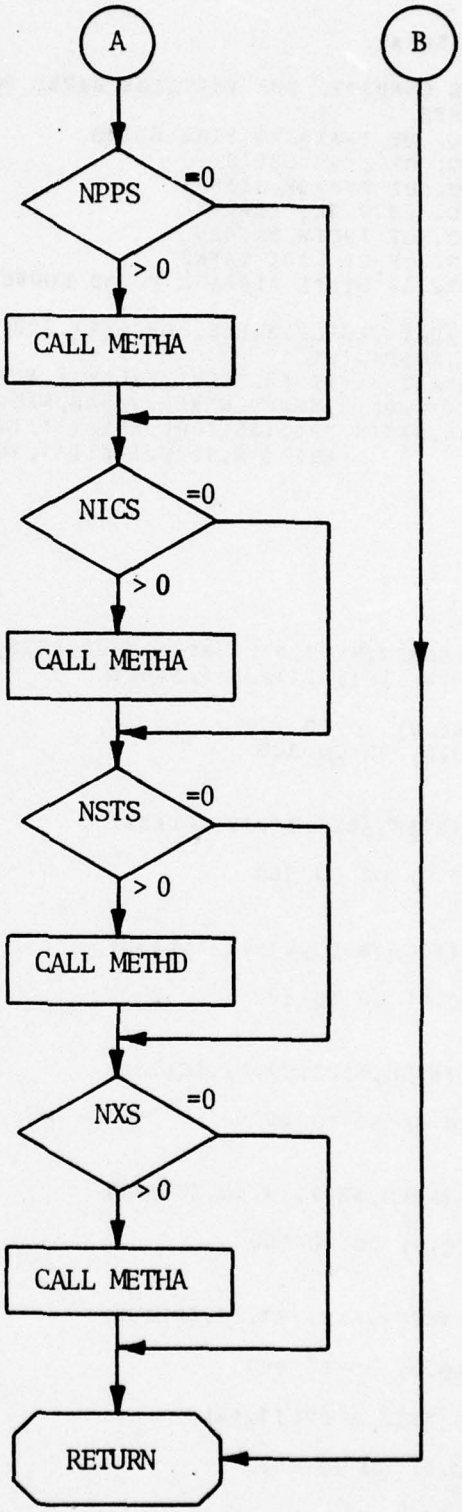
The array, APBT, is filled with geometry and emission data for airbase non-aircraft point sources.

Subroutines Called:

METHA, METHC, METHD

SUBROUTINE ABPTAR




A
B
NPPS
=0
> 0
CALL METHA
NICS
=0
> 0
CALL METHA
NSTS
=0
> 0
CALL METHD
NXS
=0
> 0
CALL METHA
RETURN

```
      SUBROUTINE ABPTAR                                                      ABPTR000
C                                                                            ABPTR001
C     THIS ROUTINE COMPUTES THE EMISSION RATES FOR ALL                       ABPTR002
C     AIRBASE POINTS                                                         ABPTR003
C        NTFS = NO. OF TRAINING FIRE SITES                                   ABPTR004
C        NTCS = NO. OF TEST CELLS                                            ABPTR005
C        NRUS = NO. OF RUN-UP STANDS                                         ABPTR006
C        NPPS = NO. OF POWER PLANTS                                          ABPTR007
C        NICS = NO. OF INCINERATORS                                          ABPTR008
C        NSTS = NO. OF STORAGE TANKS                                         ABPTR009
C        NXS  = NO. OF OTHER AIRBASE POINT SOURCES                           ABPTR010
C                                                                            ABPTR011
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)               ABPTR012
     . ,LOC1,LOC2,NGEOM,IPT                                                  ABPTR013
      COMMON / DEFALT /  ITAPE,ACLNDY,ACLNDZ,ALPHA(7),BETA(7),FLDENS(7)      ABPTR014
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,               ABPTR015
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),              ABPTR016
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)              ABPTR017
      LOC1=10                                                                ABPTR018
      LOC2=11                                                                ABPTR019
      NGEOM=9                                                                ABPTR020
      IPT=1                                                                  ABPTR021
      NSRCE=0                                                                ABPTR022
      I1=16                                                                  ABPTR023
      I2=200                                                                 ABPTR024
      READ(ITAPE) NABPT,NTOT,NTFS,NTCS,NRUS,NPPS,NICS,NSTS,NXS,              ABPTR025
     .   ((SORCE(I,N),I=1,NTOT),N=1,NABPT)                                   ABPTR026
C                                                                            ABPTR027
      IF (NABPT.EQ.0) GO TO 700                                              ABPTR028
      IF (NTFS.EQ.0) GO TO 100                                               ABPTR029
      ICLASS=101                                                             ABPTR030
C                                                                            ABPTR031
      CALL METHC(NTFS,ABPT,I1,I2,ICLASS)                                     ABPTR032
C                                                                            ABPTR033
  100 IF (NTCS.EQ.0) GO TO 200                                               ABPTR034
      ICLASS=102                                                             ABPTR035
C                                                                            ABPTR036
      CALL METHC(NTCS,ABPT,I1,I2,ICLASS)                                     ABPTR037
C                                                                            ABPTR038
  200 IF (NRUS.EQ.0) GO TO 300                                               ABPTR039
      ICLASS=103                                                             ABPTR040
C                                                                            ABPTR041
      CALL METHC(NRUS,ABPT,I1,I2,ICLASS)                                     ABPTR042
C                                                                            ABPTR043
  300 IF (NPPS.EQ.0) GO TO 400                                               ABPTR044
      ICLASS=104                                                             ABPTR045
C                                                                            ABPTR046
      CALL METHA(NPPS,ABPT,I1,I2,ICLASS)                                     ABPTR047
C                                                                            ABPTR048
  400 IF (NICS.EQ.0) GO TO 500                                               ABPTR049
      ICLASS=105                                                             ABPTR050
C                                                                            ABPTR051
      CALL METHA(NICS,ABPT,I1,I2,ICLASS)                                     ABPTR052
C                                                                            ABPTR053
  500 IF (NSTS.EQ.0) GO TO 600                                               ABPTR054
C                                                                            ABPTR055
      CALL METHD(NSTS,ABPT,I1,I2)                                            ABPTR056
C                                                                            ABPTR057
  600 IF (NXS.EQ.0) GO TO 700                                                ABPTR058
      ICLASS=107                                                             ABPTR059
C                                                                            ABPTR060
      CALL METHA(NXS,ABPT,I1,I2,ICLASS)                                      ABPTR061
```

```
C
      700 RETURN                                                        ABPTR062
          END                                                           ABPTR063
                                                                        ABPTR064
```

SUBROUTINE ACSRCE

Purpose:

To set up the aircraft source arrays to be used by the dispersion routines for calculating ground level concentrations.

Input:

Basic aircraft data, airbase activity data, points in arrival-departure paths and in training flight paths, meteorological conditions, time period of calculation.

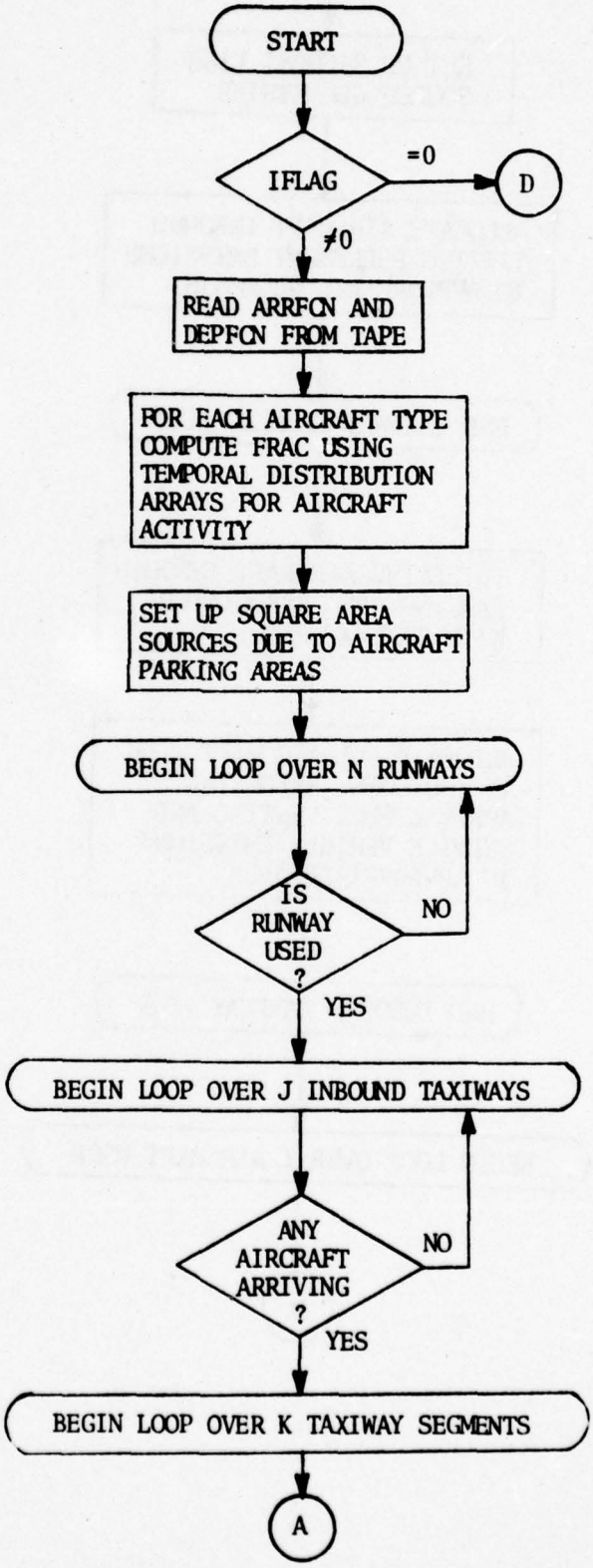
Output:

The arrays ACPT, ACLN and ACAR to contain all source information necessary to calculate dispersion and pollutant concentrations.

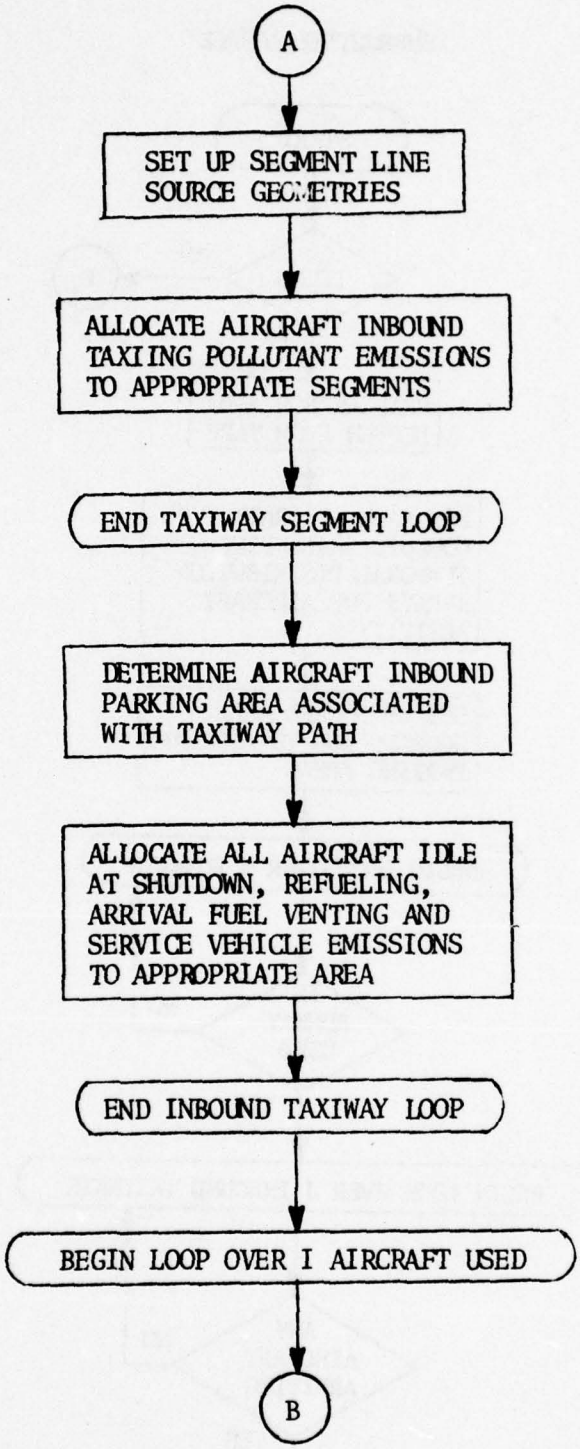
Subroutine Called:

DEPART

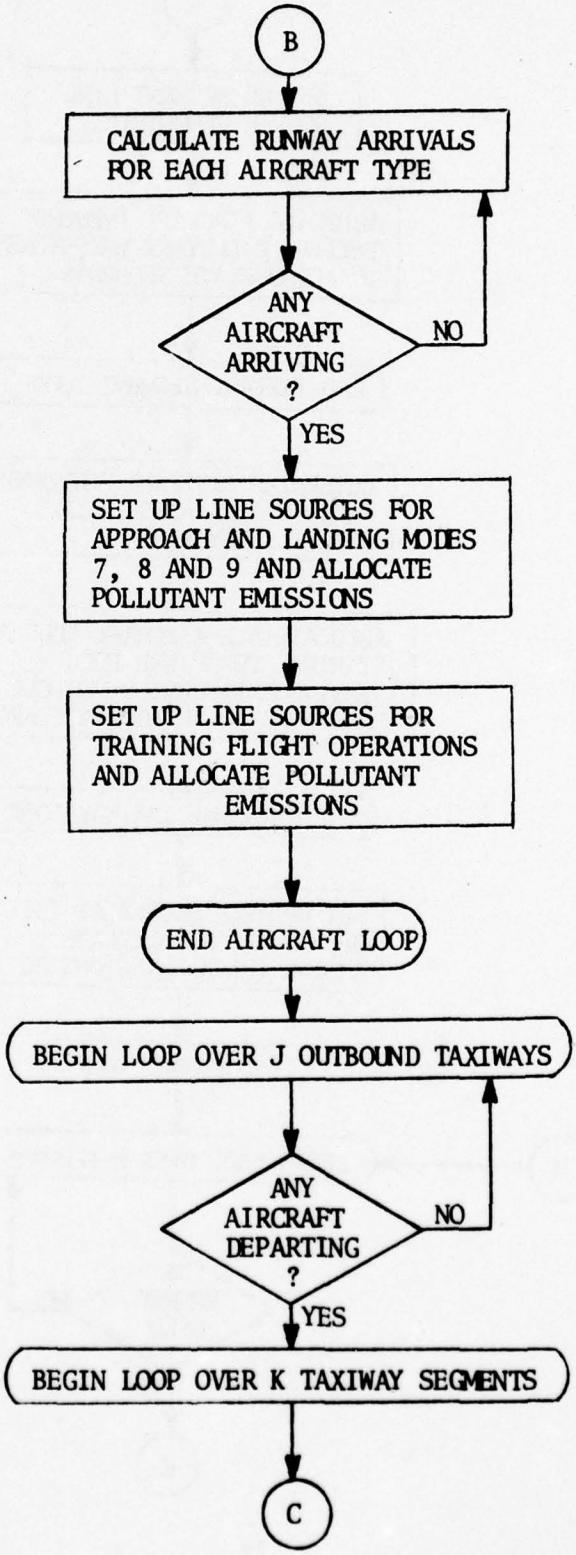
SUBROUTINE ACSRCE



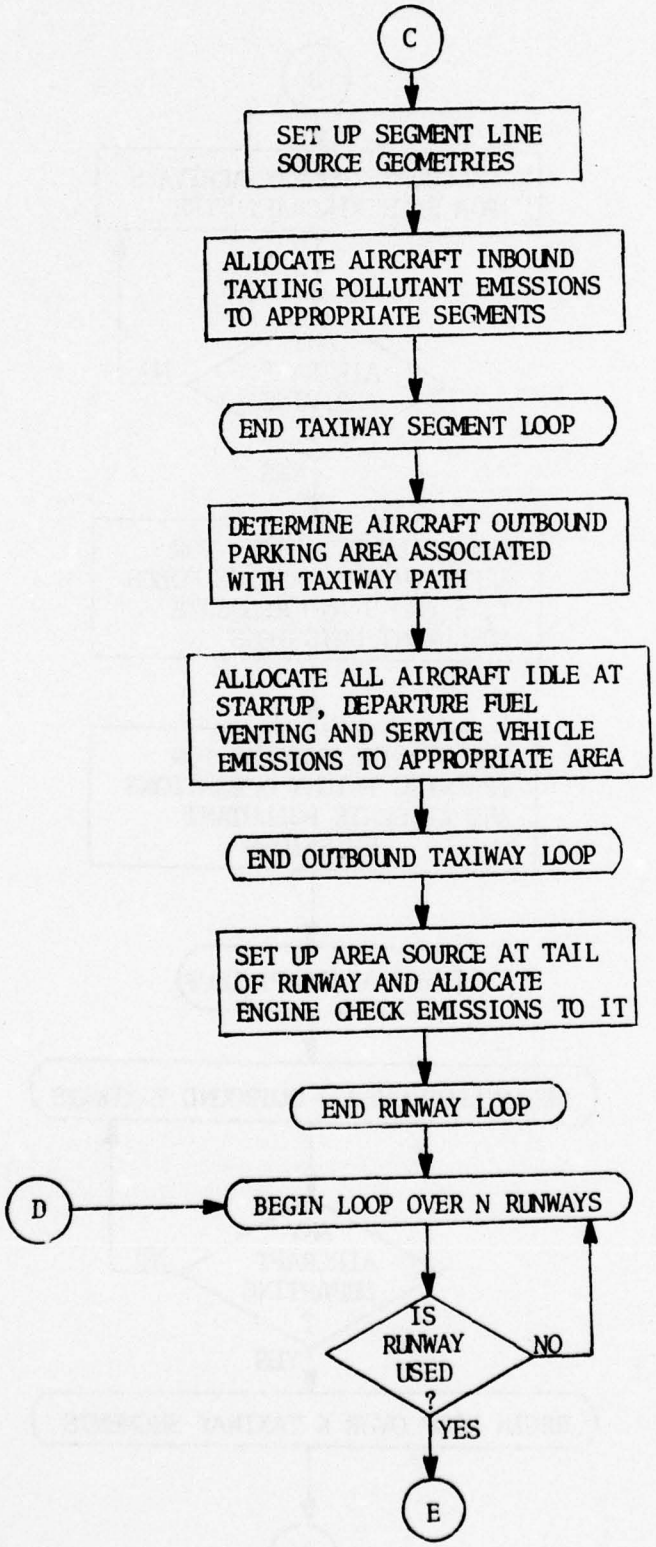
SUBROUTINE ACSRCE (Cont'd.)



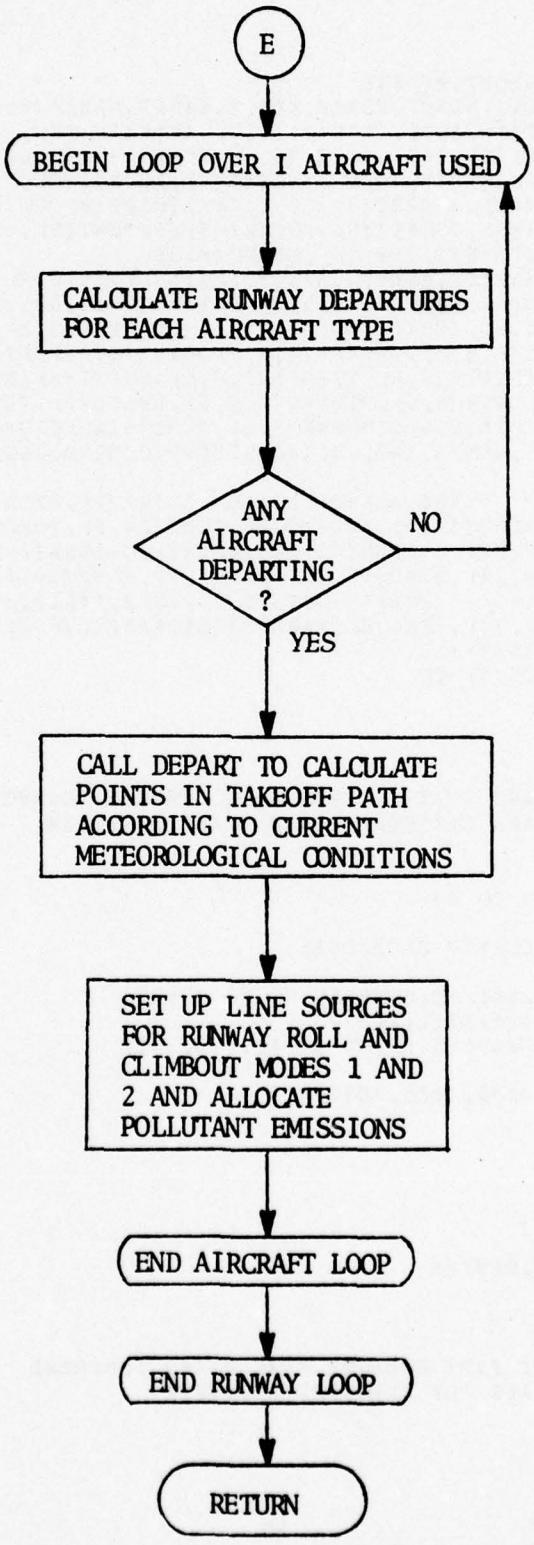
SUBROUTINE ACSRCE (Cont'd.)



SUBROUTINE ACSRCE (Cont'd.)



SUBROUTINE ACSRCE (Cont'd.)



```
      SUBROUTINE ACSRCE                                                      ACSRC000
C                                                                            ACSRC001
C     THIS ROUTINE SETS UP THE AIRCRAFT SOURCE ARRAYS                        ACSRC002
C     AND ALLOCATES THE POLLUTANT EMISSIONS TO THE                           ACSRC003
C     APPROPRIATE AREA OR LINE                                               ACSRC004
C                                                                            ACSRC005
      REAL LNDSPD                                                            ACSRC006
      INTEGER  ENGNO                                                         ACSRC007
      COMMON /RECPT/ MRECPT,MAXFIL                                           ACSRC008
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,NACPT,         ACSRC009
     . NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),ABPT(16,150),       ACSRC010
     . ABAR(11,100),ABLN(14,100),ACPT(16,1),ACAR(11,24),ACLN(18,250)         ACSRC011
      COMMON /ACEDB1/ ACEMFC(8,10,6),ASCNT1(8),ASCNT2(8),TXISPD(8),          ACSRC012
     . LNDSPD(8),APSPD1(8),APSPD2(8),COHT1(8),TOSPD(8),COSPD1(8),            ACSRC013
     . COSPD2(8),SRTUPT(8),DSCNT1(8),EGCHKT(8),SHTDNT(8),DSCNT2(8),          ACSRC014
     . APPHT,APPHT2(8),CLMBFT,TOWT(8),ENGNO(8,2)                            ACSRC015
      COMMON /ACEDB2/ NACTYP,NRNWYS,NPKAR,IEGFLG,IACTYP(8),ANNARR(8),        ACSRC016
     . ANNDEP(8),ANNTGO(8),ARRFCN(24,8,6),DEPFCN(24,8,6),TGO(3,4,8),         ACSRC017
     . DISRNW(6),RNWY(7,6),IUSWD(20,6),ACFUEL(8),ARFLVT(8),DPFLVT(8),        ACSRC018
     . ACSPIL(8),ARSVEM(6,8,5),DPSVEM(6,8,5),NIBTT(6),NIBSEG(8,6),           ACSRC019
     . IIBSEG(16,8,6),IDIBTW(8,6),TTARFR(8,8,6),NOBTT(6),NOBSEG(8,6),        ACSRC020
     . IOBSEG(16,8,6),IOBTW(8,6),TTDPFR(8,8,6),NPASQ(6),IDPRKA(6),           ACSRC021
     . PAREA(6,3,3),IDIBPA(8,6),IDOBPA(8,6),NLSEGS,ACLNSG(12,25),JES1(8)     ACSRC022
      COMMON / MET / WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMF,      ACSRC023
     1 TEMK                                                                  ACSRC024
      COMMON / DEFALT /  ITAPE,ACLNDY,ACLNDZ,ALPHA(7),BETA(7),FLDENS(7)      ACSRC025
      COMMON /DSTRBT/ ACMO(13,8),ACDY(2,8),ACHR(24,8),VHMLMO(13),            ACSRC026
     . VHMLDY(2),VHMLHR(24),CVABMO(13),CVABDY(2),CVABHR(24),CVENMO(13),      ACSRC027
     . CVENDY(2),CVENHR(24),FLMO(13,7),FLDY(2,7),FLHR(24,7),NC1              ACSRC028
      COMMON /PERIOD/ IMO    ,NODAYS,IDY ,IHR1,IHR2,IFLAG,JFLAG              ACSRC029
      DIMENSION IACAR(2,18),FRAC(8),PARFCT(18),APARSQ(6,3),NQ(25)            ACSRC030
      XP(XO,YC,W)=YC*SIN(W)+XO                                               ACSRC031
      YP(YO,YC,W)=YC*COS(W)+YO                                               ACSRC032
      DAYS=NODAYS                                                            ACSRC033
      NT=NPLTS+5                                                             ACSRC034
      IWIND=29+IWD                                                           ACSRC035
C                                                                            ACSRC036
C     AN IFLAG OF 0 MEANS THAT ALL AIRCRAFT SOURCES EXCEPT                   ACSRC037
C     FOR RUNWAY ROLL AND CLIMBOUT MODES 1 AND 2 REMAIN                      ACSRC038
C     UNCHANGED                                                              ACSRC039
C                                                                            ACSRC040
      IF(IFLAG.EQ.0) GO TO 69                                                ACSRC041
C                                                                            ACSRC042
C     READ ARRFCN AND DEPFCN FROM TAPE                                       ACSRC043
C                                                                            ACSRC044
      IF (IWD.GE.1.AND.IWD.LE.MAXFIL) GO TO 1000                             ACSRC045
      PRINT 9000,MRECPT,MAXFIL,IWD                                           ACSRC046
 9000 FORMAT(29HOFILE REQUEST ERROR IN ACSRCE,3I5)                           ACSRC047
      GO TO 1040                                                             ACSRC048
 1000 IF (MRECPT-IWD) 1010,1030,1020                                         ACSRC049
 1010 READ (30)                                                              ACSRC050
      MRECPT=MRECPT+1                                                        ACSRC051
      GO TO 1000                                                             ACSRC052
 1020 REWIND 30                                                              ACSRC053
      MRECPT=1                                                               ACSRC054
      GO TO 1000                                                             ACSRC055
 1030 READ (30) ARRFCN,DEPFCN                                                ACSRC056
      MRECPT=MRECPT+1                                                        ACSRC057
 1040 CONTINUE                                                               ACSRC058
C                                                                            ACSRC059
C     FOR EACH AIRCRAFT TYPE COMPUTE FRAC USING TEMPORAL                     ACSRC060
C     DISTRIBUTION ARRAYS FOR AIRCRAFT ACTIVITY                              ACSRC061
```

```
C                                                                       ACSRC062
      NHI=IHR2                                                          ACSRC063
      IF(IHR1.GT.IHR2) NHI=24+IHR2                                      ACSRC064
      HRS=NHI-IHR1+1                                                    ACSRC065
      DO 5 I=1,NACTYP                                                   ACSRC066
      HRFRC=0.                                                          ACSRC067
      DO 4 JJ=IHR1,NHI                                                  ACSRC068
      J=JJ                                                              ACSRC069
      IF(JJ.GT.24) J=JJ-24                                              ACSRC070
 4    HRFRC=HRFRC+ACHR(J,I)                                             ACSRC071
      HRFRC=HRFRC/HRS                                                   ACSRC072
      FRAC(I)=ACMO(IMO,I)*ACDY(IDY,I)*HRFRC*7.0/DAYS*(1.E+6/3.6)        ACSRC073
 5    CONTINUE                                                          ACSRC074
   8  NACPT=0                                                           ACSRC075
      NB=0                                                              ACSRC076
      NC=0                                                              ACSRC077
      NZ=0                                                              ACSRC078
C                                                                       ACSRC079
C     SET UP SQUARE AREA SOURCES DUE TO AIRCRAFT PARKING AREAS          ACSRC080
C                                                                       ACSRC081
      DO 1  L=1,NPKAR                                                   ACSRC082
      NSQ=NPASQ(L)                                                      ACSRC083
      SPARSQ=0.0                                                        ACSRC084
      DO 2 J=1,NSQ                                                      ACSRC085
      NB=NB+1                                                           ACSRC086
      ACAR(1,NB)=PAREA(L,J,1)                                           ACSRC087
      ACAR(2,NB)=PAREA(L,J,2)                                           ACSRC088
      ACAR(3,NB)=ACLNDZ/2.                                              ACSRC089
      ACAR(4,NB)=PAREA(L,J,3) *1000.                                    ACSRC090
      APARSQ(L,J)=ACAR(4,NB) ** 2                                       ACSRC091
      SPARSQ = SPARSQ + APARSQ(L,J)                                     ACSRC092
      ACAR(5,NB)=ACLNDZ                                                 ACSRC093
      IACAR(1,NB)=IDPRKA(L)                                             ACSRC094
 2    IACAR(2,NB)=NSQ                                                   ACSRC095
      DO 91 J=1,NSQ                                                     ACSRC096
      NZ=NZ+1                                                           ACSRC097
 91   PARFCT(NZ) = APARSQ(L,J) / SPARSQ                                 ACSRC098
 1    CONTINUE                                                          ACSRC099
C                                                                       ACSRC100
      DO 93 I=1,NLSEGS                                                  ACSRC101
 93   NQ(I)=0                                                           ACSRC102
      NPKSRC=NB                                                         ACSRC103
      DO 3  L=1,NPKSRC                                                  ACSRC104
      DO 3  K=6,NT                                                      ACSRC105
      HRACAR(K-5,L)=0.0                                                 ACSRC106
 3    ACAR(K,L)=0.0                                                     ACSRC107
      TVP= EXP(ALPHA(2)-BETA(2)/TEMK)                                   ACSRC108
C                                                                       ACSRC109
C     BEGIN LOOP OVER N RUNWAYS                                         ACSRC110
C                                                                       ACSRC111
      DO 10 N=1,NRNWYS                                                  ACSRC112
C                                                                       ACSRC113
C     IS RUNWAY USED WITH THIS WIND DIRECTION?                          ACSRC114
C                                                                       ACSRC115
      IF (IUSWD(IWD,N).EQ.0) GO TO 10                                   ACSRC116
      THETA=RNWY(7,N)                                                   ACSRC117
      XO=0.25*DISRNW(N)*SIN(THETA)+RNWY(2,N)                            ACSRC118
      YO=0.25*DISRNW(N)*COS(THETA)+RNWY(3,N)                            ACSRC119
      NTT=NIBTT(N)                                                      ACSRC120
      IF(NTT.EQ.0) GO TO 50                                             ACSRC121
C                                                                       ACSRC122
C     BEGIN LOOP OVER J INBOUND TAXIWAYS                                ACSRC123
```

```
C                                                                       ACSRC124
      DC 11 J=1,NTT                                                     ACSRC125
C                                                                       ACSRC126
C     ANY AIRCRAFT ARRIVING ON THIS RUNWAY?                             ACSRC127
C                                                                       ACSRC128
      DC 7 I=1,NACTYP                                                   ACSRC129
      IF(TTARFR(J,I,N)*ARRFCN(23,I,N).GT.0.0) GO TO 701                 ACSRC130
    7 CCNTINUE                                                          ACSRC131
      GC TC 11                                                          ACSRC132
  701 NSGLNS = NIBSEG (J,N)                                             ACSRC133
C                                                                       ACSRC134
C     BEGIN LOOP OVER K TAXIWAY SEGMENTS                                ACSRC135
C                                                                       ACSRC136
      DC 12 K=1,NSGLNS                                                  ACSRC137
C                                                                       ACSRC138
C     SET UP SEGMENT LINE SOURCE GEOMETRIES                             ACSRC139
C                                                                       ACSRC140
      JJ = IIBSEG(K,J,N)                                                ACSRC141
      IF(NQ(JJ).NE.0) GO TO 130                                         ACSRC142
      NC=NC+1                                                           ACSRC143
      NQ(JJ)=NC                                                         ACSRC144
      DO 121 L=1,12                                                     ACSRC145
  121 ACLN(L,NC)=ACLNSG(L,JJ)                                           ACSRC146
      ACLN(9,NC)=1.0                                                    ACSRC147
      ACLN(10,NC)=1.0                                                   ACSRC148
C                                                                       ACSRC149
C     ALLOCATE AIRCRAFT INBOUND TAXIING POLLUTANT EMISSIONS             ACSRC150
C     TO APPROPRIATE SEGMENTS                                           ACSRC151
C                                                                       ACSRC152
      DO 13 L=1,NPLTS                                                   ACSRC153
      LL=L+12                                                           ACSRC154
   13 ACLN(LL,NC)=0.0                                                   ACSRC155
  130 ND=NQ(JJ)                                                         ACSRC156
      DC 14 I=1,NACTYP                                                  ACSRC157
      AA=ENGNO(I ,1)                                                    ACSRC158
      IF(IEGFLG.GT.0) AA=ENGNO(I ,2)                                    ACSRC159
      ARR=TTARFR(J,I,N)*ARRFCN(23,I,N)*ANNARR(I)                        ACSRC160
      IF(ARR.LE.0.0)GO TO 14                                            ACSRC161
      TIME=ACLN(11,ND)/(TXISPD(I )*ACLNSG(9,JJ))                        ACSRC162
      FRC=AA*ARR*TIME*FRAC(I )                                          ACSRC163
      DC 15 L=1,NPLTS                                                   ACSRC164
      KK=L+12                                                           ACSRC165
   15 ACLN(KK,ND)=ACLN(KK,ND)+FRC*ACEMFC(I ,2,L)                        ACSRC166
   14 CCNTINUE                                                          ACSRC167
   12 CONTINUE                                                          ACSRC168
C                                                                       ACSRC169
C     END TAXIWAY SEGMENT LOOP                                          ACSRC170
C                                                                       ACSRC171
C                                                                       ACSRC172
C     DETERMINE AIRCRAFT INBOUND PARKING AREA                           ACSRC173
C     ASSOCIATED WITH TAXIWAY PATH                                      ACSRC174
C                                                                       ACSRC175
      DO 16 I=1,NPKSRC                                                  ACSRC176
      II=I                                                              ACSRC177
      IDPK=IACAR(1,I)                                                   ACSRC178
      IF(IDPK.EQ.IDIBPA(J,N))GO TO 17                                   ACSRC179
   16 CONTINUE                                                          ACSRC180
      PRINT 18, IDIBPA(J,N),J,N                                         ACSRC181
   18 FORMAT ('0INBCUND PARKING AREA 'I3,'OF TAXIWAY='I3,'; RUNWAY='I3,'ACSRC182
     1 IS NOT CONSISTANT WITH PARKING AREA ID NUMBERS')                 ACSRC183
      STOF                                                              ACSRC184
   17 CONTINUE                                                          ACSRC185
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C                                                                       ACSRC186
C     ALLOCATE ALL AIRCRAFT IDLE AT SHUTDOWN, REFUELING,                ACSRC187
C     ARRIVAL FUEL VENTING AND SERVICE VEHICLE EMISSIONS                ACSRC188
C     TO APPROPRIATE AREA                                               ACSRC189
C                                                                       ACSRC190
      NSQ=IACAR(2,II)                                                   ACSRC191
      DO  19 I=1,NACTYP                                                 ACSRC192
      ARR=TIARFR(J,I,N)*ARRFCN(23,I,N)*ANNARR(I)                        ACSRC193
      IF(ARR.LE.0.0) GO TO 19                                           ACSRC194
      AA=ENGNO(I,1)                                                     ACSRC195
      IF(IEGFLG.GT.0) AA=ENGNO(I,2)                                     ACSRC196
      TIME=SHTDNT(I)/60.                                                ACSRC197
      FRC=AA*ARR*TIME*FRAC(I)                                           ACSRC198
      TVP=EXP(ALPHA(JES1(I)) - BETA(JES1(I)) / TEMK)                    ACSRC199
      DO 20 L=1,NSQ                                                     ACSRC200
      JJ=II+L-1                                                         ACSRC201
      DO 21 K=1,NPLTS                                                   ACSRC202
      KK=K+5                                                            ACSRC203
      ACAR(KK,JJ)=ACAR(KK,JJ)+FRC*ACEMFC(I,1,K) * PARFCT(JJ)            ACSRC204
      ACAR(KK,JJ)=ACAR(KK,JJ) + (ARSVEM(K,I,1) + ARSVEM(K,I,2) +        ACSRC205
     .ARSVEM(K,I,3) + ARSVEM(K,I,4)+ARSVEM(K,I,5)) * ARR * FRAC(I)      ACSRC206
     . * PARFCT(JJ)                                                     ACSRC207
      IF(K.EQ.2) ACAR(KK,JJ)=ACAR(KK,JJ)+(0.3*TVP*ACFUEL(I)*0.5        ACSRC208
     1/1000. + ACSPIL(I) + ARFLVT(I)) * ARR * FLDENS(JES1(I)) * FRAC(I) ACSRC209
     . * PARFCT(JJ)                                                     ACSRC210
  21  CONTINUE                                                          ACSRC211
  20  CONTINUE                                                          ACSRC212
  19  CONTINUE                                                          ACSRC213
  11  CONTINUE                                                          ACSRC214
C                                                                       ACSRC215
C     END INBOUND TAXIWAY LOOP                                          ACSRC216
C                                                                       ACSRC217
C                                                                       ACSRC218
C     BEGIN LOOP OVER I AIRCRAFT USED                                   ACSRC219
C                                                                       ACSRC220
      DO 30 I=1,NACTYP                                                  ACSRC221
C                                                                       ACSRC222
C     CALCULATE RUNWAY ARRIVALS FOR EACH AIRCRAFT TYPE                  ACSRC223
C                                                                       ACSRC224
      ARR=ARRFCN(23,I,N)*ANNARR(I)                                      ACSRC225
C                                                                       ACSRC226
C     ANY AIRCRAFT ARRIVING?                                            ACSRC227
C                                                                       ACSRC228
      IF(ARR.LE.0.0) GO TO 30                                           ACSRC229
C                                                                       ACSRC230
C     SET UP LINE SOURCES FOR APPROACH AND LANDING MODES 7, 8 AND 9     ACSRC231
C     AND ALLOCATE POLLUTANT EMISSIONS                                  ACSRC232
C                                                                       ACSRC233
      AA=ENGNO(I,1)                                                     ACSRC234
      DO 31 J=1,3                                                       ACSRC235
      DO 32 K=1,3                                                       ACSRC236
      KK=K+NC                                                           ACSRC237
      JK=6*K-6+J                                                        ACSRC238
      ACLN(J,KK)=ARRFCN(JK,I,N)                                         ACSRC239
      ACLN(J+5,KK)=ARRFCN(JK+6,I,N)                                     ACSRC240
  32  CONTINUE                                                          ACSRC241
      JJ=NC+J                                                           ACSRC242
      JK=6*J-2                                                          ACSRC243
      ACLN(4,JJ)=ARRFCN(24,I,N)                                         ACSRC244
      ACLN(5,JJ)=DEPFCN(24,I,N)                                         ACSRC245
      ACLN(09,JJ)=APRFCN(JK,I,N)                                        ACSRC246
      ACLN(10,JJ)=ARRFCN(JK+6,I,N)                                      ACSRC247
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      ACLN(11,JJ)=ARRFCN(JK+1,I,N)                                          ACSRC248
      ACLN(12,JJ)=AFRFCN(JK+2,I,N)                                          ACSRC249
      JMODE=J+6                                                             ACSRC250
      DO 33 K=1,NPLTS                                                       ACSRC251
      KK=K+12                                                               ACSRC252
      ACLN(KK,JJ)=AA*ACEMFC(I,JMODE,K)*ARR*ARRFCN(JK+2,I,N)*FRAC(I)         ACSRC253
   33 CONTINUE                                                              ACSRC254
   31 CONTINUE                                                              ACSRC255
      NC=NC+3                                                               ACSRC256
C                                                                           ACSRC257
C     SET UP LINE SOURCES FOR TRAINING FLIGHT OPERATIONS                    ACSRC258
C     AND ALLOCATE POLLUTANT EMISSIONS                                      ACSRC259
C                                                                           ACSRC260
      IF(ANNTGO(I).LE.0.0) GO TO 30                                         ACSRC261
      NC=NC+1                                                               ACSRC262
      ACLN(1,NC)=XP(XO,TGO(1,1,I),THETA)                                    ACSRC263
      ACLN(2,NC)=YP(YO,TGO(1,1,I),THETA)                                    ACSRC264
      ACLN(6,NC)=XP(XO,TGO(1,2,I),THETA)                                    ACSRC265
      ACLN(7,NC)=YP(YO,TGO(1,2,I),THETA)                                    ACSRC266
      ACLN(1,NC+1)=ACLN(6,NC)                                               ACSRC267
      ACLN(2,NC+1)=ACLN(7,NC)                                               ACSRC268
      ACLN(6,NC+1)=XO                                                       ACSRC269
      ACLN(7,NC+1)=YO                                                       ACSRC270
      ACLN(1,NC+2)=XO                                                       ACSRC271
      ACLN(2,NC+2)=YO                                                       ACSRC272
      ACLN(6,NC+2)=XP(XO,0.3048,THETA)                                      ACSRC273
      ACLN(7,NC+2)=YP(YO,0.3048,THETA)                                      ACSRC274
      ACLN(1,NC+3)=ACLN(6,NC+2)                                             ACSRC275
      ACLN(2,NC+3)=ACLN(7,NC+2)                                             ACSRC276
      ACLN(6,NC+3)=XP(XO,TGO(1,3,I),THETA)                                  ACSRC277
      ACLN(7,NC+3)=YP(YO,TGO(1,3,I),THETA)                                  ACSRC278
      ACLN(1,NC+4)=ACLN(6,NC+3)                                             ACSRC279
      ACLN(2,NC+4)=ACLN(7,NC+3)                                             ACSRC280
      ACLN(6,NC+4)=XP(XO,TGO(1,4,I),THETA)                                  ACSRC281
      ACLN(7,NC+4)=YP(YO,TGO(1,4,I),THETA)                                  ACSRC282
      ACLN(3,NC)=APPHT*1000.                                                ACSRC283
      ACLN(8,NC)=APPHT2(I)*1000.                                            ACSRC284
      ACLN(3,NC+1)=APPHT2(I)*1000.                                          ACSRC285
      ACLN(8,NC+1)=ACLNDZ/2.                                                ACSRC286
      ACLN(3,NC+2)=ACLNDZ/2.                                                ACSRC287
      ACLN(8,NC+2)=ACLNDZ/2.                                                ACSRC288
      ACLN(3,NC+3)=ACLNDZ/2.                                                ACSRC289
      ACLN(8,NC+3)=COHT1(I)*1000.                                           ACSRC290
      ACLN(3,NC+4)=COHT1(I)*1000.                                           ACSRC291
      ACLN(8,NC+4)=CLMBHT*1000.                                             ACSRC292
      ACLN(09,NC)=APSPD1(I)                                                 ACSRC293
      ACLN(10,NC)=APSPD2(I)                                                 ACSRC294
      ACLN(11,NC)=TGO(2,1,I)                                                ACSRC295
      ACLN(12,NC)=TGO(3,1,I)                                                ACSRC296
      ACLN(09,NC+1)=APSPD2(I)                                               ACSRC297
      ACLN(10,NC+1)=LNDSPD(I)                                               ACSRC298
      ACLN(11,NC+1)=TGO(2,2,I)                                              ACSRC299
      ACLN(12,NC+1)=TGO(3,2,I)                                              ACSRC300
      ACLN(09,NC+2)=LNDSPD(I)*1.3                                           ACSRC301
      ACLN(10,NC+2)=TOSPD(I)*0.7                                            ACSRC302
      ACLN(11,NC+2)=0.3048                                                  ACSRC303
      ACLN(12,NC+2)=2.0*0.3048/(1.3*LNDSPD(I)+0.7*TOSPD(I))                 ACSRC304
      ACLN(09,NC+3)=TOSPD(I)                                                ACSRC305
      ACLN(10,NC+3)=COSPD1(I)                                               ACSRC306
      ACLN(11,NC+3)=TGO(2,3,I)                                              ACSRC307
      ACLN(12,NC+3)=TGO(3,3,I)                                              ACSRC308
      ACLN(09,NC+4)=COSPD1(I)                                               ACSRC309
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      ACLN(10,NC+4)=COSPD2(I)                                          ACSRC310
      ACLN(11,NC+4)=TGO(2,4,I)                                         ACSRC311
      ACLN(12,NC+4)=TGO(3,4,I)                                         ACSRC312
      DO 45 J=1,5                                                      ACSRC313
      JJ=NC+J-1                                                        ACSRC314
      ACLN(4,JJ)=ARRFCN(24,I,N)                                        ACSRC315
      ACLN(5,JJ)=DEPFCN(24,I,N)                                        ACSRC316
      GO TO (34,35,41,36,37),J                                         ACSRC317
 34   KD=7                                                             ACSRC318
      GO TO 38                                                         ACSRC319
 35   KD=8                                                             ACSRC320
      GO TO 38                                                         ACSRC321
 36   KD=5                                                             ACSRC322
      GO TO 38                                                         ACSRC323
 37   KD=6                                                             ACSRC324
 38   DO 39 K=1,NPLTS                                                  ACSRC325
      KK=K+12                                                          ACSRC326
 39   ACLN(KK,JJ)=ANNTGO(I)*ACEMFC(I,KD,K)*ARRFCN(23,I,N)*ACLN(12,JJ)* ACSRC327
     1FRAC(I)*AA                                                       ACSRC328
      GO TO 45                                                         ACSRC329
 41   DO 42 K=1,NPLTS                                                  ACSRC330
      KK=K+12                                                          ACSRC331
 42   ACLN(KK,JJ)=AA*(0.3*ACEMFC(I,9,K)+0.7*ACEMFC(I,4,K))*            ACSRC332
     1 ANNTGO(I)*ARRFCN(23,I,N)*ACLN(12,JJ)*FRAC(I)                    ACSRC333
 45   CONTINUE                                                         ACSRC334
      NC=NC+4                                                          ACSRC335
  30  CONTINUE                                                         ACSRC336
C                                                                      ACSRC337
C     END AIRCRAFT LOOP                                                ACSRC338
C                                                                      ACSRC339
 50   NTT=NOBTT(N)                                                     ACSRC340
      IF(NTT.EQ.0) GO TO 10                                            ACSRC341
C                                                                      ACSRC342
C     BEGIN LOOP OVER J OUTBOUND TAXIWAYS                              ACSRC343
C                                                                      ACSRC344
      DO 51 J=1,NTT                                                    ACSRC345
C                                                                      ACSRC346
C     ANY AIRCRAFT DEPARTING ON THIS TAXIWAY?                          ACSRC347
C                                                                      ACSRC348
      DO 6 I=1,NACTYP                                                  ACSRC349
      IF(TTDPFR(J,I,N)*DEPFCN(23,I,N).GT.0.0) GO TO 601                ACSRC350
    6 CONTINUE                                                         ACSRC351
      GO TO 51                                                         ACSRC352
  601 NSGLNS=NOBSEG(J,N)                                               ACSRC353
C                                                                      ACSRC354
C     BEGIN LOOP OVER K TAXIWAY SEGMENTS                               ACSRC355
C                                                                      ACSRC356
      DO 52 K=1,NSGLNS                                                 ACSRC357
C                                                                      ACSRC358
C     SET UP SEGMENT LINE SOURCE GEOMETRIES                            ACSRC359
C                                                                      ACSRC360
      JJ=IOBSEG(K,J,N)                                                 ACSRC361
      IF(NQ(JJ).NE.0) GO TO 131                                        ACSRC362
      NC=NC+1                                                          ACSRC363
      NQ(JJ)=NC                                                        ACSRC364
      DO 122 L=1,12                                                    ACSRC365
  122 ACLN(L,NC)=ACLNSG(L,JJ)                                          ACSRC366
      ACLN(9,NC)=1.0                                                   ACSRC367
      ACLN(10,NC)=1.0                                                  ACSRC368
C                                                                      ACSRC369
C     ALLOCATE AIRCRAFT INBOUND TAXIING POLLUTANT EMISSIONS            ACSRC370
C     TO APPROPRIATE SEGMENTS                                          ACSRC371
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C                                                                       ACSRC372
      DO 53 L=1,NPLTS                                                   ACSRC373
      LL=L+12                                                           ACSRC374
   53 ACLN(LL,NC)=0.0                                                   ACSRC375
  131 ND=NC(JJ)                                                         ACSRC376
      DO 54 I=1,NACTYP                                                  ACSRC377
      DEP=TIDPFR(J,I,N)*DEPFCN(23,I,N)*ANNDEP(I)                        ACSRC378
      IF(DEP.LE.0.0) GO TO 54                                           ACSRC379
      AA=ENGNO(I,1)                                                     ACSRC380
      IF(IEGFLG.GT.0) AA=ENGNO(I,2)                                     ACSRC381
      TIME= ACLN(11,ND) / TXISPD(I)                                     ACSRC382
      FRC= AA* DEP*TIME*FRAC(I)                                         ACSRC383
      DO 55 L=1,NPLTS                                                   ACSRC384
      KK=L+12                                                           ACSRC385
   55 ACLN(KK,ND)= ACLN(KK,ND)+FRC*ACEMFC(I,2,L)                        ACSRC386
   54 CONTINUE                                                          ACSRC387
   52 CONTINUE                                                          ACSRC388
C                                                                       ACSRC389
C     END TAXIWAY SEGMENT LOOP                                          ACSRC390
C                                                                       ACSRC391
C                                                                       ACSRC392
C     DETERMINE AIRCRAFT OUTBOUND PARKING AREA ASSOCIATED               ACSRC393
C     WITH TAXIWAY PATH                                                 ACSRC394
C                                                                       ACSRC395
      DO 56 I=1,NPKSRC                                                  ACSRC396
      II =I                                                             ACSRC397
      IDPK=IACAR(1,I)                                                   ACSRC398
      IF(IDPK.EQ.IDOBPA(J,N)) GO TO 58                                  ACSRC399
   56 CONTINUE                                                          ACSRC400
      PRINT 57,IDOBPA(J,N),J,N                                          ACSRC401
   57 FORMAT(22HOOUTBOUND PARKING AREA,I3,11H OF TAXIWAY,I3,8H, RUNWAY, ACSRC402
     . I3,47H IS NOT CONSISTENT WITH PARKING AREA ID NUMBERS)           ACSRC403
      STOP                                                              ACSRC404
C                                                                       ACSRC405
C     ALLOCATE ALL AIRCRAFT IDLE AT STARTUP, DEPARTURE FUEL             ACSRC406
C     VENTING AND SERVICE VEHICLE EMISSIONS TO APPROPRIATE AREA         ACSRC407
C                                                                       ACSRC408
   58 NSQ=IACAR(2,II )                                                  ACSRC409
      DO 59 I=1,NACTYP                                                  ACSRC410
      DEP=TIDPFR(J,I,N)*DEPFCN(23,I,N)*ANNDEP(I)                        ACSRC411
      IF(DEP.EQ.0.0) GO TO 59                                           ACSRC412
      AA=ENGNO(I,1)                                                     ACSRC413
      IF(IEGFLG.GT.0) AA=ENGNO(I,2)                                     ACSRC414
      TIME=SRTUPT(I)/60.                                                ACSRC415
      FRC = AA* DEP* TIME * FRAC(I)                                     ACSRC416
      TVP=EXP(ALPHA(JES1(I)) - BETA(JES1(I)) / TEMK)                    ACSPC417
      DO 60 L=1,NSQ                                                     ACSRC418
      JJ =II +L-1                                                       ACSRC419
      DO 61 K=1,NPLTS                                                   ACSRC420
      KK=K+5                                                            ACSRC421
      ACAR(KK,JJ) = ACAR(KK,JJ) + ((FRC * ACEMFC(I,1,K)) +              ACSRC422
     . ((DPSVEM(K,I,1) + DPSVEM(K,I,2) + DPSVEM(K,I,3) + DPSVEM(K,I,4)  ACSRC423
     . + DPSVEM(K,I,5)) * DEP * FRAC(I))) * PARFCT(JJ)                  ACSRC424
      IF (K.EQ.2) ACAR(KK,JJ) = ACAR(KK,JJ) + DPFLVT(I) * DEP * FLDENS( ACSRC425
     . JES1(I)) * FRAC(I) * PARFCT(JJ)                                  ACSRC426
   61 CONTINUE                                                          ACSRC427
   60 CONTINUE                                                          ACSRC428
   59 CONTINUE                                                          ACSRC429
   51 CONTINUE                                                          ACSRC430
C                                                                       ACSRC431
C     END OUTBOUND TAXIWAY LOOP                                         ACSRC432
C                                                                       ACSRC433
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      NB=NB+1                                                          ACSRC434
C                                                                      ACSRC435
C     SET UP AREA SOURCE AT TAIL OF RUNWAY AND ALLOCATE                ACSRC436
C     ENGINE CHECK EMISSIONS TO IT                                     ACSRC437
C                                                                      ACSRC438
      ACAR(1,NB)=RNWY(2,N)-.05 * SIN(THETA)                            ACSRC439
      ACAR(2,NB)=RNWY(3,N)-.05*COS(THETA)                              ACSRC440
      ACAR(3,NB)= ACLNDZ/2.                                            ACSRC441
      ACAR(4,NB)= 100.0                                                ACSRC442
      ACAR(5,NB)= ACLNDZ                                               ACSRC443
      DO 65 K=1,NPLTS                                                  ACSRC444
      KK=K+5                                                           ACSRC445
   65 ACAR(KK,NB)=0.0                                                  ACSRC446
      DO 66 I=1,NACTYP                                                 ACSRC447
      DEP=DEPFCN(23,I,N)*ANNDEP(I)                                     ACSRC448
      IF(DEP.EQ.0.0) GO TO 66                                          ACSRC449
      AA=ENGNO(I,1)                                                    ACSRC450
      IF(IEGFLG.GT.0) AA=ENGNO(I,2)                                    ACSRC451
      TIME= EGCHKT(I)/60.                                              ACSRC452
      FRC= TIME *DEP*AA*FRAC(I)                                        ACSRC453
      DO 67 K=1,NPLTS                                                  ACSRC454
      KK=K+5                                                           ACSRC455
   67 ACAR(KK,NB)=ACAR(KK,NB)+ FRC* ACEMFC(I,3,K)                      ACSRC456
   66 CONTINUE                                                         ACSRC457
   10 CONTINUE                                                         ACSRC458
C                                                                      ACSRC459
C     END RUNWAY LOOP                                                  ACSRC460
C                                                                      ACSRC461
      NACAR=NB                                                         ACSRC462
      NC1=NC                                                           ACSRC463
   69 NC=NC1                                                           ACSRC464
C                                                                      ACSRC465
C     BEGIN LOOP OVER N RUNWAYS                                        ACSRC466
C                                                                      ACSRC467
      DO 79 N=1,NRNWYS                                                 ACSRC468
C                                                                      ACSRC469
C     IS RUNWAY USED WITH THIS WIND DIRECTION?                         ACSRC470
C                                                                      ACSRC471
      IF(IUSWD(IWD,N).EQ.0) GO TO 79                                   ACSRC472
C                                                                      ACSRC473
C     BEGIN LOOP OVER I AIRCRAFT USED                                  ACSRC474
C                                                                      ACSRC475
      DO 70 I=1,NACTYP                                                 ACSRC476
C                                                                      ACSRC477
C     CALCULATE RUNWAY DEPARTURES FOR EACH AIRCRAFT TYPE               ACSRC478
C                                                                      ACSRC479
      DEP=DEPFCN(23,I,N)*ANNDEP(I)                                     ACSRC480
C                                                                      ACSRC481
C     ANY AIRCRAFT DEPARTING FROM THIS RUNWAY?                         ACSRC482
C                                                                      ACSRC483
      IF(DEP.EQ.0.0) GO TO 70                                          ACSRC484
C                                                                      ACSRC485
C     CALL DEPART TO CALCULATE POINTS IN TAKEOFF PATH ACCORDING        ACSRC486
C     TO CURRENT METEOROLOGICAL CONDITIONS                             ACSRC487
C                                                                      ACSRC488
      CALL DEPART (N,I)                                                ACSRC489
      AA=ENGNO(I ,1)                                                   ACSRC490
C                                                                      ACSRC491
C     SET UP LINE SOURCES FOR RUNWAY ROLL AND CLIMBOUT MODES 1 AND 2   ACSRC492
C     AND ALLOCATE POLLUTANT EMISSIONS                                 ACSRC493
C                                                                      ACSRC494
      DO 71 J=1,3                                                      ACSRC495
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      DO 72 K=1,3                                                          ACSRC496
      KK=K+NC                                                              ACSRC497
      JK=6*K-6+J                                                           ACSRC498
      ACLN(J,KK)=DEPFCN(JK,I,N)                                            ACSRC499
   72 ACLN(J+5,KK)=DEPFCN(JK+6,I,N)                                        ACSRC500
      JJ=NC+J                                                              ACSRC501
      JK=6*J-2                                                             ACSRC502
      ACLN(4,JJ)=ARRFCN(24,I,N)                                            ACSRC503
      ACLN(5,JJ)=DEPFCN(24,I,N)                                            ACSRC504
      ACLN(09,JJ)=DEPFCN(JK,I,N)                                           ACSRC505
      ACLN(10,JJ)=DEPFCN(JK+6,I,N)                                         ACSRC506
      ACLN(11,JJ)=DEPFCN(JK+1,I,N)                                         ACSRC507
      ACLN(12,JJ)=DEPFCN(JK+2,I,N)                                         ACSRC508
      JMODE=J+3                                                            ACSRC509
      DO 73 K=1,NPLTS                                                      ACSRC510
      KK=K+12                                                              ACSRC511
      ACLN(KK,JJ)=AA*ACEMFC(I,JMODE,K)*DEP*DEPFCN(JK+2,I,N)*FRAC(I)        ACSRC512
   73 CONTINUE                                                             ACSRC513
   71 CONTINUE                                                             ACSRC514
      NC=NC+3                                                              ACSRC515
   70 CONTINUE                                                             ACSRC516
C                                                                          ACSRC517
C     END AIRCRAFT LOOP                                                    ACSRC518
C                                                                          ACSRC519
   79 CONTINUE                                                             ACSRC520
C                                                                          ACSRC521
C     END RUNWAY LOOP                                                      ACSRC522
C                                                                          ACSRC523
      NACLN=NC                                                             ACSRC524
      RETURN                                                               ACSRC525
      END                                                                  ACSRC526
```

FUNCTION AINE

Purpose:

1. To translate the line and receptor coordinates to an x-axis along the wind vector, placing the origin of the line at its low end.
2. To set up the necessary parameters for the CAVL and QMOD routines.
3. To determine the concentration due to the given line.

Input:

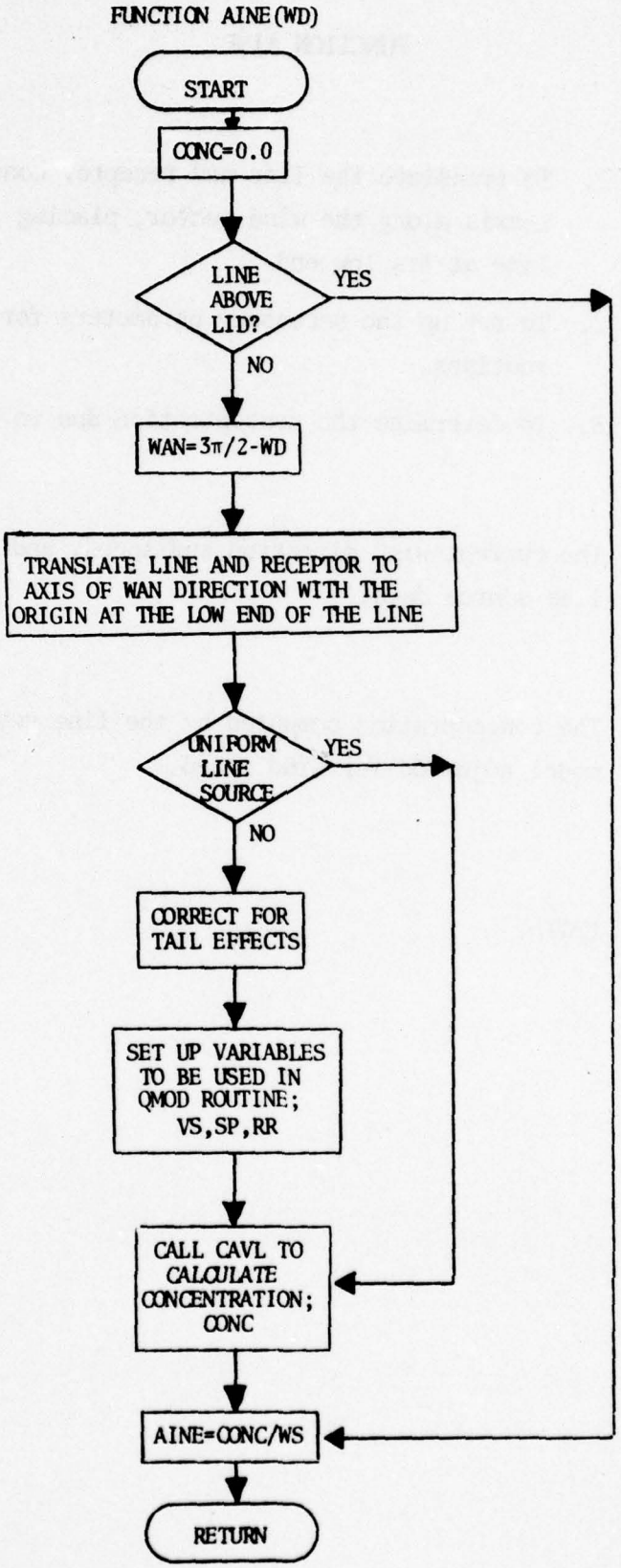
The current wind direction and speed, and the receptor and line source data.

Output:

The concentration computed by the line source diffusion model adjusted for wind speed.

Subroutines Called:

CAVL


FUNCTION AINE(WD)
START
CONC=0.0
LINE ABOVE LID?
YES
NO
WAN=3π/2-WD
TRANSLATE LINE AND RECEPTOR TO AXIS OF WAN DIRECTION WITH THE ORIGIN AT THE LOW END OF THE LINE
UNIFORM LINE SOURCE
YES
NO
CORRECT FOR TAIL EFFECTS
SET UP VARIABLES TO BE USED IN QMOD ROUTINE; VS,SP,RR
CALL CAVL TO CALCULATE CONCENTRATION; CONC
AINE=CONC/WS
RETURN

```
      FUNCTION AINE (WD)                                                AINE0000
C                                                                       AINE0001
C   THIS FUNCTION TRANSLATES THE LINE AND RECEPTOR COORDINATES TO AN    AINE0002
C   X-AXIS ALONG THE WIND VECTOR, PLACING THE ORIGIN OF THE LINE AT     AINE0003
C   ITS LOW END.  THE VEHICLE MOVES FROM (X1,Y1,Z1) TO (X2,Y2,Z2)       AINE0004
C                                                                       AINE0005
      COMMON /MET/ WS,WSMPH,IWS,WX,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMF,   AINE0006
     . TEMK                                                             AINE0007
      COMMON /RCPT/ NRECEP,RECEP(2,312)                                 AINE0008
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE,HTAERO,X1,Y1,Z1,W,DELZ,X2,Y2,Z2,AINE0009
     . V1,V2,DL,TIME,EMIS(6),NPOL                                       AINE0010
      COMMON /LN/ XW1,YW1,ZW1,XW2,YW2,ZW2,SUDOY,SUDOZ,IAD,TAIL,A,V12,VS,AINE0011
     . WS2,WSC,RR,SP,XST,YST,ZST,XND,YND,ZND                            AINE0012
      DATA PI32/4.7123890/                                              AINE0013
C                                                                       AINE0014
      CONC = 0.                                                         AINE0015
C                                                                       AINE0016
C     IF LINE IS ABOVE LID, DO NOT CALCULATE CONC                       AINE0017
C                                                                       AINE0018
      IF(ZW1.GE.HLID-.5) GO TO 60                                       AINE0019
C                                                                       AINE0020
C     TRANSLATE LINE AND RECEPTOR TO AXIS OF WAN DIRECTION              AINE0021
C                                                                       AINE0022
      WAN=PI32-WD                                                       AINE0023
      CSAN=COS(WAN)                                                     AINE0024
      SNAN=SIN(WAN)                                                     AINE0025
      XW2=(X2-X1)*CSAN+(Y2-Y1)*SNAN                                     AINE0026
      YW2=(X1-X2)*SNAN+(Y2-Y1)*CSAN                                     AINE0027
      XR = RECEP(1,IRECEP) * 1000.                                      AINE0028
      YR = RECEP(2,IRECEP) * 1000.                                      AINE0029
      ZST=ZW1                                                           AINE0030
      ZND=ZW2                                                           AINE0031
      IF(Z1.LE.Z2) GO TO 5                                              AINE0032
      XW2=-XW2                                                          AINE0033
      XST=XW2                                                           AINE0034
      YW2=-YW2                                                          AINE0035
      YST=YW2                                                           AINE0036
      XND=0.0                                                           AINE0037
      YND=0.0                                                           AINE0038
      XRCP=(XR-X2)*CSAN+(YR-Y2)*SNAN                                    AINE0039
      YRCP=(X2-XR)*SNAN+(YR-Y2)*CSAN                                    AINE0040
      GO TO 8                                                           AINE0041
    5 CONTINUE                                                          AINE0042
      XST=0.0                                                           AINE0043
      YST=0.0                                                           AINE0044
      XND=XW2                                                           AINE0045
      YND=YW2                                                           AINE0046
      XRCP=(XR-X1)*CSAN+(YR-Y1)*SNAN                                    AINE0047
      YRCP=(X1-XR)*SNAN+(YR-Y1)*CSAN                                    AINE0048
    8 CONTINUE                                                          AINE0049
      ZRCP = 2.                                                         AINE0050
C                                                                       AINE0051
C     IS THIS A UNIFORM LINE SOURCE                                     AINE0052
C                                                                       AINE0053
   50 IF(IAD.EQ.0) GO TO 500                                            AINE0054
C                                                                       AINE0055
C     CORRECT FOR TAIL EFFECTS IF ARRIVAL OR DEPARTURE                  AINE0056
C                                                                       AINE0057
      CSA = -XW2 / DL                                                   AINE0058
      WSC = 2 * WS * CSA                                                AINE0059
      EXT = TAIL / DL                                                   AINE0060
      DX = XW2 * EXT                                                    AINE0061
```

```
      DY = YW2 * EXT                                                    AINE0062
      XW2 = XW2 + DX                                                    AINE0063
      YW2 = YW2 + DY                                                    AINE0064
      VS = TAIL / TIME                                                  AINE0065
      W1 = V1 + VS                                                      AINE0066
      W2 = V2 + VS                                                      AINE0067
      YY1 = SQRT(WS2 + W1 * (W1 + WSC))                                 AINE0068
      YY2 = SQRT(WS2 + W2 * (W2 + WSC))                                 AINE0069
      SP = YY2                                                          AINE0070
      ARG = (YY2+ W2 + WSC/2.) / (YY1+ W1 + WSC/2.)                     AINE0071
      G =YY2 -YY1 - WSC/2. * ALOG(ARG)                                  AINE0072
      RR = A / G                                                        AINE0073
      IF (Z1.NE.Z2.AND.IAD.EQ.1) GO TO 500                              AINE0074
      XRCP = XRCP + DX                                                  AINE0075
      YRCP = YRCP + DY                                                  AINE0076
C                                                                       AINE0077
C   CALCULATE THE CONCENTRATION DUE TO THIS LINE                        AINE0078
C                                                                       AINE0079
  500 CONC=CAVL(XRCP,YRCP,ZRCP)                                         AINE0080
   60 AINE = CONC / WS                                                  AINE0081
      RETURN                                                            AINE0082
      END                                                               AINE0083
```

BLOCK DATA

Purpose:

To initialize data in common blocks.

Input:

None

Output:

None

```
      BLOCK DATA                                                        BLKDT000
C                                                                       BLKDT001
C   INITIALIZE DATA IN COMMON BLOCKS FOR SHORT TERM MODEL               BLKDT002
C                                                                       BLKDT003
      REAL*8 POLNAM                                                     BLKDT004
C                                                                       BLKDT005
      COMMON /ANNMET/ TBAR,ADD,P,PA,WSBAR,DTBAR                         BLKDT006
      COMMON /DEFALT/ ITAPE,ACLNDY,ACLNDZ,ALPHA(7),BETA(7),FLDENS(7)    BLKDT007
      COMMON /DSTRBT/ ACMO(13,8),ACDY(2,8),ACHR(24,8),VHMLMO(13),       BLKDT008
     . VHMLDY(2),VHMLHR(24),CVABMO(13),CVABDY(2),CVABHR(24),CVENMO(13), BLKDT009
     . CVENDY(2),CVENHR(24),FLMO(13,7),FLDY(2,7),FLHR(24,7),NC1         BLKDT010
      COMMON /LN/ XW1,YW1,ZW1,XW2,YW2,ZW2,SUDOY,SUDOZ,IAD,TAIL,B,V12,VS,BLKDT011
     . WS2,WSC,RR,SP,AA1,AA2,AA3,AA4,AA5,AA6                            BLKDT012
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG,IONCE    BLKDT013
      COMMON /SRCE/ NPOL,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,NACPT,     BLKDT014
     . NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),ABPT(16,150),  BLKDT015
     . ABAR(11,100),ABLN(14,100),ACPT(16,1),ACAR(11,24),ACLN(18,250)    BLKDT016
      COMMON /TITL/ POLNAM( 6),TITLE1(20),IPCHOS( 6),NXPOL,IP           BLKDT017
      COMMON /WNDPRO/ XP(6)                                             BLKDT018
C                                                                       BLKDT019
C     ************************DATA STATEMENTS*************************BLKDT020
C                                                                       BLKDT021
      DATA XW1, YW1, TAIL / 0.0, 0.0, 140. /                            BLKDT022
      DATA XP / 0.2, 0.2, 0.2, 0.3, 0.4, 0.4 /                          BLKDT023
      DATA ALPHA / 11.70365, 11.10675, 12.42382, 12.68789, 13.687,      BLKDT024
     . 13.038, 13.024 /                                                 BLKDT025
      DATA BETA / 2868.54, 3129.5187, 3276.8848, 5108.4194,5329.139,    BLKDT026
     . 4789.301, 4782.209 /                                             BLKDT027
      DATA FLDENS / 0.695, 0.773, 0.693, 0.842, 0.824, 0.807, 0.807 /   BLKDT028
      DATA ACLNDY, ACLNDZ / 20.0,8.0 /                                  BLKDT029
      DATA ITAPE, IONCE / 21, 0 /                                       BLKDT030
      DATA POLNAM / 8H   CO   ,8H   HC   ,8H  NOX   ,8H   PT   ,        BLKDT031
     . 8H  SO2   ,8H  POL6  /                                           BLKDT032
      DATA ENPT,ENAR,ENLN,ABPT,ABAR,ABLN,ACPT,ACAR,ACLN / 12660*0.0 /   BLKDT033
      DATA NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,NACPT,NACAR,NACLN /9*0.0/BLKDT034
      END                                                               BLKDT035
```

FUNCTION CAVL

Purpose:

To compute the coupling coefficient at a receptor due to a line source.

Input:

Meteorological conditions: wind speed; stability; mixing height; critical distance for vertical mixing; psuedo downwind distances for horizontal and vertical spreads of the line source.

Source parameters: end point coordinates of the line (X-axis has been chosen to be along the wind vector); IAD flag for uniform or non-uniform line.

Receptor coordinates.

Output:

CAVL, the coupling coefficient.

Procedure:

1. Test whether the receptor is located with respect to the line source such that the concentration is negligible.
2. If the angle between the wind vector and line is sufficiently small, and the line is sufficiently long, set a flag for the line to be segmented.
3. Compute effective downwind distance and the horizontal and vertical dispersion coefficients.
4. Determine factor to be used in subdividing the line.
5. Test whether the line has a uniform density. If it is a runway used for aircraft arrival or departure (non-uniform density), call subroutine QMOD.
6. Determine the proper expression to be used and compute the concentration due to the line segment.
7. Test whether further segments need be considered. If not, output the concentration for the given receptor.

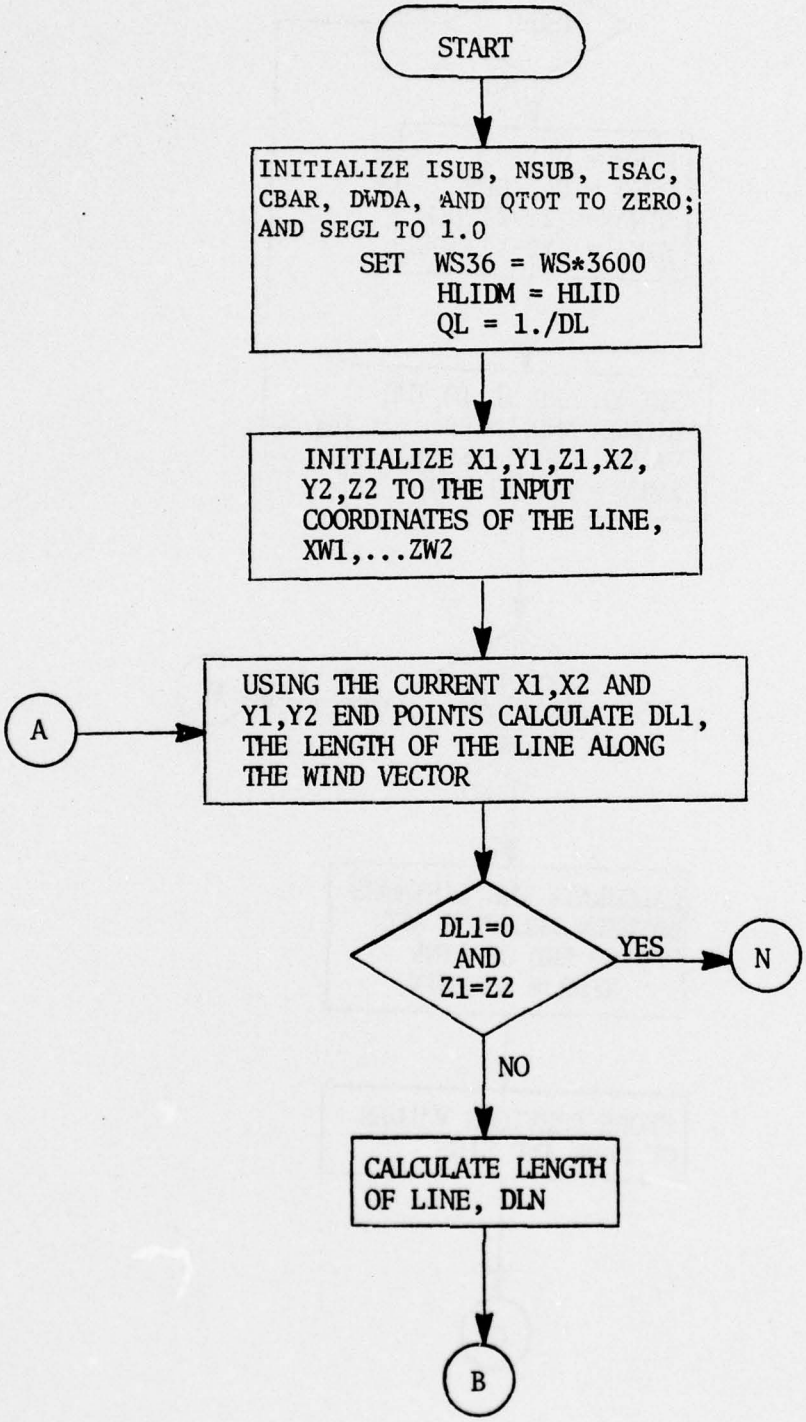
Functions Called:

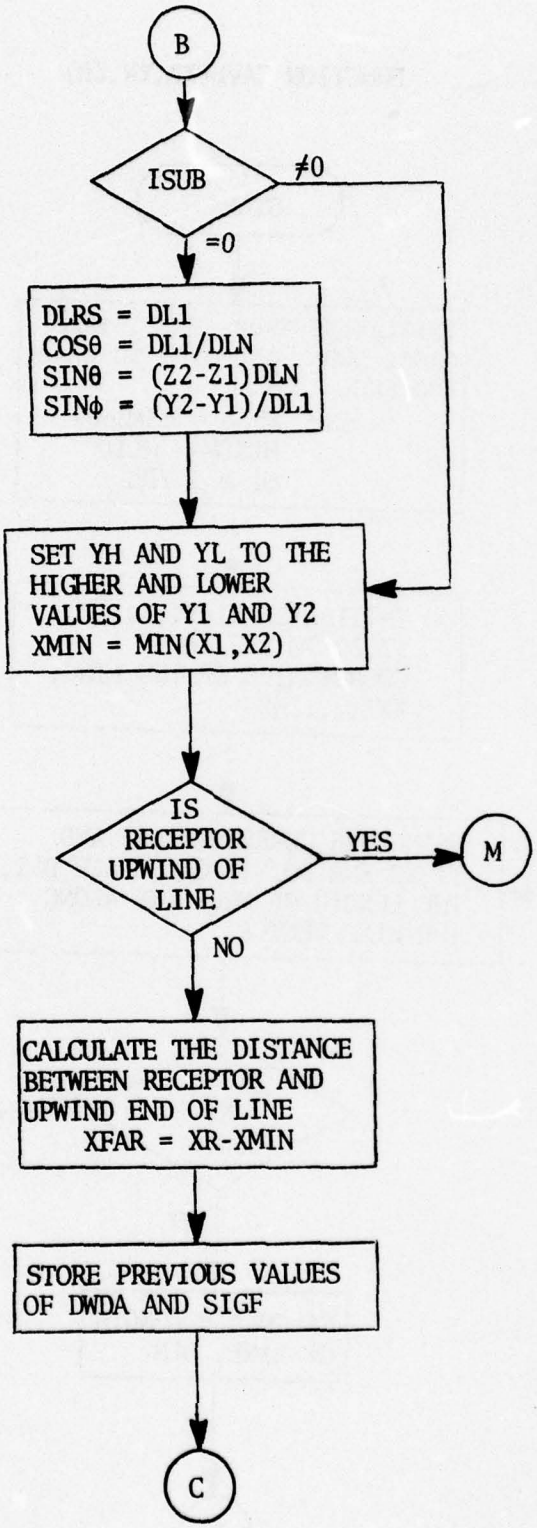
SIGY,SIGZ,DIFERF

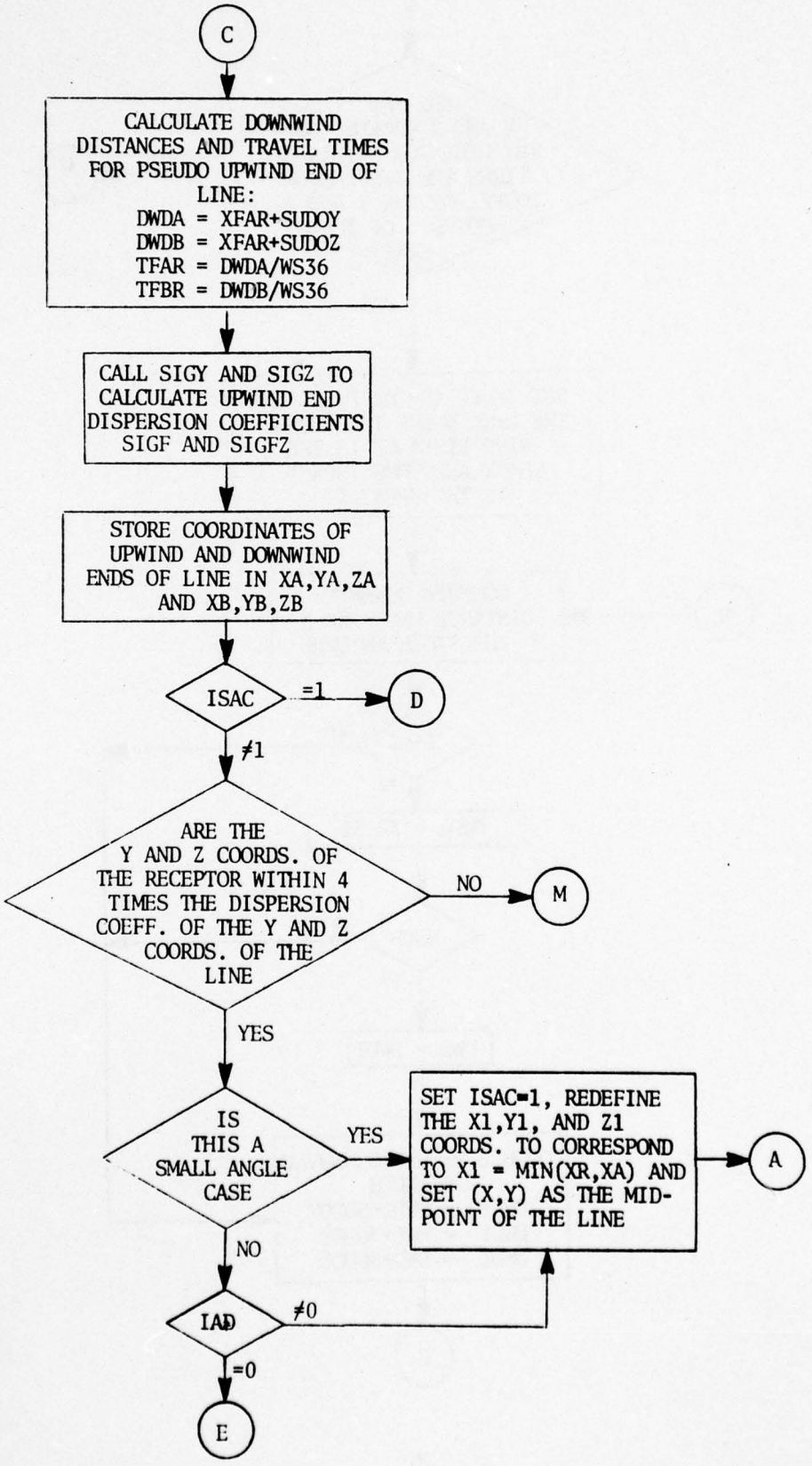
Subroutine Called:

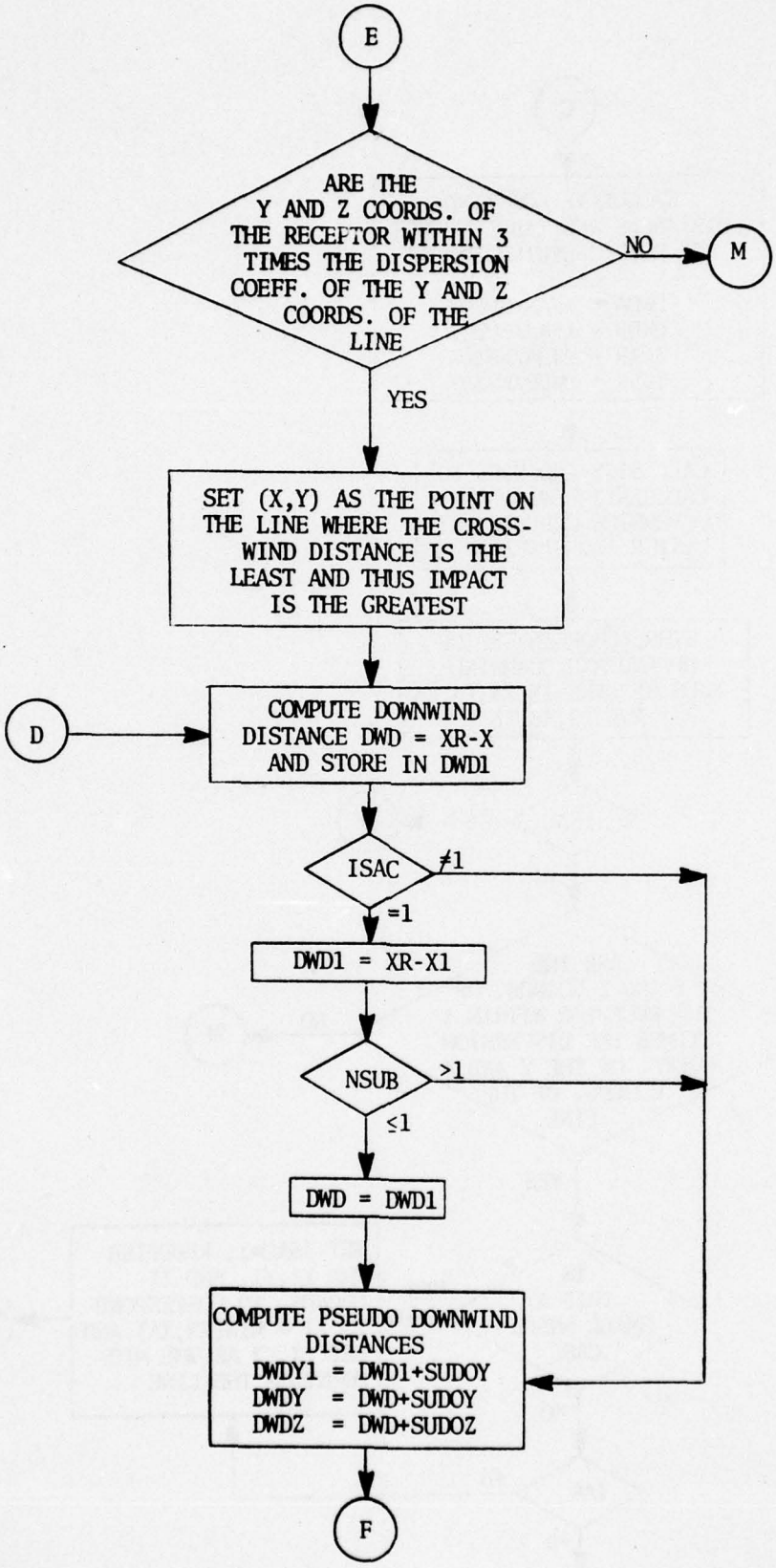
QMOD

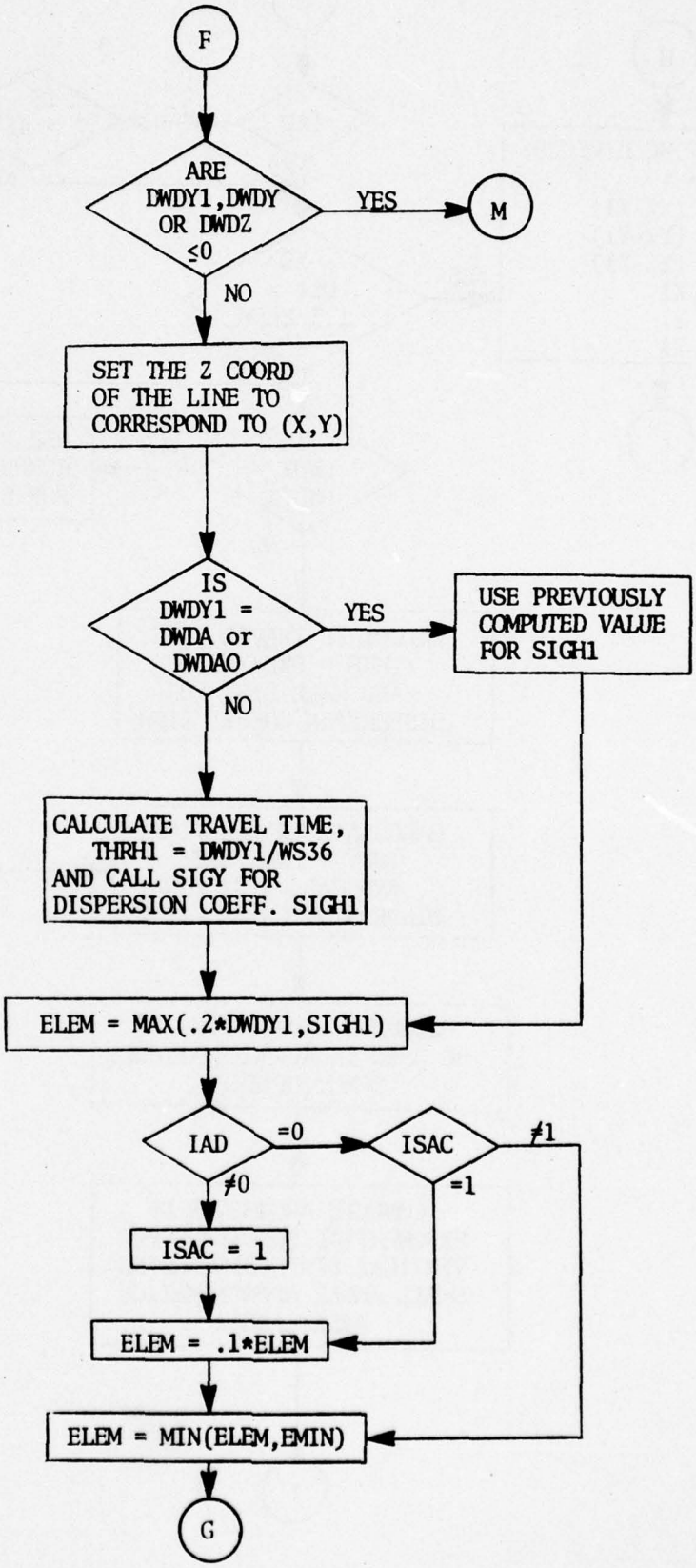
FUNCTION CAVL(XR,YR,ZR)

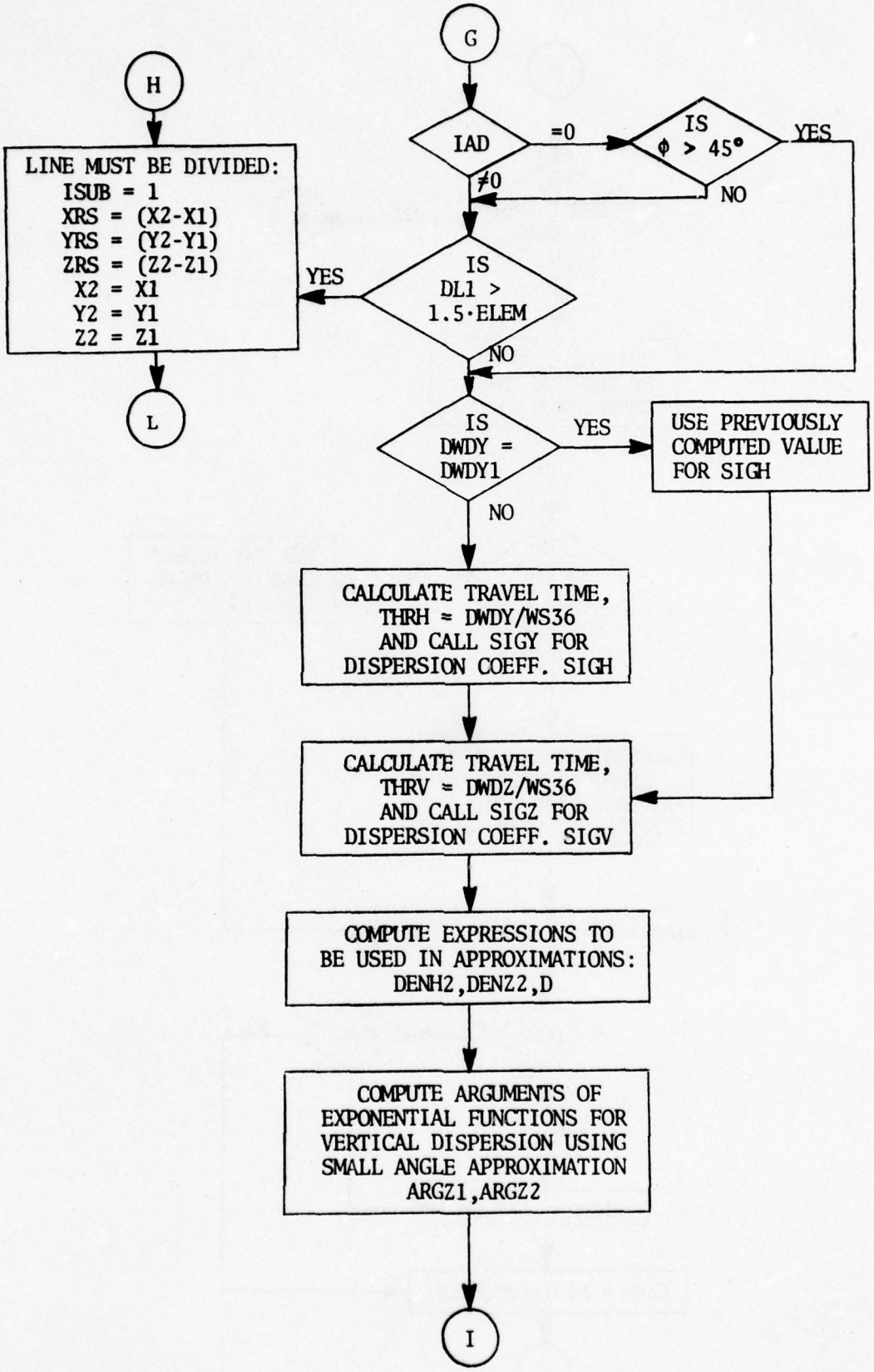


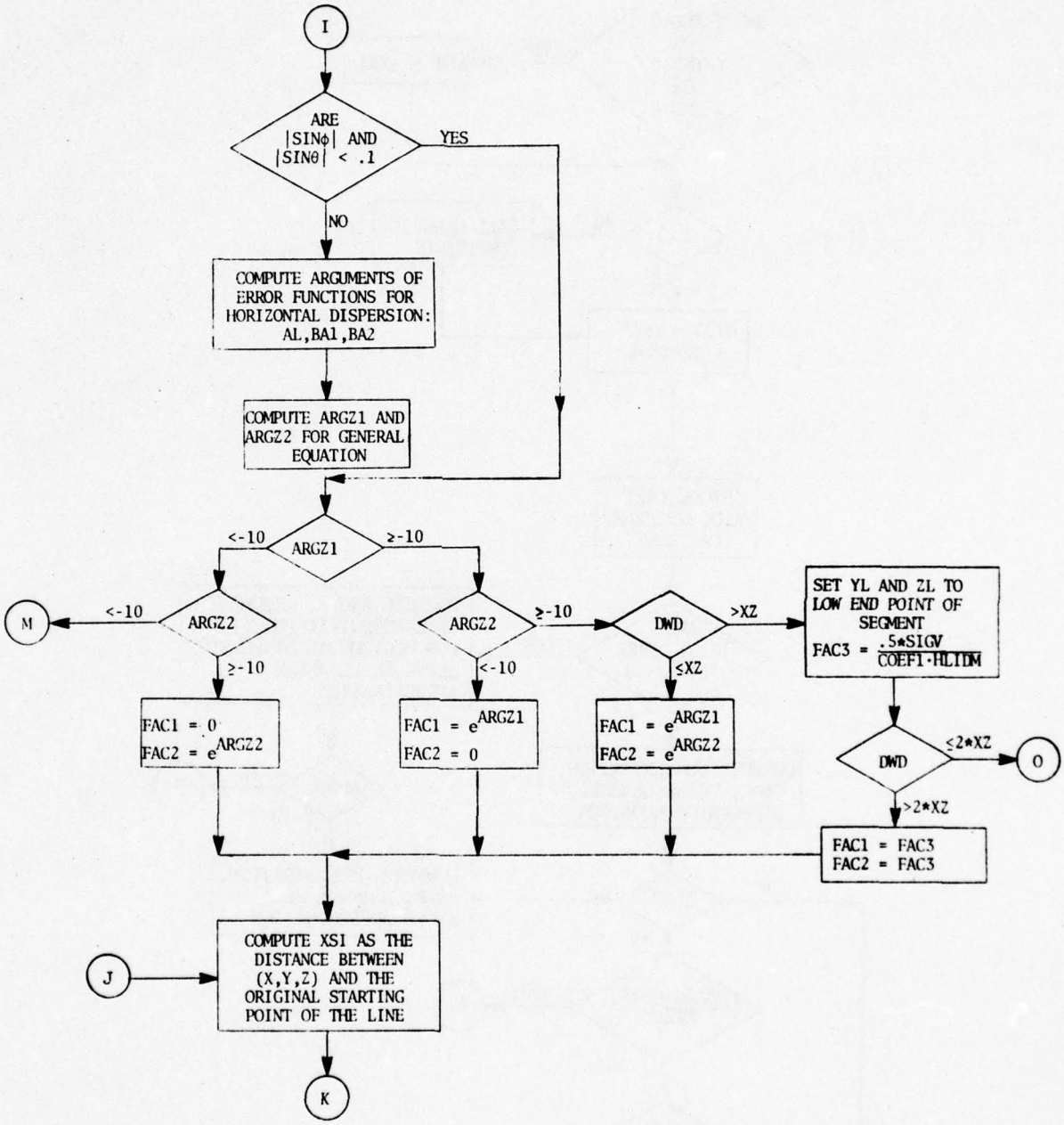

B
ISUB
≠0
=0
DLRS = DL1
COSθ = DL1/DLN
SINθ = (Z2-Z1)DLN
SINϕ = (Y2-Y1)/DL1
SET YH AND YL TO THE HIGHER AND LOWER VALUES OF Y1 AND Y2
XMIN = MIN(X1,X2)
IS RECEPTOR UPWIND OF LINE
YES
M
NO
CALCULATE THE DISTANCE BETWEEN RECEPTOR AND UPWIND END OF LINE
XFAR = XR-XMIN
STORE PREVIOUS VALUES OF DWDA AND SIGF
C

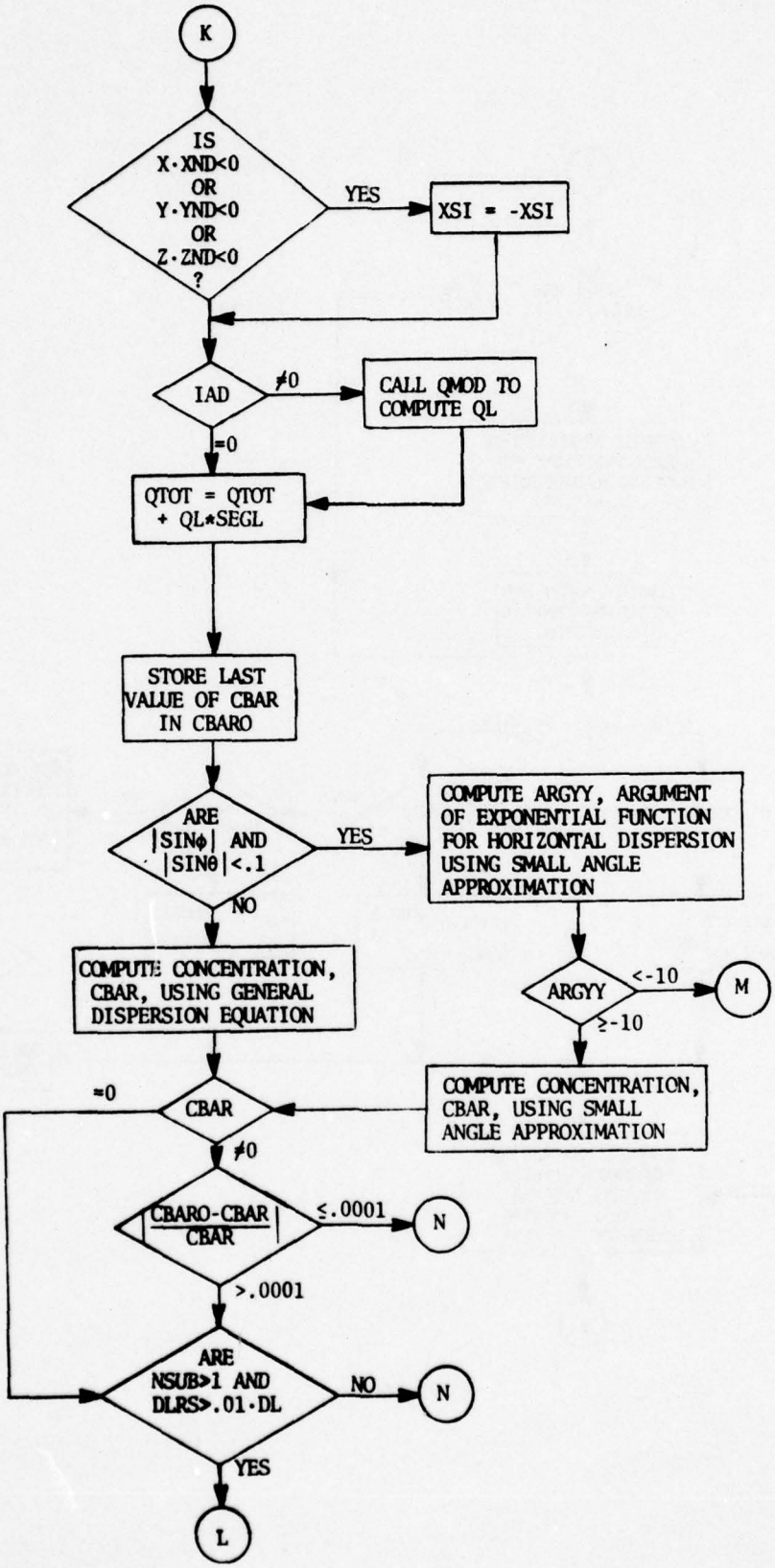

C
CALCULATE DOWNWIND DISTANCES AND TRAVEL TIMES FOR PSEUDO UPWIND END OF LINE:
DWDA = XFAR+SUDOY
DWDB = XFAR+SUDOZ
TFAR = DWDA/WS36
TFBR = DWDB/WS36
CALL SIGY AND SIGZ TO CALCULATE UPWIND END DISPERSION COEFFICIENTS SIGF AND SIGFZ
STORE COORDINATES OF UPWIND AND DOWNWIND ENDS OF LINE IN XA,YA,ZA AND XB,YB,ZB
ISAC
=1
D
≠1
ARE THE Y AND Z COORDS. OF THE RECEPTOR WITHIN 4 TIMES THE DISPERSION COEFF. OF THE Y AND Z COORDS. OF THE LINE
NO
M
YES
IS THIS A SMALL ANGLE CASE
YES
SET ISAC=1, REDEFINE THE X1,Y1, AND Z1 COORDS. TO CORRESPOND TO X1 = MIN(XR,XA) AND SET (X,Y) AS THE MID-POINT OF THE LINE
A
NO
IAD
≠0
=0
E

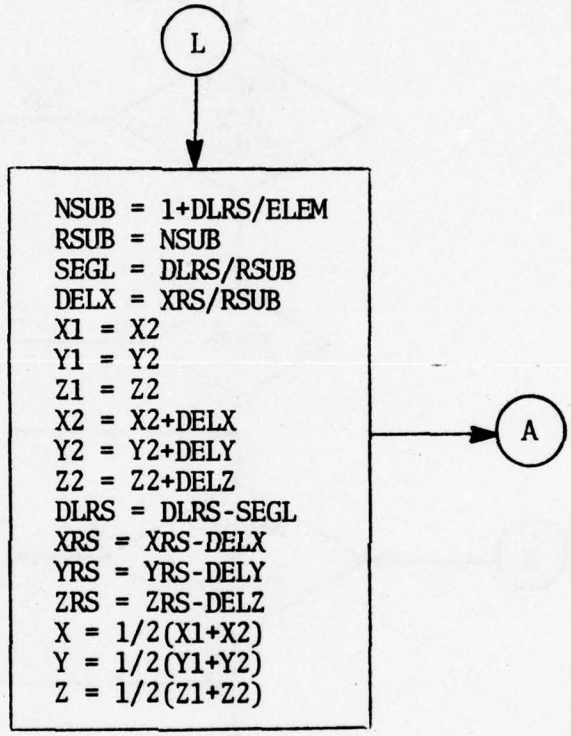

E
ARE THE Y AND Z COORDS. OF THE RECEPTOR WITHIN 3 TIMES THE DISPERSION COEFF. OF THE Y AND Z COORDS. OF THE LINE
NO
M
YES
SET (X,Y) AS THE POINT ON THE LINE WHERE THE CROSS-WIND DISTANCE IS THE LEAST AND THUS IMPACT IS THE GREATEST
D
COMPUTE DOWNWIND DISTANCE DWD = XR-X AND STORE IN DWD1
ISAC
≠1
=1
DWD1 = XR-X1
NSUB
>1
≤1
DWD = DWD1
COMPUTE PSEUDO DOWNWIND DISTANCES
DWDY1 = DWD1+SUDOY
DWDY = DWD+SUDOY
DWDZ = DWD+SUDOZ
F

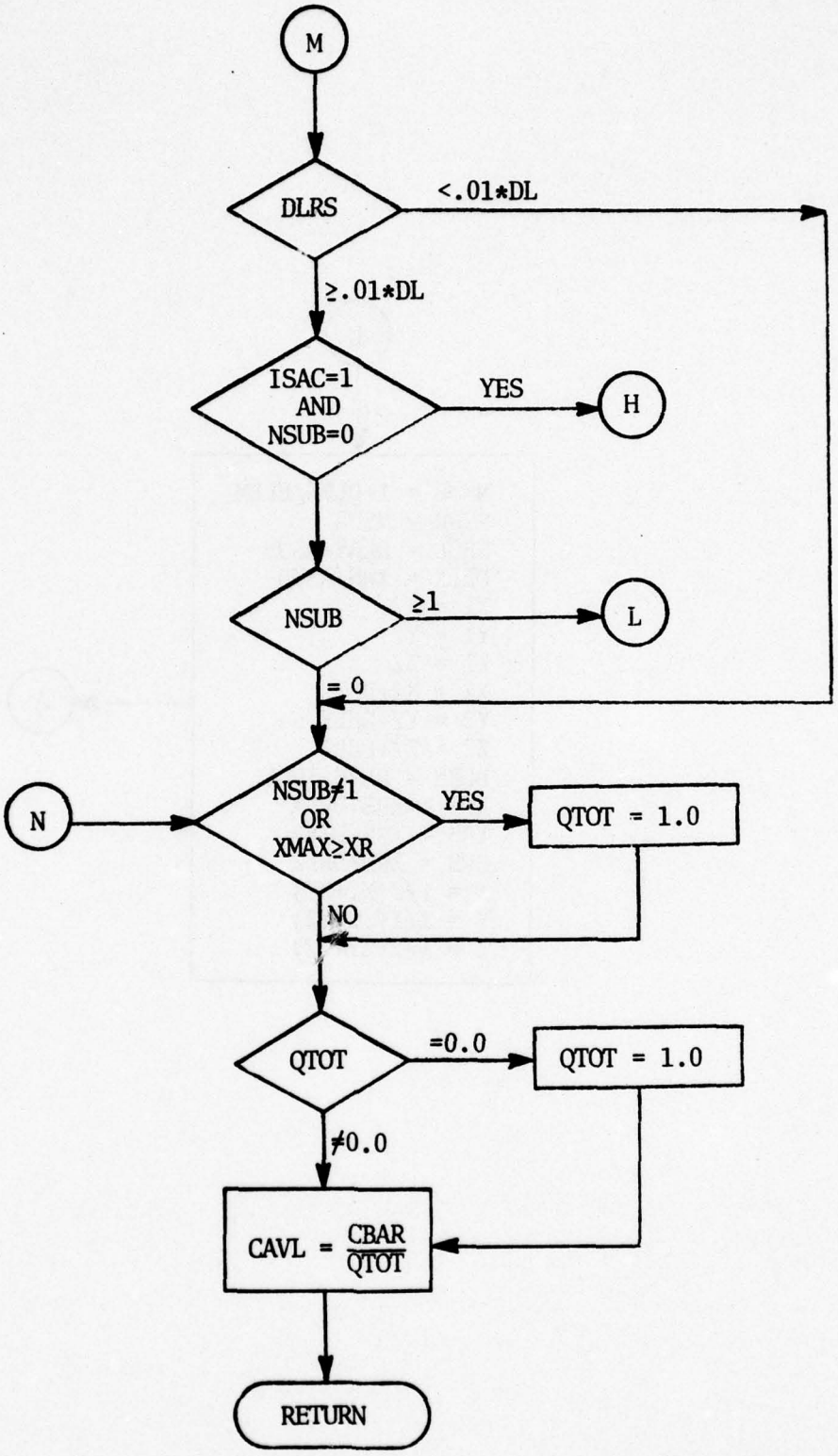

F
ARE DWDY1,DWDY OR DWDZ ≤0
YES
M
NO
SET THE Z COORD OF THE LINE TO CORRESPOND TO (X,Y)
IS DWDY1 = DWDA or DWDAO
YES
USE PREVIOUSLY COMPUTED VALUE FOR SIGH1
NO
CALCULATE TRAVEL TIME, THRH1 = DWDY1/WS36 AND CALL SIGY FOR DISPERSION COEFF. SIGH1
ELEM = MAX(.2*DWDY1,SIGH1)
IAD
=0
ISAC
≠1
≠0
=1
ISAC = 1
ELEM = .1*ELEM
ELEM = MIN(ELEM,EMIN)
G

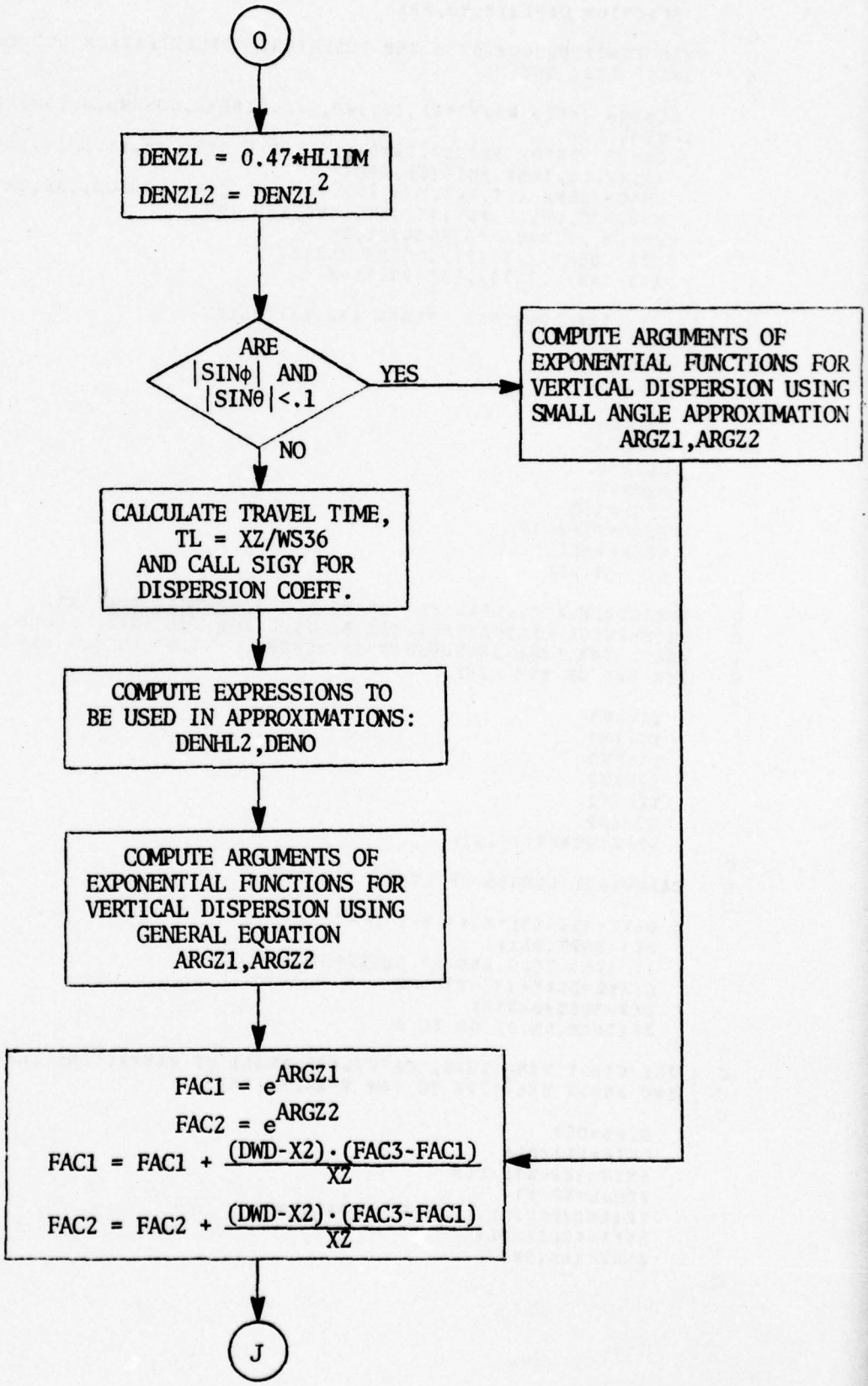

G
H
IAD
=0
IS
φ > 45°
YES
NO
≠0
IS
DL1 >
1.5·ELEM
YES
NO
LINE MUST BE DIVIDED:
ISUB = 1
XRS = (X2-X1)
YRS = (Y2-Y1)
ZRS = (Z2-Z1)
X2 = X1
Y2 = Y1
Z2 = Z1
L
IS
DWDY =
DWDY1
YES
USE PREVIOUSLY
COMPUTED VALUE
FOR SIGH
NO
CALCULATE TRAVEL TIME,
THRH = DWDY/WS36
AND CALL SIGY FOR
DISPERSION COEFF. SIGH
CALCULATE TRAVEL TIME,
THRV = DWDZ/WS36
AND CALL SIGZ FOR
DISPERSION COEFF. SIGV
COMPUTE EXPRESSIONS TO
BE USED IN APPROXIMATIONS:
DENH2,DENZ2,D
COMPUTE ARGUMENTS OF
EXPONENTIAL FUNCTIONS FOR
VERTICAL DISPERSION USING
SMALL ANGLE APPROXIMATION
ARGZ1,ARGZ2
I


I
ARE |SINφ| AND |SINθ| < .1
YES
NO
COMPUTE ARGUMENTS OF ERROR FUNCTIONS FOR HORIZONTAL DISPERSION: AL, BA1, BA2
COMPUTE ARGZ1 AND ARGZ2 FOR GENERAL EQUATION
ARGZ1
<-10
≥-10
ARGZ2
M
<-10
≥-10
FAC1 = 0
FAC2 = e^ARGZ2
ARGZ2
≥-10
<-10
FAC1 = e^ARGZ1
FAC2 = 0
DWD
>XZ
≤XZ
FAC1 = e^ARGZ1
FAC2 = e^ARGZ2
SET YL AND ZL TO LOW END POINT OF SEGMENT
FAC3 = .5*SIGV / COEFI·HLIDM
DWD
≤2*XZ
>2*XZ
O
FAC1 = FAC3
FAC2 = FAC3
J
COMPUTE XS1 AS THE DISTANCE BETWEEN (X,Y,Z) AND THE ORIGINAL STARTING POINT OF THE LINE
K


K
IS X·XND<0 OR Y·YND<0 OR Z·ZND<0 ?
YES
XSI = -XSI
IAD
≠0
CALL QMOD TO COMPUTE QL
=0
QTOT = QTOT + QL*SEGL
STORE LAST VALUE OF CBAR IN CBARO
ARE |SINφ| AND |SINθ|<.1
YES
NO
COMPUTE ARGYY, ARGUMENT OF EXPONENTIAL FUNCTION FOR HORIZONTAL DISPERSION USING SMALL ANGLE APPROXIMATION
ARGYY
<-10
M
≥-10
COMPUTE CONCENTRATION, CBAR, USING GENERAL DISPERSION EQUATION
COMPUTE CONCENTRATION, CBAR, USING SMALL ANGLE APPROXIMATION
=0
CBAR
≠0
|CBARO-CBAR / CBAR|
≤.0001
N
>.0001
ARE NSUB>1 AND DLRS>.01·DL
NO
N
YES
L


L
NSUB = 1+DLRS/ELEM
RSUB = NSUB
SEGL = DLRS/RSUB
DELX = XRS/RSUB
X1 = X2
Y1 = Y2
Z1 = Z2
X2 = X2+DELX
Y2 = Y2+DELY
Z2 = Z2+DELZ
DLRS = DLRS-SEGL
XRS = XRS-DELX
YRS = YRS-DELY
ZRS = ZRS-DELZ
X = 1/2(X1+X2)
Y = 1/2(Y1+Y2)
Z = 1/2(Z1+Z2)
A


M
DLRS
<.01*DL
≥.01*DL
ISAC=1
AND
NSUB=0
YES
H
NSUB
≥1
L
= 0
N
NSUB≠1
OR
XMAX≥XR
YES
QTOT = 1.0
NO
QTOT
=0.0
QTOT = 1.0
≠0.0
CAVL = CBAR/QTOT
RETURN


O
DENZL = 0.47*HL1DM
DENZL2 = DENZL^2
ARE |SINφ| AND |SINθ|<.1
YES
NO
COMPUTE ARGUMENTS OF EXPONENTIAL FUNCTIONS FOR VERTICAL DISPERSION USING SMALL ANGLE APPROXIMATION ARGZ1,ARGZ2
CALCULATE TRAVEL TIME, TL = XZ/WS36 AND CALL SIGY FOR DISPERSION COEFF.
COMPUTE EXPRESSIONS TO BE USED IN APPROXIMATIONS: DENHL2,DENO
COMPUTE ARGUMENTS OF EXPONENTIAL FUNCTIONS FOR VERTICAL DISPERSION USING GENERAL EQUATION ARGZ1,ARGZ2
FAC1 = e^{ARGZ1}
FAC2 = e^{ARGZ2}
FAC1 = FAC1 + $\frac{(DWD-X2)\cdot(FAC3-FAC1)}{XZ}$
FAC2 = FAC2 + $\frac{(DWD-X2)\cdot(FAC3-FAC1)}{XZ}$
J

```
      FUNCTION CAVL(XR,YR,ZR)                                          CAVL0000
C                                                                      CAVL0001
C     THIS FUNCTION COMPUTES THE POLLUTANT CONCENTRATION DUE TO A      CAVL0002
C     FINITE LINE SOURCE                                               CAVL0003
C                                                                      CAVL0004
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMF,  CAVL0005
     . TEMK                                                           CAVL0006
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE,HTAERO,X5,Y5,Z5,W,DELZ,X6,Y6,Z6,CAVL0007
     . V1,V2,DL,TIME,EMIS(6),NPOL                                     CAVL0008
      COMMON /LN/ XW1,YW1,ZW1,XW2,YW2,ZW2,SUDOY,SUDOZ,IAD,TAIL,B,V12,VS,CAVL0009
     . WS2,WSC,RR,SP,XST,YST,ZST,XND,YND,ZND                          CAVL0010
      COMMON /XTRAN/ XZ,WSMD,TY,TZ                                     CAVL0011
      DATA COEF1 /.39894/,COEF2 /.31831/                               CAVL0012
      DATA CAN/0.7071/,EMIN/9.144/                                     CAVL0013
C                                                                      CAVL0014
C     INITIALIZE COUNTERS, FLAGS AND VARIABLES                         CAVL0015
C                                                                      CAVL0016
      ISUB=0                                                           CAVL0017
      NSUB=0                                                           CAVL0018
      ISAC=0                                                           CAVL0019
      LSAC=0                                                           CAVL0020
      CBAR=0.                                                          CAVL0021
      DWDA=0.                                                          CAVL0022
      QTOT=0.                                                          CAVL0023
      SEGL=1.0                                                         CAVL0024
      WS36=WS*3600.                                                    CAVL0025
      HLIDM=HLID                                                       CAVL0026
      QL = 1./DL                                                       CAVL0027
C                                                                      CAVL0028
C     INTRODUCE A GENERAL SET OF NOTATION SO THAT THE SAME             CAVL0029
C     DISPERSION CALCULATION CAN BE USED FOR THE SMALL ANGLE CASE      CAVL0030
C     WHERE THE LINE IS FURTHER SEGMENTED.  X1,Y1,Z1 NOW REFER TO THE  CAVL0031
C     LOW END OF THE LINE.                                             CAVL0032
C                                                                      CAVL0033
      X1=XW1                                                           CAVL0034
      Y1=YW1                                                           CAVL0035
      Z1=ZW1                                                           CAVL0036
      X2=XW2                                                           CAVL0037
      Y2=YW2                                                           CAVL0038
      Z2=ZW2                                                           CAVL0039
      XMAX=AMAX1(X1,X2)                                                CAVL0040
C                                                                      CAVL0041
C     CALCULATE LENGTH OF LINE                                         CAVL0042
C                                                                      CAVL0043
    5 DLXY=(X2-X1)**2+(Y2-Y1)**2                                       CAVL0044
      DL1=SQRT(DLXY)                                                   CAVL0045
      IF (DL1.EQ.0.AND.Z1.EQ.Z2)GO TO 600                              CAVL0046
      DLXYZ=DLXY+(Z2-Z1)**2                                            CAVL0047
      DLN=SQRT(DLXYZ)                                                  CAVL0048
      IF(ISUB.NE.0) GO TO 6                                            CAVL0049
C                                                                      CAVL0050
C     THE FIRST TIME THRU, CALCULATE ANGLE OF ELEVATION, THETA,        CAVL0051
C     AND ANGLE RELATIVE TO THE X-AXIS, PHI                            CAVL0052
C                                                                      CAVL0053
      DLRS=DL1                                                         CAVL0054
      CSTH=DL1/DLN                                                     CAVL0055
      SNTH=(Z2-Z1)/DLN                                                 CAVL0056
      PROJL=Y2-Y1                                                      CAVL0057
      IF(ABS(PROJL).LT.1.E-20)PROJL=0.                                 CAVL0058
      SNFI=PROJL/DL1                                                   CAVL0059
      ASNF=ABS(SNFI)                                                   CAVL0060
C                                                                      CAVL0061
```

```
C   FIND HIGH AND LOW ENDS OF LINE AS PROJECTED ON THE X-Y PLANE          CAVL0062
C                                                                         CAVL0063
    6 CONTINUE                                                            CAVL0064
      IF(Y1.GT.Y2) GO TO 1                                                CAVL0065
      YH=Y2                                                               CAVL0066
      YL=Y1                                                               CAVL0067
      GO TO 2                                                             CAVL0068
    1 YH=Y1                                                               CAVL0069
      YL=Y2                                                               CAVL0070
    2 CONTINUE                                                            CAVL0071
C                                                                         CAVL0072
C   TEST THE RECEPTOR LOCATION RELATIVE TO THE LINE SOURCE                CAVL0073
C                                                                         CAVL0074
      XMIN=AMIN1(X1,X2)                                                   CAVL0075
      IF ((XMIN-XR).GE.0.5) GO TO 500                                     CAVL0076
C                                                                         CAVL0077
C   RECEPTOR IS DOWNWIND, FIND DISTANCE TO UPWIND END OF LINE             CAVL0078
C                                                                         CAVL0079
      XFAR=XR-XMIN                                                        CAVL0080
C                                                                         CAVL0081
C   STORE PREVIOUS VALUES AND COMPUTE NEW DOWNWIND DISTANCES              CAVL0082
C   AND TRAVEL TIMES FOR PSEUDO UPWIND END OF LINE                        CAVL0083
C                                                                         CAVL0084
      DWDAO=DWDA                                                          CAVL0085
      SIGFO=SIGF                                                          CAVL0086
      DWDA=XFAR+SUDOY                                                     CAVL0087
      DWDB=XFAR+SUDOZ                                                     CAVL0088
      TFAR=DWDA/WS36                                                      CAVL0089
      TFBR=DWDB/WS36                                                      CAVL0090
C                                                                         CAVL0091
C   COMPUTE UPWIND END DISPERSION COEFFICIENTS                            CAVL0092
C                                                                         CAVL0093
      SIGF=SIGY(JSTAR,TFAR)                                               CAVL0094
      SIGFZ=SIGZ(JSTAB,TFBR)                                              CAVL0095
C                                                                         CAVL0096
C   STORE LINE COORDINATES                                                CAVL0097
C                                                                         CAVL0098
      IF(X1.LE.X2) GO TO 21                                               CAVL0099
      XA=X2                                                               CAVL0100
      YA=Y2                                                               CAVL0101
      XB=X1                                                               CAVL0102
      YB=Y1                                                               CAVL0103
      ZB=Z1                                                               CAVL0104
      GO TO 22                                                            CAVL0105
   21 XA=X1                                                               CAVL0106
      YA=Y1                                                               CAVL0107
      XB=X2                                                               CAVL0108
      YB=Y2                                                               CAVL0109
      ZB=Z2                                                               CAVL0110
   22 CONTINUE                                                            CAVL0111
      IF(ISAC.EQ.1) GO TO 4                                               CAVL0112
C                                                                         CAVL0113
C   ARE Y AND Z COORDS OF RECEPTOR WITHIN 4 TIMES THE DISPERSION          CAVL0114
C   COEFFICIENT OF THE Y AND Z COORDS OF THE LINE                         CAVL0115
C                                                                         CAVL0116
      IF(YR.GT.(YH+4.*SIGF)) GO TO 500                                    CAVL0117
      IF(YR.LT.(YL-4.*SIGF)) GO TO 500                                    CAVL0118
      IF(ZR.GT.(Z2+4.*SIGFZ)) GO TO 500                                   CAVL0119
      IF(ZR.LT.(Z1-4.*SIGFZ)) GO TO 500                                   CAVL0120
      IF (ASNF .LT.  CAN .AND. ABS(SNTH) .LT. CAN) GO TO 3                CAVL0121
      IF (IAD.NE.0) GO TO 3                                               CAVL0122
C                                                                         CAVL0123
```

```
C   ANGLE IS LARGE:  ARE THE RECEPTOR COORDS WITHIN 3 TIMES THE          CAVL0124
C   DISPERSION COEFFICIENT OF THE LINE COORDS.                           CAVL0125
C                                                                        CAVL0126
      IF(YR.GT.(YH+3.*SIGF)) GO TO 500                                   CAVL0127
      IF(YR.LT.(YL-3.*SIGF)) GO TO 500                                   CAVL0128
      IF(ZR.GT.(Z2+3.*SIGFZ)) GO TO 500                                  CAVL0129
      IF(ZR.LT.(Z1-3.*SIGFZ)) GO TO 500                                  CAVL0130
C                                                                        CAVL0131
C   SET (X,Y) AS POINT ON LINE WHERE IMPACT IS GREATEST                  CAVL0132
C                                                                        CAVL0133
      X=X1+(YR-Y1)*(X2-X1)/(Y2-Y1)                                       CAVL0134
      IF(X.GT.XB) GO TO 333                                              CAVL0135
      IF(X.LT.XA) GO TO 33                                               CAVL0136
      Y=YR                                                               CAVL0137
      GO TO 4                                                            CAVL0138
C                                                                        CAVL0139
C   ANGLE IS SMALL:  REDEFINE LINE COORDS AND SET (X,Y) AS               CAVL0140
C   MIDPOINT OF SEGMENT                                                  CAVL0141
C                                                                        CAVL0142
    3 IF(ASNF.LT.0.1.AND.(ABS(SNTH)).LT.0.1) LSAC=1                      CAVL0143
      ISAC=1                                                             CAVL0144
   30 X=AMIN1(XR,XA)                                                     CAVL0145
      Y1=Y1+(X-X1)*(Y2-Y1)/(X2-X1)                                       CAVL0146
      Z1=Z1+(X-X1)*(Z2-Z1)/(X2-X1)                                       CAVL0147
      X1=X                                                               CAVL0148
      X2=XB                                                              CAVL0149
      Y2=YB                                                              CAVL0150
      Z2=ZB                                                              CAVL0151
      X=0.5*(X1+X2)                                                      CAVL0152
      Y=0.5*(Y1+Y2)                                                      CAVL0153
      GO TO 5                                                            CAVL0154
   33 X=XA                                                               CAVL0155
      Y=YA                                                               CAVL0156
      GO TO 4                                                            CAVL0157
  333 X=XB                                                               CAVL0158
      Y=YB                                                               CAVL0159
C                                                                        CAVL0160
C   COMPUTE DOWNWIND DISTANCE                                            CAVL0161
C                                                                        CAVL0162
    4 DWD=XR-X                                                           CAVL0163
      IF (DWD.LT.-.01) GO TO 30                                          CAVL0164
      DWD1=DWD                                                           CAVL0165
      IF (ISAC.NE.1) GO TO 40                                            CAVL0166
      DWD1=XR-X1                                                         CAVL0167
      IF (NSUB.LE.1) DWD=DWD1                                            CAVL0168
C                                                                        CAVL0169
C   COMPUTE PSEUDO DOWNWIND DISTANCES                                    CAVL0170
C                                                                        CAVL0171
   40 DWDY1=DWD1+SUDOY                                                   CAVL0172
      DWDY=DWD+SUDOY                                                     CAVL0173
      DWDZ=DWD+SUDOZ                                                     CAVL0174
C                                                                        CAVL0175
C   SET Z COORDINATE OF LINE                                             CAVL0176
C                                                                        CAVL0177
      IF(X1.EQ.X2) GO TO 44                                              CAVL0178
      Z=Z1+(X-X1)*(Z2-Z1)/(X2-X1)                                        CAVL0179
      GO TO 444                                                          CAVL0180
   44 Z=Z1+(Y-Y1)*(Z2-Z1)/(Y2-Y1)                                        CAVL0181
  444 CONTINUE                                                           CAVL0182
C                                                                        CAVL0183
C   COMPUTE TRAVEL TIME AND DISPERSION COEFFICIENT FOR                   CAVL0184
C   PSEUDO DOWNWIND DISTANCE                                             CAVL0185
```

```
C                                                                       CAVL0186
      IF (DWDY1.EQ.DWDA) GO TO 4111                                     CAVL0187
      IF (DWDY1.EQ.DWDAO) GO TO 4113                                    CAVL0188
      THRH1=DWDY1/WS36                                                  CAVL0189
      SIGH1=SIGY(JSTAB,THRH1)                                           CAVL0190
 4211 CONTINUE                                                          CAVL0191
C                                                                       CAVL0192
C   DETERMINE FACTOR TO BE USED IN SUB-DIVIDING THE LINE                CAVL0193
C                                                                       CAVL0194
      ELEM=AMAX1(0.2*DWDY1,SIGH1)                                       CAVL0195
      IF (IAD.NE.0) ISAC=1                                              CAVL0196
      IF(ISAC.EQ.1) ELEM=.1*ELEM                                        CAVL0197
      IF(ELEM.LT.EMIN) ELEM=EMIN                                        CAVL0198
C                                                                       CAVL0199
C   BRANCH IF ANGLE IS SMALL AND LINE SOURCE IS LONG.                   CAVL0200
C                                                                       CAVL0201
      IF (IAD.NE.0) GO TO 4311                                          CAVL0202
      IF (ASNF.GE.CAN) GO TO 4312                                       CAVL0203
 4311 IF (DL1.GT.(1.5*ELEM)) GO TO 55                                   CAVL0204
C                                                                       CAVL0205
C   COMPUTE TRAVEL TIME AND DISPERION COEFFICIENT FOR PSEUDO            CAVL0206
C   VERTICAL DISTANCE                                                   CAVL0207
C                                                                       CAVL0208
 4312 IF (DWDY.EQ.DWDY1) GO TO 4112                                     CAVL0209
      THRH=DWDY/WS36                                                    CAVL0210
      SIGH=SIGY(JSTAB,THRH)                                             CAVL0211
 4212 CONTINUE                                                          CAVL0212
      THRV=DWDZ/WS36                                                    CAVL0213
      SIGV=SIGZ(JSTAB,THRV)                                             CAVL0214
C                                                                       CAVL0215
C   EXPRESSIONS TO BE USED IN APPROXIMATIONS                            CAVL0216
C                                                                       CAVL0217
      DENH2=2.*SIGH**2                                                  CAVL0218
      DENZ2=2.*SIGV**2                                                  CAVL0219
      D=SIGH*SIGV                                                       CAVL0220
C                                                                       CAVL0221
C   ARGUMENTS OF EXPONENTIAL FUNCTION FOR VERTICAL DISPERSION           CAVL0222
C   USING SMALL ANGLE APPROXIMATION                                     CAVL0223
C                                                                       CAVL0224
      ARGZ1=-(ZR-Z1)**2/DENZ2                                           CAVL0225
      ARGZ2=-(ZR+Z1)**2/DENZ2                                           CAVL0226
      IF (LSAC.EQ.1) GO TO 446                                          CAVL0227
      GO TO 445                                                         CAVL0228
 4111 SIGH1=SIGF                                                        CAVL0229
      GO TO 4211                                                        CAVL0230
 4112 SIGH=SIGH1                                                        CAVL0231
      GO TO 4212                                                        CAVL0232
 4113 SIGH1=SIGFO                                                       CAVL0233
      GO TO 4211                                                        CAVL0234
C                                                                       CAVL0235
C   LARGE ANGLE CASE:  ARGUMENTS OF ERROR FUNCTIONS FOR                 CAVL0236
C   HORIZONTAL DISPERSION                                               CAVL0237
C                                                                       CAVL0238
  445 CONTINUE                                                          CAVL0239
      ARG=CSTH**2*SNFI**2*SIGV**2+SNTH**2*SIGH**2                       CAVL0240
      RARG=SQRT(ARG)                                                    CAVL0241
      A=RARG/(1.4142*D)                                                 CAVL0242
      AL=DLN*A                                                          CAVL0243
      ARG1=(YR-Y1)*CSTH*SNFI*SIGV**2                                    CAVL0244
      ARG21=(ZR-Z1)*SNTH*SIGH**2                                        CAVL0245
      ARG22=-(ZR+Z1)*SNTH*SIGH**2                                       CAVL0246
      PA1=-(ARG1+ARG21)/(1.4142*D*RARG)                                 CAVL0247
```

```
      BA2=-(ARG1+ARG22)/(1.4142*D*BARG)                                 CAVL0248
      C1=(YR-Y1)**2/DENH2-ARGZ1                                         CAVL0249
      C2=(YR-Y1)**2/DENH2-ARGZ2                                         CAVL0250
C                                                                       CAVL0251
C   ARGUMENTS OF EXPONENTIAL FUNCITONS FOR VERTICAL DISPERSION          CAVL0252
C   USING THE GENERAL EQUATION                                          CAVL0253
C                                                                       CAVL0254
      ARGZ1=BA1**2-C1                                                   CAVL0255
      ARGZ2=BA2**2-C2                                                   CAVL0256
  446 IF(ARGZ1.LT.-10.)GOTO 2411                                        CAVL0257
      IF(ARGZ2.GE.-10.)GOTO 2412                                        CAVL0258
      FAC1=EXP(ARGZ1)                                                   CAVL0259
      FAC2=0                                                            CAVL0260
      GO TO 39                                                          CAVL0261
 2411 IF (ARGZ2.LT.-10) GO TO 500                                       CAVL0262
      FAC1=0                                                            CAVL0263
      FAC2=EXP(ARGZ2)                                                   CAVL0264
      GO TO 39                                                          CAVL0265
 2412 IF(DWD.GT.XZ) GO TO 100                                           CAVL0266
C                                                                       CAVL0267
C   DOWNWIND DISTANCE IS LESS THAN THE CRITICAL DISTANCE:  ONLY         CAVL0268
C   SOURCE AND GROUND REFLECTION ARE CONSIDERED                         CAVL0269
C                                                                       CAVL0270
      FAC1=EXP(ARGZ1)                                                   CAVL0271
      FAC2=EXP(ARGZ2)                                                   CAVL0272
   39 CONTINUE                                                          CAVL0273
C                                                                       CAVL0274
C   FIND THE LINEAR DISTRIBUTION OF POLLUTION ON THE                    CAVL0275
C   RUNWAY FOR LANDING AND TAKE-OFF                                     CAVL0276
C                                                                       CAVL0277
      XSI2=(X-XST)**2+(Y-YST)**2+(Z-ZST)**2                             CAVL0278
      XSI=SQRT(XSI2)                                                    CAVL0279
      IF(X*XND.LT.0.OR.Y*YND.LT.0.OR.Z*ZND.LT.0) XSI=-XSI               CAVL0280
      IF (IAD .NE. 0) CALL QMOD(XSI,QL)                                 CAVL0281
      QTOT=QTOT+QL*SEGL                                                 CAVL0282
C                                                                       CAVL0283
C   STORE LAST VALUE OF CBAR                                            CAVL0284
C                                                                       CAVL0285
      CBARO=CBAR                                                        CAVL0286
      IF(LSAC.EQ.1) GO TO 50                                            CAVL0287
C                                                                       CAVL0288
C   GENERAL DISPERSION EQUATION                                         CAVL0289
C                                                                       CAVL0290
      FJ1=FAC1*DIFEFF(BA1,AL)                                           CAVL0291
      FJ2=FAC2*DIFEFF(BA2,AL)                                           CAVL0292
      CBAR=CBAR+0.35355*COEF1*QI*(FJ1+FJ2)/(A*D)                        CAVL0293
  499 IF (CBARO.EQ.0) GO TO 49                                          CAVL0294
      IF(ABS((CBARO-CBAR)/CBAR).LE..00010) GO TO 600                    CAVL0295
   49 CONTINUE                                                          CAVL0296
      IF(NSUB.GT.1.AND.DLRS.GT.(.01*DL)) GO TO 60                       CAVL0297
      GO TO 600                                                         CAVL0298
C                                                                       CAVL0299
C   SMALL-ANGLE APPROXIMATION                                           CAVL0300
C                                                                       CAVL0301
   50 ARGYY=-(YR-Y1)**2/DENH2                                           CAVL0302
      IF(ARGYY.LT.-10.) GO TO 500                                       CAVL0303
      FAC=0.5*(FAC1+FAC2)                                               CAVL0304
      BRAC=EXP(ARGYY)                                                   CAVL0305
      CBAR=CBAR+COEF2*QL*DLN*FAC*BRAC/D                                 CAVL0306
      GO TO 499                                                         CAVL0307
C                                                                       CAVL0308
C   ANGLE IS SMALL AND SOURCE IS LONG                                   CAVL0309
```

```
C                                                                       CAVL0310
   55 ISUB=1                                                            CAVL0311
      XRS=X2-X1                                                         CAVL0312
      YRS=Y2-Y1                                                         CAVL0313
      ZRS=Z2-Z1                                                         CAVL0314
      X2=X1                                                             CAVL0315
      Y2=Y1                                                             CAVL0316
      Z2=Z1                                                             CAVL0317
C                                                                       CAVL0318
C   COMPUTE COORDINATES FOR NEXT LINE SEGMENT                           CAVL0319
C                                                                       CAVL0320
   60 NSUB=1.+DLRS/FLEM                                                 CAVL0321
      RSUB=NSUB                                                         CAVL0322
      SEGL=DLRS/RSUB                                                    CAVL0323
      DELX=XRS/RSUB                                                     CAVL0324
      DELY=YRS/RSUB                                                     CAVL0325
      DELZ=ZRS/RSUB                                                     CAVL0326
      X1=X2                                                             CAVL0327
      Y1=Y2                                                             CAVL0328
      Z1=Z2                                                             CAVL0329
      X2=X2+DELX                                                        CAVL0330
      Y2=Y2+DELY                                                        CAVL0331
      Z2=Z2+DELZ                                                        CAVL0332
      DLRS=DLRS-SEGL                                                    CAVL0333
      XRS=XRS-DELX                                                      CAVL0334
      YRS=YRS-DELY                                                      CAVL0335
      ZRS=ZRS-DELZ                                                      CAVL0336
      X=.5*(X1+X2)                                                      CAVL0337
      Y=.5*(Y1+Y2)                                                      CAVL0338
      Z=.5*(Z1+Z2)                                                      CAVL0339
C                                                                       CAVL0340
C   GO BACK TO COMPUTE CONTRIBUTION FROM NEXT SEGMENT                   CAVL0341
C                                                                       CAVL0342
      GO TO 5                                                           CAVL0343
C                                                                       CAVL0344
C   DOWNWIND DISTANCE IS GREATER THAN, BUT LESS THAN TWICE, THE         CAVL0345
C   CRITICAL DISTANCE.  LINEAR INTERPOLATION IS USED                    CAVL0346
C                                                                       CAVL0347
  100 YL = Y1                                                           CAVL0348
      ZL = Z1                                                           CAVL0349
      IF (Z1 .LE. Z2) GO TO 105                                         CAVL0350
      YL = Y2                                                           CAVL0351
      ZL = Z2                                                           CAVL0352
  105 FAC3=0.5*SIGV/(COEF1*HLIDM)                                       CAVL0353
      IF(DWD.GT.2.*XZ) GO TO 200                                        CAVL0354
      DENZL=0.47*HLIDM                                                  CAVL0355
      DENZL2=DENZL**2                                                   CAVL0356
      IF (ISAC.EQ.1) GO TO 101                                          CAVL0357
  102 TI=XZ/WS36                                                        CAVL0358
      DENHL2=2.*SIGY(JSTAB,TL)**2                                       CAVL0359
      DENO=CSTH**2*SNFI**2*DENZL2  +SNTH**2*DENHL2                      CAVL0360
      ARGZ1=-((YR-YL)*SNTH-(ZR-ZL)*CSTH*SNFI)**2/DENO                   CAVL0361
      ARGZ2=-((YR-YL)*SNTH-(ZR+ZL)*CSTH*SNFI)**2/DENO                   CAVL0362
      GO TO 103                                                         CAVL0363
  101 ARGZ1=-(ZR-ZL)**2/DENZL2                                          CAVL0364
      ARGZ2=-(ZR+ZL)**2/DENZL2                                          CAVL0365
  103 FAC1=EXP(ARGZ1)                                                   CAVL0366
      FAC2=EXP(ARGZ2)                                                   CAVL0367
      FAC1=FAC1+(DWD-XZ)*(FAC3-FAC1)/XZ                                 CAVL0368
      FAC2=FAC2+(DWD-XZ)*(FAC3-FAC2)/XZ                                 CAVL0369
      GO TO 39                                                          CAVL0370
C                                                                       CAVL0371
```

```
C   DOWNWIND DISTANCE IS BEYOND 2 TIMES THE CRITICAL DISTANCE,          CAVL0372
C   UNIFORM MIXING IS ASSUMED                                           CAVL0373
C                                                                       CAVL0374
  200 FAC1=FAC3                                                         CAVL0375
      FAC2=FAC3                                                         CAVL0376
      GO TO 39                                                          CAVL0377
  500 IF(DLRS.LT.(.01*DL)) GO TO 600                                    CAVL0378
      IF(ISAC.EQ.1.AND.NSUB.EQ.0) GO TO 55                              CAVL0379
      IF(NSUB.GE.1) GO TO 60                                            CAVL0380
  600 IF (NSUB.NE.1.OR.XMAX.GE.XP) QTOT=1.0                             CAVL0381
      IF (QTOT.EQ.0.0) QTOT=1.0                                         CAVL0382
C                                                                       CAVL0383
C   NORMALIZE CBAR TO THE TOTAL POLLUTANT DENSITY CALCULATED            CAVL0384
C   ALONG THE LINE                                                      CAVL0385
C                                                                       CAVL0386
      CAVL=CBAR/QTOT                                                    CAVL0387
      RETURN                                                            CAVL0388
      END                                                               CAVL0389
```

SUBROUTINE CLASSE

Purpose:

To print an error message if the wrong ICLASS value is input to one of the airbase non-aircraft or environ emission distribution subroutines.

Input:

None

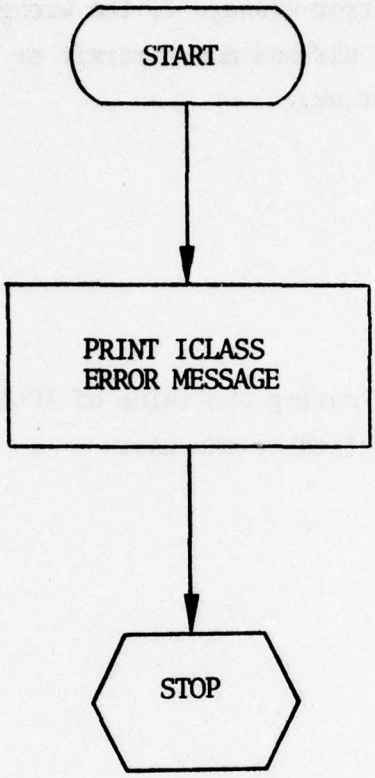
Output:

A message indicating the value of ICLASS set by the code and the value supplied by the user.

Subroutines Called:

None

SUBROUTINE CLASSE



```
      SUBROUTINE CLASSE  (I,J)                                          CLASE000
C                                                                       CLASE001
C     THIS ROUTINE PRINTS THE ICLASS ERROR MESSAGE                      CLASE002
C                                                                       CLASE003
      PRINT 1, I,J                                                      CLASE004
    1 FORMAT(17HOICLASS SHOULD BE,I4,18H, INPUT CARD READS,I4)          CLASE005
      STOP                                                              CLASE006
      END                                                               CLASE007
```

SUBROUTINE DEPART

Purpose:

To calculate the points in the runway roll and climbout modes as a function of aircraft type using current meteorological conditions and airbase specific pressure altitudes and airbase dependent basic aircraft parameters.

Input:

Basic aircraft data, current meteorological conditions, runway data, aircraft identification.

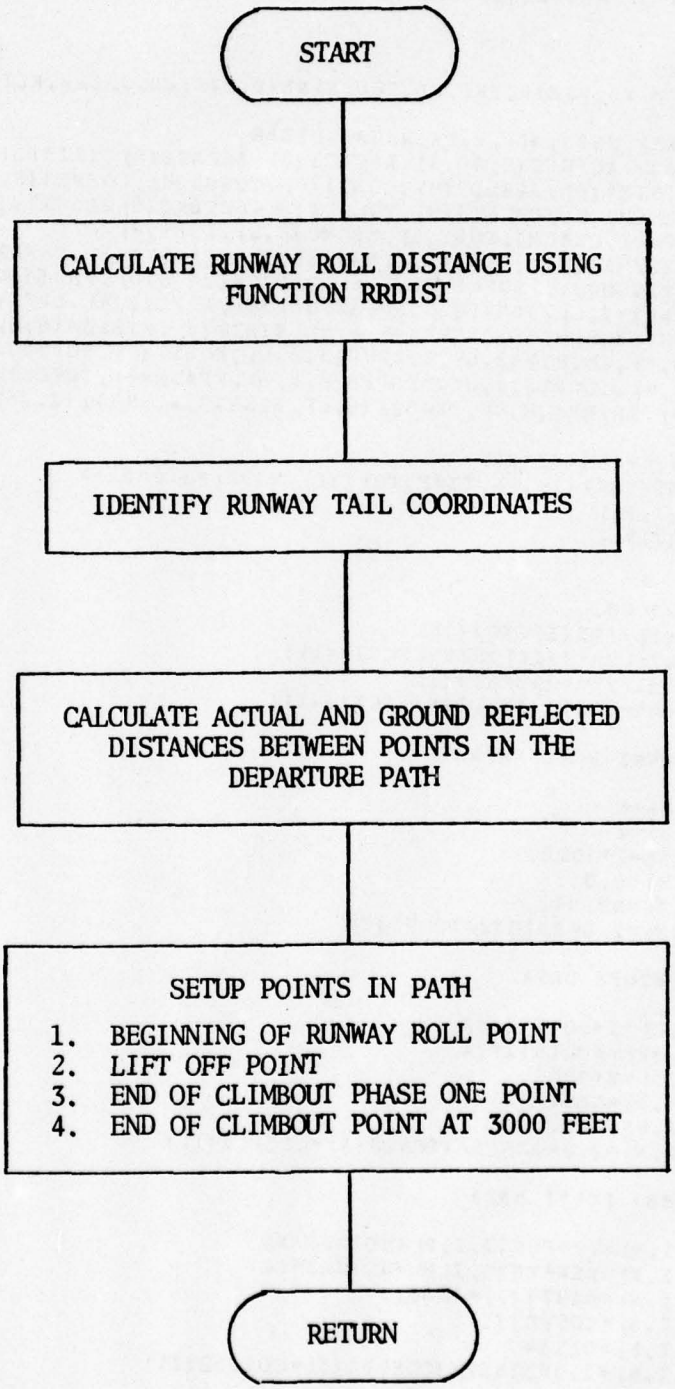
Output:

Points in departure path as a function of runway and aircraft type.

Subroutine Called:

Function RRDIST.

SUBROUTINE DEPART



```
      SUBRCUTINE DEPART(N,I)                                                DEPRT000
C                                                                           DEPRT001
C     THIS RCUTINE CALCULATES THE POINTS IN THE DEPARTURE PATH              DEPRT002
C     AS A FUNCTION OF RUNWAY(N) AND AIRCRAFT TYPE(I)                       DEPRT003
C                                                                           DEPRT004
      REAL INDSPD                                                           DEPRT005
      INTEGER  ENGNO                                                        DEPRT006
      COMMON / MET / WS,WSMPH,IWS,WD,IWD,SINEWD,CVSEWD,JSTAB,HLID,TEMF,     DEPRT007
     . TEMK                                                                 DEPRT008
      CCMMCN /ANNMET/ TBAR,ALD,P,PA,WSBAR,DTBAR                             DEPRT009
      COMMON /ACEDB1/ ACEMFC(8,10,6),ASCNT1(8),ASCNT2(8),TXISPD(8),         DEPRT010
     . INDSPD(8),APSPD1(8),APSPD2(8),COHT1(8),TOSPD(8),COSPD1(8),          DEPRT011
     . COSPD2(8),SRTUPT(8),DSCNT1(8),EGCHKT(8),SHTDNT(8),DSCNT2(8),        DEPRT012
     . APPHT,APPHT2(8),CLMBHT,TOWT(8),ENGNO(8,2),IDRR(8)                   DEPRT013
      COMMCN /ACEDB2/ NACTYP,NRNWYS,NPKAR,IEGFLG,IACTYP(8),ANNAPR(8),       DEPRT014
     . ANNDEP(8),ANNTGO(8),ARRFCN(24,8,6),DEPFCN(24,8,6),TGO(3,4,8),       DEPRT015
     . DISRNW(6),RNWY(7,6),IUSWD(20,6),ACFUEL(8),ARFLVT(8),DPFLVT(8),      DEPRT016
     .ACSPIL(8),ARSVEM(6,8,5),DPSVEM(6,8,5),NIBTT(6),NIBSEG(8,6),          DEPRT017
     . IIBSEG(16,8,6),IDIBTW(8,6),TTARFR(8,8,6),NOBTT(6),NOBSEG(8,6),      DEPRT018
     . IOBSEG(16,8,6),IDOBTW(8,6),TTDPFR(8,8,6),NPASQ(6),IDPRKA(6),        DEPRT019
     . PAREA(6,3,3),IDIBPA(8,6),IDOBPA(8,6),NLSEGS,ACLNSG(12,25),JFS1(8)   DEPRT020
      RD=RNWY(7,N)                                                          DEPRT021
      WSPD=WS*1.9426*COS(WD-RD)                                             DEPRT022
      HDIS12=RRDIST(IDRR(I),PA,TEMF,TOWT(I),WSPD)*3.048E-4                  DEPRT023
      XA=SIN(RNWY(7,N))                                                     DEPRT024
      YA=COS(RNWY(7,N))                                                     DEPRT025
      X=RNWY(2,N)                                                           DEPRT026
      Y=RNWY(3,N)                                                           DEPRT027
      Z=RNWY(4,N)/1000.                                                     DEPRT028
      DIS23=COHT1(I)/SIN(ASCNT1(I))                                         DEPRT029
      DIS34=(CLMBHT-COHT1(I))/SIN(ASCNT2(I))                                DEPRT030
      HDIS23=COHT1(I)/TAN(ASCNT1(I))                                        DEPRT031
      HDIS34=(CLMBHT-COHT1(I))/TAN(ASCNT2(I))                               DEPRT032
C                                                                           DEPRT033
C     START OF RUNWAY ROLL DATA                                             DEPRT034
C                                                                           DEPRT035
      DEPFCN(1,I,N)=X                                                       DEPRT036
      DEPFCN(2,I,N)=Y                                                       DEPRT037
      DEPFCN(3,I,N)=Z*1000.                                                 DEPRT038
      DEPFCN(4,I,N)=0.0                                                     DEPRT039
      DEPFCN(5,I,N)=HDIS12                                                  DEPRT040
      DEPFCN(6,I,N)=2.0*HDIS12/TOSPD(I)                                     DEPRT041
C                                                                           DEPRT042
C     POINT OF LIFTOFF DATA                                                 DEPRT043
C                                                                           DEPRT044
      DEPFCN(7,I,N)=X+HDIS12*XA                                             DEPRT045
      DEPFCN(8,I,N)=Y+HDIS12*YA                                             DEPRT046
      DEPFCN(9,I,N)=Z*1000.                                                 DEPRT047
      DEPFCN(10,I,N)=TOSPD(I)                                               DEPRT048
      DEPFCN(11,I,N)=DIS23                                                  DEPRT049
      DEPFCN(12,I,N)=2.0*DIS23/(TOSPD(I)+COSPD1(I))                         DEPRT050
C                                                                           DEPRT051
C     END OF CLIMB1 POINT DATA                                              DEPRT052
C                                                                           DEPRT053
      DEPFCN(13,I,N)=DEPFCN(7,I,N)+HDIS23*XA                                DEPRT054
      DEPFCN(14,I,N)=DEPFCN(8,I,N)+HDIS23*YA                                DEPRT055
      DEPFCN(15,I,N)=COHT1(I)*1000.                                         DEPRT056
      DEPFCN(16,I,N)=COSPD1(I)                                              DEPRT057
      DEPFCN(17,I,N)=DIS34                                                  DEPRT058
      DEPFCN(18,I,N)=2.0*DIS34/(COSPD1(I)+COSPD2(I))                        DEPRT059
C                                                                           DEPRT060
C     END OF CLIMBOUT POINT DATA                                            DEPRT061
```

```
C
      DEPFCN(19,I,N)=DEPFCN(13,I,N)+HDIS34*XA                          DEPRT062
      DEPFCN(20,I,N)=DEPFCN(14,I,N)+HDIS34*YA                          DEPRT063
      DEPFCN(21,I,N)=CLMBHT*1000.                                      DEPRT064
      DEPFCN(22,I,N)=COSPD2(I)                                         DEPRT065
      RETURN                                                           DEPRT066
      END                                                              DEPRT067
                                                                       DEPRT068
```

FUNCTION DIFERF(X,PH)

Purpose:

To find the difference between two error functions, erf(X+PH) - erf(X).

Input:

X and PH

Output:

The difference between the error functions

Procedure:

1. If PH ≤ .05, the formula given in the Handbook of Mathematical Functions, National Bureau of Standards, Applied Mathematics Series 55 is used:

   $$DIFERF = 1.12838 \cdot PH \cdot e^{-X^2} [1 - PH \cdot X + (2 \cdot X^2 - 1) \cdot PH^{2/3}]$$

2. If PH > .05 and X and X+PH are of different sign:

   DIFERF = erf(X+PH) - erf(X)

3. If PH > .05 and X and X+PH are both negative:

   DIFERF = -1.*[erfc(-X) - erfc(-X-PH)]

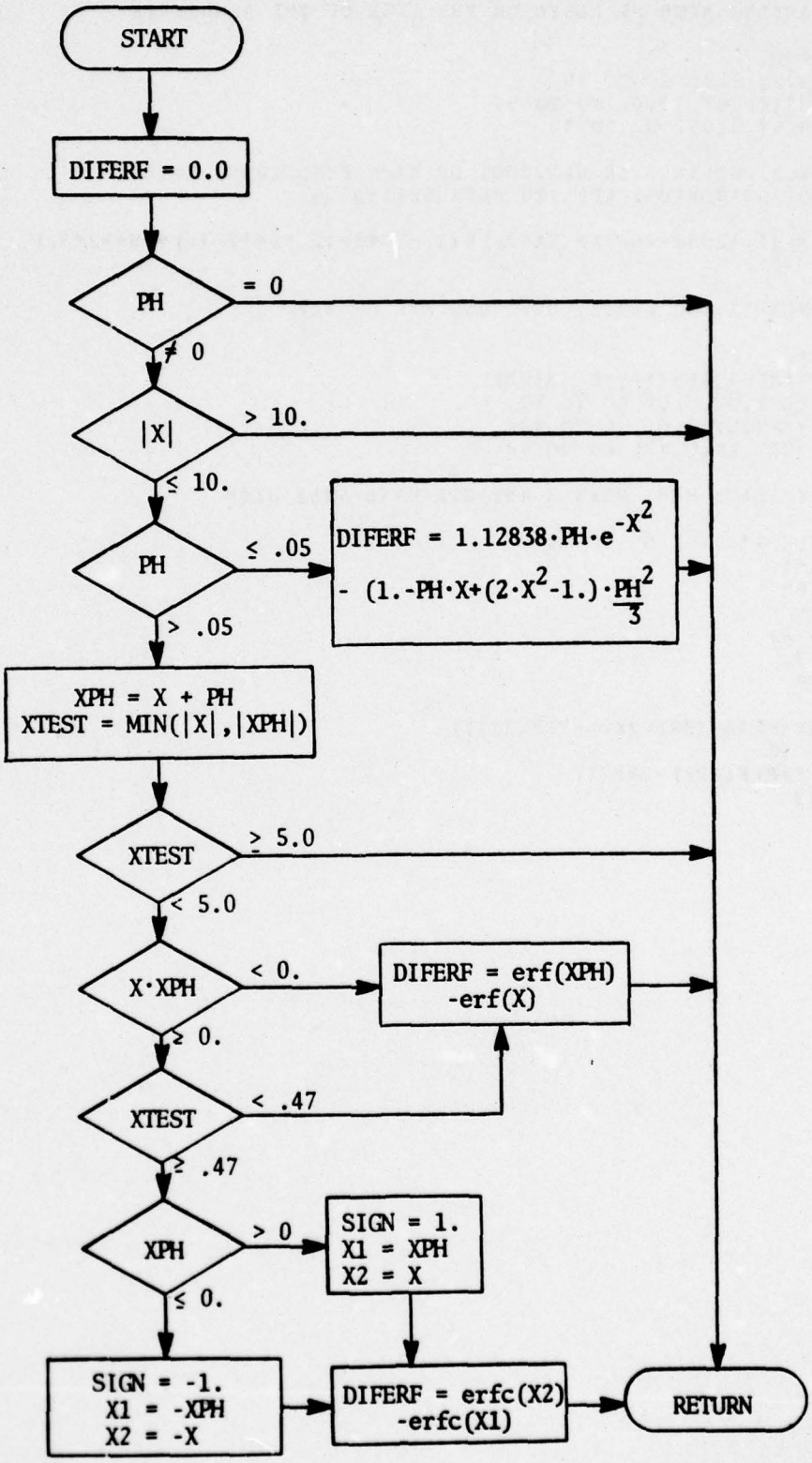
4. If PH > .05 and X and X+PH are both positive:

   DIFERF = erfc(X) - erfc(X+PH)

Function Called:

ERF, ERFC

FUNCTION DIFERF(X,PH)



```
      FUNCTION DIFERF(X,PH)                                              DIFER000
C                                                                        DIFER001
C   THIS FUNCTION FINDS THE DIFFERENCE BETWEEN TWO ERROR FUNCTIONS       DIFER002
C   USING VARYING METHODS BASED ON THE SIZE OF THE ARGUMENTS             DIFER003
C                                                                        DIFER004
      DIFERF=0.                                                          DIFER005
      IF (PH.EQ.0.0) GO TO 50                                            DIFER006
      IF (ABS(X).GT.10.0) GO TO 50                                       DIFER007
      IF (PH.GT.0.05) GO TO 10                                           DIFER008
C                                                                        DIFER009
C   USE METHOD OUTLINED IN HANDBOOK OF MATH FUNCTIONS, NATL              DIFER010
C   BUREAU OF STANDARDS, APPLIED MATH SERIES 55                          DIFER011
C                                                                        DIFER012
      DIFERF=(1.12838*PH/EXP(X**2))*(1.-PH*X+(2.*X**2-1.)*PH**2/3.)      DIFER013
      GO TO 50                                                           DIFER014
C                                                                        DIFER015
C   DIFFERENCE IS TOO LARGE, MUST USE ERF OR ERFC                        DIFER016
C                                                                        DIFER017
   10 XPH=X+PH                                                           DIFER018
      XTEST=AMIN1(ABS(X),ABS(X+PH))                                      DIFER019
      IF (XTEST.GE.5.0) GO TO 50                                         DIFER020
      IF (X*XPH.LT.0.0) GO TO 40                                         DIFER021
      IF (XTEST.LT.0.47) GO TO 40                                        DIFER022
C                                                                        DIFER023
C   CAN ONLY REACH HERE WHEN X AND XPH HAVE SAME SIGN                    DIFER024
C                                                                        DIFER025
      IF (XPH.GT.0.0) GO TO 20                                           DIFER026
      SIGN=-1.                                                           DIFER027
      X1=-XPH                                                            DIFER028
      X2=-X                                                              DIFER029
      GO TO 30                                                           DIFER030
   20 SIGN=1.                                                            DIFER031
      X1=XPH                                                             DIFER032
      X2=X                                                               DIFER033
   30 DIFERF=SIGN*(ERFC(X2)-ERFC(X1))                                    DIFER034
      GO TO 50                                                           DIFER035
   40 DIFERF=ERF(XPH)-ERF(X)                                             DIFER036
   50 RETURN                                                             DIFER037
      END                                                                DIFER038
```

SUBROUTINE EMISAR

Purpose:

To add emissions from a given activity to all others contained in the specified geometric area or line.

Input:

None

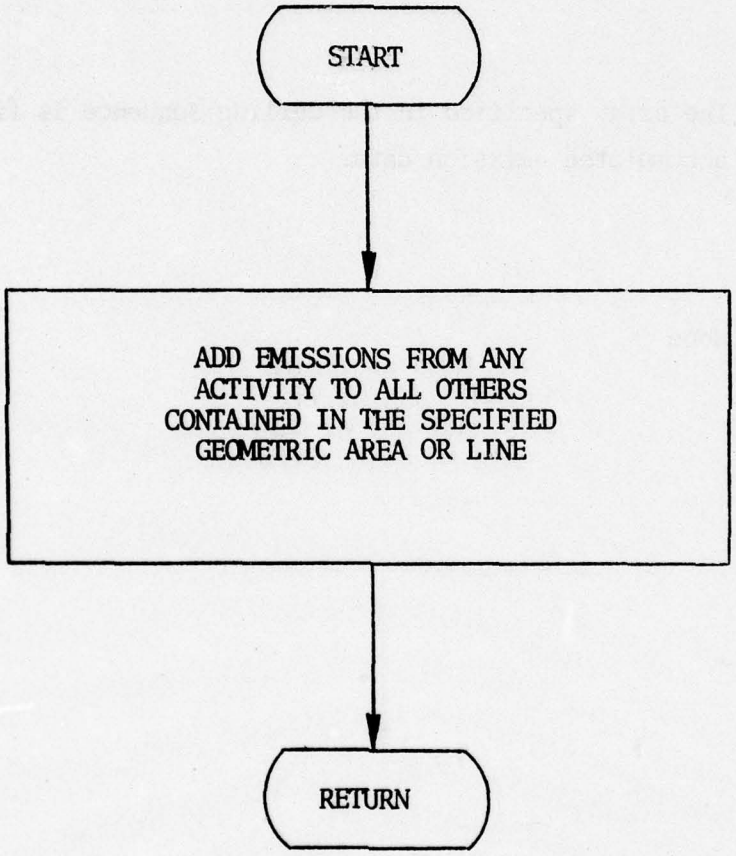
Output:

The array specified in the calling sequence is filled with the accumulated emission data.

Subroutines Called:

None

SUBROUTINE EMISAR



```
      SUBROUTINE EMISAR(MAXN,ARRAY,I1,I2)                                EMISR000
C                                                                        EMISR001
C     THIS ROUTINE ACCUMULATES EMISSIONS FROM ANY ACTIVITY WITH          EMISR002
C     OTHERS CONTAINED IN THE SAME AIRBASE AREA OR LINE.                 EMISR003
C        MAXN        = NO. OF SOURCES IN AN ACTIVITY                     EMISR004
C        ARRAY       = SPECIFIED AREA OR LINE OUTPUT ARRAY               EMISR005
C        I1,I2       = DIMENSIONS OF ARRAY                               EMISR006
C        NSPCE       = POINTER TO LOCATION OF SOURCES IN SORCE           EMISR007
C        LCC1        = POINTER TO LOCATION OF LIST OF EMISSIONS IN ARRAY EMISR008
C        SORCE(2,N)  = POINTER TO LOCATION OF SOURCE AREA OR LINE        EMISR009
C                                                                        EMISR010
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,           EMISR011
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),          EMISR012
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)          EMISR013
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)           EMISR014
     . ,LCC1,LCC2,NGEOM,IPT                                              EMISR015
      DIMENSION ARRAY(I1,I2)                                             EMISR016
      LSRCE=NSRCE+1                                                      EMISR017
      NSRCE=NSRCE+MAXN                                                   EMISR018
C                                                                        EMISR019
      DO 10 N=LSRCE,NSRCE                                                EMISR020
      J=SORCE(2,N)                                                       EMISR021
      DO 10 I=1,NPLTS                                                    EMISR022
      ARRAY(I+LOC1,J)=ARRAY(I+LCC1,J)+SORCE(I+2,N)                       EMISR023
   10 CONTINUE                                                           EMISR024
      RETURN                                                             EMISR025
      END                                                                EMISR026
```

SUBROUTINE ENARAY

Purpose:

1. To read from the master source tape all data needed to define environ point, area and line sources.
2. To compute the emission rates due to point sources, stationary, mobile, land use or combined area sources and roadway and non-roadway line sources.

Input:

If the diurnal distribution cards are input, an additional parameter, IMETH, is input here to choose the method of distribution of emissions from those land use or combined area source activities not using the default of a uniform distribution.

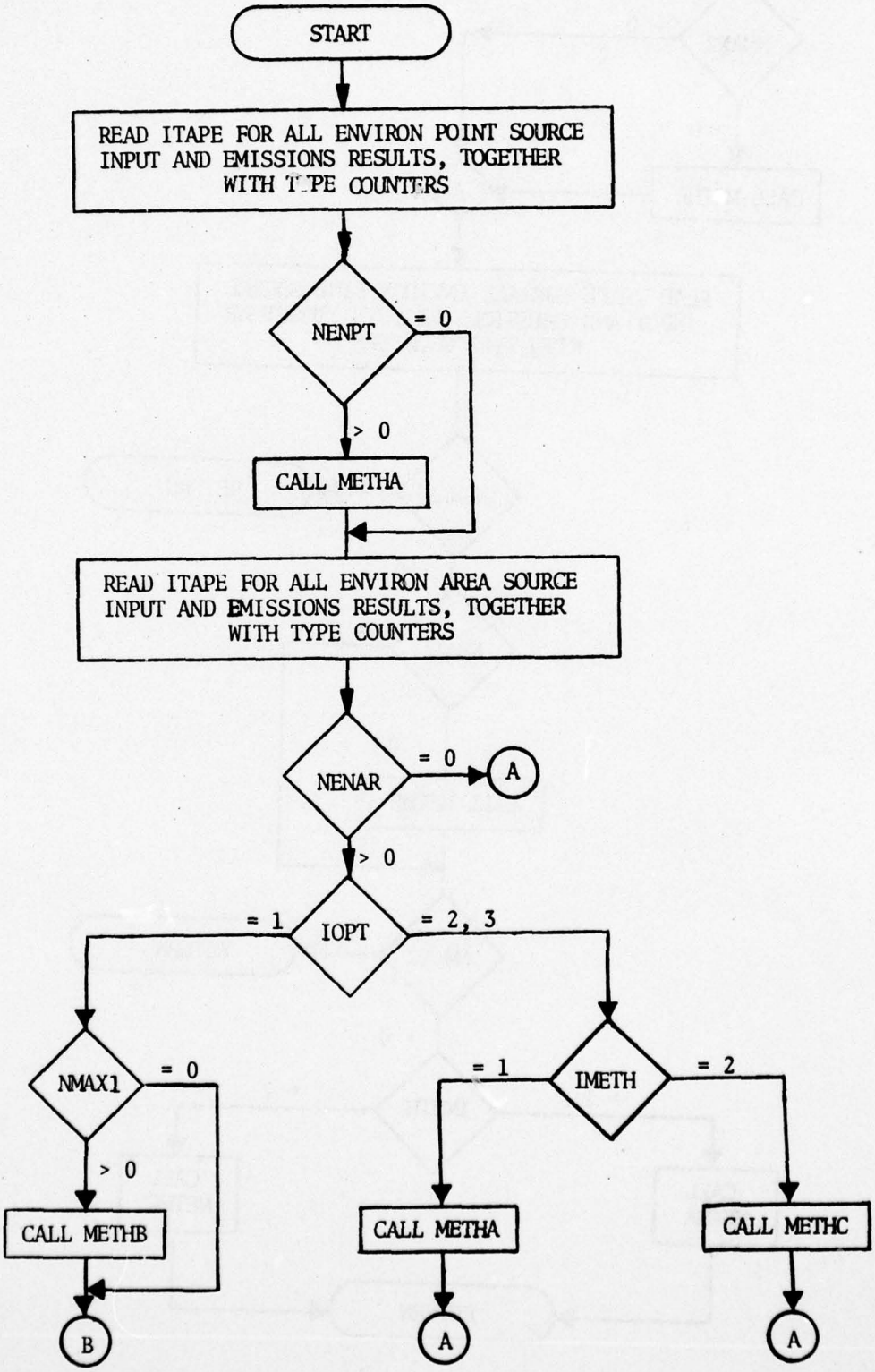
Output:

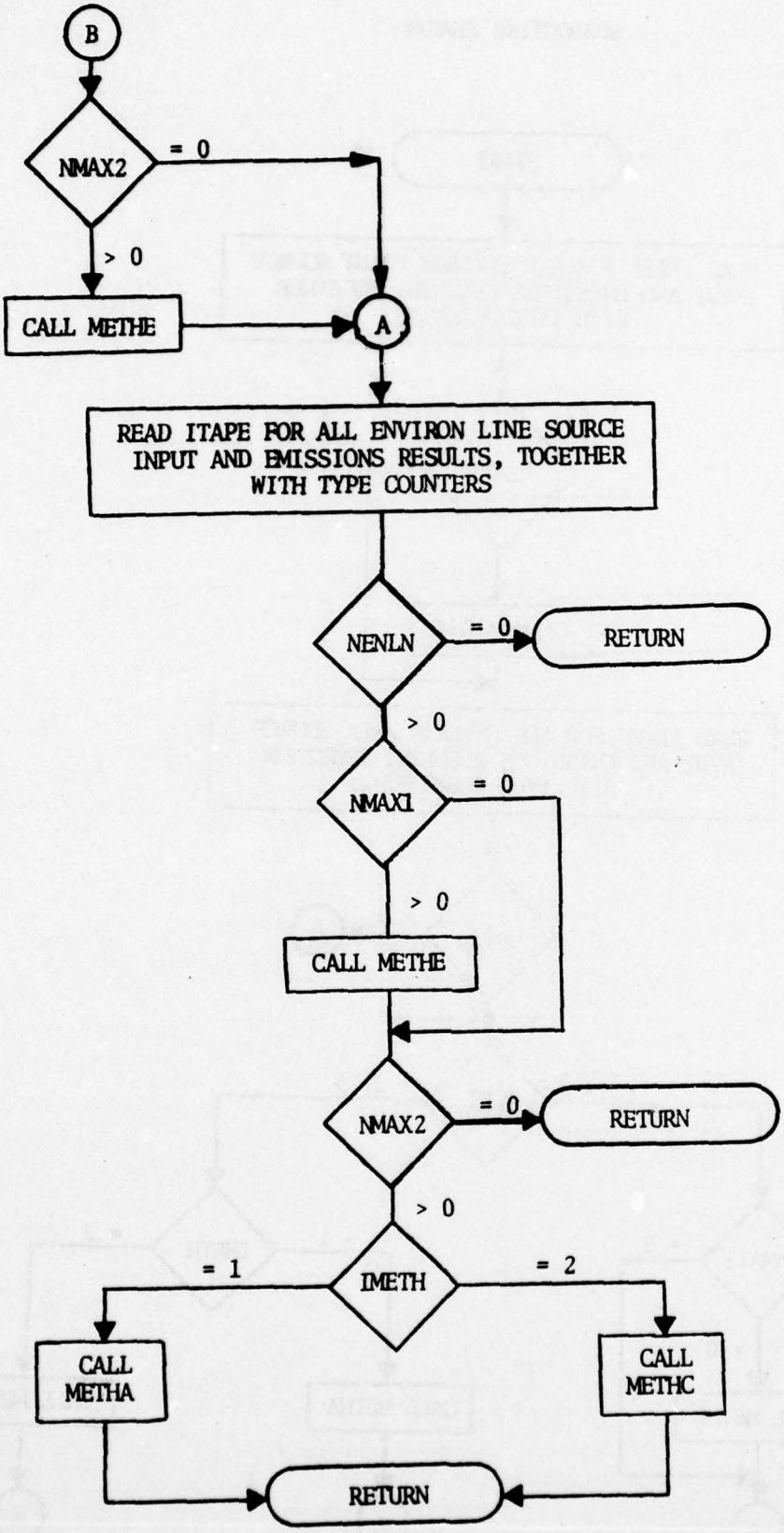
The arrays, ENPT, ENAR, and ENLN, are filled with geometry and emission data for all environ sources.

Subroutines Called:

METHA, METHB, METHC, METHE

SUBROUTINE ENARAY




B
NMAX2
= 0
> 0
CALL METHE
A
READ ITAPE FOR ALL ENVIRON LINE SOURCE INPUT AND EMISSIONS RESULTS, TOGETHER WITH TYPE COUNTERS
NENLN
= 0
RETURN
> 0
NMAX1
= 0
> 0
CALL METHE
NMAX2
= 0
RETURN
> 0
IMETH
= 1
= 2
CALL METHA
CALL METHC
RETURN

```
      SUBROUTINE ENARAY                                                 ENARY000
C                                                                       ENARY001
C     THIS ROUTINE COMPUTES THE EMISSSION RATES FOR ALL                 ENARY002
C     ENVIRON SOURCES                                                   ENARY003
C                                                                       ENARY004
      COMMON / DEFALT /  ITAPE,ACLNDY,ACLNDZ,ALPHA(7),BETA(7),FLDENS(7) ENARY005
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)          ENARY006
     . ,LOC1,LOC2,NGEOM,IPT                                             ENARY007
      COMMON/MONMET/TMBAR,WSMBAR,AMDMBR,DTMBAR                          ENARY008
      COMMON/MET/WS,WSMPH,IWS,WD,IWD,SINWD,COSWD,                       ENARY009
     .  JSTAB,HLID,TEMF,TEMK                                            ENARY010
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG          ENARY011
      COMMON /DSTRBT/ ACMO(13,8),ACDY(2,8),ACHR(24,8),VHMLMO(13),       ENARY012
     . VHMLDY(2),VHMLHR(24),CVABMO(13),CVABDY(2),CVABHR(24),CVENMO(13), ENARY013
     . CVENDY(2),CVENHR(24),FLMO(13,7),FLDY(2,7),FLHR(24,7),NC1         ENARY014
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,          ENARY015
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         ENARY016
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)         ENARY017
C                                                                       ENARY018
C****POINTS                                                             ENARY019
C                                                                       ENARY020
      READ(ITAPE) NENPT,NTOT,((SORCE(I,N),I=1,NTOT),N=1,NENPT)          ENARY021
      IF (NENPT.EQ.0) GO TO 100                                         ENARY022
      ICLASS=201                                                        ENARY023
      LOC1=10                                                           ENARY024
      LOC2=11                                                           ENARY025
      NGEOM=9                                                           ENARY026
      I1=16                                                             ENARY027
      I2=100                                                            ENARY028
      IPT=1                                                             ENARY029
      NSRCE=0                                                           ENARY030
      CALL METHA(NENPT,ENPT,I1,I2,ICLASS)                               ENARY031
C                                                                       ENARY032
C****AREAS                                                              ENARY033
C                                                                       ENARY034
  100 READ(ITAPE) NENAR,NTOT,IOPT,NMAX1,NMAX2,                         ENARY035
     1  ((SORCE(I,N),I=1,NTOT),N=1,NENAR)                              ENARY036
      IF (NENAR.EQ.0) GO TO 300                                         ENARY037
      LOC1=5                                                            ENARY038
      LOC2=7                                                            ENARY039
      NGEOM=5                                                           ENARY040
      IPT=0                                                             ENARY041
      I1=11                                                             ENARY042
      I2=100                                                            ENARY043
      NSRCE=0                                                           ENARY044
      GO TO (110,120,130),IOPT                                          ENARY045
C                                                                       ENARY046
C****OPTION 1  STATIONARY AREAS                                         ENARY047
C                                                                       ENARY048
  110 ICLASS=202                                                        ENARY049
      IF (NMAX1.GT.0)                                                   ENARY050
     1 CALL METHB(NMAX1,ENAR,I1,I2,ICLASS)                              ENARY051
C                                                                       ENARY052
C****OPTION 1  MOBILE AREAS                                             ENARY053
C                                                                       ENARY054
      IF (NMAX2.GT.0)                                                   ENARY055
     1 CALL METHE(NMAX2,ENAR,CVENMO,CVENDY,CVENHR,I1,I2)                ENARY056
      GO TO 300                                                         ENARY057
C                                                                       ENARY058
C****OPTION 2 OR 3  LAND USE OR COMBINED AREAS                          ENARY059
C                                                                       ENARY060
  120 ICLASS=203                                                        ENARY061
```

```
      GO TO 200                                                          ENARY062
  130 ICLASS=204                                                         ENARY063
  200 IMETH=1                                                            ENARY064
      IF (JFLAG.EQ.0) READ 201,IMETH                                     ENARY065
  201 FORMAT(I4)                                                         ENARY066
      IF (IMETH.EQ.1) CALL METHA(NMAX1,ENAR,I1,I2,ICLASS)                ENARY067
      IF (IMETH.EQ.2) CALL METHC(NMAX1,ENAR,I1,I2,ICLASS)                ENARY068
C                                                                        ENAPY069
C****LINES                                                             ENARY070
C       NMAX1 = NO. OF  ROADWAY LINES                                    ENARY071
C       NMAX2 = NO. OF NON-ROADWAY LINES                                 ENARY072
C                                                                        ENARY073
  300 READ(ITAPE) NENLN,NTOT,NMAX1,NMAX2,                               ENARY074
     1  ((SORCE(I,N),I=1,NTOT),N=1,NENLN)                               ENARY075
      IF (NENLN.EQ.0) GO TO 400                                          ENARY076
      LCC1=8                                                             ENARY077
      LCC2=10                                                            ENARY078
      NGEOM=8                                                            ENARY079
      NSRCE=0                                                            ENARY080
      I1=14                                                              ENARY081
      I2=20                                                              ENARY082
      IPT=0                                                              ENARY083
      IF (NMAX1.GT.0)                                                    ENARY084
     1 CALL METHE(NMAX1,ENLN,CVENMO,CVENDY,CVENHR,I1,I2)                 ENARY085
C                                                                        ENARY086
      IF (NMAX2.EQ.0) GO TO 400                                          ENARY087
      ICLASS=206                                                         ENARY088
      IMETH=1                                                            ENARY089
      IF (JFLAG.EQ.0) READ 201,IMETH                                     ENARY090
      IF (IMETH.EQ.1) CALL METHA(NMAX2,ENLN,I1,I2,ICLASS)                ENARY091
      IF (IMETH.EQ.2) CALL METHC(NMAX2,ENLN,I1,I2,ICLASS)                ENARY092
  400 RETURN                                                             ENARY093
      END                                                                ENARY094
```

SUBROUTINE INDINP
ENTRY DEPINP

Purpose:

To print the input parameters for both wind independent and wind dependent sources.

Input:

All source parameters.

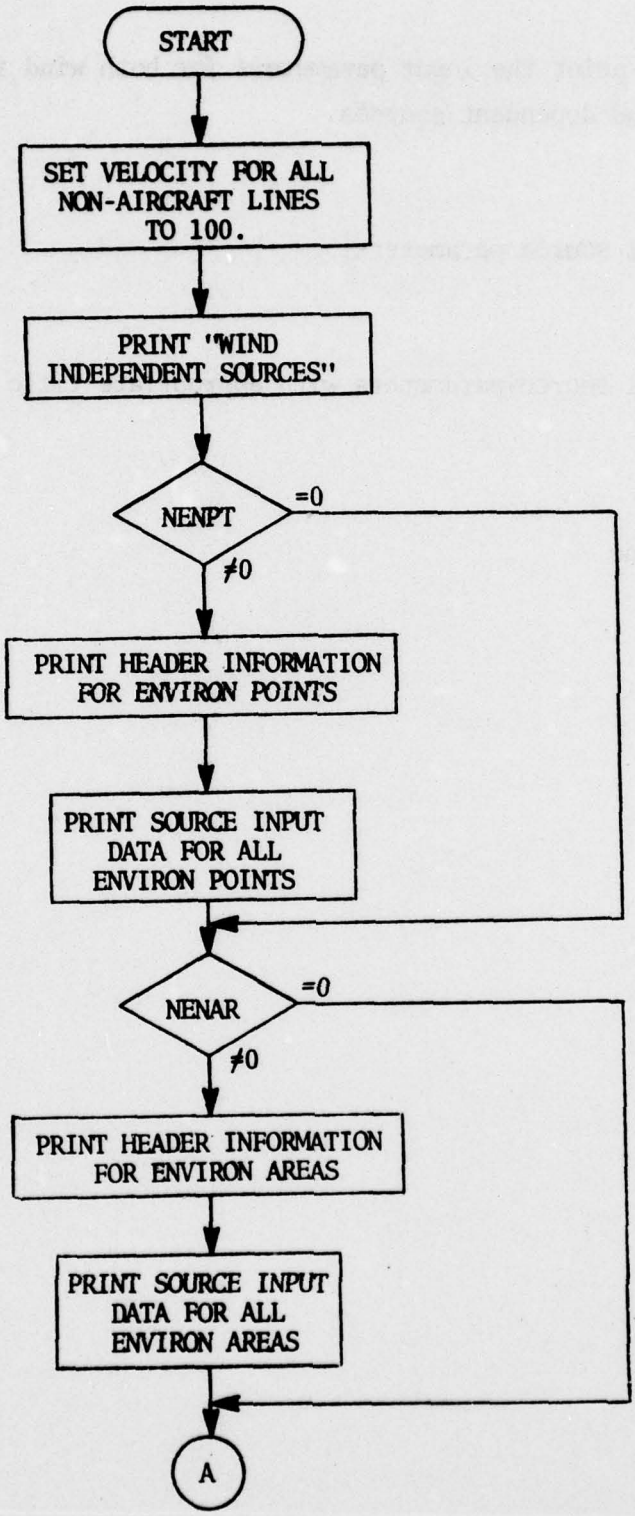
Output:

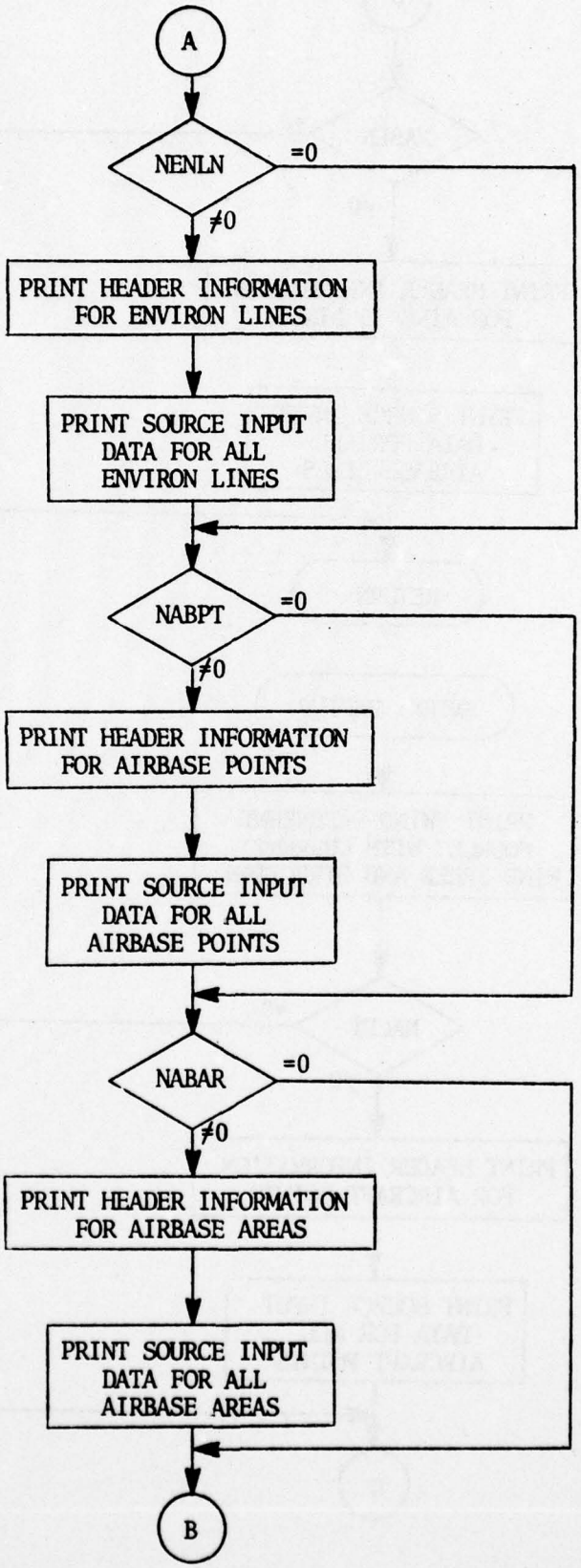
All source parameters with appropriate title information.

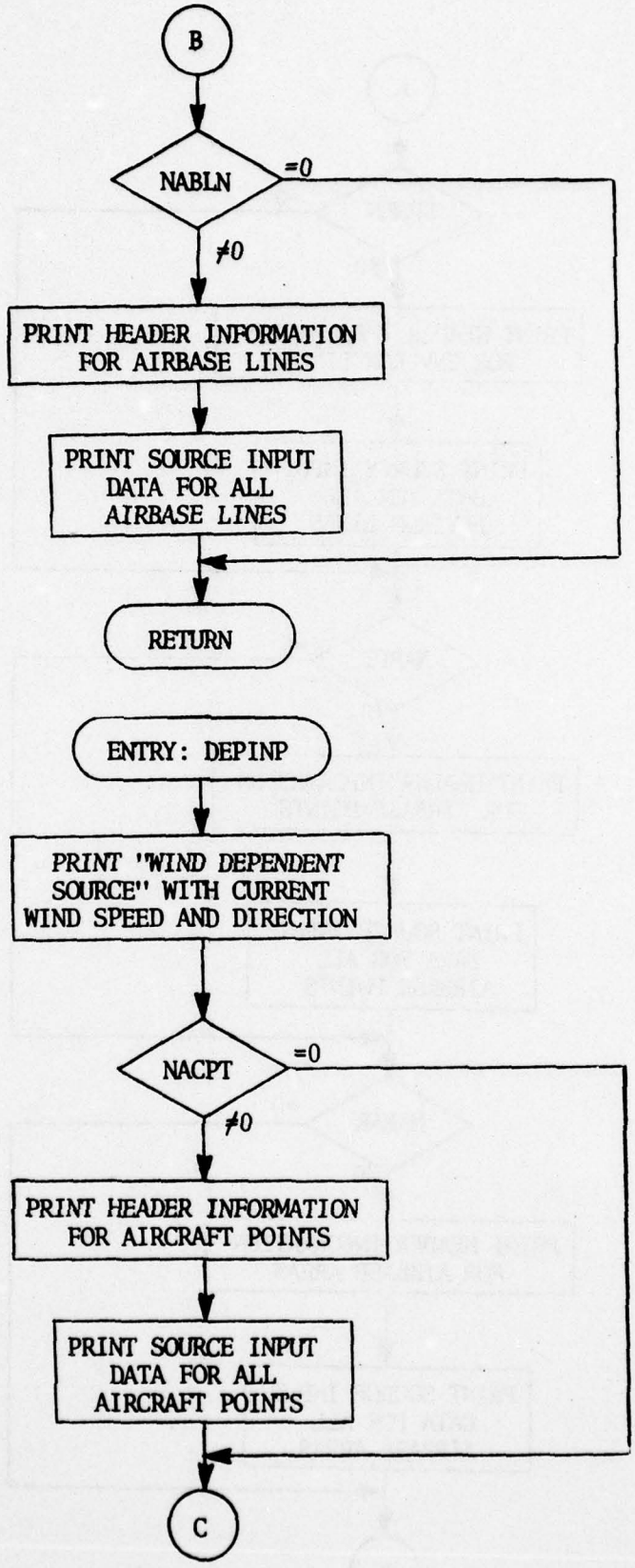
Subroutines Called:

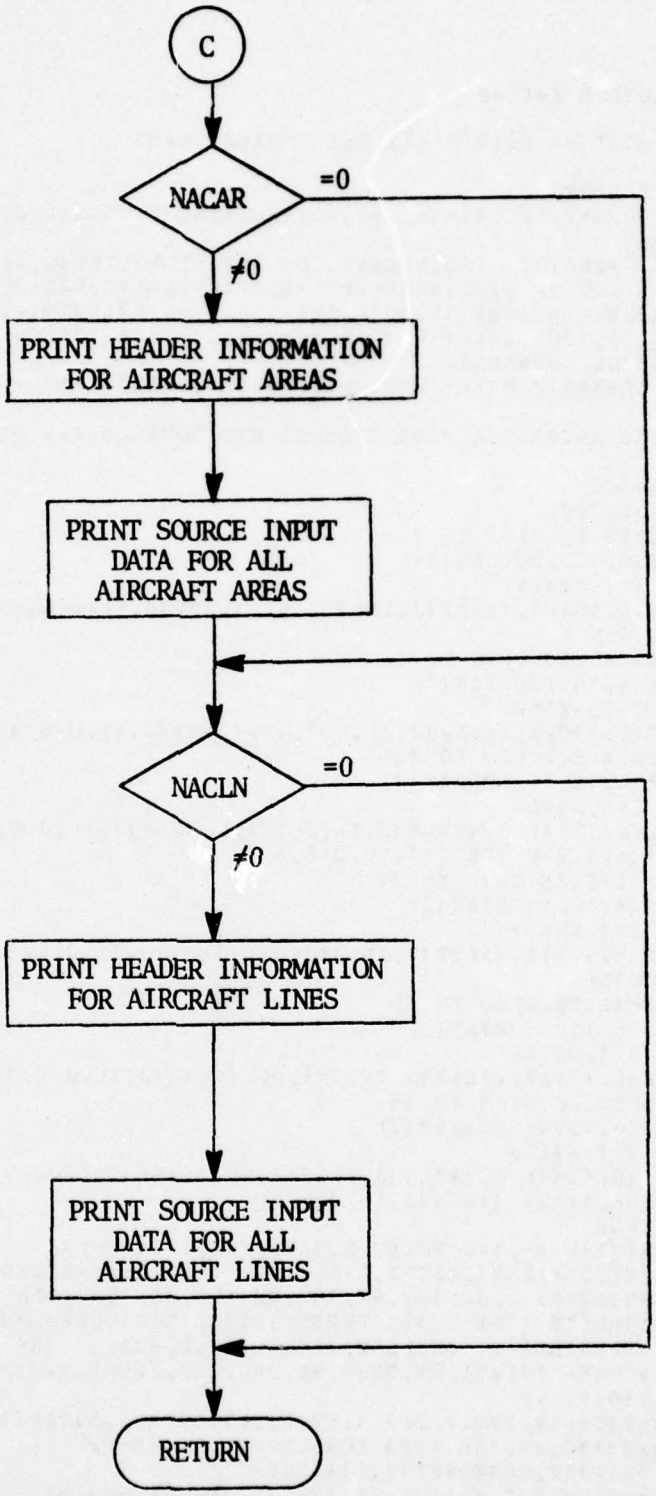
None

SUBROUTINE INDINP
(ENTRY: DEPINP)




A
NENLN
=0
≠0
PRINT HEADER INFORMATION FOR ENVIRON LINES
PRINT SOURCE INPUT DATA FOR ALL ENVIRON LINES
NABPT
=0
≠0
PRINT HEADER INFORMATION FOR AIRBASE POINTS
PRINT SOURCE INPUT DATA FOR ALL AIRBASE POINTS
NABAR
=0
≠0
PRINT HEADER INFORMATION FOR AIRBASE AREAS
PRINT SOURCE INPUT DATA FOR ALL AIRBASE AREAS
B


B
NABLN
=0
≠0
PRINT HEADER INFORMATION FOR AIRBASE LINES
PRINT SOURCE INPUT DATA FOR ALL AIRBASE LINES
RETURN
ENTRY: DEPINP
PRINT "WIND DEPENDENT SOURCE" WITH CURRENT WIND SPEED AND DIRECTION
NACPT
=0
≠0
PRINT HEADER INFORMATION FOR AIRCRAFT POINTS
PRINT SOURCE INPUT DATA FOR ALL AIRCRAFT POINTS
C


C
NACAR
=0
≠0
PRINT HEADER INFORMATION FOR AIRCRAFT AREAS
PRINT SOURCE INPUT DATA FOR ALL AIRCRAFT AREAS
NACLN
=0
≠0
PRINT HEADER INFORMATION FOR AIRCRAFT LINES
PRINT SOURCE INPUT DATA FOR ALL AIRCRAFT LINES
RETURN

```
      SUBROUTINE INDINP                                                 INDIP000
C                                                                       INDIP001
C     THIS ROUTINE PRINTS ALL THE SOURCE INPUT                          INDIP002
C                                                                       INDIP003
      REAL*8 SORNAM                                                     INDIP004
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMP    INDIP005
     . ,TEMK                                                            INDIP006
      COMMON /PERIOD/ IMO,NCDAYS,IDY,IHR1,IHR2,IFLAG,JFLAG              INDIP007
      COMMON /SRCE/ NPOL,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,NACPT,     INDIP008
     . NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),ABPT(16,150),  INDIP009
     . ABAR(11,100),ABLN(14,100),ACPT(16,1),ACAR(11,24),ACLN(18,250)    INDIP010
      DIMENSION SORNAM(3)                                               INDIP011
      DATA SCRNAM / 8HENVIRON ,8HAIRBASE ,8HAIRCRAFT /                  INDIP012
C                                                                       INDIP013
C     AT THIS ENTRY ALL WIND INDEPENDENT SOURCES ARE PRINTED            INDIP014
C                                                                       INDIP015
      ENLNA=1.0                                                         INDIP016
      WRITE(6,200)                                                      INDIP017
      IF(NENPT.EQ.0)GO TO 11                                            INDIP018
      WRITE(6,100)SORNAM(1)                                             INDIP019
      DO 1 I=1,NENPT                                                    INDIP020
    1 WRITE(6,101)I,(ENPT(J,I),J=1,4),(ENPT(J,I),J=6,8),(ENPT(J,I),     INDIP021
     . J=10,15)                                                         INDIP022
   11 IF (NENAR.EQ.0)GO TO 12                                           INDIP023
      WRITE(6,110)SORNAM(1)                                             INDIP024
      DO 2 I=1,NENAR                                                    INDIP025
    2 WRITE(6,111)I,(ENAR(J,I),J=1,4),(ENAR(J,I),J=6,10)                INDIP026
   12 IF(NENLN.EQ.0)GO TO 13                                            INDIP027
      WRITE(6,1200) SORNAM(1)                                           INDIP028
      DO 5 I=1,NENLN                                                    INDIP029
      WRITE(6,1211) I,(ENLN(J,I),J=1,4),(ENLN(J,I),J=9,13)              INDIP030
    5 WRITE(6,1222) (ENLN(J,I),J=6,8)                                   INDIP031
   13 IF (NABPT.EQ.0)GO TO 14                                           INDIP032
      WRITE(6,100)SORNAM(2)                                             INDIP033
      DO 3 I=1,NABPT                                                    INDIP034
    3 WRITE(6,101)I,(ABPT(J,I),J=1,4),(ABPT(J,I),J=6,8),(ABPT(J,I),     INDIP035
     . J=10,15)                                                         INDIP036
   14 IF(NABAR.EQ.0)GO TO 15                                            INDIP037
      WRITE(6,110)SORNAM(2)                                             INDIP038
      DO 4 I=1,NABAR                                                    INDIP039
    4 WRITE(6,111)I,(ABAR(J,I),J=1,4),(ABAR(J,I),J=6,10)                INDIP040
   15 IF(NABLN.EQ.0)GO TO 16                                            INDIP041
      WRITE(6,1200) SCRNAM(2)                                           INDIP042
      DO 6 I=1,NABLN                                                    INDIP043
      WRITE(6,1211) I,(ABLN(J,I),J=1,4),(ABLN(J,I),J=9,13)              INDIP044
    6 WRITE(6,1222) (ABLN(J,I),J=6,8)                                   INDIP045
   16 CONTINUE                                                          INDIP046
  100 FORMAT(1H0,A8,14H POINT SOURCES/1X,119(1H-)/                      INDIP047
     . 8X,1HI,11X,8HGEOMETRY,11X,22HI  STACK PARAMETERS  I,4X,1HI/      INDIP048
     . 1X,8HSOURCE I,3X,1HX,8X,1HY,7X,1HZ,3X,12HWIDTH I TEMP,4X,3HVEL,  INDIP049
     . 3X,11HDIAM I PR I,13X,28HEMISSIONS(MICROGRAMS/SECOND)/           INDIP050
     . 1X,14HNUMBER I  (KM),5X,4H(KM),4X,25H(M)    (M)  I(DEG K) (M/S), INDIP051
     . 3X,10H(M) IFLAGI,4X,2HCO,9X,2HHC,8X,3HNOX,9X,2HPT,8X,3HSO2/      INDIP052
     . 1X,119(1H-))                                                     INDIP053
  101 FORMAT(I6,1X,2F9.2,2F7.1,F7.0,2F7.1,F4.0,5(1PE11.3))              INDIP054
  110 FORMAT(1H0,A8,13H AREA SOURCES/1X,94(1H-)/                        INDIP055
     . 8X,1HI,11X,8HGEOMETRY,11X,1HI/                                   INDIP056
     . 1X,8HSOURCE I,3X,1HX,8X,1HY,7X,1HZ,4X,6HSIDE I,                  INDIP057
     . 14X,28HEMISSIONS(MICROGRAMS/SECOND)/                             INDIP058
     . 1X,14HNUMBER I  (KM),5X,4H(KM),4X,3H(M),4X,5H(M) I,              INDIP059
     . 5X,2HCO,9X,2HHC,8X,3HNOX,9X,2HPT,8X,3HSO2/1X,94(1H-))            INDIP060
  111 FORMAT(I6,1X,2F9.2,2F7.1,5(1PE11.3))                              INDIP061
```

```
  120 FORMAT(1HO,A8,13H LINE SOURCES/1X,123(1H-)/                        INDIP062
     . 8X,1HI,11X,8HGEOMETRY,11X,1HI,10X,1HI,54X,15HI AIRCRAFT ONLY/     INDIP063
     . 1X,8HSOURCE I,3X,1HX,8X,1HY,7X,1HZ,3X,18HWIDTH I VELOCITY I,      INDIP064
     . 13X,28HEMISSIONS(MICROGRAMS/SECOND),13X,15HI LENGTH   TIME/       INDIP065
     . 1X,14HNUMBER I   (KM),5X,4H(KM),4X,23H(M)    (M)  I (KM/HR)  I,  INDIP066
     . 5X,2HCO,9X,2HHC,8X,3HNOX,9X,2HPT,8X,3HSO2,3X,15HI   (KM)    (HR)/ INDIP067
     . 1X,123(1H-))                                                     INDIP068
  121 FORMAT(I6,1X,2F9.2,2F7.1,6(1PE11.3),0PF7.2,1PE11.3)               INDIP069
  122 FORMAT(7X,2F9.2,F7.1,7X,1PE11.3)                                  INDIP070
 1200 FORMAT(1HO,A8,13H LINE SOURCES/1X,96(1H-)/                        INDIP071
     . 8X,1HI,11X,8HGEOMETRY,12X,1HI/                                   INDIP072
     . 1X,8HSOURCE I,3X,1HX,8X,1HY,7X,1HZ,4X,7HWIDTH I,                 INDIP073
     . 23X,28HEMISSIONS(MICROGRAMS/SECOND)/                             INDIP074
     . 1X,14HNUMBER I   (KM),5X,4H(KM),4X,3H(M),4X,6H(M)   I,           INDIP075
     . 6X,2HCO,9X,2HHC,8X,3HNOX,9X,2HPT,8X,3HSO2/                       INDIP076
     . 1X,96(1H-))                                                      INDIP077
 1211 FORMAT(I6,1X,2F9.2,2F7.1,2X,5(1PE11.3))                           INDIP078
 1222 FORMAT(7X,2F9.2,F7.1)                                             INDIP079
  200 FORMAT(25HOWIND INDEPENDENT SOURCES/1HO)                          INDIP080
      RETURN                                                            INDIP081
C                                                                       INDIP082
      ENTRY DEPINP                                                      INDIP083
C                                                                       INDIP084
C     AT THIS ENTRY ALL WIND DEPENDENT SOURCES ARE PRINTED              INDIP085
C                                                                       INDIP086
      WRITE(6,300) WS,WD                                                INDIP087
  300 FORMAT(1H1,'WIND DEPENDENT SOURCES FOR',F8.4,' MPS WIND SPEED AND'INDIP088
     . ,F8.4,' RADIANS WIND DIRECTION')                                 INDIP089
      IF (IFLAG.EQ.0) GO TO 18                                          INDIP090
      IF (NACPT.EQ.0) GO TO 17                                          INDIP091
      WRITE(6,100) SORNAM(3)                                            INDIP092
      DO 7 I=1,NACPT                                                    INDIP093
    7 WRITE(6,101) I,(ACPT(J,I),J=1,4),(ACPT(J,I),J=6,8),(ACPT(J,I),    INDIP094
     . J=11,15)                                                         INDIP095
   17 IF(NACAR.EQ.0) GO TO 18                                           INDIP096
      WRITE(6,110) SORNAM(3)                                            INDIP097
      DO 8 I=1,NACAR                                                    INDIP098
    8 WRITE(6,111) I,(ACAR(J,I),J=1,4),(ACAR(J,I),J=6,10)               INDIP099
   18 IF(NACLN.EQ.0) GO TO 19                                           INDIP100
      WRITE(6,120) SORNAM(3)                                            INDIP101
      DO 9 I=1,NACLN                                                    INDIP102
      IF (ACLN(9,I).NE.1.0) GO TO 1987                                  INDIP103
      WRITE(6,1219) I,(ACLN(J,I),J=1,4),(ACLN(J,I),J=13,17),ACLN(11,I)  INDIP104
      WRITE(6,1229) (ACLN(J,I),J=6,8)                                   INDIP105
 1219 FORMAT(I6,1X,2F9.2,2F7.1,4X,3HN/A,4X,5(1PE11.3),0PF7.1,4X,3HN/A)  INDIP106
 1229 FORMAT(7X,2F9.2,F7.1,11X,3HN/A)                                   INDIP107
      GO TO 9                                                           INDIP108
 1987 CONTINUE                                                          INDIP109
      WRITE(6,121) I,(ACLN(J,I),J=1,4),ACLN(9,I),(ACLN(J,I),J=13,17),   INDIP110
     . ACLN(11,I),ACLN(12,I)                                            INDIP111
      WRITE(6,122)  (ACLN(J,I),J=6,8),ACLN(10,I)                        INDIP112
    9 CONTINUE                                                          INDIP113
   19 CONTINUE                                                          INDIP114
      RETURN                                                            INDIP115
      END                                                               INDIP116
```

PROGRAM MAIN

Purpose:

To read the general problem input, set up the receptor grid, call a routine to read the master emission file and then call the short-term model.

Input:

1. Problem title
2. Definition of pollutants to be output
3. Description of special cases
4. Description of receptor grid
5. Description of statistical receptors

Output:

All input is printed

Procedure:

1. Read card input
2. Calculate receptor locations
3. Check statistical receptors against the receptor locations
4. Call routine to read master emission file
5. Call the short-term model

Subroutines Called:

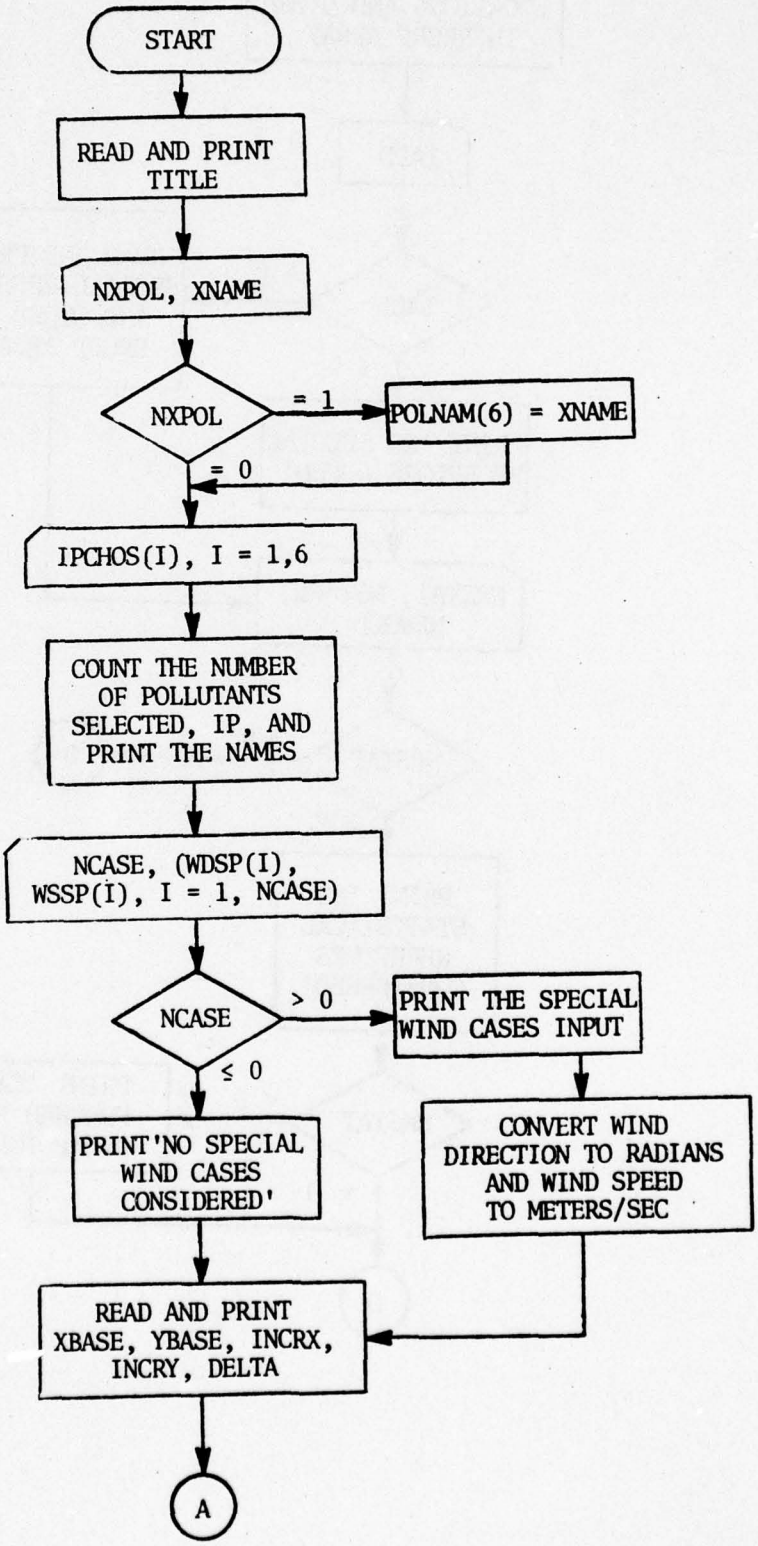
READ, MAINS

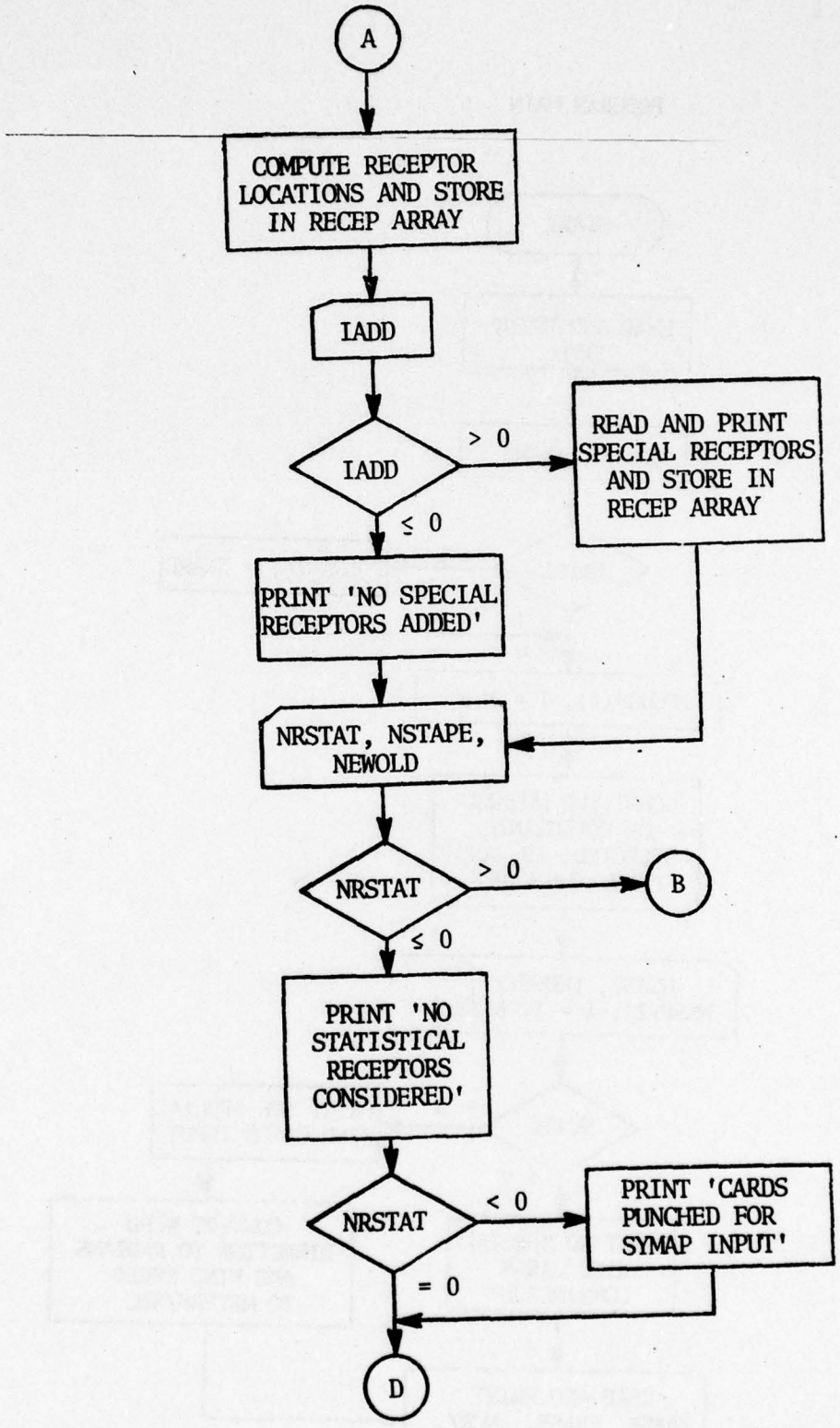
AD-A046 348 ARGONNE NATIONAL LAB ILL F/G 13/2
AIR QUALITY ASSESSMENT MODEL FOR AIR FORCE OPERATIONS - SHORT-T--ETC(U)
APR 77 D J BINGAMAN

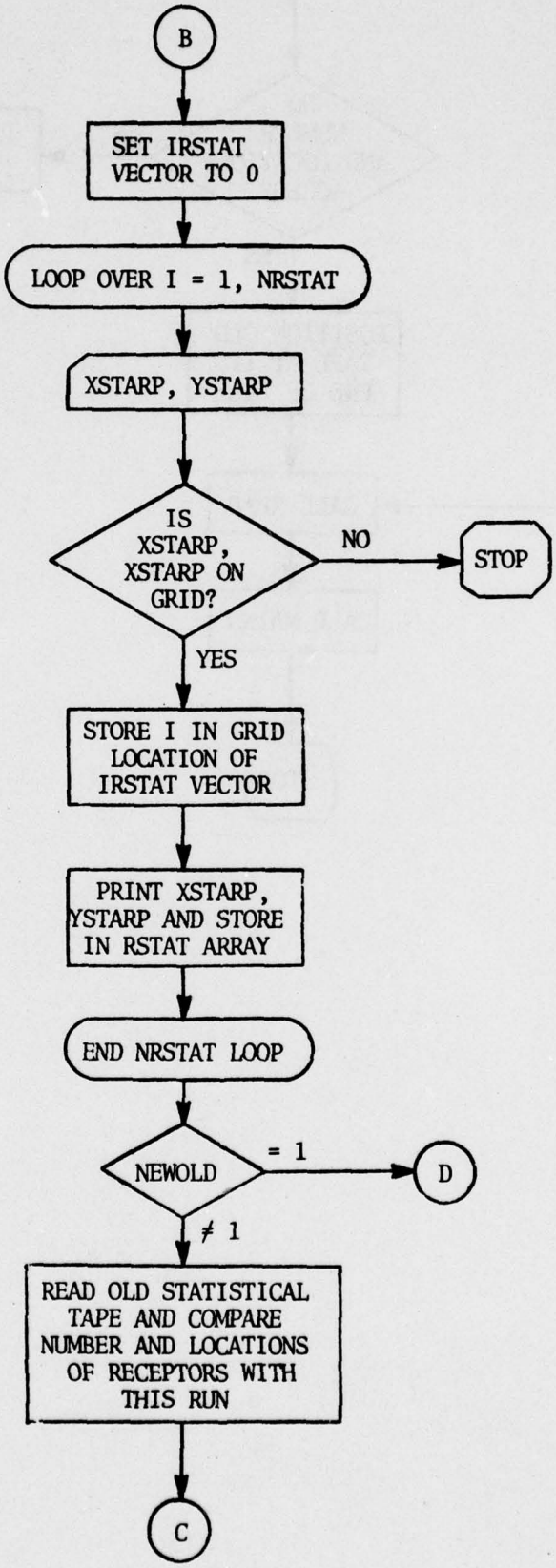
UNCLASSIFIED CEEDO-TR-76-34 NL

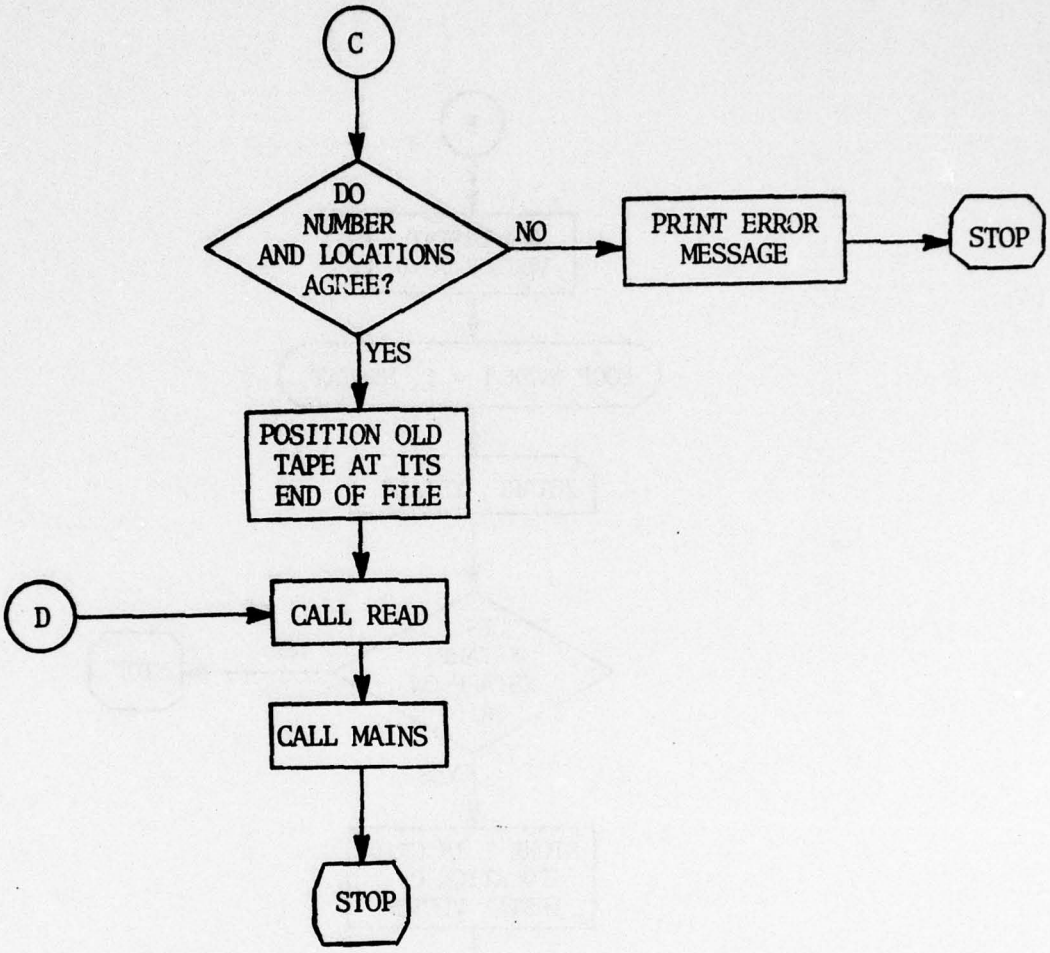
2 OF 3
AD A046348

PROGRAM MAIN




A
COMPUTE RECEPTOR LOCATIONS AND STORE IN RECEP ARRAY
IADD
IADD
> 0
READ AND PRINT SPECIAL RECEPTORS AND STORE IN RECEP ARRAY
≤ 0
PRINT 'NO SPECIAL RECEPTORS ADDED'
NRSTAT, NSTAPE, NEWOLD
NRSTAT
> 0
B
≤ 0
PRINT 'NO STATISTICAL RECEPTORS CONSIDERED'
NRSTAT
< 0
PRINT 'CARDS PUNCHED FOR SYMAP INPUT'
= 0
D


B
SET IRSTAT VECTOR TO 0
LOOP OVER I = 1, NRSTAT
XSTARP, YSTARP
IS XSTARP, XSTARP ON GRID?
NO
STOP
YES
STORE I IN GRID LOCATION OF IRSTAT VECTOR
PRINT XSTARP, YSTARP AND STORE IN RSTAT ARRAY
END NRSTAT LOOP
NEWOLD
= 1
D
≠ 1
READ OLD STATISTICAL TAPE AND COMPARE NUMBER AND LOCATIONS OF RECEPTORS WITH THIS RUN
C


C
DO NUMBER AND LOCATIONS AGREE?
NO
PRINT ERROR MESSAGE
STOP
YES
POSITION OLD TAPE AT ITS END OF FILE
D
CALL READ
CALL MAINS
STOP

```
C                                                                       MAIN0000
C   THIS PROGRAM IS THE MAIN DRIVER ROUTINE WHICH READS IN RECEPTOR AND MAIN0001
C   OTHER GENERAL DATA, CALLS SUBROUTINE READ TO READ THE MASTER        MAIN0002
C   SOURCE EMISSION TAPE, AND THE DIRECTS CONTROL TO MAINS FOR THE      MAIN0003
C   SHORT TERM MODEL                                                    MAIN0004
C                                                                       MAIN0005
      REAL*8 POLNAM,XNAME                                               MAIN0006
      COMMON /AIRQAL/ RECDAT(3, 6,312)                                  MAIN0007
      COMMON /ANNMET/ TBAR,ADD,P,PA,WSBAR,DTBAR                         MAIN0008
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE,HTAERO,SORC(18),IPOL            MAIN0009
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMP    MAIN0010
     . ,TEMK,UA                                                         MAIN0011
      COMMON /MONMET/ TMBAR,WSMBAR,AMDMBR,DTMBAR                        MAIN0012
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG,IONCE    MAIN0013
      COMMON /RCPT/ NRECEP,RECEP(2,312)                                 MAIN0014
      COMMON /SPEC/ NCASE,WSSP(3),WDSP(3)                               MAIN0015
      COMMON /SRCE/ NPOL,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,NACPT,     MAIN0016
     . NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),ABPT(16,150),  MAIN0017
     . ABAR(11,100),ABLN(14,100),ACPT(16,1),ACAR(11,24),ACLN(18,250)    MAIN0018
      COMMON /TITL/ POLNAM(6),TITLE1(20),IPCHOS(6),NXPOL,IP             MAIN0019
      COMMON /STAT/ NSTAPE,NRSTAT,RSTAT(2,20),IRSTAT(312)               MAIN0020
      DIMENSION AA (20),OSTATR(2,20)                                    MAIN0021
C                                                                       MAIN0022
C   READ AND PRINT RECEPTOR AND OTHER GENERAL INPUT                     MAIN0023
C                                                                       MAIN0024
    1 READ(5,100)TITLE1                                                 MAIN0025
  100 FORMAT(20A4)                                                      MAIN0026
      PRINT 200, TITLE1                                                 MAIN0027
  200 FORMAT(1H1,20A4)                                                  MAIN0028
      READ(5,110)       NXPOL, XNAME                                    MAIN0029
  110 FORMAT( I6,5A8)                                                   MAIN0030
      IF(NXPOL.EQ.0)GO TO 31                                            MAIN0031
      POLNAM(6 )=XNAME                                                  MAIN0032
   31 CONTINUE                                                          MAIN0033
      READ(5,130)(IPCHOS(I),I=1,6)                                      MAIN0034
  130 FORMAT(10I6)                                                      MAIN0035
      DO 40 I=1,6                                                       MAIN0036
      IF(IPCHOS(I).LE.0) GO TO 41                                       MAIN0037
   40 CONTINUE                                                          MAIN0038
   41 IP=I-1                                                            MAIN0039
      PRINT 203, (POLNAM(IPCHOS(I)),I=1,IP)                             MAIN0040
  203 FORMAT(21HOPOLLUTANTS SELECTED /6A8)                              MAIN0041
      READ(5,140)NCASE,(WDSP(I),WSSP(I),I=1,NCASE)                      MAIN0042
  140 FORMAT(I6,6F6.0)                                                  MAIN0043
      IF (NCASE) 48,48,49                                               MAIN0044
   48 PRINT 201                                                         MAIN0045
  201 FORMAT(33HONO SPECIAL WIND CASES CONSIDERED)                      MAIN0046
      GO TO 51                                                          MAIN0047
   49 PRINT 202,        (I,WDSP(I),WSSP(I),I=1,NCASE)                   MAIN0048
  202 FORMAT(20HOSPECIAL WIND CASES /53H   CASE   WIND DIRECTION(DEGREESMAIN0049
     .)    WIND SPEED(KNOTS)/(I6,F18.2,F23.2))                         MAIN0050
      DO 50 I=1,NCASE                                                   MAIN0051
      WDSP(I)=WDSP(I)* 0.0174533                                        MAIN0052
   50 WSSP(I)=WSSP(I)*0.5148                                            MAIN0053
   51 CONTINUE                                                          MAIN0054
      READ(5,120)XBASE,YBASE,INCRX,INCRY,DELTA                          MAIN0055
  120 FORMAT(2F8.0,2I8,F8.0)                                            MAIN0056
      PRINT 204, XBASE,YBASE,INCRX,INCRY,DELTA                          MAIN0057
  204 FORMAT(43HOLOWER LEFT CORNER OF RECEPTOR GRID IS AT (,F8.3,1H,,   MAIN0058
     .F8.3,1H)/12H   THERE ARE,I4,12H COLUMNS AND,I4,23H ROWS WITH A SPAMAIN0059
     .CING OF,F6.2,11H KILOMETERS)                                      MAIN0060
      NRECEP=0                                                          MAIN0061
```

```
      DO 10 I=1,INCPX                                                    MAIN0062
      DO 10 J=1,INCRY                                                    MAIN0063
      NRECEP=NRECEP+1                                                    MAIN0064
      RECEP(1,NRECEP)=XBASE+(I-1)*DELTA                                  MAIN0065
   10 RECEP(2,NRECEP)=YBASE+(J-1)*DELTA                                  MAIN0066
      READ(5,110)IADD                                                    MAIN0067
      IF (IADD) 14,14,15                                                 MAIN0068
   14 PRINT 205                                                          MAIN0069
  205 FORMAT(27HONO SPECIAL RECEPTORS ADDED)                             MAIN0070
      GO TO 21                                                           MAIN0071
   15 PRINT 206                                                          MAIN0072
  206 FORMAT(25HOSPECIAL RECEPTORS ADDED /36H   NO.   X-COORDINATE   Y-CMAIN0073
     .OORDINATE)                                                         MAIN0074
      DO 20 I=1,IADD                                                     MAIN0075
      READ(5,120)XRECEP,YRECEP                                           MAIN0076
      NRECEP=NRECEP+1                                                    MAIN0077
      PRINT 207, NRECEP,XRECEP,YRECEP                                    MAIN0078
  207 FORMAT(I5,F14.3,F15.3)                                             MAIN0079
      RECEP(1,NRECEP)=XRECEP                                             MAIN0080
      RECEP(2,NRECEP)=YRECEP                                             MAIN0081
   20 CONTINUE                                                           MAIN0082
   21 CONTINUE                                                           MAIN0083
C                                                                        MAIN0084
C   READ AND PRINT STATISTICAL RECEPTOR INPUT                            MAIN0085
C                                                                        MAIN0086
      READ 130,NRSTAT,NSTAPE,NEWOLD                                      MAIN0087
      IF (NRSTAT.GT.0) GO TO 305                                         MAIN0088
      PRINT 302                                                          MAIN0089
  302 FORMAT(36HONO STATISTICAL RECEPTORS CONSIDERED)                    MAIN0090
      IF (NRSTAT.LT.0) PRINT 303                                         MAIN0091
  303 FORMAT(30HOCARDS PUNCHED FOR SYMAP INPUT)                          MAIN0092
      GO TO 400                                                          MAIN0093
  305 PRINT 301,NRSTAT                                                   MAIN0094
  301 FORMAT(1HO,I8,22H STATISTICAL RECEPTORS)                           MAIN0095
      DO 310 I=1,NRECEP                                                  MAIN0096
      IRSTAT(I)=0                                                        MAIN0097
  310 CONTINUE                                                           MAIN0098
      DO 340 I=1,NRSTAT                                                  MAIN0099
      READ 120,XSTARP,YSTARP                                             MAIN0100
      DO 320 IC=1,NRECEP                                                 MAIN0101
      IF (XSTARP.EQ.RECEP(1,IC).AND.YSTARP.EQ.RECEP(2,IC)) GO TO 330     MAIN0102
  320 CONTINUE                                                           MAIN0103
      PRINT 321,XSTARP,YSTARP                                            MAIN0104
  321 FORMAT(25HOSTATISTICAL RECEPTOR X =,F7.3,5H, Y =,F7.3,             MAIN0105
     . 12H NOT ON GRID)                                                  MAIN0106
      STOP                                                               MAIN0107
  330 IRSTAT(IC)=I                                                       MAIN0108
      PRINT 322,I,XSTARP,YSTARP                                          MAIN0109
  322 FORMAT(I12,7H AT X =,F10.3,4H Y =,F10.3)                           MAIN0110
      RSTAT(1,I)=XSTARP                                                  MAIN0111
      RSTAT(2,I)=YSTARP                                                  MAIN0112
  340 CONTINUE                                                           MAIN0113
      IF (NEWOLD.EQ.1) GO TO 400                                         MAIN0114
      READ (NSTAPE) AA,IH,JRSTAT,((OSTATR(I,J),I=1,2),J=1,JRSTAT),       MAIN0115
     .  JWD,WDJ,JWS,WSJ,JJJ,HLIDJ                                        MAIN0116
      IF (JRSTAT.EQ.NRSTAT) GO TO 350                                    MAIN0117
      PRINT 341                                                          MAIN0118
  341 FORMAT(46HONUMBER OF STATISTICAL RECEPTORS ON OLD TAPE (,I2,       MAIN0119
     . 42H), DO NOT AGREE WITH NUMBER FOR THIS RUN (,I2,1H))             MAIN0120
      STOP                                                               MAIN0121
  350 DO 360 J=1,NRSTAT                                                  MAIN0122
      DO 360 I=1,2                                                       MAIN0123
```

```
      IF (OSTATR(I,J).EQ.RSTAT(I,J)) GO TO 360                          MAIN0124
      PRINT 351,((OSTATR(I,J),I=1,2),J=1,NRSTAT)                        MAIN0125
  351 FORMAT(64HOSTATISTICAL RECEPTOR LOCATIONS DO NOT MATCH,THOSE ON TAMAIN0126
     .PE ARE ,20(/2F15.3))                                              MAIN0127
      STOP                                                              MAIN0128
  360 CONTINUE                                                          MAIN0129
C                                                                       MAIN0130
C   POSITION OLD TAPE AT END OF LAST RECORD                             MAIN0131
C                                                                       MAIN0132
  370 READ (NSTAPE,END=380)                                             MAIN0133
      GO TO 370                                                         MAIN0134
  380 BACKSPACE NSTAPE                                                  MAIN0135
      BACKSPACE NSTAPE                                                  MAIN0136
  400 CONTINUE                                                          MAIN0137
      CALL  READ                                                        MAIN0138
      CALL MAINS                                                        MAIN0139
      STOP                                                              MAIN0140
      RETURN                                                            MAIN0141
      END                                                               MAIN0142
```

SUBROUTINE MAINS

Purpose:

To direct the short term calculation by reading the data, checking for special cases and calling the source and diffusion calculation routines.

Input:

1. Card input to describe the time periods to be calculated
2. Card input to describe the meteorological conditions
3. Special case data from the MAIN routine

Output:

1. Common block data to be used by the calculation and output subroutines
2. Statistical receptor data on tape and/or cards for SYMAP

Procedure:

1. Set constants
2. Read general data
3. For each period:
   a. Read time and meteorological data
   b. Check for near zero wind speed
   c. Check limits of mixing depth
   d. For each hour:
      1. Find the critical distance
      2. Set wind direction and speed classes
      3. Call the non-aircraft source routines
      4. Check for special cases of wind speed and direction
      5. Call the aircraft source routines
      6. Call the diffusion model and output routines
      7. Check for statistical output, including cards for SYMAP.

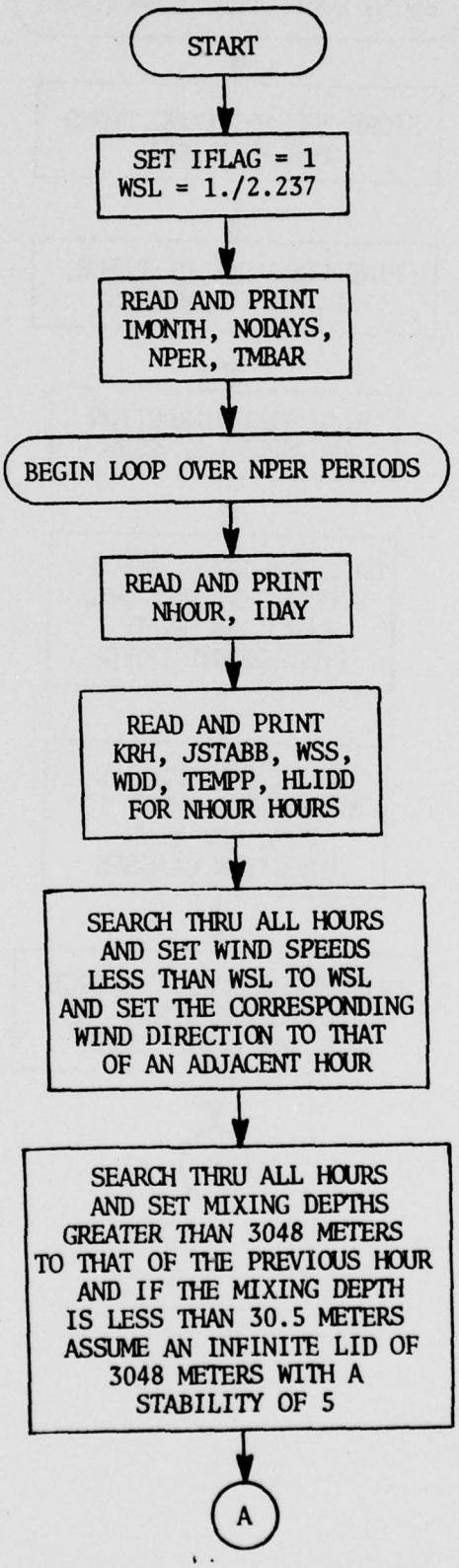
Subroutines Called:

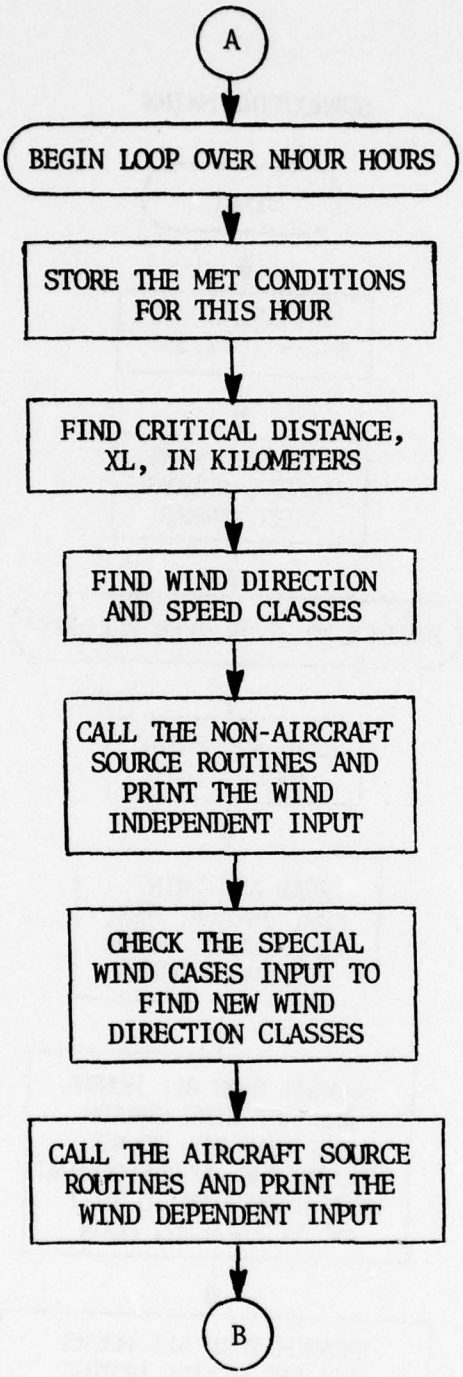
SOURCE, INDINP, ACSRCE, DEPINP, POLSOR, OUTPUT

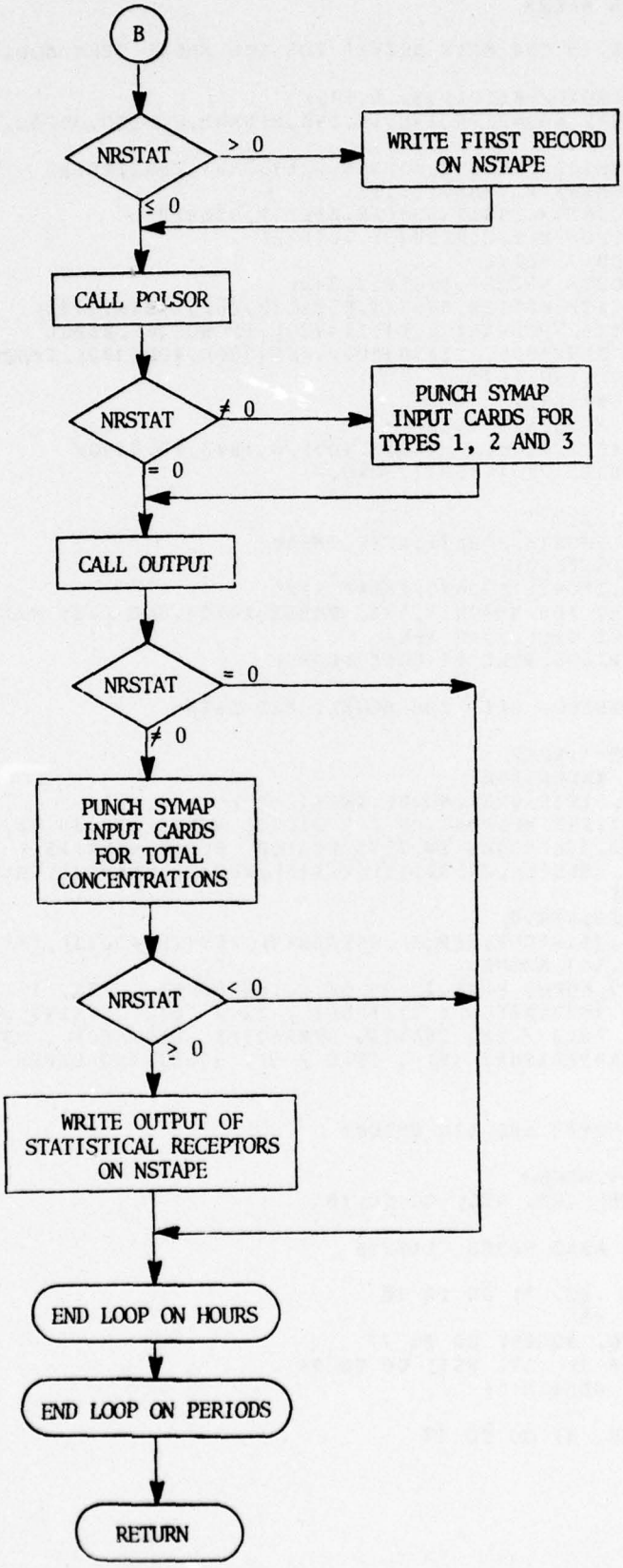
Function Called:

SIGCZ

SUBROUTINE MAINS




A
BEGIN LOOP OVER NHOUR HOURS
STORE THE MET CONDITIONS FOR THIS HOUR
FIND CRITICAL DISTANCE, XL, IN KILOMETERS
FIND WIND DIRECTION AND SPEED CLASSES
CALL THE NON-AIRCRAFT SOURCE ROUTINES AND PRINT THE WIND INDEPENDENT INPUT
CHECK THE SPECIAL WIND CASES INPUT TO FIND NEW WIND DIRECTION CLASSES
CALL THE AIRCRAFT SOURCE ROUTINES AND PRINT THE WIND DEPENDENT INPUT
B


B
NRSTAT
> 0
WRITE FIRST RECORD ON NSTAPE
≤ 0
CALL POLSOR
NRSTAT
≠ 0
PUNCH SYMAP INPUT CARDS FOR TYPES 1, 2 AND 3
= 0
CALL OUTPUT
NRSTAT
= 0
≠ 0
PUNCH SYMAP INPUT CARDS FOR TOTAL CONCENTRATIONS
NRSTAT
< 0
≥ 0
WRITE OUTPUT OF STATISTICAL RECEPTORS ON NSTAPE
END LOOP ON HOURS
END LOOP ON PERIODS
RETURN

```
      SUBROUTINE MAINS                                                  MAINS000
C                                                                       MAINS001
C   THIS ROUTINE IS THE MAIN DRIVER FOR THE SHORT TERM MODEL            MAINS002
C                                                                       MAINS003
      COMMON /AIRQAL/ RECDAT(3, 6,312)                                  MAINS004
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMF,   MAINS005
     . TEMK                                                             MAINS006
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG                MAINS007
      COMMON /XTRAN/ XL,WSMD,TY,TZ                                      MAINS008
      COMMON /MONMET/ TMBAR,WSMBAR,AMDMBR,DTMBAR                        MAINS009
      COMMON /SPEC/ NCASE,WSSP(3),WDSP(3)                               MAINS010
      COMMON /WDUN/ WSAVE                                               MAINS011
      COMMON /RCPT/ NRECEP,RECEP(2,312)                                 MAINS012
      COMMON /STAT/ NSTAPE,NRSTAT,RSTAT(2,20),IRSTAT(312)               MAINS013
      COMMON /TITL/ PGLNAM(6),TITLE1(20),IPCHOS(6),NXPOL                MAINS014
      DIMENSION KRH(100),JSTABB(100),WSS(100),WDD(100),TEMPP(100),      MAINS015
     . HLIDD(100),WSCLAS(5)                                             MAINS016
      DIMENSION WEEK(2)                                                 MAINS017
      DATA WEEK / 3HDAY, 3HEND /                                        MAINS018
      DATA WSCLAS/1.8018,3.3462,5.4055,8.4943,10.8110/                  MAINS019
      DATA PI,SHLID /3.1415927,3048./                                   MAINS020
      IFLAG = 1                                                         MAINS021
      WSL = 1./2.237                                                    MAINS022
      READ 100, IMONTH,NODAYS,NPER,TMBAR                                MAINS023
  100 FORMAT (3I6,F6.0)                                                 MAINS024
      PRINT 203,IMONTH,NODAYS,TMBAR,NPER                                MAINS025
  203 FORMAT(11H0 FOR MONTHI3,11H, THERE AREI4,36H DAYS WITH AN AVERAGE MAINS026
     .TEMPERATURE OFF6.2,4H (F)/                                        MAINS027
     .I5,27H PERIODS WILL BE CONSIDERED)                                MAINS028
C                                                                       MAINS029
C   FOR EVERY PERIOD, READ THE HOURLY MET DATA                          MAINS030
C                                                                       MAINS031
      DO 50 IPER=1,NPER                                                 MAINS032
      READ 100, NHOUR,IDAY                                              MAINS033
      PRINT 201, IPER,NPER,NHOUR,WEEK(IDAY)                             MAINS034
  201 FORMAT(1H1,29HINFORMATION FOR PERIOD NUMBER,I3,3H OF, I3,8H PERIODMAINS035
     .S  / 5X,I3,33H HOURS IN THIS PERIOD, FOR A WEEK,A3 )              MAINS036
      READ 101, (KRH(I),JSTABB(I),WSS(I),WDD(I),TEMPP(I),HLIDD(I),     MAINS037
     -I=1,NHOUR)                                                        MAINS038
  101 FORMAT (2I6,4F6.0)                                                MAINS039
      PRINT 202,(I,NHOUR,KRH(I),JSTABB(I),WSS(I),WDD(I),TEMPP(I),       MAINS040
     . HLIDD(I),I=1,NHOUR)                                              MAINS041
  202 FORMAT(1H0,8HFOR HOUR,I5,3H OF,I5,6H HOURS   /5X, 10HHOUR INDEX , MAINS042
     . I3 / 5X, 18HSTABILITY CATEGORY , I2 /  5X, 26HWIND SPEED (METERS/MAINS043
     .SECOND) , F8.2 / 5X, 24HWIND DIRECTION (DEGREES) , F8.2 /         MAINS044
     . 5X, 15HTEMPERATURE (F) , F8.2 / 5X, 21HMIXING DEPTH (METERS) ,   MAINS045
     . F 8.2 )                                                          MAINS046
C                                                                       MAINS047
C   CHECK WIND SPEED AND LID HEIGHT                                     MAINS048
C                                                                       MAINS049
      DO 20 IH=1,NHOUR                                                  MAINS050
      IF (WSS(IH) .GE. WSL) GO TO 18                                    MAINS051
C                                                                       MAINS052
C   REMOVE ZERO WIND SPEED CLASSES                                      MAINS053
C                                                                       MAINS054
      IF (NHOUR .EQ. 1) GO TO 16                                        MAINS055
      WSS(IH) = WSL                                                     MAINS056
      IF (IH .EQ. NHOUR) GO TO 17                                       MAINS057
      IF (WSS(IH+1) .LT. WSL) GO TO 14                                  MAINS058
      WDD(IH) = WDD(IH+1)                                               MAINS059
      GO TO 18                                                          MAINS060
   14 IF (IH .NE. 1) GO TO 17                                           MAINS061
```

```
      DC 15 JH=2,NHOUR                                                  MAINS062
      IF (WSS(JH) .LT. WSL) GO TO 15                                    MAINS063
      WDD(IH)= WDD(JH)                                                  MAINS064
      GO TO 18                                                          MAINS065
   15 CONTINUE                                                          MAINS066
    16 PRINT 200                                                        MAINS067
      STOP                                                              MAINS068
  200 FORMAT(1H1,10X,'WINDSPEED IS TOO SMALL')                          MAINS069
   17 WDD(IH) = WDD(IH-1)                                               MAINS070
C                                                                       MAINS071
C   SET INFINITE LID HEIGHT AT 3048 METERS                              MAINS072
C                                                                       MAINS073
    18 IF(HLIDD(IH).GT. 3048.) HLIDD(IH) = SHLID                        MAINS074
      IF (HLIDD(IH) .GE. 30.5) GO TO 19                                 MAINS075
C                                                                       MAINS076
C   GROUND LEVEL INVERSION, ASSUME INFINITE LID WITH A STABILTY OF 5    MAINS077
C                                                                       MAINS078
      HLIDD(IH) = 3048.                                                 MAINS079
      JSTABB(IH) = 5                                                    MAINS080
   19 SHLID = HLIDD(IH)                                                 MAINS081
   20 CONTINUE                                                          MAINS082
C                                                                       MAINS083
C   BEGIN HOURLY CALCULATIONS                                           MAINS084
C                                                                       MAINS085
      DO 30 IHOUR = 1,NHOUR                                             MAINS086
      IHR1 = KRH(IHOUR)                                                 MAINS087
      WS = WSS(IHOUR)                                                   MAINS088
      IHR2 = IHR1                                                       MAINS089
      WD = WDD(IHOUR)*0.0174533                                         MAINS090
      TEMF = TEMPP(IHOUR)                                               MAINS091
      TEMK = (TEMF-32.)/1.8 + 273.                                      MAINS092
      JSTAB = JSTABB(IHOUR)                                             MAINS093
      HLID = HLIDD(IHOUR)                                               MAINS094
      WSMPH = WS * 2.237                                                MAINS095
      SINEWD = SIN(WD)                                                  MAINS096
      COSEWD = COS(WD)                                                  MAINS097
      HL = 0.47*HLID                                                    MAINS098
      WSAVE=WS                                                          MAINS099
      IF(HL.LT.1.0)HL=1.0                                               MAINS100
C                                                                       MAINS101
C   FIND CRITICAL DISTANCE, XL, IN KILOMETERS                           MAINS102
C                                                                       MAINS103
      XI=SIGCZ(JSTAB,HL)/1000.                                          MAINS104
C                                                                       MAINS105
C   FIND WIND DIRECTION AND SPEED CLASSES                               MAINS106
C                                                                       MAINS107
      DO 21 K=1,16                                                      MAINS108
      IF (WD .GT. (22.5*K-11.25)*PI/180.) GO TO 21                      MAINS109
      IWD = K                                                           MAINS110
      GO TO 22                                                          MAINS111
   21 CONTINUE                                                          MAINS112
      IWD=1                                                             MAINS113
   22 DO 23 K=1,5                                                       MAINS114
      IF (WS.GT.WSCLAS(K)) GO TO 23                                     MAINS115
      IWS = K                                                           MAINS116
      GO TO 25                                                          MAINS117
   23 CONTINUE                                                          MAINS118
      IWS = 6                                                           MAINS119
   25 CONTINUE                                                          MAINS120
      PRINT 925,IHOUR                                                   MAINS121
  925 FORMAT(9H1FOR HOUR13)                                             MAINS122
C                                                                       MAINS123
```

```
C   CALL THE NON-AIRCRAFT SOURCE ROUTINES AND PRINT THE                    MAINS124
C   WIND INDEPENDENT INPUT                                                 MAINS125
C                                                                          MAINS126
      CALL SCURCE                                                          MAINS127
      CALL INDINP                                                          MAINS128
      IWDT = IWD                                                           MAINS129
      IF (NCASE .EQ. 0) GO TO 28                                           MAINS130
      DC 26 I=1,NCASE                                                      MAINS131
      COMP = WS * COS(WD - WDSP(I))                                        MAINS132
      IF (COMP .LT. WSSP(I)) GO TO 26                                      MAINS133
      IWD = 17 + I                                                         MAINS134
      GC TO 28                                                             MAINS135
   26 CCNTINUE                                                             MAINS136
   28 CONTINUE                                                             MAINS137
C                                                                          MAINS138
C   CALL THE AIRCRAFT SOURCE ROUTINES AND PRINT THE                        MAINS139
C   WIND DEPENDENT INPUT                                                   MAINS140
C                                                                          MAINS141
       CALL ACSRCE                                                         MAINS142
      CALL DEPINP                                                          MAINS143
      IWD = IWDT                                                           MAINS144
C                                                                          MAINS145
C   IF STATISICAL OPTION IS CHOSEN, WRITE FIRST RECORD ON NSTAPE           MAINS146
C                                                                          MAINS147
      IF (NRSTAT.LE.0) GO TO 300                                           MAINS148
      NHR=1                                                                MAINS149
      WRITE (NSTAPE) TITLE1,IHR1,NRSTAT,((RSTAT(I,J),I=1,2),J=1,NRSTAT),MAINS150
     . IWD,WD,IWS,WS,JSTAB,HLID,NHR                                        MAINS151
  300 CONTINUE                                                             MAINS152
C                                                                          MAINS153
C   CALL THE DIFFUSION MODEL                                               MAINS154
C                                                                          MAINS155
      CALL PCISOR                                                          MAINS156
      IF (NRSTAT.EQ.0) GO TO 320                                           MAINS157
      DC 310 K=1,3                                                         MAINS158
      PUNCH 301,NRECEP,K                                                   MAINS159
  301 FORMAT(2I6)                                                          MAINS160
      DC 310 N=1,NRECEP                                                    MAINS161
      PUNCH 302,(RECEP(I,N),I=1,2),(RECDAT(K,J,N),J=1,6)                   MAINS162
  302 FORMAT(1P8E10.3)                                                     MAINS163
  310 CCNTINUE                                                             MAINS164
  320 CONTINUE                                                             MAINS165
C                                                                          MAINS166
C   PRINT RESULTS                                                          MAINS167
C                                                                          MAINS168
      CALL CUTPUT                                                          MAINS169
C                                                                          MAINS170
C   IF THE STATISTICAL OPTION IS CHOSEN, RECORD THE OUTPUT                 MAINS171
C                                                                          MAINS172
      IF (NRSTAT.EQ.0) GO TC 360                                           MAINS173
      K=4                                                                  MAINS174
      PUNCH 301,NRECEP,K                                                   MAINS175
      DO 330 N=1,NRECEP                                                    MAINS176
      PUNCH 302,(RECEP(I,N),I=1,2),(RECDAT(1,J,N),J=1,6)                   MAINS177
  330 CCNTINUE                                                             MAINS178
      IF (NRSTAT.LT.0) GO TO 360                                           MAINS179
      K=0                                                                  MAINS180
      DC 350 N=1,NRECEP                                                    MAINS181
      IF (IRSTAT(N).LE.0) GO TO 350                                        MAINS182
      K=K+1                                                                MAINS183
      DO 340 J=1,6                                                         MAINS184
      RECDAT(1,J,K)=RECDAT(1,J,N)                                          MAINS185
```

```
340 CONTINUE                                                          MAINS186
350 CONTINUE                                                          MAINS187
    WRITE (NSTAPE) ((RECDAT(1,J,N),J=1,6),N=1,NRSTAT)                 MAINS188
360 CONTINUE                                                          MAINS189
30  CONTINUE                                                          MAINS190
50  CONTINUE                                                          MAINS191
    RETURN                                                            MAINS192
    END                                                               MAINS193
```

SUBROUTINE METHA

Purpose:

To calculate diurnal emissions allowing each source in a class to have a unique or default distribution pattern.

Input:

1. The ICLASS number of the sources and NPTC, the number of sources not using the default of a uniform distribution.
2. For each of the NPTC sources, the source ID number and fractions of the hour, day and month, FH, FD and FM, which that source is on. If one or two of the fractions are left blank, the default is used. If all are blank, the source is assumed to be off.

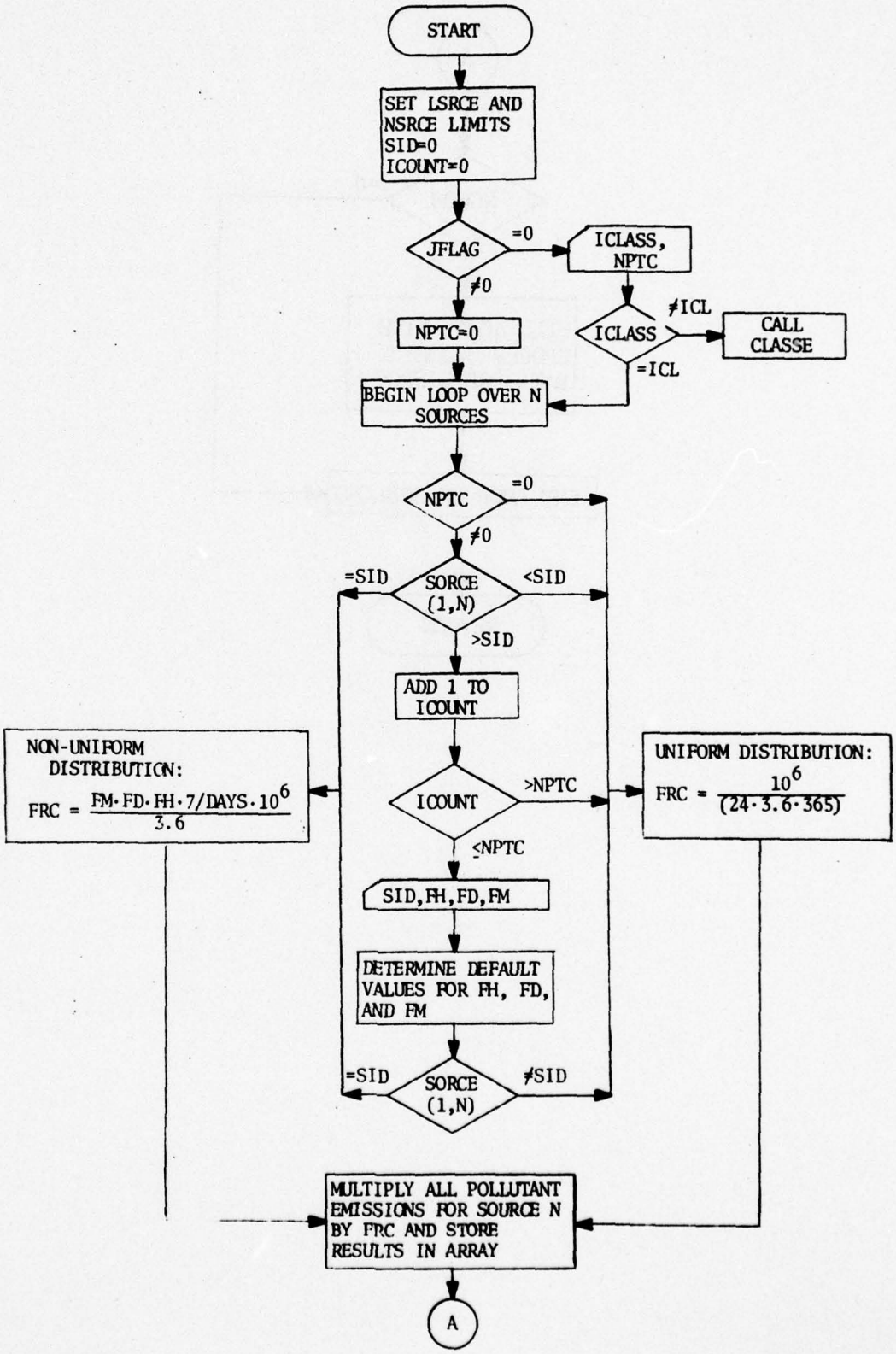
Output:

The array specified in the calling sequence to the subroutine is filled with the computed emission data.

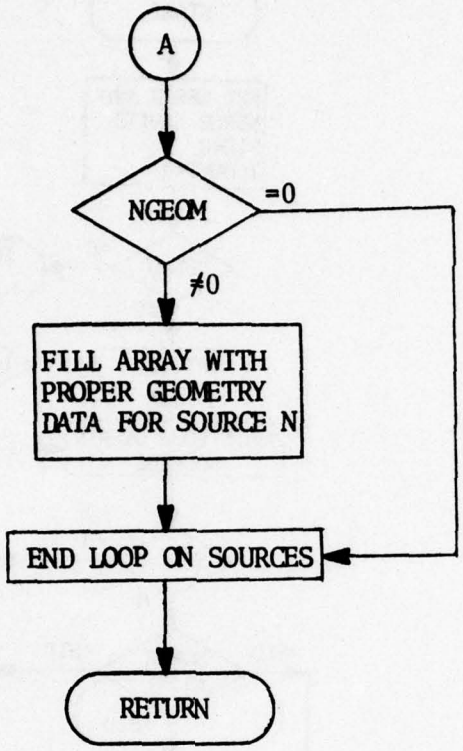
Subroutines Called:

CLASSE

SUBROUTINE METHA



SUBROUTINE METHA (Contd.)



```
      SUBROUTINE METHA(MAXN,ARRAY,I1,I2,ICL)                            METHA000
C                                                                       METHA001
C     THIS RCUTINE CALCULATES DIURNAL EMISSIONS ALLOWING EACH           METHA002
C     SOURCE IN A CLASS TO HAVE A DIFFERENT DISTRIBUTION PATTERN.       METHA003
C     DEFAULTS ARE: FH = 1/24                                           METHA004
C                   FD = 1/7                                            METHA005
C                   FM = 1/12 OR 1                                      METHA006
C                                                                       METHA007
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG          METHA008
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,          METHA009
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         METHA010
     .               ABPT(16,150),ABAR(11,100),ABLN(14,100)             METHA011
      COMMON/JUNK/DA(   SRCE,NSRCE,SORCE(17,300),SORGM(10,200)          METHA012
     . ,LOC1,LOC2,NGEOM,IPT                                             METHA013
      DIMENSION ARRAY(I1,I2)                                            METHA014
      LSRCE=NSRCE+1                                                     METHA015
      NSRCE=NSRCE+MAXN                                                  METHA016
      SID=0.                                                            METHA017
      ICOUNT=0                                                          METHA018
      IF (JFLAG.EQ.0) GO TO 5                                           METHA019
      NPTC=0                                                            METHA020
      GO TO 6                                                           METHA021
    5 READ 1,ICLASS,NPTC                                                METHA022
    1 FORMAT(2I4)                                                       METHA023
      IF(ICLASS.NE.ICL) CALL CLASSE (ICL,ICLASS)                        METHA024
    6 DO 100 N=LSRCE,NSRCE                                              METHA025
      IF (NPTC.EQ.0) GO TO 30                                           METHA026
      IF (SID-SORCE(1,N)) 10,40,30                                      METHA027
   10 ICOUNT=ICOUNT+1                                                   METHA028
      IF(ICOUNT.GT.NPTC) GO TO 30                                       METHA029
      READ 2,SID,FH,FD,FM                                               METHA030
    2 FORMAT(F4.0,4X,3F8.7)                                             METHA031
      IF (FH+FD+FM.EQ.0.0) GO TO 20                                     METHA032
C                                                                       METHA033
C     DETERMINE DEFAULT VALUES                                          METHA034
C                                                                       METHA035
      IF (FM.NE.0.0) GO TO 15                                           METHA036
      FM=1./12.                                                         METHA037
      IF (DAYS.GE.365.) FM=1.                                           METHA038
   15 IF (FD.EQ.0.0) FD=1./7.                                           METHA039
      IF (FH.EQ.0.0) FH=1./24.                                          METHA040
C                                                                       METHA041
   20 CONTINUE                                                          METHA042
      IF (SID-SORCE(1,N)) 30,40,30                                      METHA043
C                                                                       METHA044
C     UNIFORM DISTRIBUTION                                              METHA045
C                                                                       METHA046
   30 FRC=1.0E+6/(24.*3.6*365.)                                         METHA047
      GO TO 50                                                          METHA048
C                                                                       METHA049
C     NON-UNIFORM DISTRIBUTION                                          METHA050
C                                                                       METHA051
   40 FRC=FM*FD*FH*(7./DAYS)*(1.0E+6/3.6)                               METHA052
   50 DO 60 I=1,NPLTS                                                   METHA053
      ARRAY(I+LOC1,N)=SORCE(I+LOC2,N)*FRC                               METHA054
   60 CONTINUE                                                          METHA055
      IF (NGEOM.EQ.0) GO TO 100                                         METHA056
      DO 70 I=1,NGEOM                                                   METHA057
      ARRAY(I,N)=SORCE(I+2,N)                                           METHA058
   70 CONTINUE                                                          METHA059
      IF (IPT.EQ.1) ARRAY(10,N)=SORCE(2,N)                              METHA060
  100 CONTINUE                                                          METHA061
```

```
      RETURN                                                            METHA062
      END                                                               METHA063
```

SUBROUTINE METHB

Purpose:

To calculate diurnal emissions using a degree-hour method.

Input:

The ICLASS number of the sources and UNIFRC, the fraction of emissions which are to be uniformly distributed.

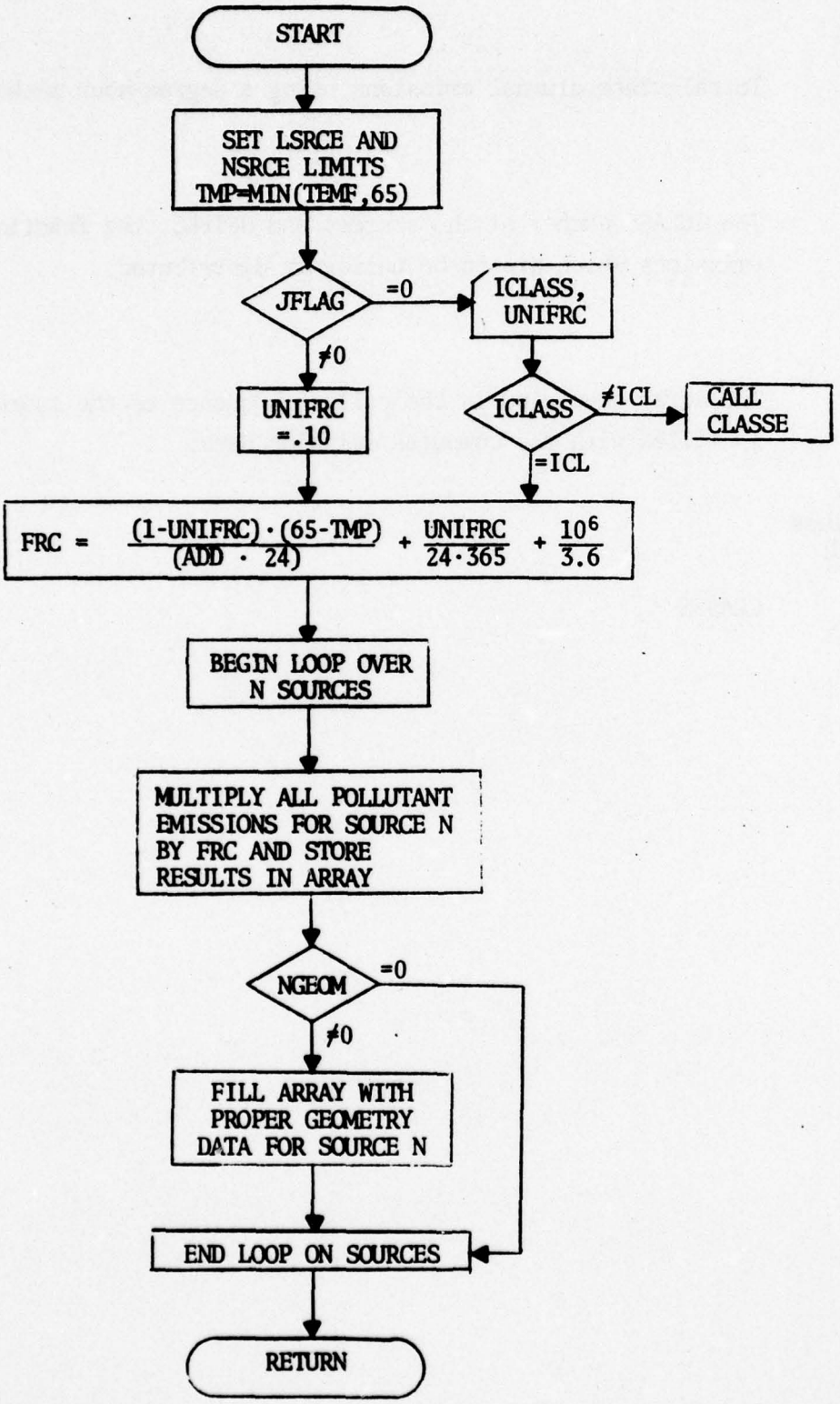
Output:

The array specified in the calling sequence to the subroutine is filled with the computed emission data.

Subroutines Called:

CLASSE

SUBROUTINE METHB



```
      SUBROUTINE METHB(MAXN,ARRAY,I1,I2,ICL)                            METHB000
C                                                                       METHB001
C     THIS ROUTINE CALCULATES DIURNAL EMISSIONS USING                   METHB002
C     A DEGREE-HOUR METHOD                                              METHB003
C                                                                       METHB004
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG          METHB005
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,          METHB006
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         METHB007
     .               ABPT(16,150),ABAR(11,100),ABLN(14,100)             METHB008
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)          METHB009
     . ,LOC1,LOC2,NGEOM,IPT                                             METHB010
      COMMON/MET/WS,WSMPH,IWS,WD,IWD,SINWD,COSWD,                       METHB011
     .  JSTAB,HLID,TEMF,TEMK                                            METHB012
      DIMENSION ARRAY(I1,I2)                                            METHB013
      COMMON /ANNMET/ TBAR,ADD,P,PA,WSBAR,DTBAR                         METHB014
      LSRCE=NSRCE+1                                                     METHB015
      NSRCE=NSRCE+MAXN                                                  METHB016
      TMP=TEMF                                                          METHB017
      IF (TEMF.GT.65.) TMP=65.                                          METHB018
      IF (JFLAG.EQ.0) GO TO 5                                           METHB019
      UNIFRC=.10                                                        METHB020
      GO TO 6                                                           METHB021
    5 READ 1,ICLASS,UNIFRC                                              METHB022
    1 FORMAT(I4,4X,F8.7)                                                METHB023
      IF(ICLASS.NE.ICL) CALL CLASSE (ICL,ICLASS)                        METHB024
    6 FRC=(((1.0-UNIFRC)*((65.0-TMP)/(ADD*24.0)))+(UNIFRC/(24.0*365.0)))METHB025
     .    * (1.0E+6/3.6)                                               METHB026
C                                                                       METHB027
      DO 30 N=LSRCE,NSRCE                                               METHB028
      DO 10 I=1,NPLTS                                                   METHB029
      ARRAY(I+LOC1,N)=SORCE(I+LOC2,N)*FRC                               METHB030
   10 CONTINUE                                                          METHB031
      IF (NGEOM.EQ.0) GO TO 30                                          METHB032
      DO 20 I=1,NGEOM                                                   METHB033
      ARRAY(I,N)=SORCE(I+2,N)                                           METHB034
   20 CONTINUE                                                          METHB035
   30 CONTINUE                                                          METHB036
      RETURN                                                            METHB037
      END                                                               METHB038
```

SUBROUTINE METHC

Purpose:

To calculate diurnal emissions using the same distribution pattern for all sources in the class.

Input:

The ICLASS number of the sources and the fractions of the hour, day and month, FH, FD and FM, which the sources are on. If one or two of the fractions are left blank, the default is used. If all are blank, the sources are assumed to be off.

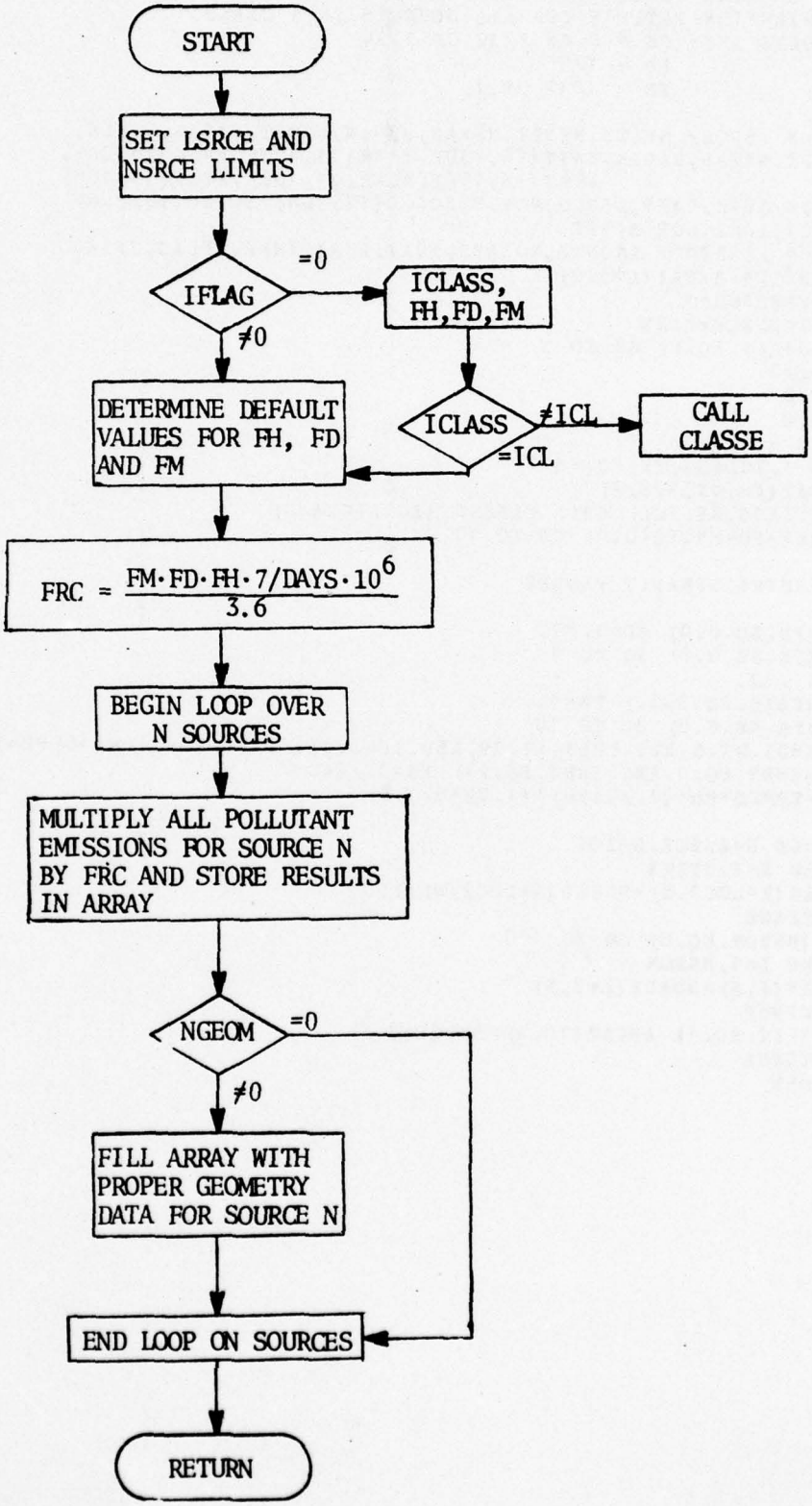
Output:

The array specified in the calling sequence to the subroutine is filled with the computed emission data.

Subroutines Called:

CLASSE

SUBROUTINE METHC



```
      SUBRCUTINE METHC(MAXN,ARRAY,I1,I2,ICL)                            METHC000
C                                                                       METHC001
C     THIS RCUTINE CALCULATES DIURNAL EMISSIONS USING THE SAME          METHC002
C     DISTRIBUTION PATTERN FOR ALL SOURCES IN A CLASS.                  METHC003
C     DEFAULTS ARE: FH = 0 CR 1/12 OR 1/24                              METHC004
C                   FD = 1/7                                            METHC005
C                   FM = 1/12 OR 1                                      METHC006
C                                                                       METHC007
      COMMON /SRCE/ NPLTS,NENPT,NFNAR,NENLN,NABPT,NABAR,NABLN,          METHC008
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         METHC009
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)         METHC010
      CCMMCN/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)          METHC011
     . ,LOC1,LOC2,NGECM,IPT                                             METHC012
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG          METHC013
      DIMENSICN ARRAY(I1,I2)                                            METHC014
      LSRCE=NSRCE+1                                                     METHC015
      NSRCE=NSRCE+MAXN                                                  METHC016
      IF (JFLAG.EQ.C) GO TO 5                                           METHC017
      FD=1./7.                                                          METHC018
      FM=0.0                                                            METHC019
      FH=0.0                                                            METHC020
      GC TC 6                                                           METHC021
    5 READ 1,ICLASS,FH,FD,FM                                            METHC022
    1 FORMAT(I4,4X,3F8.7)                                               METHC023
      IF(ICLASS.NE.ICL) CALL CLASSE (ICL,ICLASS)                        METHC024
      IF (FH+FD+FM.EQ.0.0) GO TO 10                                     METHC025
C                                                                       METHC026
C     DETERMINE DEFAULT VALUES                                          METHC027
C                                                                       METHC028
      IF (FD.EQ.0.0) FD=1./7.                                           METHC029
    6 IF (FM.NE.0.0) GO TO 7                                            METHC030
      FM=1./12.                                                         METHC031
      IF (DAYS.GE.365.) FM=1.                                           METHC032
    7 IF (FH.NE.0.0) GC TO 10                                           METHC033
      IF(IHR1.GT.6.AND.IHR1.LT.19.AND.IHR2.GT.6.AND.IHR2.LT.19)FH=1./12.METHC034
      IF (IHR1.EQ.1.AND.IHR2.EQ.24) FH=1./24.                           METHC035
   10 FRC=FM*FD*FH*(7./DAYS)*(1.0E+6/3.6)                               METHC036
C                                                                       METHC037
   20 DC 100 N=LSRCE,NSRCE                                              METHC038
      DO 30 I=1,NPLTS                                                   METHC039
      ARRAY(I+LOC1,N)=SORCE(I+LOC2,N)*FRC                               METHC040
   30 CCNTINUE                                                          METHC041
      IF (NGEOM.EQ.0) GO TO 100                                         METHC042
      DO 40 I=1,NGEOM                                                   METHC043
      ARRAY(I,N)=SORCE(I+2,N)                                           METHC044
   40 CONTINUE                                                          METHC045
      IF (IPT.EQ.1) ARRAY(10,N)=SORCE(2,N)                              METHC046
  100 CONTINUE                                                          METHC047
      RETURN                                                            METHC048
      END                                                               METHC049
```

SUBROUTINE METHD

Purpose:

To calculate diurnal emissions using the temporal distribution arrays for fuel handling activities.

Input:

None

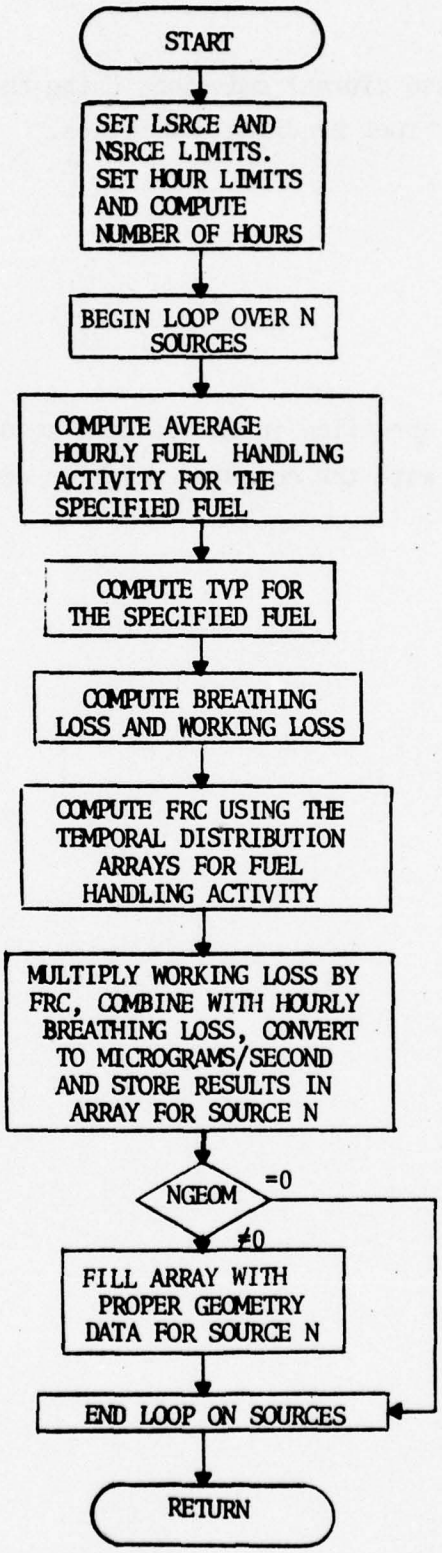
Output:

The array specified in the calling sequence to the subroutine is filled with the computed emission data.

Subroutines Called:

None

SUBROUTINE METHD



```
      SUBROUTINE METHD(MAXN,ARRAY,I1,I2)                                METHD000
C                                                                       METHD001
C     THIS ROUTINE CALCULATES DIURNAL EMISSIONS USING THE               METHD002
C     TEMPORAL DISTRIBUTION ARRAYS FOR FUEL HANDLING ACTIVITIES         METHD003
C                                                                       METHD004
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,          METHD005
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         METHD006
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)         METHD007
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)          METHD008
     . ,LOC1,LOC2,NGEOM,IPT                                             METHD009
      COMMON/PERIOD/IMONTH,NODAYS,IDAY,IHR1,IHR2                        METHD010
      COMMON/MET/WS,WSMPH,IWS,WD,IWD,SINWD,COSWD,                       METHD011
     .  JSTAB,RLID,TEMF,TEMK                                            METHD012
      COMMON / DEFALT /  ITAPE,ACLNDY,ACLNDZ,ALPHA(7),BETA(7),FLDENS(7) METHD013
      COMMON /DSTRBT/ ACMO(13,8),ACDY(2,8),ACHR(24,8),VHMLMO(13),       METHD014
     . VHMLDY(2),VHMLHR(24),CVABMO(13),CVABDY(2),CVABHR(24),CVENMO(13), METHD015
     . CVENDY(2),CVENHR(24),FLMO(13,7),FLDY(2,7),FLHR(24,7),NC1         METHD016
      COMMON/MONMET/ TMBAR                                              METHD017
      DIMENSION ARRAY(I1,I2)                                            METHD018
      LSRCE=NSRCE+1                                                     METHD019
      NSRCE=NSRCE+MAXN                                                  METHD020
      NHI=IHR2                                                          METHD021
      IF(IHR1.GT.IHR2) NHI=24+IHR2                                      METHD022
      HRS=NHI-IHR1 + 1                                                  METHD023
      DO 30 N=LSRCE,NSRCE                                               METHD024
      FLHOUR=0.                                                         METHD025
      IDF=SORCE(14,N)                                                   METHD026
      DO 10 I=IHR1,NHI                                                  METHD027
      II=I                                                              METHD028
      IF(I.GT.24) II=I-24                                               METHD029
      FLHOUR=FLHR(II,IDF)+FLHOUR                                        METHD030
   10 CONTINUE                                                          METHD031
      FLHOUR=FLHOUR/HRS                                                 METHD032
      TVP=EXP(ALPHA(IDF)-BETA(IDF)/(5.*(TMBAR-32.)/9.+273.))            METHD033
      BRLOSS=SORCE(13,N)*(TVP/(14.7-TVP))**0.69                         METHD034
      WRKLOS=SORCE(12,N)*TVP                                            METHD035
      FRC=FLMO(IMONTH,IDF)*FLDY(IDAY,IDF)*FLHOUR*(7./DAYS)              METHD036
C                                                                       METHD037
      ARRAY(12,N)=(BRLOSS/(365.*24.)+WRKLOS*FRC)*1.E+6/3.6              METHD038
      IF(IPT.EQ.1)  ARRAY(10,N)=SORCE(2,N)                              METHD039
      IF (NGEOM.EQ.0) GO TO 30                                          METHD040
      DO 20 I=1,NGEOM                                                   METHD041
      ARRAY(I,N)=SORCE(I+2,N)                                           METHD042
   20 CONTINUE                                                          METHD043
   30 CONTINUE                                                          METHD044
      RETURN                                                            METHD045
      END                                                               METHD046
```

SUBROUTINE METHE

Purpose:

To calculate diurnal emissions using the temporal distribution arrays for vehicle activities.

Input:

None

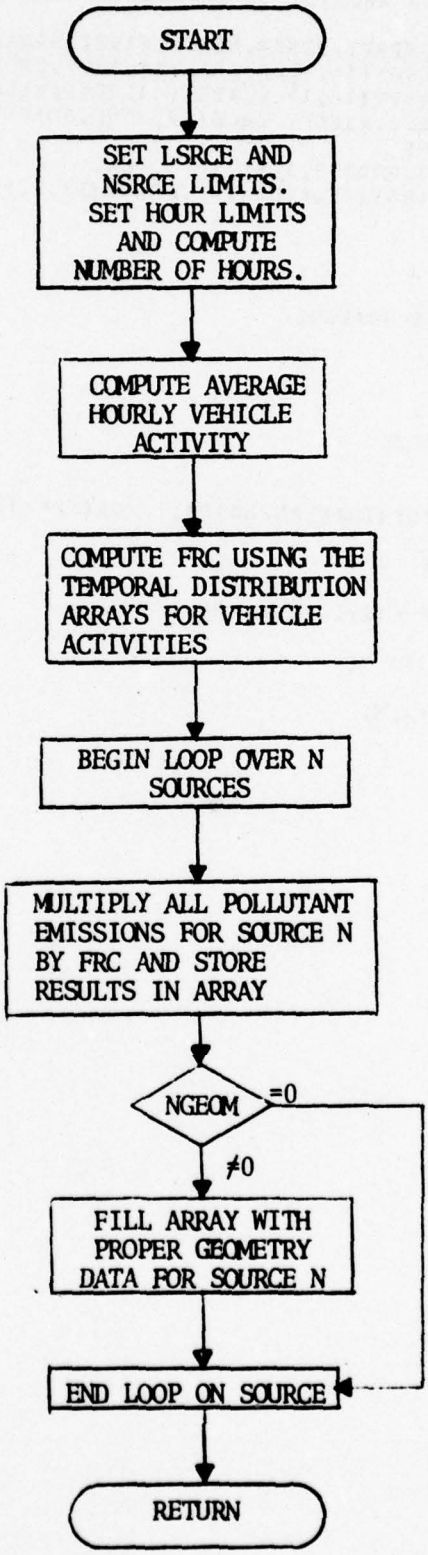
Output:

The array specified in the calling sequence to the subroutine is filled with the computed emission data.

Subroutines Called:

None

SUBROUTINE METHE



```
      SUBRCUTINE METHE(MAXN,ARRAY,ARMO,ARDY,ARHR,I1,I2)                 METHE000
C                                                                       METHE001
C     THIS ROUTINE CALCULATES DIURNAL EMISSIONS USING THE               METHE002
C     TEMPORAL DISTRIBUTION ARRAYS FOR VEHICLE ACTIVITES                METHE003
C                                                                       METHE004
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,          METHE005
     . NACPT,NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),         METHE006
     .                   ABPT(16,150),ABAR(11,100),ABLN(14,100)         METHE007
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)          METHE008
     . ,LOC1,LOC2,NGEOM,IPT                                             METHE009
      COMMON/PERIOD/IMONTH,NODAYS,IDAY,IHR1,IHR2                        METHE010
      DIMENSION ARMO(13),ARDY(2),ARHR(24),ARRAY(I1,I2)                  METHE011
      LSRCE=NSRCE+1                                                     METHE012
      NSRCE=NSRCE+MAXN                                                  METHE013
      ARHOUR=0.                                                         METHE014
      NHI=IHR2                                                          METHE015
      IF(IHR1.GT.IHR2) NHI=24+IHR2                                      METHE016
      HRS=NHI-IHR1+1                                                    METHE017
      DO 10 I=IHR1,NHI                                                  METHE018
      II=I                                                              METHE019
      IF(I.GT.24) II=I-24                                               METHE020
      ARHOUR=ARHOUR+ARHR(II)                                            METHE021
   10 CONTINUE                                                          METHE022
      ARHOUR=ARHOUR/HRS                                                 METHE023
      FRC=ARMO(IMONTH)*ARDY(IDAY)*ARHOUR*(7./DAYS)*(1E+6/3.6)           METHE024
C                                                                       METHE025
      DO 40 N=LSRCE,NSRCE                                               METHE026
      DO 20 I=1,NPLTS                                                   METHE027
      ARRAY(I+LOC1,N)=SORCE(I+LOC2,N)*FRC                               METHE028
   20 CONTINUE                                                          METHE029
      IF (NGEOM.EQ.C) GO TO 40                                          METHE030
      DO 30 I=1,NGEOM                                                   METHE031
   30 ARRAY(I,N)=SORCE(I+2,N)                                           METHE032
   40 CONTINUE                                                          METHE033
      RETURN                                                            METHE034
      END                                                               METHE035
```

SUBROUTINE OUTPUT

Purpose:

To print the pollutant concentrations at all receptors for the environ, airbase, aircraft and total combined sources.

Input:

1. Title information.
2. The RECEP and RECDAT arrays containing receptor and concentration data.

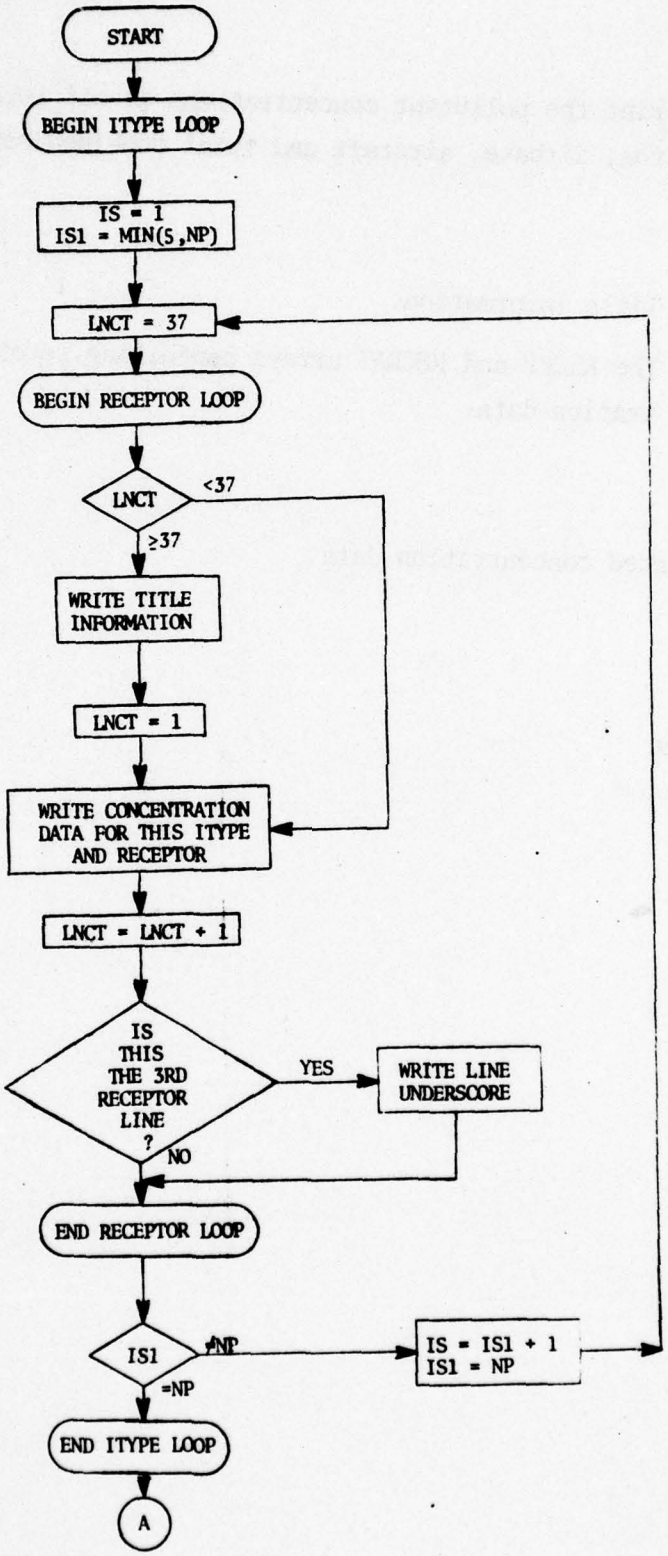
Output:

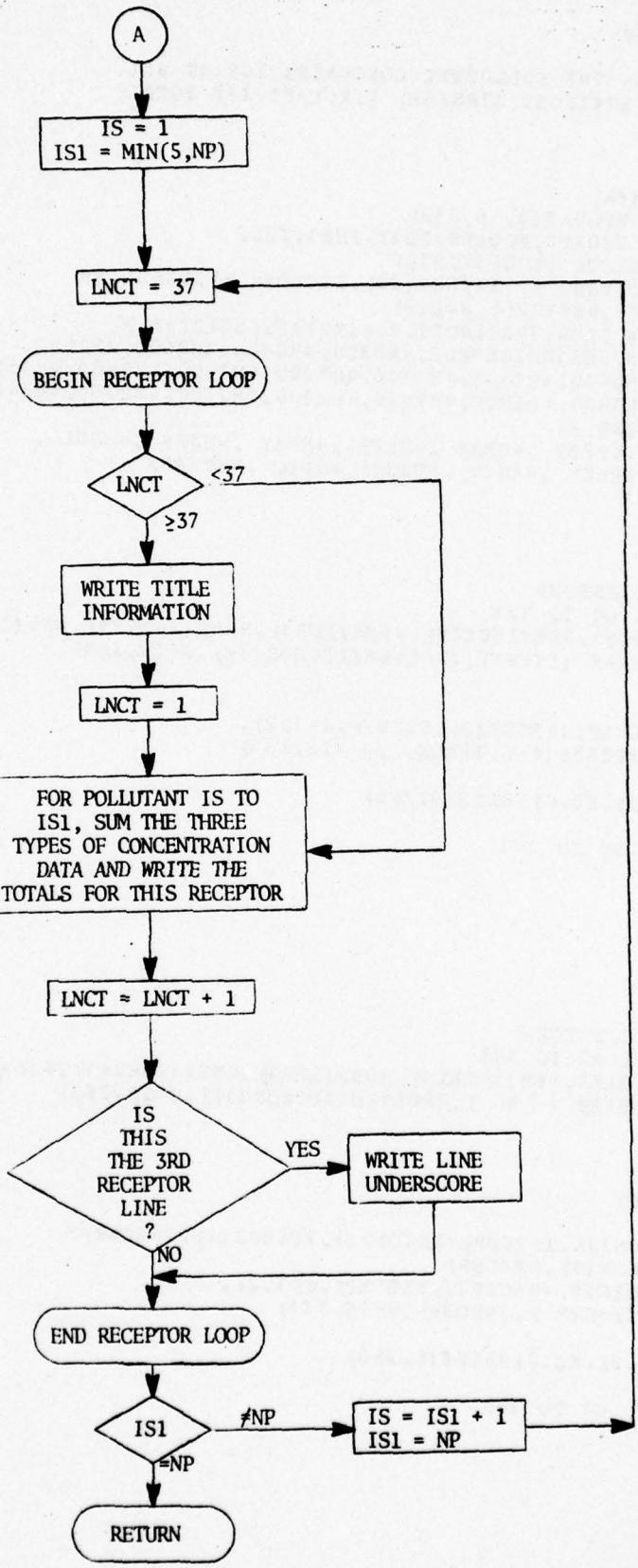
Printed concentration data.

Subroutines Called:

None

SUBROUTINE OUTPUT




A
IS = 1
IS1 = MIN(5,NP)
LNCT = 37
BEGIN RECEPTOR LOOP
LNCT
<37
≥37
WRITE TITLE INFORMATION
LNCT = 1
FOR POLLUTANT IS TO IS1, SUM THE THREE TYPES OF CONCENTRATION DATA AND WRITE THE TOTALS FOR THIS RECEPTOR
LNCT = LNCT + 1
IS THIS THE 3RD RECEPTOR LINE ?
YES
WRITE LINE UNDERSCORE
NO
END RECEPTOR LOOP
IS1
≠NP
IS = IS1 + 1
IS1 = NP
=NP
RETURN

```
      SUBROUTINE OUTPUT                                                 OUTPT000
C                                                                       OUTPT001
C   THIS ROUTINE PRINTS THE POLLUTANT CONCENTRATION AT ALL              OUTPT002
C   RECEPTORS FOR THE ENVIRON, AIRBASE, AIRCRAFT AND TOTAL              OUTPT003
C   COMBINED SOURCES.                                                   OUTPT004
C                                                                       OUTPT005
      REAL*8 POLNAM                                                     OUTPT006
      REAL*8    SORNAM(4)                                               OUTPT007
      COMMON /AIRQAL/ RECDAT(3, 6,312)                                  OUTPT008
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2                      OUTPT009
      COMMON /RCPT/ NRECEP,RECEP(2,312)                                 OUTPT010
      COMMON /TITL/ POLNAM( 6),TITLE1(20),IPCHOS( 6),NXPOL,NP           OUTPT011
      DIMENSION NNM(13),NNHR(25),NND(2)                                 OUTPT012
      DATA SORNAM/7HENVIRON,7HAIRPORT,8HAIRCRAFT,5HTOTAL /              OUTPT013
      DATA NNHR/4H0000,4H0100,4H0200,4H0300,4H0400,4H0500,4H0600,       OUTPT014
     .4H0700,4H0800,4H0900,4H1000,4H1100,4H1200,4H1300,4H1400,4H1500,   OUTPT015
     .4H1600,4H1700,4H1800,4H1900,4H2000,4H2100,4H2200,4H2300,4H2400/,  OUTPT016
     . NND /4HDAY ,4HEND /,                                             OUTPT017
     .     NNM/4HJAN ,4HFEB ,4HMAR ,4HAPR ,4HMAY ,4HJUN ,4HJUL ,        OUTPT018
     .       4HAUG ,4HSEP ,4HOCT ,4HNOV ,4HDEC ,4HYEAR/                 OUTPT019
      DO 100 ITYPE=1,3                                                  OUTPT020
      IS=1                                                              OUTPT021
      IS1=MIN0(5,NP)                                                    OUTPT022
  110 LNCT=37                                                           OUTPT023
      DO 120 IRECEP=1,NRECEP                                            OUTPT024
      IF (LNCT.LT.37) GO TO 121                                         OUTPT025
      WRITE(6,220)TITLE1,NNM(IMONTH),NNHR(IHR1),NNHR(IHR2+1),NND(IDAY)  OUTPT026
      WRITE(6,200)SORNAM (ITYPE),(POLNAM(IPCHOS(J)),J=IS,IS1)           OUTPT027
      WRITE (6,260)                                                     OUTPT028
      LNCT=1                                                            OUTPT029
  121 WRITE(6,210)IRECEP,(RECEP(J,IRECEP),J=1,2),                       OUTPT030
     .(RECDAT(ITYPE,IPCHOS(K ),IRECEP),K =IS,IS1)                       OUTPT031
      LNCT=LNCT+1                                                       OUTPT032
      IF(MOD(IRECEP,3).EQ.0)WRITE(6,260)                                OUTPT033
  120 CONTINUE                                                          OUTPT034
      IF (IS1.EQ.NP) GO TO 100                                          OUTPT035
      IS=IS1+1                                                          OUTPT036
      IS1=NP                                                            OUTPT037
      GO TO 110                                                         OUTPT038
  100 CONTINUE                                                          OUTPT039
      IS=1                                                              OUTPT040
      IS1=MIN0(5,NP)                                                    OUTPT041
  125 LNCT=37                                                           OUTPT042
      DO 130 IRECEP=1,NRECEP                                            OUTPT043
      IF (LNCT.LT.37) GO TO 133                                         OUTPT044
      WRITE(6,220)TITLE1,NNM(IMONTH),NNHR(IHR1),NNHR(IHR2+1),NND(IDAY)  OUTPT045
      WRITE(6,200)SORNAM (  4  ),(POLNAM(IPCHOS(J)),J=IS,IS1)           OUTPT046
      WRITE (6,260)                                                     OUTPT047
      LNCT=1                                                            OUTPT048
  133 CONTINUE                                                          OUTPT049
      DO 131 J=IS,IS1                                                   OUTPT050
      DO 131 K=2,3                                                      OUTPT051
  131 RECDAT(1,IPCHOS(J),IRECEP)=RECDAT(1,IPCHOS(J),IRECEP) +           OUTPT052
     . RECDAT(K,IPCHOS(J),IRECEP)                                       OUTPT053
      WRITE(6,210)IRECEP,(RECEP(J,IRECEP),J=1,2),                       OUTPT054
     . (RECDAT(1,IPCHOS(K ),IRECEP),K=IS,IS1)                           OUTPT055
      LNCT=LNCT+1                                                       OUTPT056
      IF(MOD(IRECEP,3).EQ.0)WRITE(6,260)                                OUTPT057
  130 CONTINUE                                                          OUTPT058
      IF (IS1.EQ.NP) GO TO 140                                          OUTPT059
      IS=IS1+1                                                          OUTPT060
      IS1=NP                                                            OUTPT061
```

```
      GO TO 125                                                          OUTPT062
  140 CONTINUE                                                           OUTPT063
  200 FORMAT(1H0,96(1H-)/2H I,22X,33HRECEPTOR CONCENTRATION DATA FROM , OUTPT064
     . A8,8H SOURCES,23X,1HI/2H I,94(1H-),1HI/                           OUTPT065
     . 37H I RECEPTOR I   RECEPTOR LOCATION   I,17X,24HEXPECTED ARITHMETOUTPT066
     .IC MEAN,18X,1HI/13H I  NUMBER  I,23X,1HI,59X,1HI/                  OUTPT067
     . 2H I,10(1H-),1HI,23(1H-),1HI,59(1H-),1HI/                         OUTPT068
     . 2H I,10X,1HI,5X,12H(KILOMETERS),6X,1HI,18X,22H(MICROGRAMS/CU. METOUTPT069
     .ER),19X,1HI,/2H I,10X,1HI,5X,1HX,5X,1HI,5X,1HY,                    OUTPT070
     . 5X,4(3HI  ,A8,1X),3HI  ,A8,2H I)                                  OUTPT071
  210 FORMAT(2H I,I6,4X,2(1HI,F9.3,2X),1HI,5(1PE10.3,2H I))              OUTPT072
  220 FORMAT(1H1,9X,20A4/10H  MONTH = ,A4,12H   PERIOD = ,A4,4H TO ,     OUTPT073
     . A4,16H HOURS ON A WEEK,A4)                                        OUTPT074
  260 FORMAT(2HI,10(1H-),1HI,7(11(1H-),1HI))                             OUTPT075
      RETURN                                                             OUTPT076
      END                                                                OUTPT077
```

SUBROUTINE PLRISE

Purpose:

To calculate the effective height and the vertical and horizontal dispersion coefficients for a given stack.

Input:

The stack parameters and current meteorological conditions.

Output:

1. The effective height, h_{eff}.
2. The vertical and horizontal dispersion coefficients, σ_{yo} and σ_{zo}.
3. KSTAB, a flag used in the TRAN function
   - = 0, the modified stack height is below the lid
   - = 1, the modified stack height is initially above the lid
   - = 2, the plume will penetrate the lid.

Procedure:

1. For point sources having no plume rise:

   $h_{eff} = \max (Z_S, H_B, \Delta Z/2.)$

   $\sigma_{yo} = \Delta Y/2.4$

   $\sigma_{zo} = \Delta Z/2.4$

   KSTAB = 0 or 1

2. For point sources which may undergo plume rise:
   a. Estimate the wind speed at the top of the aerovane
   b. Modify the stack height by the effect of the stack downwash
   c. Test for building downwash effects. If downwash occurs:

      $h_{eff} = H_B + .5L_B$

      $\sigma_{yo} = \sigma_{zo} = h_{eff}/1.2$

      KSTAB = 0 or 1

   d. Test to determine if the buoyant plume rise is significant.

e. Check for an inversion

f. Compute the plume rise using function RISE

g. If no downwash occurs:

$$H_{eff} = Z_S + 2\left(\frac{VS}{U_a} - 1.5\right) \cdot DS + \text{plume rise}$$

$$\sigma_{yo} = \Delta Y/2.4$$

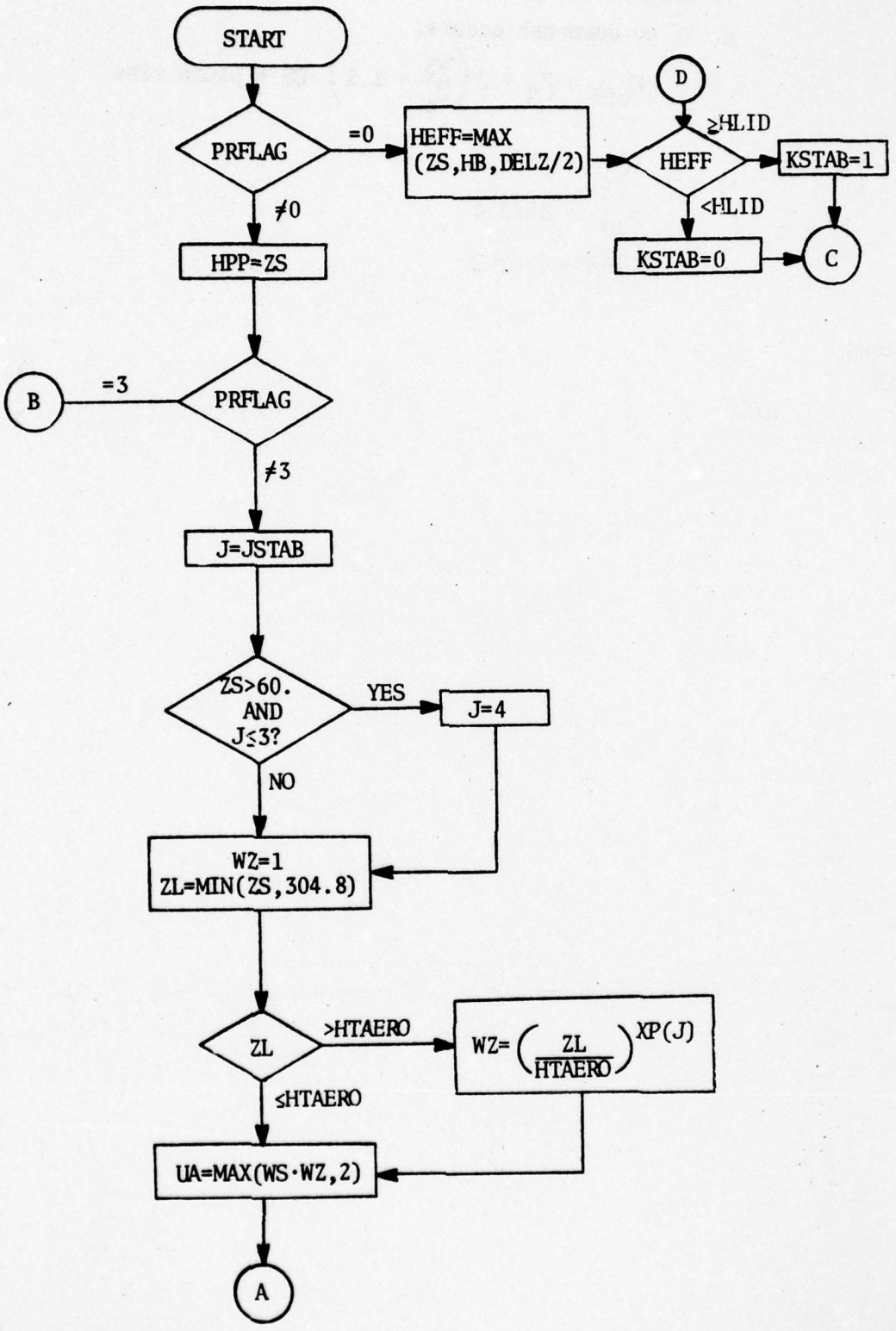
$$\sigma_{zo} = \Delta Z/2.4$$

KSTAB = 1 or 2

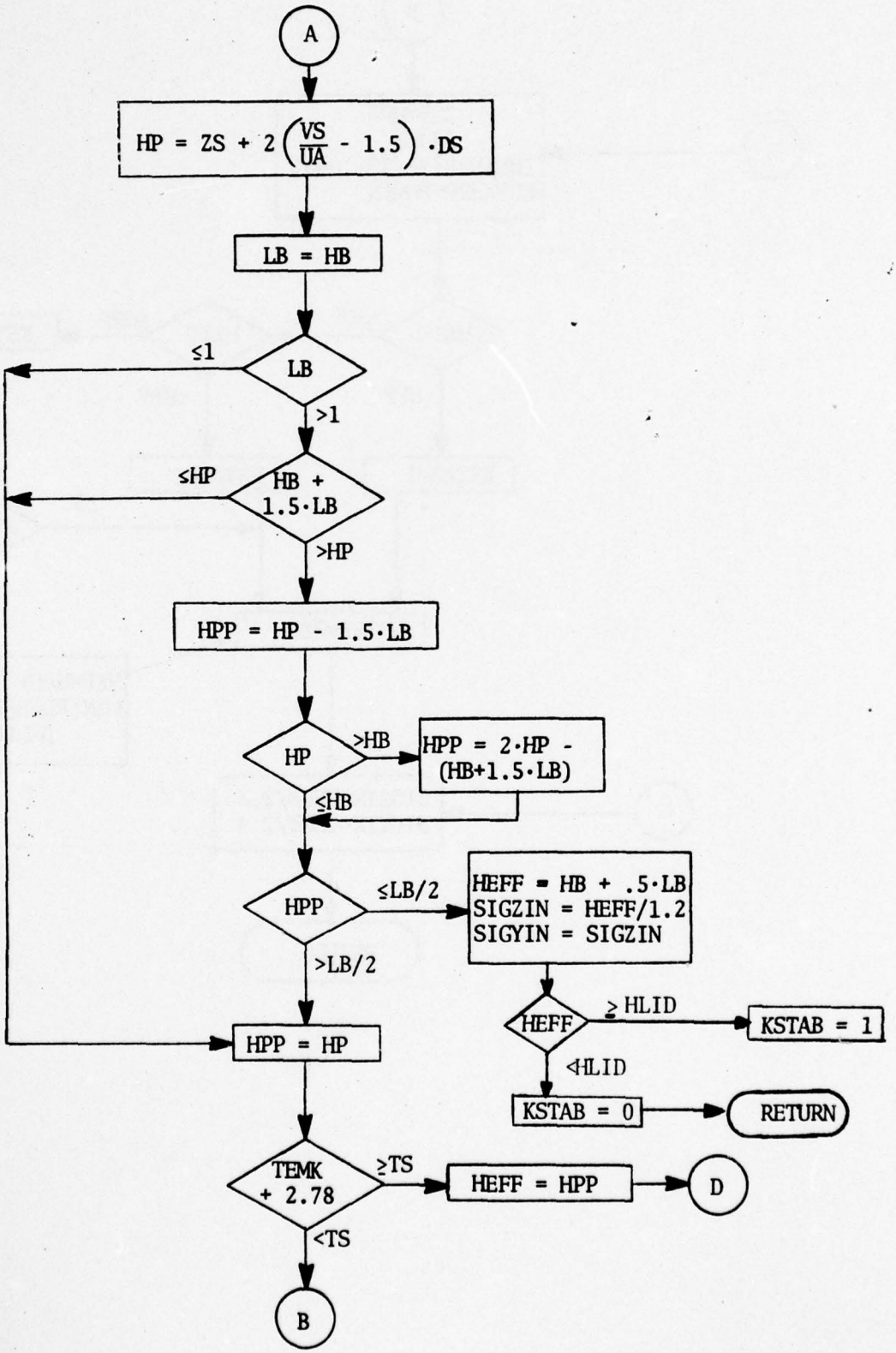
Functions Called:

RISE

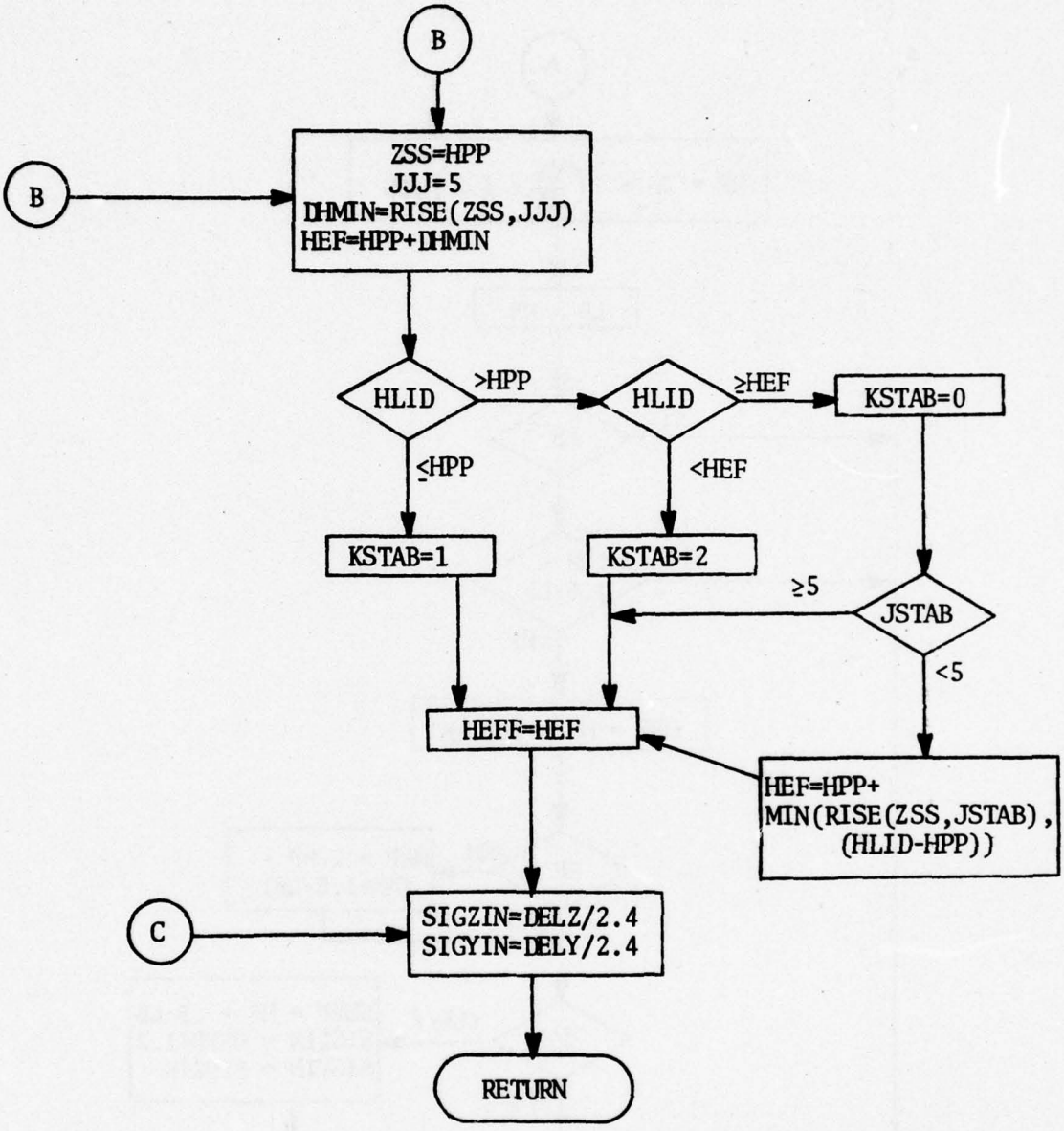
SUBROUTINE PLRISE



SUBROUTINE PLRISE (Cont'd.)



SUBROUTINE PLRISE (Cont'd.)



```
      SUBROUTINE PLRISE(HEFF,KSTAB,SIGZIN,SIGYIN)                       PLRSE000
C                                                                       PLRSE001
C   THIS SUBROUTINE CALCULATES THE EFFECTIVE HEIGHT AND THE             PLRSE002
C   VERTICAL AND HORIZONTAL DISPERSION COEFFICIENTS                     PLRSE003
C   FOR A GIVEN STACK                                                   PLRSE004
C                                                                       PLRSE005
      REAL LB                                                           PLRSE006
      COMMON /MET/ VS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMP,   PLRSE007
     . TEMK,UA                                                          PLRSE008
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE,HTAERO,XS,YS,ZS,DELY,DELZ,      PLRSE009
     .  TS,VS,DS,HB,PRFLAG,EMIS(8),NPOL                                 PLRSE010
      COMMON /WNDPRO/ XP(6)                                             PLRSE011
      IF (PRFLAG.NE.0) GO TO 100                                        PLRSE012
C                                                                       PLRSE013
C   FOR AN AREA SOURCE WITH A DIAMETER OF LESS THAN 50 METERS           PLRSE014
C   THE EFFECTIVE EMISSION HEIGHT IS SET TO THE MAXIMUM OF              PLRSE015
C   Z, THE BUILDING HEIGHT OR DELTA Z/2.0                               PLRSE016
C                                                                       PLRSE017
      HEFF=AMAX1(ZS,HB,DELZ/2.)                                         PLRSE018
   50 KSTAB=0                                                           PLRSE019
      IF (HEFF.GE.HLID) KSTAB=1                                         PLRSE020
      GO TO 230                                                         PLRSE021
C                                                                       PLRSE022
  100 CONTINUE                                                          PLRSE023
      HPP=ZS                                                            PLRSE024
      IF (PRFLAG.EQ.3) GO TO 130                                        PLRSE025
C                                                                       PLRSE026
C   FIRST TEST FOR DOWNWASH, THEN COMPUTE PLUME RISE, IF ANY            PLRSE027
C                                                                       PLRSE028
C   FOR TALL STACKS USE STABILITY 4 IN THE WIND PROFILE LAW             PLRSE029
C                                                                       PLRSE030
      J=JSTAB                                                           PLRSE031
      IF (ZS.GT.60..AND.J.LE.3) J=4                                     PLRSE032
C                                                                       PLRSE033
C   COMPUTE THE WINDSPEED AT THE ELEVATION OF THE STACK                 PLRSE034
C                                                                       PLRSE035
      WZ=1.0                                                            PLRSE036
      ZL=AMIN1(ZS,304.8)                                                PLRSE037
      IF (ZL.GT.HTAERO) WZ=(ZL/HTAERO)**XP(J)                           PLRSE038
      UA=AMAX1(VS*WZ,2.0)                                               PLRSE039
C                                                                       PLRSE040
C   COMPUTE STACK DOWNWASH                                              PLRSE041
C                                                                       PLRSE042
      HP=ZS+2.0*(VS/UA-1.5)*DS                                          PLRSE043
      LB=HP                                                             PLRSE044
C                                                                       PLRSE045
C   BUILDING DOWNWASH TESTS                                             PLRSE046
C                                                                       PLRSE047
      IF (LB.LE.1.) GO TO 110                                           PLRSE048
      IF (HP.GE.(HB+1.5*LB)) GO TO 110                                  PLRSE049
      HPP=HP-1.5*LB                                                     PLRSE050
      IF (HP.GT.HB) HPP=2.0*HP-(HB+1.5*LB)                              PLRSE051
      IF (HPP.GT.(LP/2.0)) GO TO 110                                    PLRSE052
C                                                                       PLRSE053
C   BUILDING DOWNWASH OCCURS                                            PLRSE054
C                                                                       PLRSE055
      HEFF=HB+0.5*LP                                                    PLRSE056
      SIGZIN=HEFF/1.2                                                   PLRSE057
      SIGYIN=SIGZIN                                                     PLRSE058
      KSTAB=0                                                           PLRSE059
      IF (HEFF.GE.HLID) KSTAB=1                                         PLRSE060
      RETURN                                                            PLRSE061
```

```
C                                                                       PLRSE062
C   NC BUILDING DOWNWASH, TEST FOR PLUME RISE                           PLRSE063
C                                                                       PLRSE064
  110 HPP=HP                                                            PLRSE065
      IF (TS.GT.(TEMK+2.78)) GO TO 130                                  PLRSE066
C                                                                       PLRSE067
C   COLD PLUME                                                          PLRSE068
C                                                                       PLRSE069
      HEFF=HPP                                                          PLRSE070
      GO TO 50                                                          PLRSE071
  130 CONTINUE                                                          PLRSE072
C                                                                       PLRSE073
C   PLUME RISE EXPECTED TO BE SIGNIFICANT                               PLRSE074
C   CALCULATE MINIMUM PLUME RISE                                        PLRSE075
C                                                                       PLRSE076
      ZSS=HPP                                                           PLRSE077
      JJJ=5                                                             PLRSE078
      DHMIN=RISE(ZSS,JJJ)                                               PLRSE079
      HEF=HPP+DHMIN                                                     PLRSE080
C                                                                       PLRSE081
C   TEST FOR INTERFERENCE OF LID WITH MODIFIED PHYSICAL STACK           PLRSE082
C   HEIGHT AND PLUME                                                    PLRSE083
C                                                                       PLRSE084
      IF (HLID.GT.HPP) GO TO 220                                        PLRSE085
C                                                                       PLRSE086
C   LID INTERFERES WITH STACK HEIGHT, USE STABILITY 5 WITH              PLRSE087
C   INFINITE LID HEIGHT                                                 PLRSE088
C                                                                       PLRSE089
      KSTAB=1                                                           PLRSE090
      GO TO 225                                                         PLRSE091
C                                                                       PLRSE092
C   LID INTERFERES WITH PLUME, USE STABILITY 5 WITH INFINITE LID        PLRSE093
C                                                                       PLRSE094
  220 IF (HLID.GE.HEF) GO TO 221                                        PLRSE095
      KSTAB=2                                                           PLRSE096
      GO TO 225                                                         PLRSE097
C                                                                       PLRSE098
C   CALCULATE PLUME RISE, PLUME CANNOT PENETRATE THE LID                PLRSE099
C                                                                       PLRSE100
  221 KSTAB=0                                                           PLRSE101
      IF (JSTAB.LT.5) HEF=HPP+AMIN1(RISE(ZSS,JSTAB),(HLID-HPP))        PLRSE102
  225 CONTINUE                                                          PLRSE103
      HEFF=HEF                                                          PLRSE104
  230 SIGZIN=DELZ/2.4                                                   PLRSE105
      SIGYIN=DELY/2.4                                                   PLRSE106
      RETURN                                                            PLRSE107
      END                                                               PLRSE108
```

SUBROUTINE POLSOR

Purpose:

To direct the calls to the proper diffusion routine for all input sources.

Input:

1. Point source data for:
   a. Environs
   b. Airbase
   c. Aircraft
2. Area source data for:
   a. Environs
   b. Airbase
   c. Aircraft
3. Line source data for:
   a. Environs
   b. Airbase
   c. Aircraft

Output:

SORC, a vector which contains data for the current source to be transferred to the diffusion models.

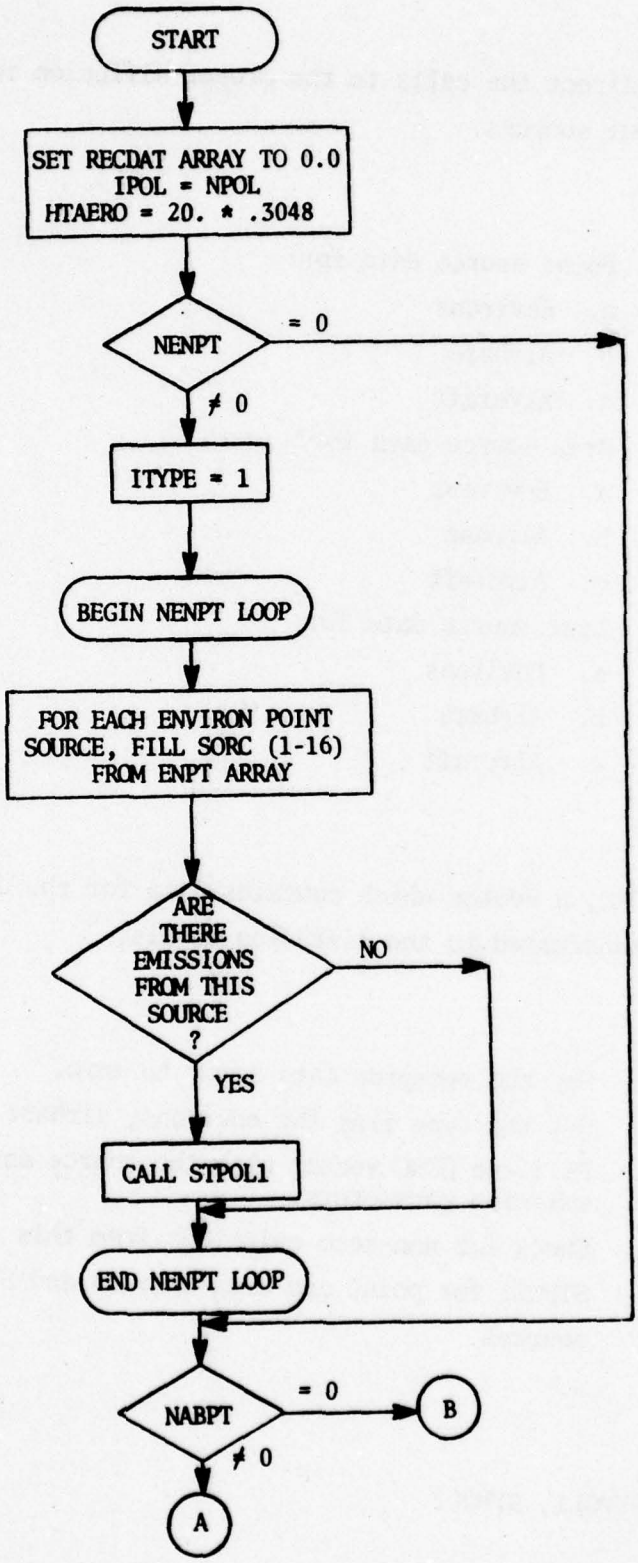
Procedure:

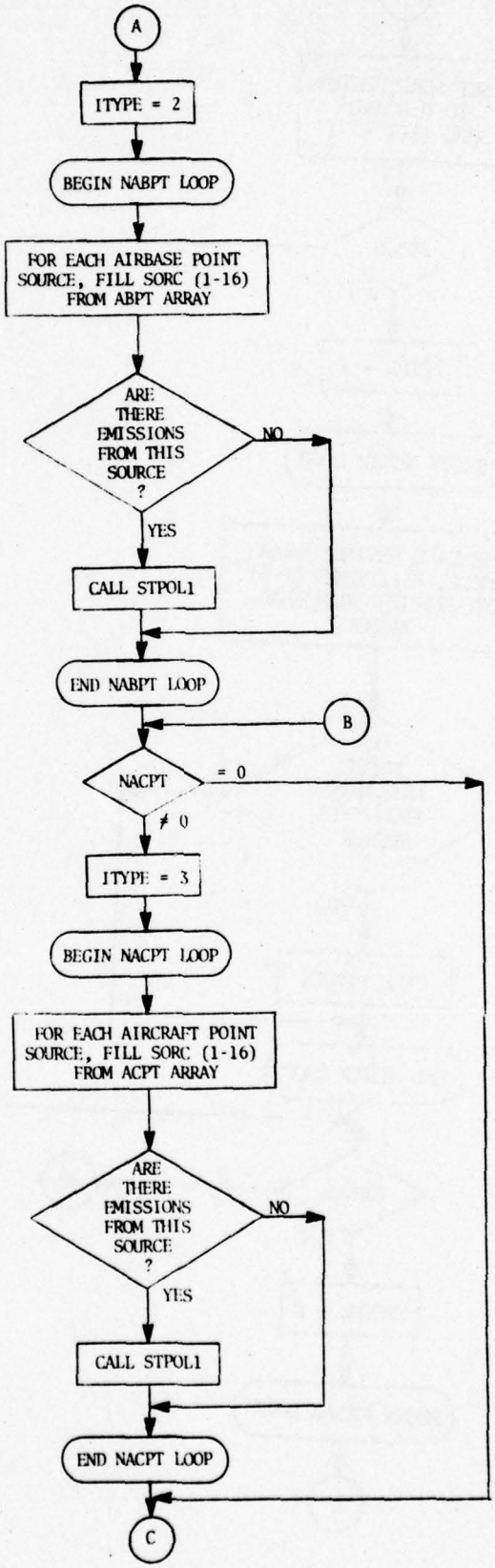
1. Set the receptor data array to zero.
2. Set the type flag for environs, airbase or aircraft.
3. Fill the SORC vector with the source description and emission parameters.
4. Check for non-zero emissions from this source and call STPOL1 for point and area sources and STPOL2 for line sources.

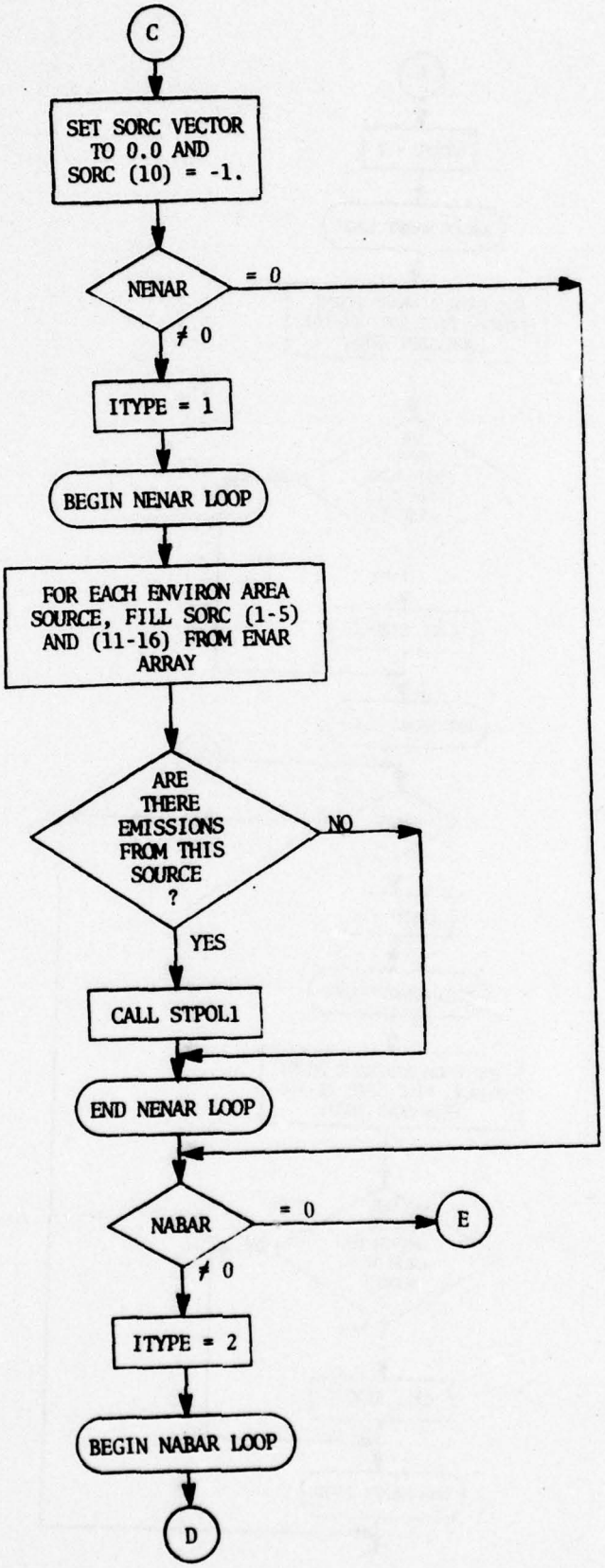
Subroutines Called:

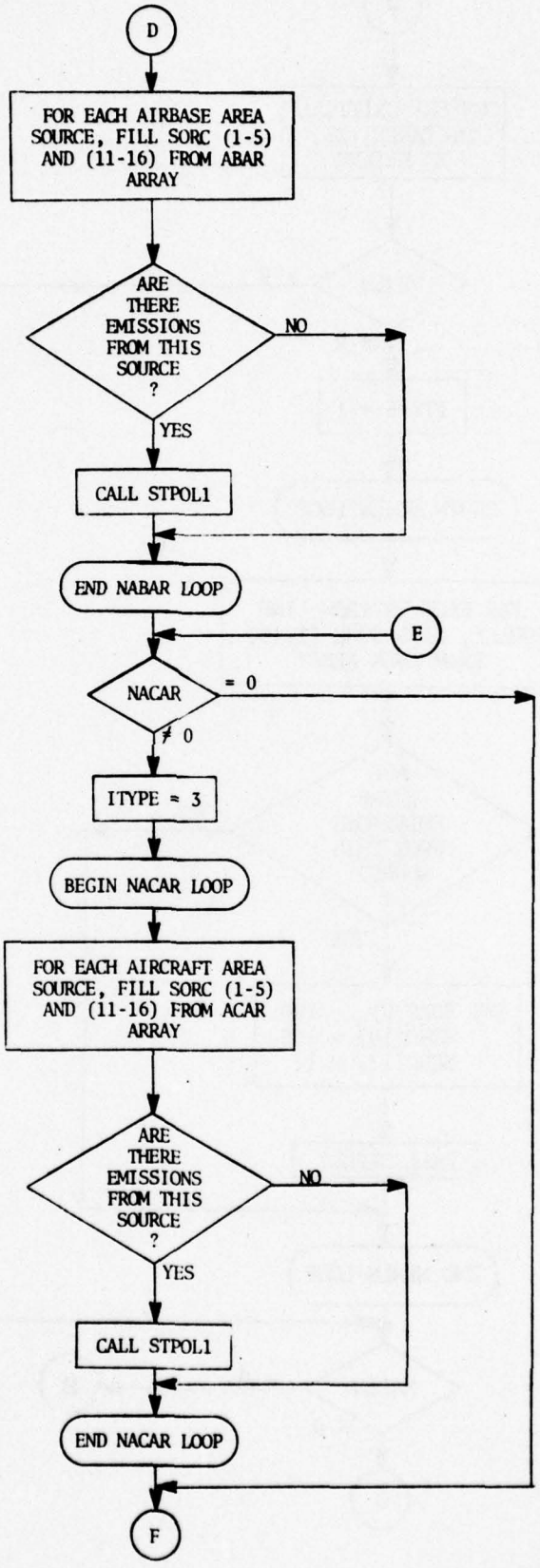
STPOL1, STPOL2

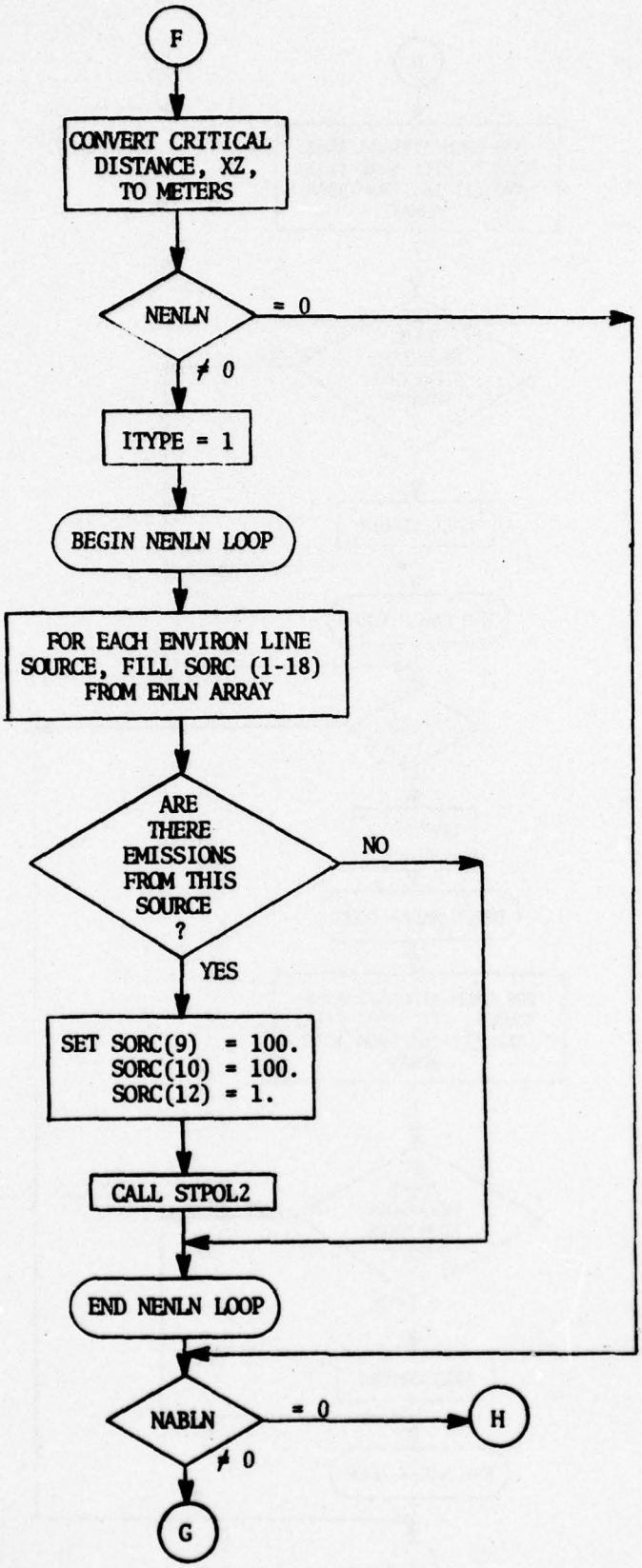
SUBROUTINE POLSOR

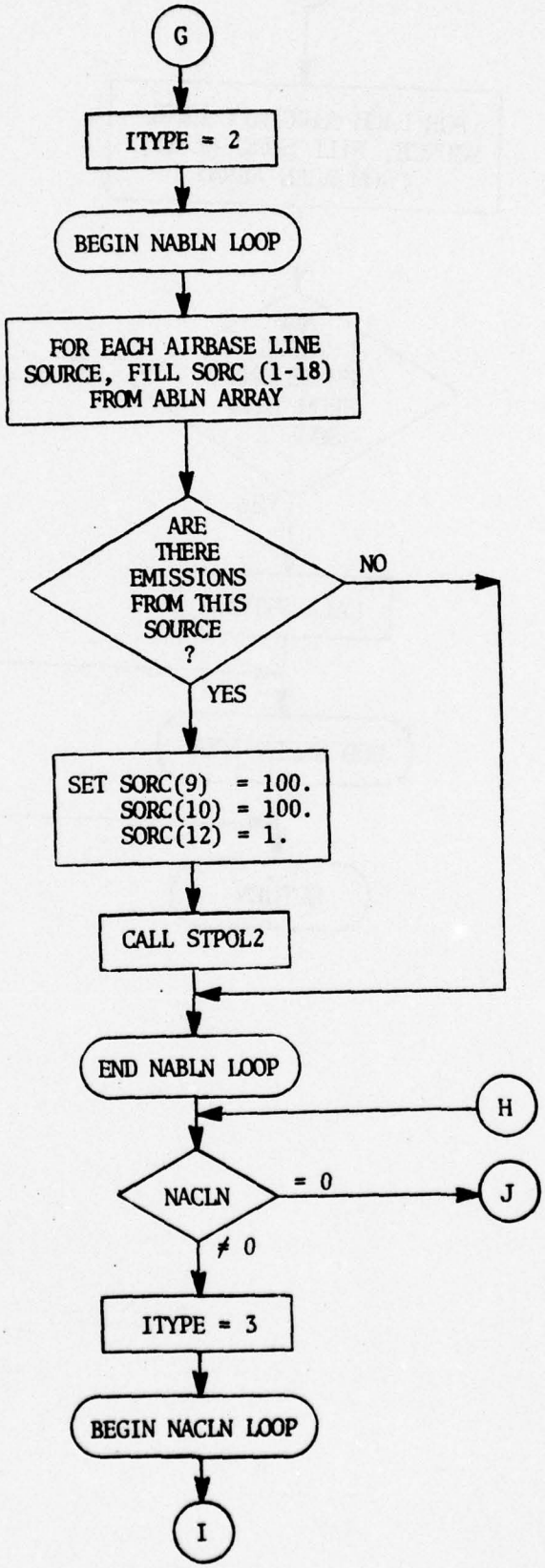


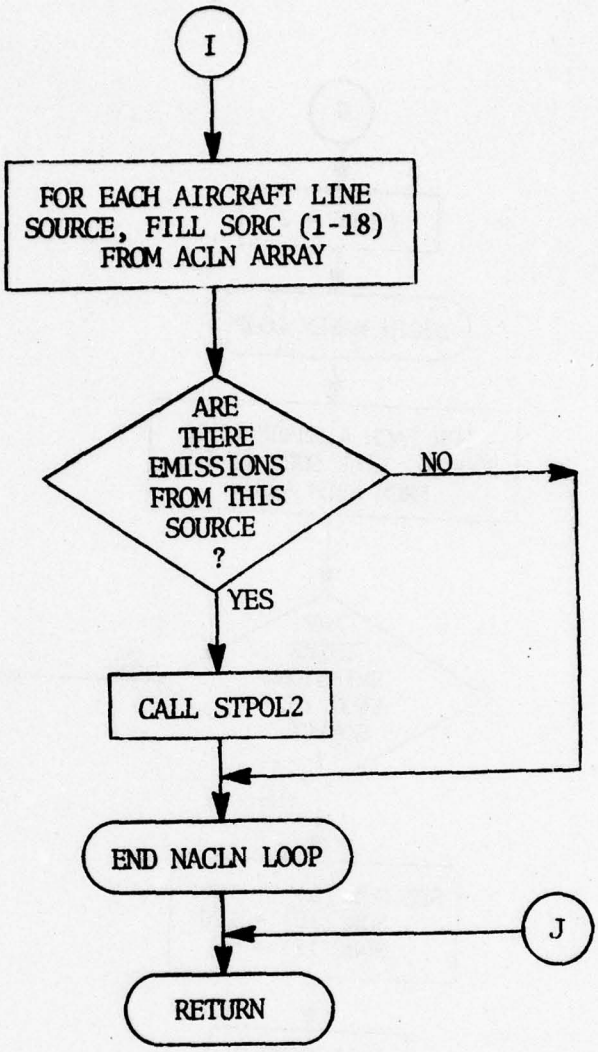

A
ITYPE = 2
BEGIN NABPT LOOP
FOR EACH AIRBASE POINT SOURCE, FILL SORC (1-16) FROM ABPT ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
CALL STPOL1
END NABPT LOOP
B
NACPT
= 0
≠ 0
ITYPE = 3
BEGIN NACPT LOOP
FOR EACH AIRCRAFT POINT SOURCE, FILL SORC (1-16) FROM ACPT ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
CALL STPOL1
END NACPT LOOP
C


C
SET SORC VECTOR TO 0.0 AND SORC (10) = -1.
NENAR
= 0
≠ 0
ITYPE = 1
BEGIN NENAR LOOP
FOR EACH ENVIRON AREA SOURCE, FILL SORC (1-5) AND (11-16) FROM ENAR ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
CALL STPOL1
END NENAR LOOP
NABAR
= 0
E
≠ 0
ITYPE = 2
BEGIN NABAR LOOP
D


D
FOR EACH AIRBASE AREA SOURCE, FILL SORC (1-5) AND (11-16) FROM ABAR ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
CALL STPOL1
END NABAR LOOP
E
NACAR
= 0
≠ 0
ITYPE = 3
BEGIN NACAR LOOP
FOR EACH AIRCRAFT AREA SOURCE, FILL SORC (1-5) AND (11-16) FROM ACAR ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
CALL STPOL1
END NACAR LOOP
F


F
CONVERT CRITICAL DISTANCE, XZ, TO METERS
NENLN
= 0
≠ 0
ITYPE = 1
BEGIN NENLN LOOP
FOR EACH ENVIRON LINE SOURCE, FILL SORC (1-18) FROM ENLN ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
SET SORC(9) = 100.
SORC(10) = 100.
SORC(12) = 1.
CALL STPOL2
END NENLN LOOP
NABLN
= 0
H
≠ 0
G


G
ITYPE = 2
BEGIN NABLN LOOP
FOR EACH AIRBASE LINE SOURCE, FILL SORC (1-18) FROM ABLN ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
SET SORC(9) = 100.
SORC(10) = 100.
SORC(12) = 1.
CALL STPOL2
END NABLN LOOP
H
NACLN
= 0
J
≠ 0
ITYPE = 3
BEGIN NACLN LOOP
I


I
FOR EACH AIRCRAFT LINE SOURCE, FILL SORC (1-18) FROM ACLN ARRAY
ARE THERE EMISSIONS FROM THIS SOURCE ?
NO
YES
CALL STPOL2
END NACLN LOOP
J
RETURN

```
      SUBROUTINE POLSOR                                                 POLSR000
C                                                                       POLSR001
C   THIS ROUTINE IS THE DRIVER FOR THE DIFFUSION MODEL.  FOR ALL        POLSR002
C   ENVIRON, AIRBASE AND AIRCRAFT POINTS, AREAS AND LINES,              POLSR003
C   THE SORC VECTOR IS FILLED WITH THE APPROPRIATE SOURCE               POLSR004
C   PARAMETERS AND THEN THE PROPER DIFFUSION ROUTINE IS CALLED          POLSR005
C                                                                       POLSR006
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMF,   POLSR007
     . TEMK                                                             POLSR008
      COMMON /SRCE/ NPOL,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,NACPT,     POLSR009
     . NACAR,NACLN,ENPT(16,100),ENAP(11,100),ENLN(14,20),ABPT(16,150),  POLSR010
     . ABAR(11,100),ABLN(14,100),ACPT(16,1),ACAR(11,24),ACLN(18,250)    POLSR011
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE     ,HTAERO,SORC(18),IPOL       POLSR012
      COMMON /AIRQAL/ RECDAT(3, 6,312)                                  POLSR013
      COMMON /XTRAN/ XZ                                                 POLSR014
C                                                                       POLSR015
C   SET RECDAT ARRAY TO 0.0                                             POLSR016
C                                                                       POLSR017
      DO 10 I=1,3                                                       POLSR018
      DO 10 J=1,6                                                       POLSR019
      DO 10 K=1,312                                                     POLSR020
   10 RECDAT(I,J,K) = 0.                                                POLSR021
      IPOL = NPOL                                                       POLSR022
      HTAERO=20.*.3048                                                  POLSR023
C                                                                       POLSR024
C   ENVIRON POINTS                                                      POLSR025
C                                                                       POLSR026
      IF (NENPT .EQ. 0) GO TO 126                                       POLSR027
      ITYPE = 1                                                         POLSR028
      DO 125 I=1,NENPT                                                  POLSR029
      DO 124 J=1,16                                                     POLSR030
  124 SORC(J) = ENPT(J,I)                                               POLSR031
      DO 224 J=11,16                                                    POLSR032
      IF(SORC(J).NE.0.0) GO TO 225                                      POLSR033
  224 CONTINUE                                                          POLSR034
      GO TO 125                                                         POLSR035
  225 CALL STPOL1                                                       POLSR036
  125 CONTINUE                                                          POLSR037
C                                                                       POLSR038
C   AIRBASE POINTS                                                      POLSR039
C                                                                       POLSR040
  126 IF (NABPT .EQ. 0) GO TO 136                                       POLSR041
      ITYPE = 2                                                         POLSR042
      DO 135 I=1,NABPT                                                  POLSR043
      DO 134 J=1,16                                                     POLSR044
  134 SORC(J) = ABPT(J,I)                                               POLSR045
      DO 234 J=11,16                                                    POLSR046
      IF(SORC(J).NE.0.0) GO TO 235                                      POLSR047
  234 CONTINUE                                                          POLSR048
      GO TO 135                                                         POLSR049
  235 CALL STPOL1                                                       POLSR050
  135 CONTINUE                                                          POLSR051
C                                                                       POLSR052
C   AIRCRAFT POINTS                                                     POLSR053
C                                                                       POLSR054
  136 IF(NACPT .EQ. 0) GO TO 146                                        POLSR055
      ITYPE = 3                                                         POLSR056
      DO 145 I=1,NACPT                                                  POLSR057
      DO 144 J=1,16                                                     POLSR058
  144 SORC(J) = ACPT(J,I)                                               POLSR059
      DO 244 J=11,16                                                    POLSR060
      IF(SORC(J).NE.0.0) GO TO 245                                      POLSR061
```

```
  244 CONTINUE                                                          POLSR062
      GO TO 145                                                         POLSR063
  245 CALL STPOL1                                                       POLSR064
  145 CONTINUE                                                          POLSR065
  146 DO 150 I=1,18                                                     POLSR066
  150 SORC(I) = 0.                                                      POLSR067
      SORC(10) = -1.                                                    POLSR068
C                                                                       POLSR069
C   ENVIRON AREAS                                                       POLSR070
C                                                                       POLSR071
      IF (NENAR .EQ. 0) GO TO 156                                       POLSR072
      ITYPE = 1                                                         POLSR073
      DO 155 I=1,NENAR                                                  POLSR074
      DO 153 J=1,5                                                      POLSR075
  153 SORC(J) = ENAR(J,I)                                               POLSR076
      DO 154 J=6,11                                                     POLSR077
  154 SORC(J+5) = ENAR(J,I)                                             POLSR078
      DO 253 J=11,16                                                    POLSR079
      IF(SORC(J).NE.0.0) GO TO 254                                      POLSR080
  253 CONTINUE                                                          POLSR081
      GO TO 155                                                         POLSR082
  254 CALL STPOL1                                                       POLSR083
  155 CONTINUE                                                          POLSR084
C                                                                       POLSR085
C   AIRBASE AREAS                                                       POLSR086
C                                                                       POLSR087
  156 IF (NABAR .EQ. 0) GO TO 166                                       POLSR088
      ITYPE = 2                                                         POLSR089
      DO 165 I=1,NABAR                                                  POLSR090
      DO 163 J=1,5                                                      POLSR091
  163 SORC(J) = ABAR(J,I)                                               POLSR092
      DO 164 J=6,11                                                     POLSR093
  164 SORC(J+5) = ABAR(J,I)                                             POLSR094
      DO 263 J=11,16                                                    POLSR095
      IF(SORC(J).NE.0.0) GO TO 264                                      POLSR096
  263 CONTINUE                                                          POLSR097
      GO TO 165                                                         POLSR098
  264 CALL STPOL1                                                       POLSR099
  165 CONTINUE                                                          POLSR100
C                                                                       POLSR101
C   AIRCRAFT AREAS                                                      POLSR102
C                                                                       POLSR103
  166 IF (NACAR .EQ. 0) GO TO 176                                       POLSR104
      ITYPE = 3                                                         POLSR105
      DO 175 I=1,NACAR                                                  POLSR106
      DO 173 J=1,5                                                      POLSR107
  173 SORC(J) = ACAR(J,I)                                               POLSR108
      DO 174 J=6,11                                                     POLSR109
  174 SORC(J+5) = ACAR(J,I)                                             POLSR110
      DO 273 J=11,16                                                    POLSR111
      IF(SORC(J).NE.0.0) GO TO 274                                      POLSR112
  273 CONTINUE                                                          POLSR113
      GO TO 175                                                         POLSR114
  274 CALL STPOL1                                                       POLSR115
  175 CONTINUE                                                          POLSR116
C                                                                       POLSR117
C   CRITICAL DISTANCE, XZ, MUST BE CONVERTED TO METERS FOR LINE MODEL   POLSR118
C                                                                       POLSR119
  176 XZ = XZ  * 1000.                                                  POLSR120
C                                                                       POLSR121
C   ENVIRON LINES                                                       POLSR122
C                                                                       POLSR123
```

```
      IF (NENLN .EQ. 0) GO TO 186                                       POLSR124
      ITYPE = 1                                                         POLSR125
      DO 185 I=1,NENLN                                                  POLSR126
      DO 184 J=1,8                                                      POLSR127
  184 SORC(J) = ENLN(J,I)                                               POLSR128
      DO 384 J=13,18                                                    POLSR129
  384 SORC(J)=ENLN(J-4,I)                                               POLSR130
      DO 284 J=13,18                                                    POLSR131
      IF(SORC(J).NE.0.0) GO TO 285                                      POLSR132
  284 CONTINUE                                                          POLSR133
      GO TO 185                                                         POLSR134
  285 SORC( 9) = 100.                                                   POLSR135
      SORC(10) = 100.                                                   POLSR136
      SORC(12) = 1.                                                     POLSR137
      CALL STPOL2                                                       POLSR138
  185 CONTINUE                                                          POLSR139
C                                                                       POLSR140
C   AIRBASE LINES                                                       POLSR141
C                                                                       POLSR142
  186 IF(NABLN .EQ. 0) GO TO 196                                        POLSR143
      ITYPE = 2                                                         POLSR144
      DO 195 I=1,NABLN                                                  POLSR145
      DO 194 J=1,8                                                      POLSR146
  194 SORC(J) = ABLN(J,I)                                               POLSR147
      DO 394 J=13,18                                                    POLSR148
  394 SORC(J)=ABLN(J-4,I)                                               POLSR149
      DO 294 J=13,18                                                    POLSR150
      IF(SORC(J).NE.0.0) GO TO 295                                      POLSR151
  294 CONTINUE                                                          POLSR152
      GO TO 195                                                         POLSR153
  295 SORC( 9) = 100.                                                   POLSR154
      SORC(10) = 100.                                                   POLSR155
      SORC(12) = 1.                                                     POLSR156
      CALL STPOL2                                                       POLSR157
  195 CONTINUE                                                          POLSR158
C                                                                       POLSR159
C   AIRCRAFT LINES                                                      POLSR160
C                                                                       POLSR161
  196 IF (NACLN .EQ. 0) GO TO 206                                       POLSR162
      ITYPE = 3                                                         POLSR163
      DO 205 I=1,NACLN                                                  POLSR164
      DO 204 J=1,18                                                     POLSR165
  204 SORC(J) = ACLN(J,I)                                               POLSR166
      DO 304 J=13,18                                                    POLSR167
      IF(SORC(J).NE.0.0) GO TO 305                                      POLSR168
  304 CONTINUE                                                          POLSR169
      GO TO 205                                                         POLSR170
  305 CALL STPOL2                                                       POLSR171
  205 CONTINUE                                                          POLSR172
  206 CONTINUE                                                          POLSR173
      RETURN                                                            POLSR174
      END                                                               POLSR175
```

SUBROUTINE PSEUDO

Purpose:

To call the SIGCY and SIGCZ functions to find the virtual distance in meters from the source to the pseudo upwind point source.

Input:

1. Initial dispersions in y and z directions.
2. Wind speed and stability class.

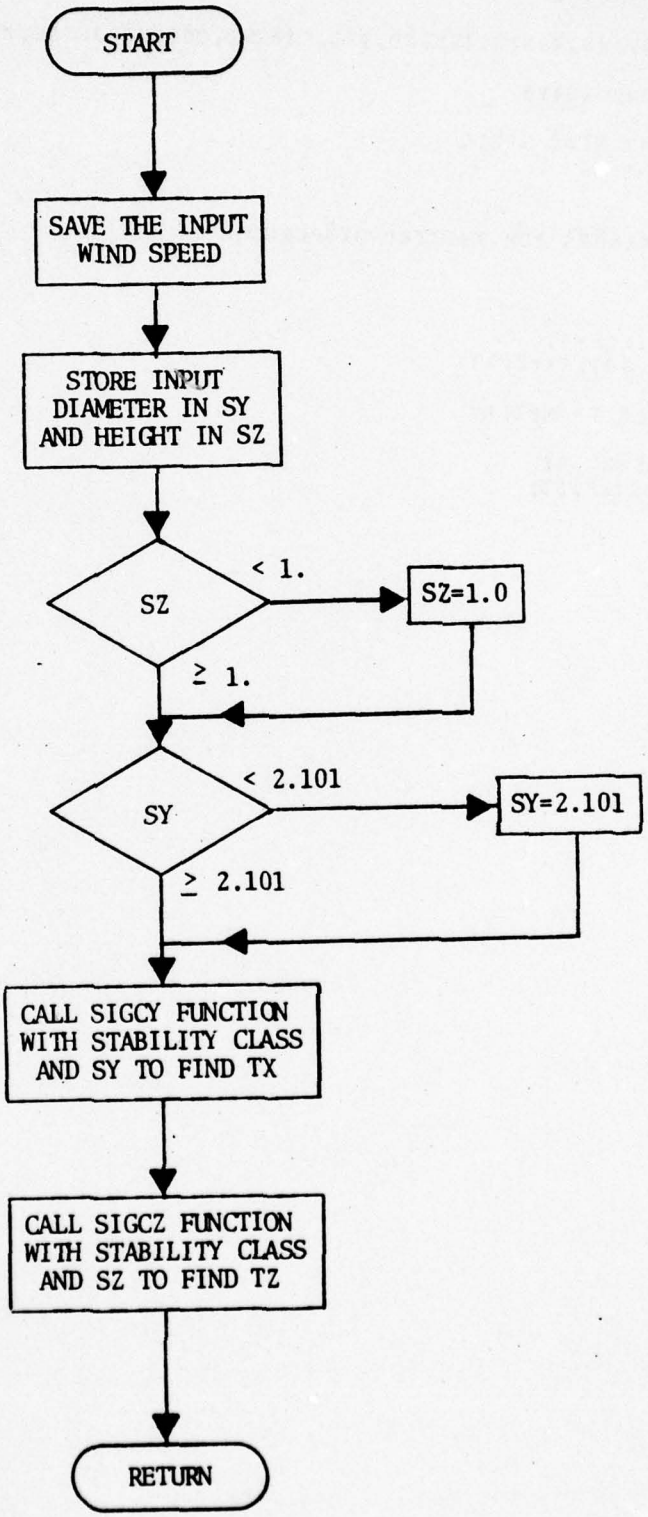
Output:

The virtual distances in the y and z directions.

Functions Called:

SIGCY
SIGCZ

SUBROUTINE PSEUDO



```
      SUBROUTINE PSEUDO(DS,WIN,HS,TY,TZ)                                PSUD0000
C                                                                       PSUD0001
C     THIS SUBROUTINE CALLS THE SIGCY AND SIGCZ FUNCTIONS               PSUD0002
C     TO FIND THE VIRTUAL DISTANCE FROM THE SOURCE TO THE PSEUDO        PSUD0003
C     UPWIND POINT SOURCE                                               PSUD0004
C                                                                       PSUD0005
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,        PSUD0006
     . TEMP,TEMK                                                        PSUD0007
      COMMON /WDUN/ WSAVE                                               PSUD0008
C                                                                       PSUD0009
C     SAVE THE INPUT WIND SPEED                                         PSUD0010
C                                                                       PSUD0011
      WSAVE=WIN                                                         PSUD0012
C                                                                       PSUD0013
C     SET MINIMUM VALUES FOR INITIAL DISPERSIONS                        PSUD0014
C                                                                       PSUD0015
      SY=DS                                                             PSUD0016
      SZ=HS                                                             PSUD0017
      IF(SZ.LT.1.)SZ=1.0                                                PSUD0018
      IF(SY.LT.2.101)SY=2.101                                           PSUD0019
C                                                                       PSUD0020
C     FIND DISTANCES IN METERS                                          PSUD0021
C                                                                       PSUD0022
      TY=SIGCY(JSTAB,SY)                                                PSUD0023
      TZ=SIGCZ(JSTAB,SZ)                                                PSUD0024
      RETURN                                                            PSUD0025
      END                                                               PSUD0026
```

SUBROUTINE QMOD

Purpose:

To compute the linear distribution, in inverse length, of the pollution along a runway due to aircraft emission during landing or takeoff.

Input:

YSI	Distance along runway measured from tip of exhaust plume near starting end of runway
TAIL	Length or penetration of exhaust plume of aircraft at rest
DL	Length of smoke slug on runway
A	Acceleration (or deceleration) of aircraft
V12	Initial velocity squared
VS	Average velocity of exhaust particles relative to air mass in exhaust plume
WS2	Wind speed squared
WSC	2·wind speed·(- cosine of angle between runway and wind vector)
RR	A/G, where A is acceleration and G is the normalization constant for line density

Output:

QL	The linear distribution of pollution

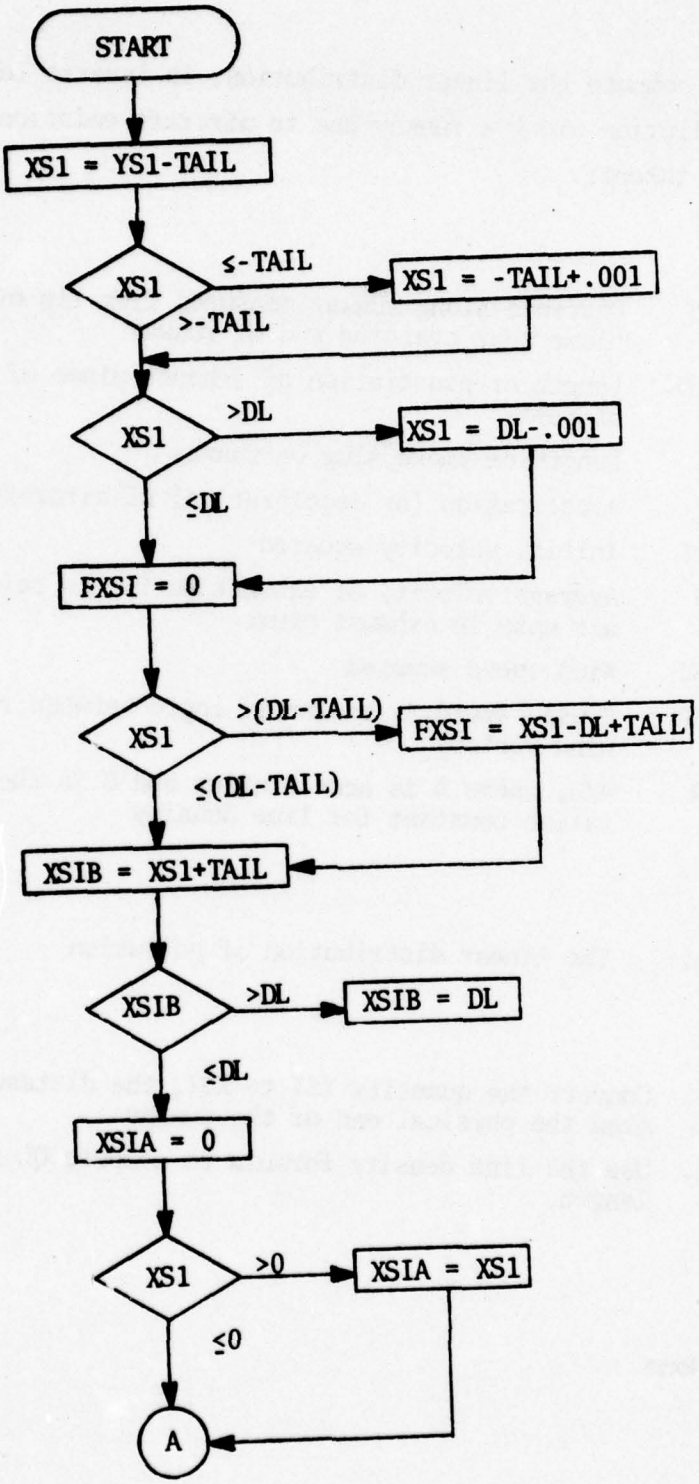
Procedure:

1. Convert the quantity YSI to XSI, the distance measured from the physical end of the runway.
2. Use the line density formula to compute QL in inverse length.

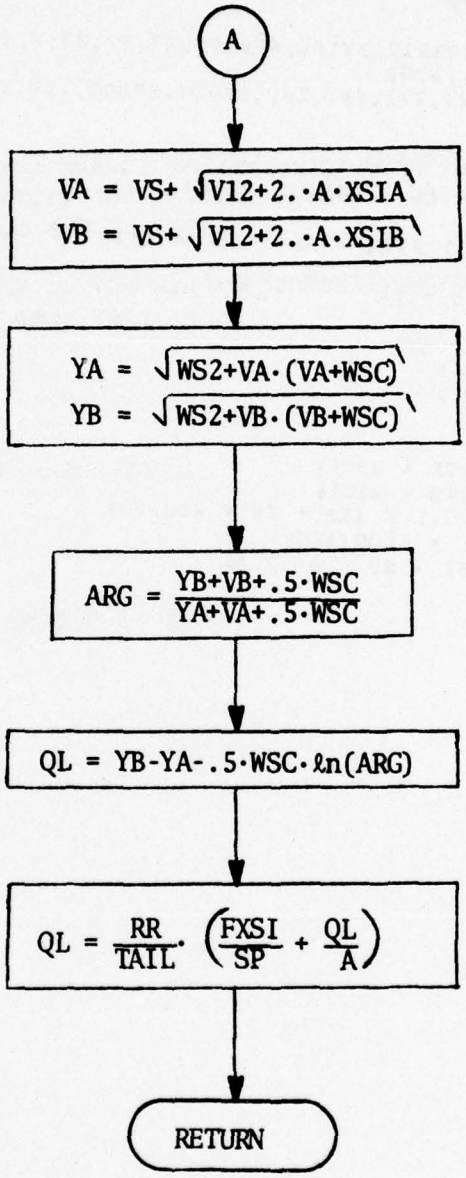
Subroutines Called:

None

SUBROUTINE QMOD



SUBROUTINE QMOD (Contd.)



```
      SUBROUTINE QMOD (YS1,QL)                                          QMOD0000
C                                                                       QMOD0001
C   THIS ROUTINE COMPUTES THE LINEAR DISTRIBUTION, IN INVERSE LENGTH,   QMOD0002
C   OF THE POLLUSION ALONG A RUNWAY DUE TO AIRCRAFT EMMISION            QMOD0003
C   DURING LANDING OR TAKEOFF                                           QMOD0004
C                                                                       QMOD0005
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE,HTAERO,X1,Y1,Z1,W,DELZ,X2,Y2,Z2,QMOD0006
     . V1,V2,DL,TIME,EMIS(6),NPOL                                       QMOD0007
      COMMON /LN/ XW1,YW1,ZW1,XW2,YW2,ZW2,SUDOY,SUDOZ,IAD,TAIL,A,V12,VS,QMOD0008
     . WS2,WSC,RR,SP                                                    QMOD0009
      XS1 = YS1 - TAIL                                                  QMOD0010
      IF (XS1 .LE. -TAIL) XS1 = -TAIL + .001                            QMOD0011
      IF (XS1 .GT. DL) XS1 = DL - .001                                  QMOD0012
      FXSI = 0.                                                         QMOD0013
      IF (XS1 .GT. (DL-TAIL)) FXSI = XS1 - DL + TAIL                    QMOD0014
   30 XSIB = XS1 + TAIL                                                 QMOD0015
      IF (XSIB .GT. DL) XSIB = DL                                       QMOD0016
      XSIA = 0.                                                         QMOD0017
      IF (XS1 .GT. 0) XSIA = XS1                                        QMOD0018
      ROOTB = V12 + 2.*A*XSIB                                           QMOD0019
      ROOTA = V12 + 2.*A*XSIA                                           QMOD0020
      VA = SQRT(ROOTA) + VS                                             QMOD0021
      VB = SQRT(ROOTB) + VS                                             QMOD0022
      YA = SQRT(WS2 + VA *(VA + WSC))                                   QMOD0023
      YB = SQRT(WS2 + VB *(VB + WSC))                                   QMOD0024
      ARG = (YB + VB + WSC/2.) / (YA + VA + WSC/2.)                     QMOD0025
      QL = YB - YA - WSC/2. * ALOG(ARG)                                 QMOD0026
      QL = RR / TAIL * (FXSI / SP + QL / A)                             QMOD0027
      RETURN                                                            QMOD0028
      END                                                               QMOD0029
```

SUBROUTINE READ

Purpose:

1. To read master source tape, thereby providing the emission inventory and related data to the source emission distribution subroutines.

2. To set up the wind-dependent sources as random access disk data sets.

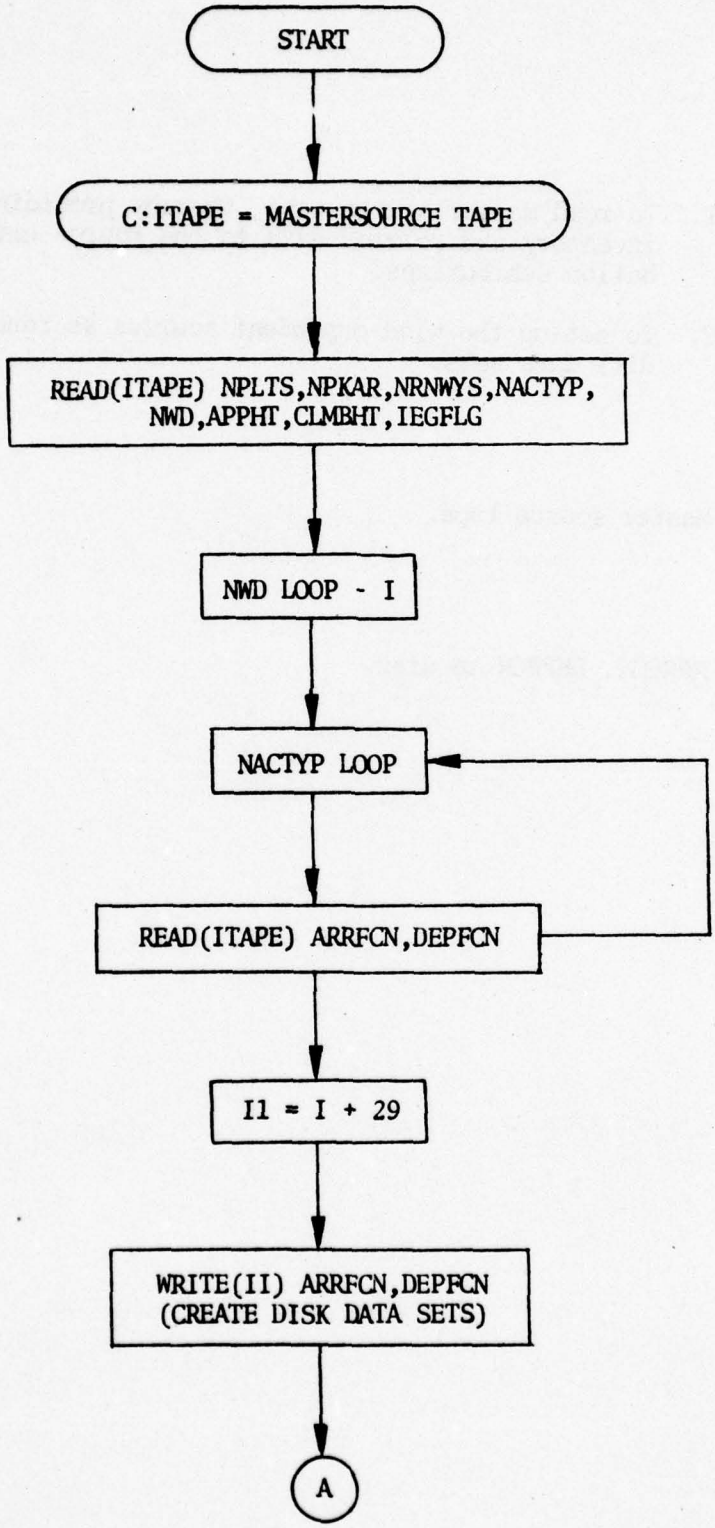
Input:

Master source tape.

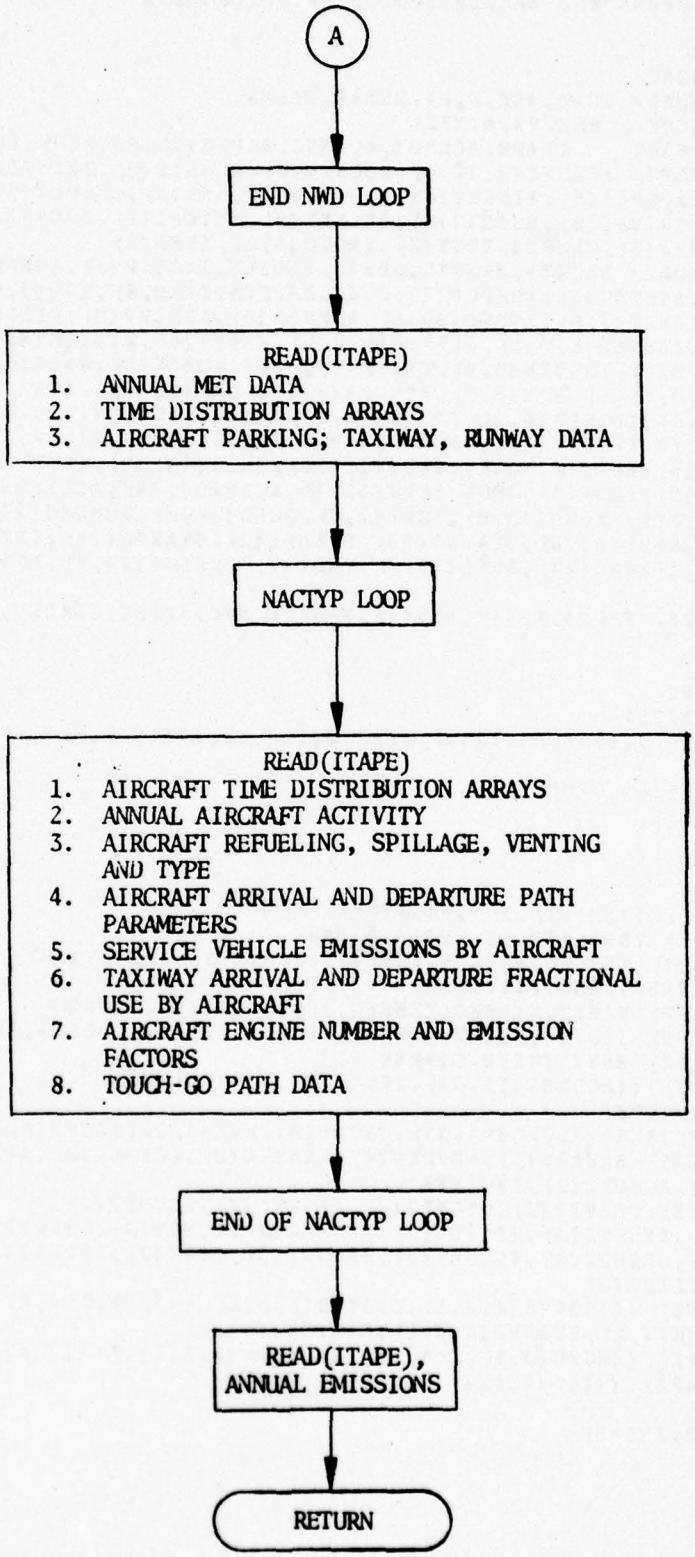
Output:

ARRFCN, DEPFCN to disk.

SUBROUTINE READ



SUBROUTINE READ (Continued)



```
      SUBROUTINE READ                                                   READ0000
C                                                                       READ0001
C   THIS ROUTINE READS THE MASTER SOURCE EMISSION TAPE                  READ0002
C                                                                       READ0003
      REAL LNDSPD                                                       READ0004
      INTEGER  ENGNO                                                    READ0005
      COMMON /ANNMET/ TBAR,ADD,P,PA,WSBAR,DTBAR                         READ0006
      COMMON / RECPT / MRECPT,MAXFIL                                    READ0007
      COMMON / DEFALT /  ITAPE,ACLNDY,ACLND2,ALPHA(7),BETA(7),FLDENS(7) READ0008
      COMMON /ACEDB1/ ACEMFC(8,10,6),ASCNT1(8),ASCNT2(8),TXISPD(8),     READ0009
     . LNDSPD(8),APSPD1(8),APSPD2(8),COHT1(8),TOSPD(8),COSPD1(8),       READ0010
     . COSPD2(8),SRTUPT(8),DSCNT1(8),EGCHKT(8),SHTDNT(8),DSCNT2(8),     READ0011
     . APPHT,APPHT2(8),CLMBHT,TOWT(8),ENGNO(8,2),IDRR(8)               READ0012
      COMMON /ACEDB2/ NACTYP,NRNWYS,NPKAR,IEGFLG,IACTYP(8),ANNARR(8),   READ0013
     . ANNDEP(8),ANNTGO(8),ARRFCN(24,8,6),DEPFCN(24,8,6),TGO(3,4,8),    READ0014
     . DISRNW(6),RNWY(7,6),IUSWD(20,6),ACFUEL(8),ARFLVT(8),DPFLVT(8),   READ0015
     . ACSPIL(8),ARSVEM(6,8,5),DPSVEM(6,8,5),NIBTT(6),NIBSEG(8,6),      READ0016
     . IIBSEG(16,8,6),IDIBTW(8,6),TTARFR(8,8,6),NOBTT(6),NOBSEG(8,6),   READ0017
     . IOBSEG(16,8,6),IDOBTW(8,6),TTDPFR(8,8,6),NPASQ(6),IDPRKA(6),     READ0018
     . PAREA(6,3,3),IDIBPA(8,6),IDOBPA(8,6),NLSEGS,ACLNSG(12,25),JES1(8) READ0019
      COMMON /SRCE/ NPLTS,NENPT,NENAR,NENLN,NABPT,NABAR,NABLN,NACPT,    READ0020
     . NACAR,NACLN,ENPT(16,100),ENAR(11,100),ENLN(14,20),ABPT(16,150),  READ0021
     . ABAR(11,100),ABLN(14,100),ACPT(16,1),ACAR(11,24),ACLN(18,250)    READ0022
      COMMON /DSTRBT/ ACMO(13,8),ACDY(2,8),ACHR(24,8),VHMLMO(13),       READ0023
     . VHMLDY(2),VHMLHR(24),CVABMO(13),CVABDY(2),CVABHR(24),CVENMO(13), READ0024
     . CVENDY(2),CVENHR(24),FLMO(13,7),FLDY(2,7),FLHR(24,7),NC1         READ0025
C                                                                       READ0026
      READ  (ITAPE) NPLTS,NPKAR,NRNWYS,NACTYP,NWD,APPHT,CLMBHT,IEGFLG   READ0027
     . , NLSEGS                                                         READ0028
      REWIND 30                                                         READ0029
      DO 2 I=1,NWD                                                      READ0030
      DO 5 J=1,NACTYP                                                   READ0031
      READ (ITAPE) ((ARRFCN(L,J,K),DEPFCN(L,J,K),L=1,24),K=1,6)         READ0032
    5 CONTINUE                                                          READ0033
      WRITE(30)ARRFCN,DEPFCN                                            READ0034
    2 CONTINUE                                                          READ0035
      REWIND 30                                                         READ0036
      MRECPT=1                                                          READ0037
      MAXFIL=NWD                                                        READ0038
      READ (ITAPE) (JES1(I),I=1,NACTYP)                                 READ0039
      READ (ITAPE) TBAR,ADD,PA,WSBAR,DTBAR                              READ0040
      READ  (ITAPE) VHMLMO,VHML ≤,VHMLqr┴ceaBmO┴ceaAAh,c aAεr┴c enM ┴T   READ0041
     . CVENDY,CVENHR,FLMO,FLDY,FLHR                                     READ0042
      READ  (ITAPE) NIBTT,NIBSEG,IIBSEG,NOBTT,NOBSEG,IOBSEG             READ0043
      READ  (ITAPE) IDOBTW,IDIBTW,IDPRKA,PAREA,IDIBPA,IDOBPA,NPASQ      READ0044
      READ  (ITAPE) RNWY,IUSWD,DISRNW                                   READ0045
      READ (ITAPE) ((ACLNSG(II,JJ),II=1,12),JJ=1,NLSEGS)                READ0046
      DO 40 J=1,NACTYP                                                  READ0047
      READ(ITAPE) (ACMO(K,J),K=1,13),(ACDY(K,J),K=1,2),(ACHR(K,J),K=1,24) READ0048
      READ  (ITAPE) ANNARR(J),ANNDEP(J),ANNTGO(J),ACFUEL(J),ARFLVT(J),  READ0049
     . DPFLVT(J),ACSPIL(J),IACTYP(J)                                    READ0050
      READ (ITAPE) DSCNT1(J),DSCNT2(J),ASCNT1(J),ASCNT2(J),             READ0051
     . TXISPD(J),LNDSPD(J),APSPD1(J),APSPD2(J),TOSPD(J),COSPD1(J),      READ0052
     . COSPD2(J),SRTUPT(J),EGCHKT(J),SHTDNT(J),TOWT(J),APPHT2(J),       READ0053
     . COHT1(J),IDRR(J)                                                 READ0054
      READ (ITAPE) ((ARSVEM(K,J,L),DPSVEM(K,J,L),L=1,5),K=1,6),         READ0055
     . ((TTARFR(K,J,L),TTDPFR(K,J,L),K=1,8),L=1,6)                      READ0056
      READ (ITAPE) (ENGNO(J,L),L=1,2),((ACEMFC(J,K,L),K=1,10),L=1,6)    READ0057
      READ  (ITAPE) ((TGO(K,L,J),K=1,3),L=1,4)                          READ0058
   40 CONTINUE                                                          READ0059
    4 READ(ITAPE,END=3)                                                 READ0060
      GO TO 4                                                           READ0061
```

```
3 CCNTINUE                                                    READ0062
  RETURN                                                      READ0063
  END                                                         READ0064
```

FUNCTION RISE

Purpose:

To calculate the plume rise using either the Carson-Moses or Holland plume rise formula.

Input:

Stack parameters, current wind speed and stability, temperature, and the plume rise flag.

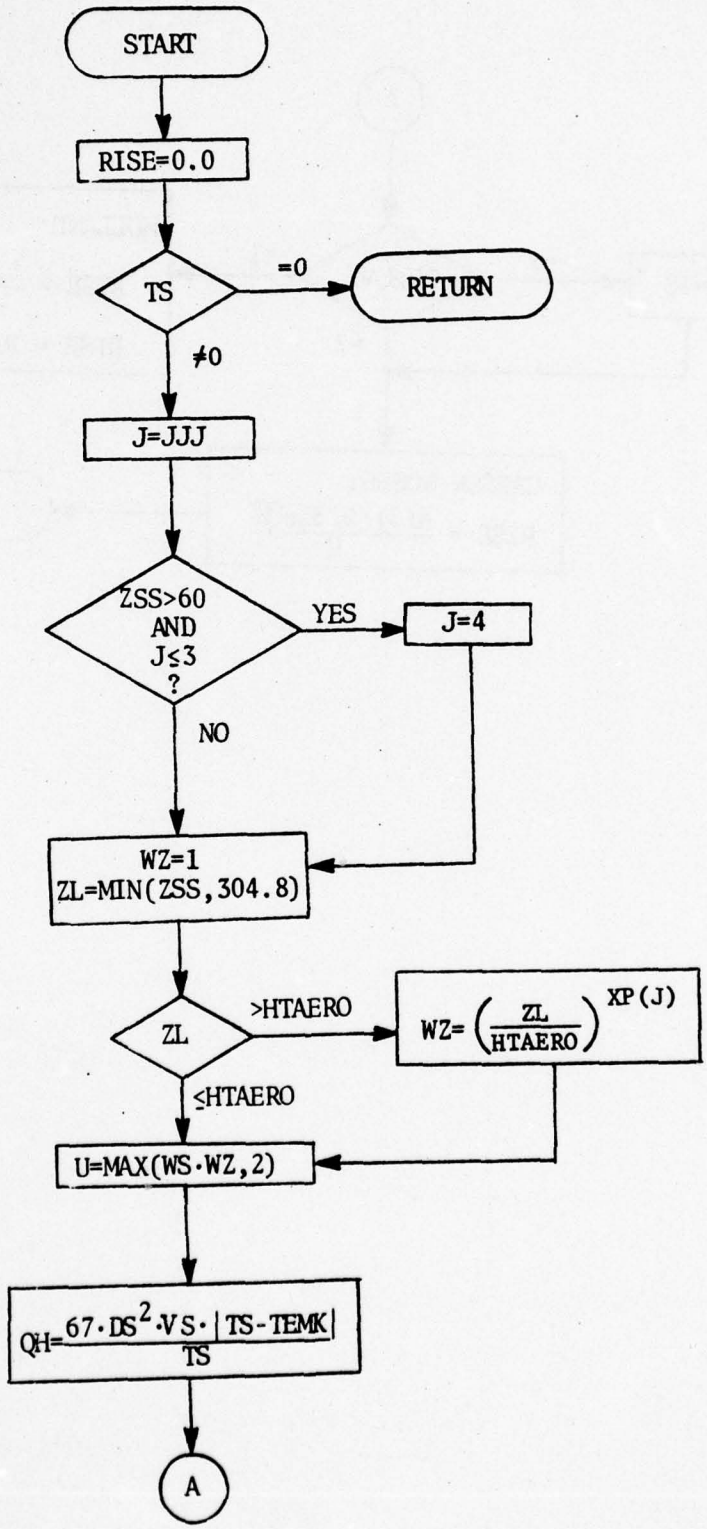
Output:

The height of the plume rise.

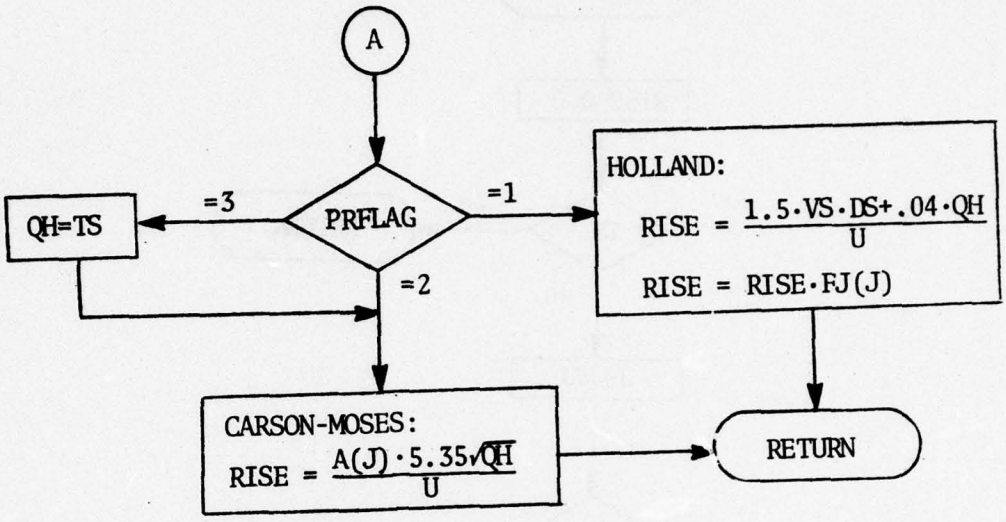
Subroutines Called:

None

FUNCTION RISE



FUNCTION RISE (Cont'd.)



```
      FUNCTION RISE(ZSS,JJJ)                                            RISE0000
C                                                                       RISE0001
C   THIS FUNCTION CALCULATES THE PLUME RISE                             RISE0002
C      ZSS IS THE PHYSICAL STACK HEIGHT MODIFIED FOR DOWNWASH           RISE0003
C          EFFECTS, IF ANY                                              RISE0004
C      JJJ IS THE AMBIENT STABILITY                                     RISE0005
C                                                                       RISE0006
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMF,   RISE0007
     . TEMK                                                             RISE0008
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE,HTAERO,XS,YS,ZS,DELY,DELZ,      RISE0009
     . TS,VS,DS,HB,PRFLAG,EMIS(8),NPOL                                  RISE0010
      DIMENSION A(6),FJ(6)                                              RISE0011
      COMMON /WNDPRO/ XP(6)                                             RISE0012
      DATA A /2.65,2.65,2.65,1.08,2*0.68/,                              RISE0013
     .     FJ / 1.2,1.2,1.2,1.0,0.8,0.8/                                RISE0014
      RISE=0.0                                                          RISE0015
C                                                                       RISE0016
C   CHECK THE STACK EXIT GAS TEMPERATURE                                RISE0017
C                                                                       RISE0018
      IF (TS.EQ.0.0) RETURN                                             RISE0019
C                                                                       RISE0020
C   FOR TALL STACKS USE STABILITY 4 IN THE WIND PROFILE LAW             RISE0021
C                                                                       RISE0022
      J=JJJ                                                             RISE0023
      IF(ZSS.GT.60.AND.J.LE.3)J=4                                       RISE0024
C                                                                       RISE0025
C   COMPUTE THE WIND SPEED AT THE ELEVATION OF THE STACK                RISE0026
C   FOR STABILITY J                                                     RISE0027
C                                                                       RISE0028
      WZ=1.0                                                            RISE0029
      ZL=AMIN1(ZSS,304.8)                                               RISE0030
      IF(ZL.GT.HTAERO) WZ=(ZL/HTAERO)**XP(J)                            RISE0031
      U=AMAX1(WS*WZ,2.0)                                                RISE0032
C                                                                       RISE0033
C   COMPUTE THE THERMAL EMISSION RATE                                   RISE0034
C                                                                       RISE0035
      QH=67.0*DS*DS*VS*ABS(TS-TEMK)/TS                                  RISE0036
      IF (PRFLAG.EQ.1.0) GO TO 1                                        RISE0037
      IF (PRFLAG.EQ.3.0) QH=TS                                          RISE0038
C                                                                       RISE0039
C   CARSON-MOSES PLUME RISE FORMULA                                     RISE0040
C                                                                       RISE0041
      RISE=A(J)*5.35*SQRT(QH)/U                                         RISE0042
      RETURN                                                            RISE0043
C                                                                       RISE0044
C   HOLLAND PLUME RISE FORMULA                                          RISE0045
C                                                                       RISE0046
    1 CONTINUE                                                          RISE0047
      RISE=1.5*VS*DS/U+0.04*QH/U                                        RISE0048
      RISE=RISE*FJ(J)                                                   RISE0049
      RETURN                                                            RISE0050
      END                                                               RISE0051
```

FUNCTION RRDIST

Purpose:

To calculate the length of runway necessary for takeoff using aircraft dependent equations.

Input:

Aircraft identification, pressure altitude, ambient temperature and wind speed, and aircraft takeoff weight.

Output:

Takeoff length in feet of runway roll to liftoff.

Procedure:

For a given aircraft, use the proper set of takeoff equations provided by the USAF.

Subroutines Called:

None

```
      FUNCTION RRDIST (IR,PA,T,GW,WS)                                   RRDST000
C                                                                       RRDST001
C     FUNCTION CALCULATES RUNWAY ROLL DISTANCE IN FEET                  RRDST002
C     IR IS AIRCRAFT IDENTIFICATION NUMBER                              RRDST003
C     PA IS PRESSURE ALTITUDE IN HUNDREDS OF FEET                       RRDST004
C     T IS TEMPERATURE IN DEGREES FAHRENHEIT                            RRDST005
C     GW IS AC TAKE OFF WEIGHT IN THOUSAND POUNDS                       RRDST006
C     WS IS THE WIND SPEED IN KNOTS                                     RRDST007
C                                                                       RRDST008
      FGR=0.0                                                           RRDST009
      IF(IR.EQ.100) GO TO 100                                           RRDST010
      GO TO (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,  RRDST011
     123,24,25,26,27,28,29,30,31,32,33,34,35,36,37,100,100,100,100,100, RRDST012
     2 100,100,100,100,100, 100,100,12),IR                              RRDST013
 1    CONTINUE                                                          RRDST014
      GO TO 100                                                         RRDST015
 3    CONTINUE                                                          RRDST016
 2    TOF=-(2.78-8.5714E-4*PA)+(1.82E-2+7.2857E-5*PA)*GW                RRDST017
      GR=(1.184E+1-4.2167E-1*T+1.0E-2*T**2-4.583E-5*T**3)+              RRDST018
     .   (4.194+1.7197E-2*T-9.26018E-4*T**2)*TOF+                       RRDST019
     .   (1.0457+8.40E-3*T+2.117E-4*T**2+2.98E-7*T**3)*TOF**2           RRDST020
      FGR=(GR-(1.15E-1+9.0E-3*GR)*WS)*100.                              RRDST021
      GO TO 100                                                         RRDST022
 4    CONTINUE                                                          RRDST023
 5    TOF=(1.589+6.883E-3*PA+1.2767E-4*PA**2)+                          RRDST024
     .   (6.819E-3+1.1007E-4*PA-3.924E-7*PA**2)*T+                      RRDST025
     .   (5.979E-5+3.38096E-7*PA+8.532E-9*PA**2)*T**2                   RRDST026
      GR=(-13.25+8.75E-1*GW-1.25E-2*GW**2)+                             RRDST027
     .   (1.3925E+1-9.275E-1*GW+2.125E-2*GW**2)*TOF                     RRDST028
      FGR=(GR-(1.316E-1+8.748E-3*GR)*WS)*100.                           RRDST029
      GO TO 100                                                         RRDST030
 6    TOF=(9.3937E-1+2.0947E-2*PA+2.005E-4*PA**2)+                      RRDST031
     .   (3.746467E-2+4.05625E-4*PA)*T+                                 RRDST032
     .   (1.9928E-4-5.75006E-6*PA+1.40234E-7*PA**2)*T**2                RRDST033
      GR=(1.4307E+1-7.57144E-1*GW+2.6785E-2*GW**2)+                     RRDST034
     .   (1.67257E+1-1.17762*GW+2.7381E-2*GW**2)*TOF                    RRDST035
      FGR=(GR-(2.412799E-2+7.82971E-3*GR)*WS)*100.                      RRDST036
      GO TO 100                                                         RRDST037
 7    TOF=(-1.06E-3+1.674E-2*PA+8.1888E-5*PA**2)+                       RRDST038
     .   (1.36E-2+9.592E-6*PA+1.755E-6*PA**2)*T+                        RRDST039
     .   (5.1099E-5+1.2899E-6*PA-6.123E-9*PA**2)*T**2                   RRDST040
      GR=(-1.423E+1+6.349998E-1*GW+1.6667E-3*GW**2)+                    RRDST041
     .   (6.1857-3.2179E-1*GW+8.214E-3*GW**2)*TOF                       RRDST042
      FGR=(GR-(6.293E-2+7.328E-3*GR)*WS)*100.                           RRDST043
      GO TO 100                                                         RRDST044
 8    TOF=(9.503E-2+3.313E-2*PA+1.3666E-4*PA**2)+                       RRDST045
     .   (2.2546E-2+1.7848E-4*PA-4.04E-6*PA**2)*T+                      RRDST046
     .   (1.3438E-4-1.2166E-6*PA+4.1854E-8*PA**2)*T**2                  RRDST047
      GR=(2.95E+1-2.394*GW+6.497E-2*GW**2)+                             RRDST048
     .   (3.1035+7.52E-2*GW-3.186E-3*GW**2)*TOF+                        RRDST049
     .   (1.2715-1.5535E-1*GW+4.3889E-3*GW**2)*TOF**2                   RRDST050
      FGR=(GR-(-9.0E-2+1.807E-2*GR-7.143E-5*GR**2)*WS)*100.             RRDST051
      GO TO 100                                                         RRDST052
 9    TOF=(3.36455E-3+5.63556E-2*PA)+                                   RRDST053
     .   (4.417E-2-2.031E-3*PA+5.63E-5*PA**2-3.9954E-7*PA**3)*T+        RRDST054
     .   (-9.2E-5+2.08E-5*PA-5.39E-7*PA**2+3.8E-9*PA**3)*T**2           RRDST055
      GR=(1.65838-3.069E-1*GW+8.1363E-2*GW**2)+                         RRDST056
     .   (-3.6111+3.63559E-1*GW)*TOF+                                   RRDST057
     .   (7.3975E-1-8.78749E-2*GW+3.2487E-3*GW**2)*TOF**2               RRDST058
      FGR=(GR-(5.0E-2+7.4E-3*GR)*WS)*100.                               RRDST059
      GO TO 100                                                         RRDST060
 10   TOF=(12.5546-5.7192E-2*PA+1.3075E-4*PA**2)-                       RRDST061
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     .   (2.9032E-2-1.0254E-4*PA-1.45125E-7*PA**2) *T                    RRDST062
      GR= ((-5.14955E+1+2.57957*GW-1.4425E-2*GW**2) -                     RRDST063
     .   (-1.1535E+1+5.915E-1*GW-4.6828E-3*GW**2) *TOF+                  RRDST064
     .   (-6.2285E-1+3.2375E-2*GW-2.9056E-4*GW**2) *TOF**2) *1000.       RRDST065
      FGR= (3.305E+1+9.729E-1*GR+2.31E-6*GR**2) -                         RRDST066
     .   (8.244+8.3598E-3*GR-1.44E-8*GR**2) *WS                          RRDST067
      GO TO 100                                                           RRDST068
11    TCF= (7.436E-1+4.29E-2*PA) + (2.1276E-2-3.1116E-5*PA) *T            RRDST069
      GR= (1.638E+1-7.78E-1*GW+2.84E-2*GW**2) +                           RRDST070
     .   (3.809-1.947E-1*GW+4.264E-3*GW**2) *TOF+                        RRDST071
     .   (-1.976E-1+1.5757E-2*GW+4.6189E-4*GW**2) *TOF**2                RRDST072
      FGR= (GR- (8.5E-2+8.25E-3*GR) *WS) *100.                            RRDST073
      GO TO 100                                                           RRDST074
12    TCF= (1.1405-4.659E-3*PA+1.28E-5*PA**2) -                           RRDST075
     .   (2.0146E-3-2.46E-5*PA+3.5514E-7*PA**2) *T                       RRDST076
      GR= (-3.0029E+1-9.6225E-2*GW+1.25428E-1*GW**2) -                    RRDST077
     .   (-7.3845E+1+1.20433*GW+1.7857E-1*GW**2) *TOF+                   RRDST078
     .   (-3.57857E+1+7.857E-1*GW+7.14286E-2*GW**2) *TOF**2              RRDST079
      FGR= ((3.17413E-1+9.762E-1*GR+2.657E-4*GR**2) -                     RRDST080
     .   (1.1114E-1+7.91177E-3*GR+4.40169E-5*GR**2) *WS) *100.           RRDST081
      GO TO 100                                                           RRDST082
13    TOF= (9.166-5.485E-2*PA) - (3.412E-2-1.8E-4*PA) *T                  RRDST083
      GR= (3.02E+2-3.519E+1*GW+1.841*GW**2) -                             RRDST084
     .   (1.306E+2-1.277E+1*GW+5.4E-1*GW**2) *TOF+                       RRDST085
     .   (2.0687E+1-1.715*GW+6.07E-2*GW**2) *TOF**2-                     RRDST086
     .   (1.1578-8.4228E-2*GW+2.46E-3*GW**2) *TOF**3                     RRDST087
      FGR= (GR- (9.55E-2+7.15E-3*GR) *WS) *100.                           RRDST088
      GO TO 100                                                           RRDST089
14    TOF= (2.336+1.582E-2*PA+1.172E-4*PA**2) +                           RRDST090
     .   (5.604E-3+9.97746E-5*PA-5.8117147E-7*PA**2) *T+                 RRDST091
     .   (9.19269E-5-1.34357E-8*PA+1.61411E-8*PA**2) *T**2               RRDST092
      GR= (7.7366-2.52997E-1*GW+2.385E-3*GW**2) +                         RRDST093
     .   (-2.1071+4.2586E-2*GW+12.748E-4*GW**2) *TOF                     RRDST094
      FGR= (GR- (1.0755E-1+1.4588E-2*GR-7.94156E-5*GR**2) *WS) *100.      RRDST095
      GO TO 100                                                           RRDST096
15    CONTINUE                                                            RRDST097
      GO TO 100                                                           RRDST098
16    TOF= (7.6859-1.15E-1*PA+4.413E-4*PA**2) -                           RRDST099
     .   (2.925E-2-8.1128E-4*PA+6.999E-6*PA**2) *T-                      RRDST100
     .   (2.2289E-4+5.054E-6*PA-7.57E-8*PA**2) *T**2                     RRDST101
      GR= (2.546E+1-2.3388*GW+1.0717E-1*GW**2) -                          RRDST102
     .   (7.9095-6.7434E-1*GW+2.1045E-2*GW**2) *TOF+                     RRDST103
     .   (6.099E-1-5.0858E-2*GW+1.434E-3*GW**2) *TOF**2                  RRDST104
      FGR= (GR- (1.16E-1+7.27E-3*GR-3.64E-6*GR**2) *WS) *100.             RRDST105
      GO TO 100                                                           RRDST106
17    CONTINUE                                                            RRDST107
      GO TO 100                                                           RRDST108
18    TOF= (2.118+1.058E-2*PA+1.014E-4*PA**2) +                           RRDST109
     .   (2.102E-3+1.84E-4*PA-1.177E-6*PA**2) *T+                        RRDST110
     .   (1.001E-4-7.046E-7*PA+1.355E-8*PA**2) *T**2                     RRDST111
      GR= (1.0E-5) + (-1.9687+4.209E-1*GW+3.9445E-2*GW**2) *TOF           RRDST112
      FGR= (GR- (8.363E-2+1.488E-2*GR-9.78E-5*GR**2) *WS) *100.           RRDST113
      GO TO 100                                                           RRDST114
19    TCF= (4.65478+6.94444E-3*T) + (3.257E-1+2.7778E-4*T) * (PA/10.)     RRDST115
      GR= (.1457+3.5625E-2*GW-6.763E-5*GW**2) +                           RRDST116
     .   (5.1428-3.175E-2*GW+7.0089E-5*GW**2) *TOF                       RRDST117
      FGR= (GR- (.1+.0082*GR) *WS) *100.                                  RRDST118
      GO TO 100                                                           RRDST119
20    TOF= (1.2192956+2.2091577E-3*PA+3.380102E-4*PA**2) +                RRDST120
     .   (1.4628966E-2+2.6313968E-4*PA-1.3818053E-7*PA**2) *T-           RRDST121
     .   (2.4891E-4-6.875E-6*PA+7.8125E-8*PA**2) *T**2+                  RRDST122
     .   (2.20314E-6-6.49E-8*PA+7.47E-10*PA**2) *T**3                    RRDST123
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      GF=((2.3806396-5.9265772E-2*GW+6.67969E-4*GW**2)+                  RRDST124
     .   (-1.19933136+5.041098E-2*GW-2.12517E-4*GW**2)*TOF)*10.          RRDST125
      FGR=(1.0+9.7757143E+1*GR+6.4285714E-2*GR**2)-                      RRDST126
     .   (4.8785706+5.4275515E-1*GR+4.438775E-3*GR**2)*WS                RRDST127
      GO TO 100                                                          RRDST128
   21 TOF=(-4.799107E-1 + 3.3165178E-2*PA +2.7902E-4*PA**2)  +           RRDST129
     . (2.129E-2 + 2.2538E-4 * PA - 2.9186E-6 * PA ** 2)  * T            RRDST130
      GR = (1.16103 + 5.318E-2 * GW + 9.0525E-4 * GW **2 )  +            RRDST131
     . (3.3695E1 - 6.94278E-1 * GW + 3.8559E-3 * GW ** 2 ) * TOF -       RRDST132
     . (-9.041 + 2.307E-1 * GW - 1.264E-3 * GW ** 2 ) * TOF ** 2 +       RRDST133
     . (-1.0708 + 2.477E-2 * GW - 1.108E-4 * GW ** 2 )*TOF ** 3          RRDST134
      FGR=(GR-(2.41318E-1+2.115E-4*GR + 1.935E-4*GR**2)*WS)*100.         RRDST135
      GO TO 100                                                          RRDST136
   22 CONTINUE                                                           RRDST137
   23 TOF=(3.9116E-2+6.3976E-2*PA)+(1.6557E-2-7.6643E-6*PA)*T            RRDST138
      GR=(5.625-9.5E-2*GW+1.3125E-3*GW**2)+                              RRDST139
     .   (8.6496E-1-1.2768E-2*GW+1.077E-4*GW**2)*TOF+                    RRDST140
     .   (4.0067E-1-5.382E-3*GW+3.627E-5*GW**2)*TOF**2                   RRDST141
      FGR=(GR-(1.508E-1+8.625E-3*GR)*WS)*100.                            RRDST142
      GO TO 100                                                          RRDST143
   24 TOF=(5.4067E+1-1.3375E-1*PA-2.2755E-4*PA**2+3.6508E-6*PA**3)-      RRDST144
     .   (7.395E-2-1.71E-4*PA-5.91E-6*PA**2+4.22E-8*PA**3)*T            RRDST145
      GR=(8.6549E+3-7.75196E+1*GW+2.07846E-1*GW**2)-                     RRDST146
     .   (5.6302E+2-4.9948*GW+1.30519E-2*GW**2)*TOF+                     RRDST147
     .   (1.22509E+1-1.07805E-1*GW+2.759985E-4*GW**2)*TOF**2-            RRDST148
     .   (8.8948E-2-7.77463E-4*GW+1.956483E-6*GW**2)*TOF**3              RRDST149
      FGR=(GR-(1.4123219E-1+8.5293578E-3*GR+5.709895E-6*GR**2)*WS)*100.  RRDST150
      GO TO 100                                                          RRDST151
   25 TOF=(7.90371+6.68965E-2*PA+2.12622E-4*PA**2)+                      RRDST152
     .   (3.00808E-2+2.67118E-5*PA+9.85E-6*PA**2)*T+                     RRDST153
     .   (1.23149E-4+1.3589E-6*PA-3.1641E-8*PA**2)*T**2                  RRDST154
      GR=(2.1742857+2.04286E-1*GW-1.071429E-2*GW**2)+                    RRDST155
     .   (1.14943-1.2707E-1*GW+5.1785E-3*GW**2)*TOF                      RRDST156
      FGR=(GR-(-2.7327E-2+1.904E-2*GR)*WS+                               RRDST157
     .   (-6.308077E-4+1.94654E-4*GR)*WS**2)*100.                        RRDST158
      GO TO 100                                                          RRDST159
   26 CONTINUE                                                           RRDST160
   27 CONTINUE                                                           RRDST161
   28 CONTINUE                                                           RRDST162
   29 TOF=(7.83935E-1+5.38189E-2*PA)+                                    RRDST163
     .   (1.20408E-2+9.888357E-5*PA-2.32448E-6*PA**2)*T-                 RRDST164
     .   (9.72E-6+1.8278E-6*PA-2.405E-8*PA**2)*T**2                      RRDST165
      GR=(3.18978E+1-1.785*GW+3.602E-2*GW**2)+                           RRDST166
     .   (-8.8285+5.1387E-1*GW-5.679E-3*GW**2)*TOF+                      RRDST167
     .   (-1.76441+4.82709E-2*GW)*TOF**2                                 RRDST168
      FGR=(GR-(8.6457E-2+1.1414E-2*GR)*WS)*100.                          RRDST169
      GO TO 100                                                          RRDST170
   30 TOF=(-2.890514E-1+5.8370956E-2*PA)+                                RRDST171
     .   (4.161561E-2-3.518445E-5*PA)*T+(-6.0515E-5+3.53095E-6*PA)*T**2 RRDST172
      GF=(-2.684337E+1+3.224954*GW)+(-2.0581519+3.7024356E-1*GW)*TOF+    RRDST173
     .   (-8.861357E-1+8.3093188E-2*GW)*TOF**2                           RRDST174
      FGR=(GR-(1.3583333E-1+9.5833E-3*GR)*WS)*100.                       RRDST175
      GO TO 100                                                          RRDST176
   31 TOF=(7.46275E-1+1.789924E-2*PA+1.667729E-4*PA**2)+                 RRDST177
     .   (6.1017875E-3+3.4816947E-4*PA-1.6406229E-6*PA**2)*T+            RRDST178
     .   (1.718525E-4-2.621825E-6*PA+4.184375E-8*PA**2)*T**2             RRDST179
      GR=(-7.2378129E+1+3.8485684E+1*GW-6.565*GW**2+3.916E-1*GW**3)+     RRDST180
     .   (-5.477E+1+2.92E+1*GW-4.975*GW**2+2.906E-1*GW**3)*TOF          RRDST181
      FGR=((-1.607758+1.222176*GR-5.64375E-3*GR**2)-                     RRDST182
     .   (.482382E-1+2.2260152E-2*GR-4.7462116E-4*GR**2)*WS)*100.       RRDST183
      GO TO 100                                                          RRDST184
   32 TOF=(1.996+1.69E-2*PA+2.56E-5*PA**2)+                              RRDST185
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     .   (8.64E-3-7.5E-5*PA+1.61F-6*PA**2)*T                              RRDST186
      GR=(6.26E+1-1.299E+1*GW+6.886E-1*GW**2)+                           RRDST187
     .   (-1.0004E+2+2.0317E+1*GW-9.67E-1*GW**2)*TOF+                    RRDST188
     .   (1.30368E+1-2.689*GW+1.403E-1*GW**2)*TOF**2                     RRDST189
      FGR=((-3.3E-1+1.047*GR-8.57E-4*GR**2)-                             RRDST190
     .   (4.22E-2+9.47E-3*GR+1.9898E-5*GR)*WS)*100.                      RRDST191
      GO TO 100                                                          RRDST192
33    TCF=(6.6742857E-1+4.4226786E-2*PA)+                                RRDST193
     .   (1.027143E-2+3.051339E-4*PA)*T+(1.74994E-4+5.023E-7*PA)*T**2    RRDST194
      GR=(-1.37666666E+1+1.679166666*GW)+(-3.55+4.71875E-1*GW)*TOF       RRDST195
      FGR=(GR-(1.5166666666E-1+1.0083333333E-2*GR)*WS)*100.              RRDST196
      GO TO 100                                                          RRDST197
34    CONTINUE                                                           RRDST198
35    CONTINUE                                                           RRDST199
36    TCF=(-9.2083337E-1+5.9113889E-2*PA)+(2.291666E-2-2.7778E-5*PA)*T   RRDST200
      GR=(3.711176E+1-1.640279E+1*GW+2.22809*GW**2)+                     RRDST201
     .   (-2.09922E+1+8.6991796*GW-8.4586E-1*GW**2)*TOF+                 RRDST202
     .   (2.246949-9.093486E-1*GW+1.061975E-1*GW**2)*TOF**2              RRDST203
      FGR=(GR-(4.3358E-2+2.196E-2*GR)*WS+                                RRDST204
     .   (8.79209E-4+8.21219E-5*GR)*WS**2)*100.                          RRDST205
      GO TO 100                                                          RRDST206
37    TCF=(-6.46E-1+6.7857E-2*PA+2.723E-4*PA**2)+                        RRDST207
     .   (3.69E-2-2.24E-3*PA+3.49E-5*PA**2)*T+                          RRDST208
     .   (1.07E-4+3.85E-5*PA-4.688E-7*PA**2)*T**2                       RRDST209
      GR=(5.38-1.105*GW+1.14E-1*GW**2)+                                  RRDST210
     .   (8.02E-1-2.57E-1*GW+2.4F-2*GW**2)*TOF                          RRDST211
      FGR=(GR-(1.6E-2+2.44E-2*GR-2.128E-4*GR**2)*WS)*100.                RRDST212
      GO TO 100                                                          RRDST213
100   RRDIST=FGR                                                         RRDST214
      RETURN                                                             RRDST215
      END                                                                RRDST216
```

FUNCTION SIGY
(ENTRY: SIGCY)

Purpose:

To compute the horizontal dispersion coefficient in meters, or at entry SIGCY, to compute the virtual distance corresponding to the initial horizontal dispersion.

Input:

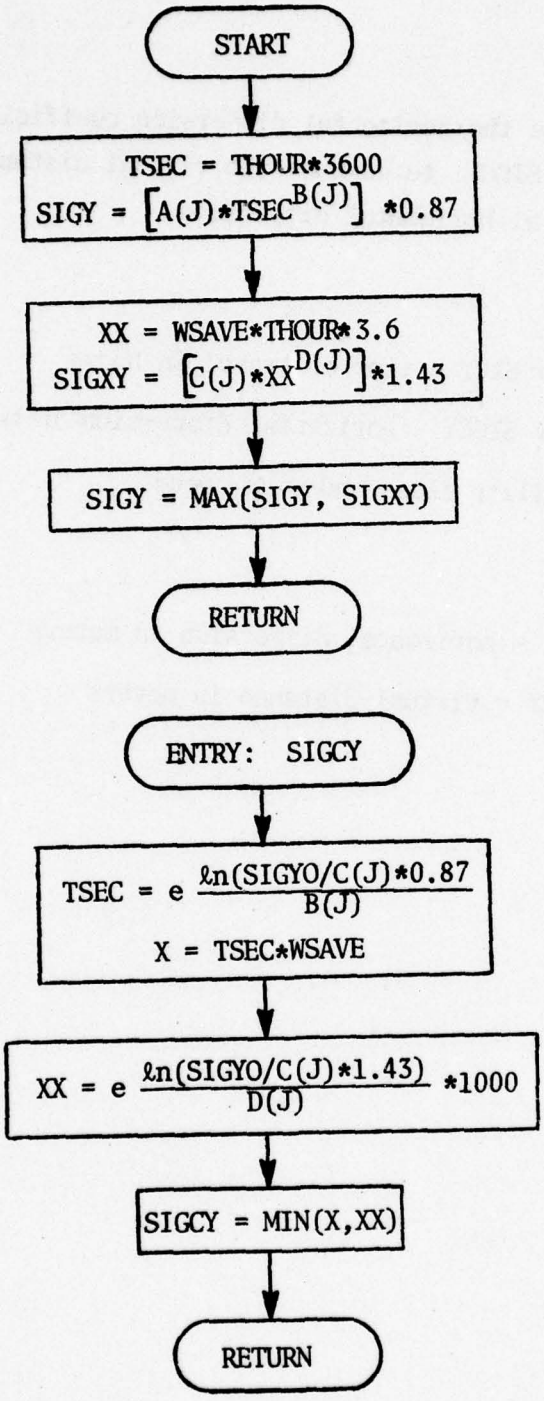
1. Entry SIGY - time of travel in hours
2. Entry SIGCY - horizontal dispersion in meters
3. Stability class and wind speed

Output:

1. SIGY = horizontal dispersion in meters
2. SIGCY = virtual distance in meters

FUNCTION SIGY

ENTRY: SIGCY



```
      FUNCTION SIGY(J,THOUR)                                            SIGY0000
C                                                                       SIGY0001
C   THIS FUNCTION COMPUTES THE HORIZONTAL DISPERSION COEFFICIENT        SIGY0002
C   IN METERS                                                           SIGY0003
C                                                                       SIGY0004
      COMMON /WDUN/ WSAVE                                               SIGY0005
      DIMENSION A(6),B(6),C(6),D(6)                                     SIGY0006
      DATA A/2.1511,1.5454,1.0606,.68465,.59366,.59366/                 SIGY0007
      DATA B/.87326,.88261,.89031,.88866,.89138,.89138/                 SIGY0008
      DATA C /212.,155.,100.,68.,50.,34./                               SIGY0009
      DATA D/0.89,0.91,0.92,0.93,0.90,0.93/                             SIGY0010
C                                                                       SIGY0011
      TSEC=THOUR*3600.                                                  SIGY0012
      SIGY=(A(J)*TSEC**B(J))*0.87                                       SIGY0013
      XX=WSAVE*THOUR*3.6                                                SIGY0014
      SIGXY=C(J)*(XX**D(J))*1.43                                        SIGY0015
      SIGY=AMAX1(SIGY,SIGXY)                                            SIGY0016
      RETURN                                                            SIGY0017
      ENTRY STGCY(J,SIGY0)                                              SIGY0018
C                                                                       SIGY0019
C   AT THIS ENTRY THE DISTANCE OR TRAVEL TIME CORRESPONDING TO THE      SIGY0020
C   INPUT VALUE OF THE HORIZONTAL DISPERSION IS CALCULATED AND          SIGY0021
C   RETURNED AS DISTANCE IN METERS                                      SIGY0022
C                                                                       SIGY0023
      TSEC=EXP(ALOG(SIGY0/(A(J)*0.87))/B(J))                            SIGY0024
      X=TSEC*WSAVE                                                      SIGY0025
      XX=EXP(ALOG(SIGYC/(C(J)*1.43))/D(J))*1000.                        SIGY0026
      SIGCY=AMIN1(X,XX)                                                 SIGY0027
      RETURN                                                            SIGY0028
      END                                                               SIGY0029
```

FUNCTION SIGZ
(ENTRY: SIGCZ)

Purpose:

To compute the vertical dispersion coefficient in meters, or at entry SIGCZ, to compute the virtual distance corresponding to the initial vertical dispersion.

Input:

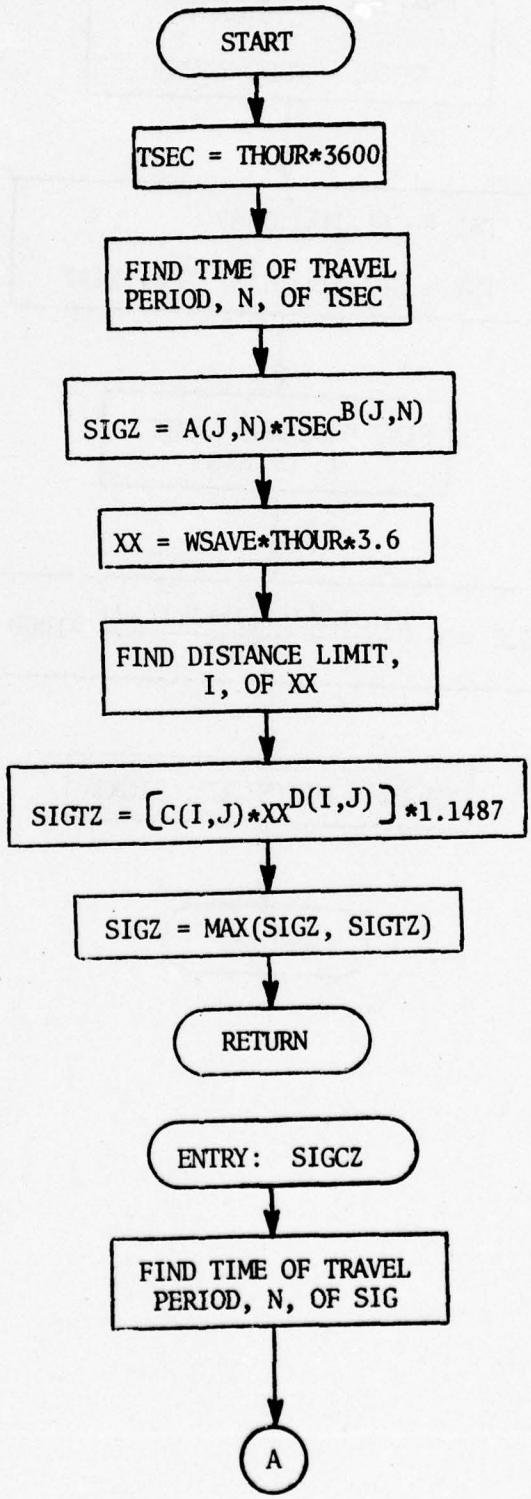
1. Entry SIGZ - time of travel in hours
2. Entry SIGCZ - vertical dispersion in meters
3. Stability class and wind speed

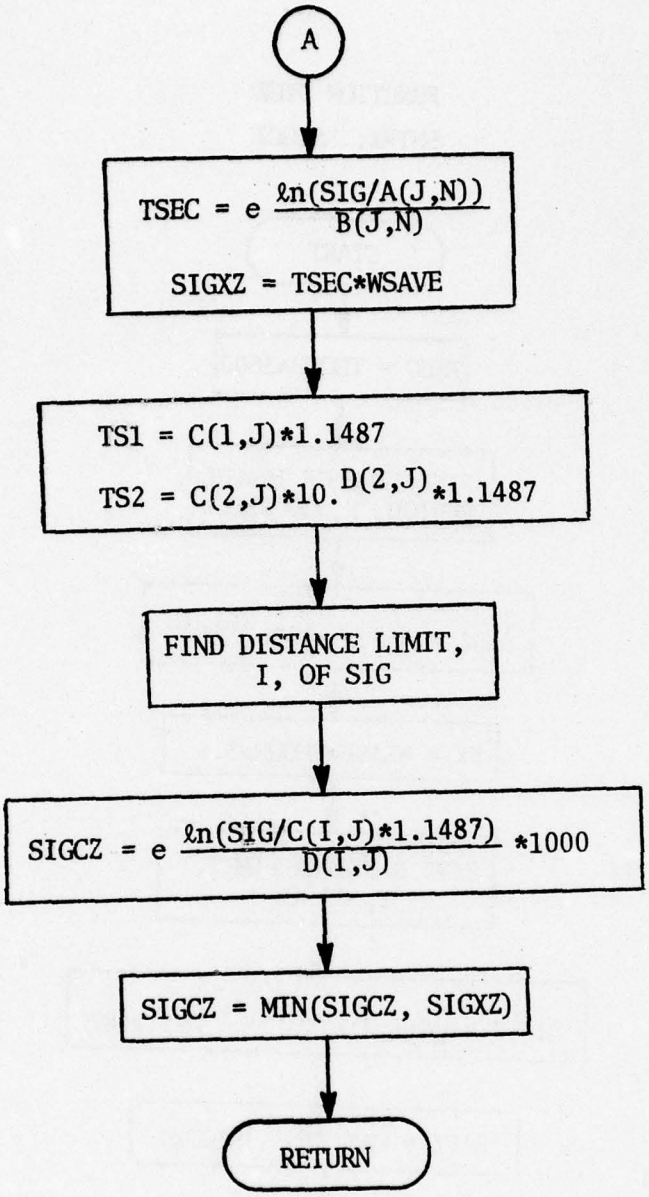
Output:

1. SIGZ = vertical dispersion in meters
2. SIGCZ = virtual distance in meters

FUNCTION SIGZ

ENTRY: SIGCZ




A
TSEC = e ℓn(SIG/A(J,N)) / B(J,N)
SIGXZ = TSEC*WSAVE
TS1 = C(1,J)*1.1487
TS2 = C(2,J)*10.D(2,J)*1.1487
FIND DISTANCE LIMIT, I, OF SIG
SIGCZ = e ℓn(SIG/C(I,J)*1.1487) / D(I,J) *1000
SIGCZ = MIN(SIGCZ, SIGXZ)
RETURN

```
      FUNCTION SIGZ(J,THOUR)                                                SIGZ0000
C                                                                           SIGZ0001
C   THIS FUNCTION COMPUTES THE VERTICAL DISPERSION COEFFICIENT              SIGZ0002
C   IN METERS                                                               SIGZ0003
C                                                                           SIGZ0004
      COMMON /WDUN/ WSAVE                                                   SIGZ0005
      DIMENSION C(3,6),D(3,6),A(6,6),B(6,6),CK(6,6)                         SIGZ0006
      DIMENSION TIME(6)                                                     SIGZ0007
      DATA TIME/   300.,1000.,3000.,10000.,30000.,172000./                  SIGZ0008
      DATA A/.17122,.27668,.41219,.51921,.50963,.47639,                     SIGZ0009
     1       .11062,.39953,.41219,.57145,.76485,.71936,                     SIGZ0010
     2       .01338,.16640,.41219,1.0813,1.9467,2.3901,                     SIGZ0011
     3       .01338,.16640,.41219,2.2830,2.9850,3.8684,                     SIGZ0012
     3       .01338,.16640,.41219,2.3333,5.7990,16.897,                     SIGZ0013
     3       .01338,.16640,.41219,5.6801,14.599,64.577/                     SIGZ0014
      DATA B/1.2098,1.0572,.92365,.84130,.79689,.76308,                     SIGZ0015
     1       1.2864,.99275,.92365,.82449,.72571,.69082,                     SIGZ0016
     2       1.5922,1.1195,.92365,.73217,.59047,.51700,                     SIGZ0017
     3       1.5922,1.1195,.92365,.63883,.53708,.45686,                     SIGZ0018
     4       1.5922,1.1195,.92365,.63646,.46497,.29621,                     SIGZ0019
     5       1.5922,1.1195,.92365,.55016,.37541,.16667/                     SIGZ0020
      DATA C/470.,470.,470.,110.,110.,110.,60.,60.,60.,33.,33.,40.,         SIGZ0021
     . 21.5,21.5,36.,14.,14.,23.5/                                          SIGZ0022
      DATA D/1.67,2.13,2.13,1.,1.09,1.09,0.92,0.92,0.92,0.80,0.61,0.53,     SIGZ0023
     . 0.70,0.56,0.35,0.78,0.53,0.30/                                       SIGZ0024
      DATA CK/                                                              SIGZ0025
     1 170.,     115.,     80.,      63.,     48.,     37.,                 SIGZ0026
     2 800.,     380.,     243.25,   170.,    115.,    85.,                 SIGZ0027
     3 4600.,    1300.,    671.,     380.,    220.,    150.,                SIGZ0028
     4 31279.,   5002.,    2040.32,  820.,    420.,    260.,                SIGZ0029
     5 179855.2,17111.38,5628.47,  1650.,   700.,    358.,                 SIGZ0030
     6 2900444.,120872.5,28241.86,4312.55,1348.32,481.58/                   SIGZ0031
C                                                                           SIGZ0032
      TSEC=THOUR*3600.                                                      SIGZ0033
      DO 10 N=1,6                                                           SIGZ0034
      IF(TSEC.LE.TIME(N))GO TO 20                                           SIGZ0035
   10 CONTINUE                                                              SIGZ0036
      N=6                                                                   SIGZ0037
C                                                                           SIGZ0038
C    TIME OF TRAVEL SHOULD BE LESS THAN 172000 SEC. OR APPROX. 2 DAYS       SIGZ0039
C                                                                           SIGZ0040
   20 CONTINUE                                                              SIGZ0041
      SIGZ=(A(J,N)*TSEC**B(J,N))                                            SIGZ0042
      XX=WSAVE*THOUR*3.6                                                    SIGZ0043
      I=1                                                                   SIGZ0044
      IF(XX.GT.1.) I=2                                                      SIGZ0045
      IF(XX.GT.10.) I=3                                                     SIGZ0046
C                                                                           SIGZ0047
C    CONVERTS FROM A 10 TO 20 MIN. SAMPLING TIME                            SIGZ0048
C    1.1487 = 2**.2, THE 1/5 POWER LAW ONLY APPLIES UP TO 20 MIN.           SIGZ0049
C    SAMPLING TIMES                                                         SIGZ0050
C                                                                           SIGZ0051
      SIGTZ=(C(I,J)*XX**D(I,J))*1.1487                                      SIGZ0052
      SIGZ=AMAX1(SIGZ,SIGTZ)                                                SIGZ0053
      RETURN                                                                SIGZ0054
      ENTRY SIGCZ(J,SIG)                                                    SIGZ0055
C                                                                           SIGZ0056
C    AT THIS ENTRY THE DISTANCE OR TRAVEL TIME CORESPONDING TO THE          SIGZ0057
C    INPUT VALUE OF THE VERTICAL DISPERSION IS CALCULATED AND               SIGZ0058
C    RETURNED AS DISTANCE IN METERS                                         SIGZ0059
C                                                                           SIGZ0060
      DO 110 N=1,6                                                          SIGZ0061
```

```
      IF (SIG.LE.CK(J,N)) GO TO 120                                      SIGZ0062
  110 CONTINUE                                                           SIGZ0063
      N=6                                                                SIGZ0064
  120 CONTINUE                                                           SIGZ0065
      TSEC=EXP(ALOG(SIG/A(J,N))/B(J,N))                                  SIGZ0066
      SIGXZ=TSEC*WSAVE                                                   SIGZ0067
      TS1=C(1,J)*1.1487                                                  SIGZ0068
      TS2=C(2,J)*10.**D(2,J)*1.1487                                      SIGZ0069
      I=3                                                                SIGZ0070
      IF (SIG.LT.TS2) I=2                                                SIGZ0071
      IF (SIG.LT.TS1) I=1                                                SIGZ0072
      SIGCZ=EXP(ALOG(SIG/(C(I,J)*1.1487))/D(I,J))*1000.                  SIGZ0073
      SIGCZ=AMIN1(SIGCZ,SIGXZ)                                           SIGZ0074
      RETURN                                                             SIGZ0075
      END                                                                SIGZ0076
```

SUBROUTINE SOURCE

Purpose:

To position the master source tape to read the airbase and environ source inventory data and to call the subroutines which compute the emission rates in micrograms per second at the airbase and environ sources.

Input:

JFLAG, a parameter to indicate whether the diurnal distribution used is input, default or the same as previous hour.

Output:

A statement indicating the diurnal distribution used.

Subroutines Called:

ABPTAR, ABARAR, ABLNAR, ENARAY

```
      SUBROUTINE SOURCE                                                  SOURC001
C                                                                        SOURC002
C     THIS ROUTINE SERVES AS A DRIVER TO CALL SUBROUTINES                SOURC003
C     WHICH COMPUTE THE EMISSION RATES IN MICROGRAMS                     SOURC004
C     PER SECOND AT THE AIRBASE AND ENVIRON SOURCES                      SOURC005
C                                                                        SOURC006
      COMMON / DEFALT / ITAPE                                            SOURC007
      COMMON /PERIOD/ IMONTH,NODAYS,IDAY,IHR1,IHR2,IFLAG,JFLAG,IONCE     SOURC008
      COMMON/JUNK/DAYS,LSRCE,NSRCE,SORCE(17,300),SORGM(10,200)           SOURC009
     . ,LOC1,LOC2,NGEOM,IPT                                              SOURC010
      DIMENSION NAME(2)                                                  SOURC011
      DATA NAME /4H1/12,4H1    /                                         SOURC012
      IF (IONCE.EQ.0) GO TO 30                                           SOURC013
      IEND=1                                                             SOURC014
      IST=1                                                              SOURC015
      GO TO 40                                                           SOURC016
   30 IEND=0                                                             SOURC017
      IONCE=1                                                            SOURC018
      IST=0                                                              SOURC019
   40 CONTINUE                                                           SOURC020
      DAYS=NODAYS                                                        SOURC021
      IF (IST.EQ.1) GO TO 3                                              SOURC022
    1 FORMAT (I4)                                                        SOURC023
      READ 1, JFLAG                                                      SOURC024
      IF(JFLAG) 8,7,3                                                    SOURC025
    7 PRINT 5                                                            SOURC026
    5 FORMAT(32HOINPUT DIURNAL DISTRIBUTION USED)                        SOURC027
      GO TO 4                                                            SOURC028
    8 I=1                                                                SOURC029
      IF (NODAYS.EQ.365) I=2                                             SOURC030
      PRINT 9,NAME(I)                                                    SOURC031
    9 FORMAT(34HODEFAULT DIURNAL DISTRIBUTION USED/5X,12HHOUR = 1/24,5X, SOURC032
     .10HDAY = 1/7,5X,8HMONTH = A4,1H,5X,12HUNIFRC = 0.1)                SOURC033
      GO TO 4                                                            SOURC034
    3 PRINT 6                                                            SOURC035
    6 FORMAT(39HODIURNAL DISTRIBUTION SAME AS LAST HOUR)                 SOURC036
      GO TO 10                                                           SOURC037
    4 IF(IEND.EQ.0) GO TO 12                                             SOURC038
   11 READ (ITAPE,END=12)                                                SOURC039
      GO TO 11                                                           SOURC040
   12 IEND=1                                                             SOURC041
      CALL ABETAR                                                        SOURC042
      CALL ABARAR                                                        SOURC043
      CALL ABLNAR                                                        SOURC044
      CALL ENARAY                                                        SOURC045
   10 REWIND ITAPE                                                       SOURC046
      RETURN                                                             SOURC047
      END                                                                SOURC048
```

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SUBROUTINE STPOL1

Purpose:

To calculate pollutant concentrations from point and area sources.

Input:

1. Location and conditions at point or area source
2. Location of receptors
3. Meteorological conditions

Output:

Concentration of pollutants at each receptor

Procedure:

1. For area sources determine average diameter, effective stack height, and initial values of horizontal and vertical dispersion. Also consider effects of downwash on these.
2. For point sources determine plume rise by calling PLRISE.
3. Consider effects of wind speed at height of source.
4. Calculate crosswind and downwind components for the source.
5. Calculate time required for plume to travel from virtual point source to actual location of true source by PSEUDO routine.
6. For each receptor, calculate crosswind and downwind components.
7. Consider the relative location of receptor with respect to source and, if necessary, calculate coupling coefficient using TRAN routine.
8. For each pollutant, add in concentration determined.

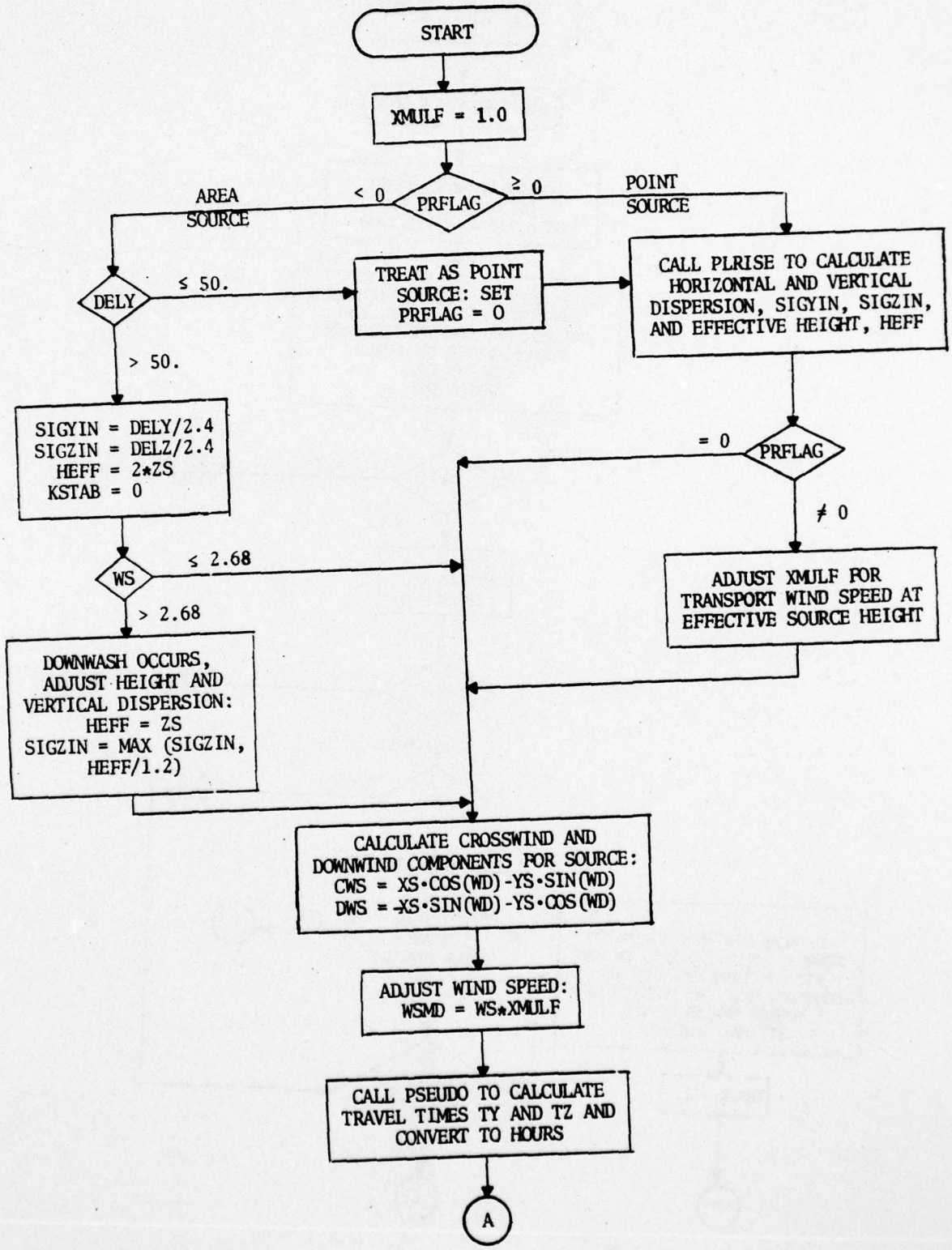
Subroutines Called:

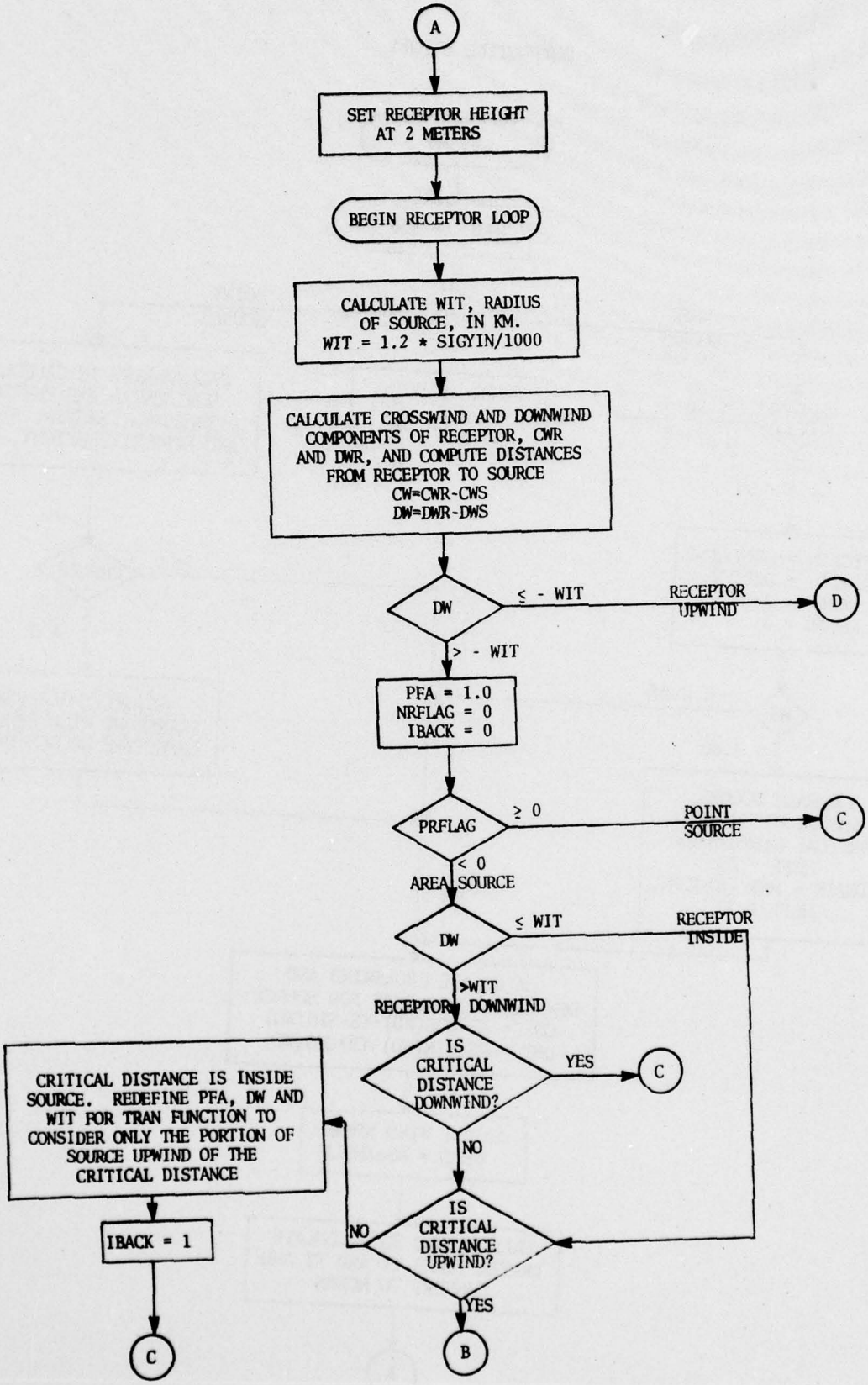
PLRISE, PSEUDO

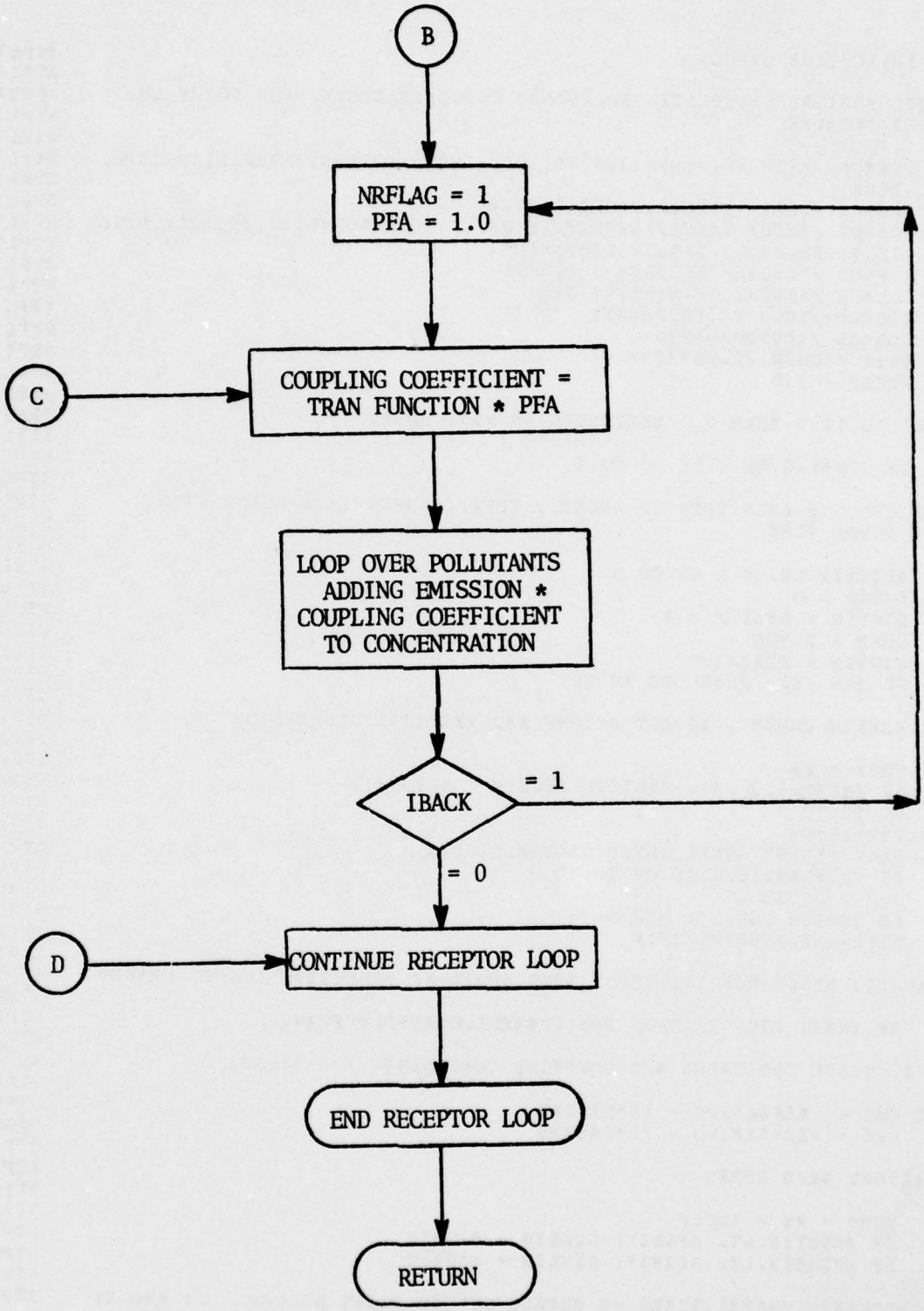
Function Called:

TRAN

SUBROUTINE STPOL1




A
SET RECEPTOR HEIGHT AT 2 METERS
BEGIN RECEPTOR LOOP
CALCULATE WIT, RADIUS OF SOURCE, IN KM. WIT = 1.2 * SIGYIN/1000
CALCULATE CROSSWIND AND DOWNWIND COMPONENTS OF RECEPTOR, CWR AND DWR, AND COMPUTE DISTANCES FROM RECEPTOR TO SOURCE CW=CWR-CWS DW=DWR-DWS
DW
≤ - WIT
RECEPTOR UPWIND
D
> - WIT
PFA = 1.0 NRFLAG = 0 IBACK = 0
PRFLAG
≥ 0
POINT SOURCE
C
< 0
AREA SOURCE
DW
≤ WIT
RECEPTOR INSIDE
>WIT
RECEPTOR DOWNWIND
IS CRITICAL DISTANCE DOWNWIND?
YES
C
NO
IS CRITICAL DISTANCE UPWIND?
NO
YES
CRITICAL DISTANCE IS INSIDE SOURCE. REDEFINE PFA, DW AND WIT FOR TRAN FUNCTION TO CONSIDER ONLY THE PORTION OF SOURCE UPWIND OF THE CRITICAL DISTANCE
IBACK = 1
C
B


B
NRFLAG = 1
PFA = 1.0
C
COUPLING COEFFICIENT =
TRAN FUNCTION * PFA
LOOP OVER POLLUTANTS
ADDING EMISSION *
COUPLING COEFFICIENT
TO CONCENTRATION
IBACK
= 1
= 0
D
CONTINUE RECEPTOR LOOP
END RECEPTOR LOOP
RETURN

```
      SUBROUTINE STPOL1                                                 STPL1000
C                                                                       STPL1001
C   THIS ROUTINE CALCULATES POLLUTANT CONCENTRATIONS FROM POINT AND     STPL1002
C   AREA SOURCES                                                        STPL1003
C                                                                       STPL1004
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMF,   STPL1005
     . TEMK                                                             STPL1006
      COMMON /RCPT/ NRECEP,RECEP(2,312)                                 STPL1007
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE     ,HTAERO,XS,YS,ZS,DELY,DELZ, STPL1008
     . TS,VS,DS,HB,PRFLAG,EMIS(8),NPOL                                  STPL1009
      COMMON /AIRQAL/ RECDAT(3, 6,312)                                  STPL1010
      COMMON /XTRAN/ XL,WSMD,TY,TZ                                      STPL1011
      COMMON /LOC/ DW,CW,ZR,WIT                                         STPL1012
      COMMON /WNDPRO/ XP(6)                                             STPL1013
      DATA SIGMIN /2.083333/                                            STPL1014
      XMULF = 1.0                                                       STPL1015
C                                                                       STPL1016
C   PRFLAG LESS THAN 0.0 INDICATES AN AREA SOURCE                       STPL1017
C                                                                       STPL1018
      IF (PRFLAG.GE.0.0) GO TO 5                                        STPL1019
C                                                                       STPL1020
C   IF DELY IS LESS THAN 50 METERS, TREAT SOURCE AS A POINT WITH        STPL1021
C   NO PLUME RISE                                                       STPL1022
C                                                                       STPL1023
      IF(DELY.LE.50.) GO TO 4                                           STPL1024
      KSTAB = 0                                                         STPL1025
      SIGYIN = DELY / 2.4                                               STPL1026
      HEFF = 2.*ZS                                                      STPL1027
      SIGZIN = DELZ/2.4                                                 STPL1028
      IF (WS .LE. 2.68) GO TO 10                                        STPL1029
C                                                                       STPL1030
C   DOWNWASH OCCURS, ADJUST HEIGHT AND VERTICAL DISPERSION              STPL1031
C                                                                       STPL1032
      HEFF = ZS                                                         STPL1033
      IF (HEFF/1.2 .GT. SIGZIN) SIGZIN = HEFF/1.2                       STPL1034
      GO TO 10                                                          STPL1035
    4 PRFLAG=0.                                                         STPL1036
    5 CALL PLRISE (HEFF,KSTAB,SIGZIN,SIGYIN)                            STPL1037
      IF (PRFLAG.EQ.0.0) GO TO 10                                       STPL1038
      JJJ = JSTAB                                                       STPL1039
      IF (KSTAB .GE. 1) JJJ=5                                           STPL1040
      HEFL=AMIN1(HEFF,305.)                                             STPL1041
C                                                                       STPL1042
C   ADJUST XMULF FOR TRANSPORT WIND SPEED AT EFFECTIVE SOURCE HEIGHT    STPL1043
C                                                                       STPL1044
      IF (HEFL .GT. HTAERO) XMULF=(HEFL/HTAERO)**XP(JJJ)                STPL1045
C                                                                       STPL1046
C   CALCULATE CROSSWIND AND DOWNWIND COMPONENTS FOR SOURCE              STPL1047
C                                                                       STPL1048
   10 CWS =  XS*COSEWD - YS*SINEWD                                      STPL1049
      DWS = -XS*SINEWD - YS*COSEWD                                      STPL1050
C                                                                       STPL1051
C   ADJUST WIND SPEED                                                   STPL1052
C                                                                       STPL1053
      WSMD = WS * XMULF                                                 STPL1054
      IF (SIGYIN.LT. SIGMIN) SIGYIN = SIGMIN                            STPL1055
      IF (SIGZIN.LT. SIGMIN) SIGZIN = SIGMIN                            STPL1056
C                                                                       STPL1057
C   CALCULATE TRAVEL TIMES TO PSEUDO UPWIND POINT SOURCE.  TY AND TZ    STPL1058
C   ARE RETURNED AS DISTANCES IN METERS AND CONVERTED TO EQUIVALENT     STPL1059
C   TIMES IN HOURS                                                      STPL1060
C                                                                       STPL1061
```

```
      CALL PSEUDO(SIGYIN,WSMD,SIGZIN,TY,TZ)                          STPL1062
      TY=TY/WSMD/3600.                                               STPL1063
      TZ=TZ/WSMD/3600.                                               STPL1064
      ZR = 2.                                                        STPL1065
C                                                                    STPL1066
C     BEGIN RECEPTOR LOOP                                            STPL1067
C                                                                    STPL1068
      DO 20 NR=1,NRECEP                                              STPL1069
C                                                                    STPL1070
C     WIT IS RADIUS OF SOURCE IN KILOMETERS                          STPL1071
C                                                                    STPL1072
      WIT = 1.2 * SIGYIN / 1000.                                     STPL1073
C                                                                    STPL1074
C     CALCULATE CROSSWIND AND DOWNWIND COMPONENTS OF RECEPTOR AND    STPL1075
C     COMPUTE DISTANCES IN KILOMETERS FROM RECEPTOR TO SOURCE         STPL1076
C                                                                    STPL1077
      CWR = RECEP(1,NR)*COSEWD - RECEP(2,NR)*SINEWD                  STPL1078
      CW = CWR - CWS                                                 STPL1079
      DWR = -RECEP(1,NR) * SINEWD - RECEP(2,NR) * COSEWD             STPL1080
      DW = DWR - DWS                                                 STPL1081
C                                                                    STPL1082
C     PFA IS FRACTION OF TOTAL AREA SOURCE BEING TREATED             STPL1083
C                                                                    STPL1084
      IF (DW.LE.-WIT) GO TO 20                                       STPL1085
C                                                                    STPL1086
C     IS RECEPTOR UPWIND OF SOURCE?                                  STPL1087
C                                                                    STPL1088
      PFA = 1.0                                                      STPL1089
      NRFLAG=0                                                       STPL1090
      IBACK=0                                                        STPL1091
      IF (PRFLAG.GE.0.0) GO TO 16                                    STPL1092
C                                                                    STPL1093
C     IS RECEPTOR INSIDE SOURCE?                                     STPL1094
C                                                                    STPL1095
      IF(DW.LE.WIT) GO TO 15                                         STPL1096
C                                                                    STPL1097
C     IS CRITICAL DISTANCE DOWNWIND OF DOWNWIND EDGE OF SOURCE?      STPL1098
C                                                                    STPL1099
      IF((DWR-XL).GE.(DWS+WIT)) GO TO 16                             STPL1100
C                                                                    STPL1101
C     IS CRITICAL DISTANCE UPWIND OF UPWIND EDGE OF SOURCE?          STPL1102
C                                                                    STPL1103
   15 IF((DWR-XL).LT.(DWS-WIT)) GO TO 17                             STPL1104
C                                                                    STPL1105
C     CRITICAL DISTANCE IS INSIDE SOURCE.  REDEFINE PFA, DW AND WIT  STPL1106
C     FOR TRAN FUNCTION TO CONSIDER ONLY THE PORTION OF SOURCE       STPL1107
C     UPWIND OF THE CRITICAL DISTANCE                                STPL1108
C                                                                    STPL1109
      PFA=(DW-XL+WIT)/(2.*WIT)                                       STPL1110
      DWSS=((DWS-WIT)+(DWR-XL))/2.                                   STPL1111
      DW=DWR-DWSS                                                    STPL1112
      WIT=DW-XL                                                      STPL1113
      IBACK=1                                                        STPL1114
      GO TO 16                                                       STPL1115
   17 NRFLAG=1                                                       STPL1116
      PFA=1.                                                         STPL1117
C                                                                    STPL1118
C     CALL TRAN FUNCTION TO DETERMINE COUPLING COEFFICIENTS          STPL1119
C                                                                    STPL1120
   16 CUPCOE = TRAN (KSTAB,HEFF,NRFLAG,IBACK ) * PFA                 STPL1121
C                                                                    STPL1122
C     ADD EMISSIONS TIMES COUPLING COEFFICIENT TO CONCENTRATIONS      STPL1123
```

```
C   AT ALL RECEPTORS                                                    STPL1124
C                                                                       STPL1125
      DO 18 IPOL = 1,NPOL                                               STPL1126
   18 RECDAT(ITYPE,IPOL,NR) = RECDAT(ITYPE,IPOL,NR) + EMIS(IPOL) *CUPCOESTPL1127
      IF(IBACK.EQ.1) GO TO 17                                           STPL1128
   20  CONTINUE                                                         STPL1129
      RETURN                                                            STPL1130
      END                                                               STPL1131
```

SUBROUTINE STPOL2

Purpose:

To prepare the data required by the line source model and, for each receptor, to call the model and then add the pollutant concentrations calculated to the accumulated totals at that receptor.

Input:

1. Source parameters for the current line.
2. Wind speed and direction, and lid height.

Output:

Accumulated pollutant concentrations at all receptors.

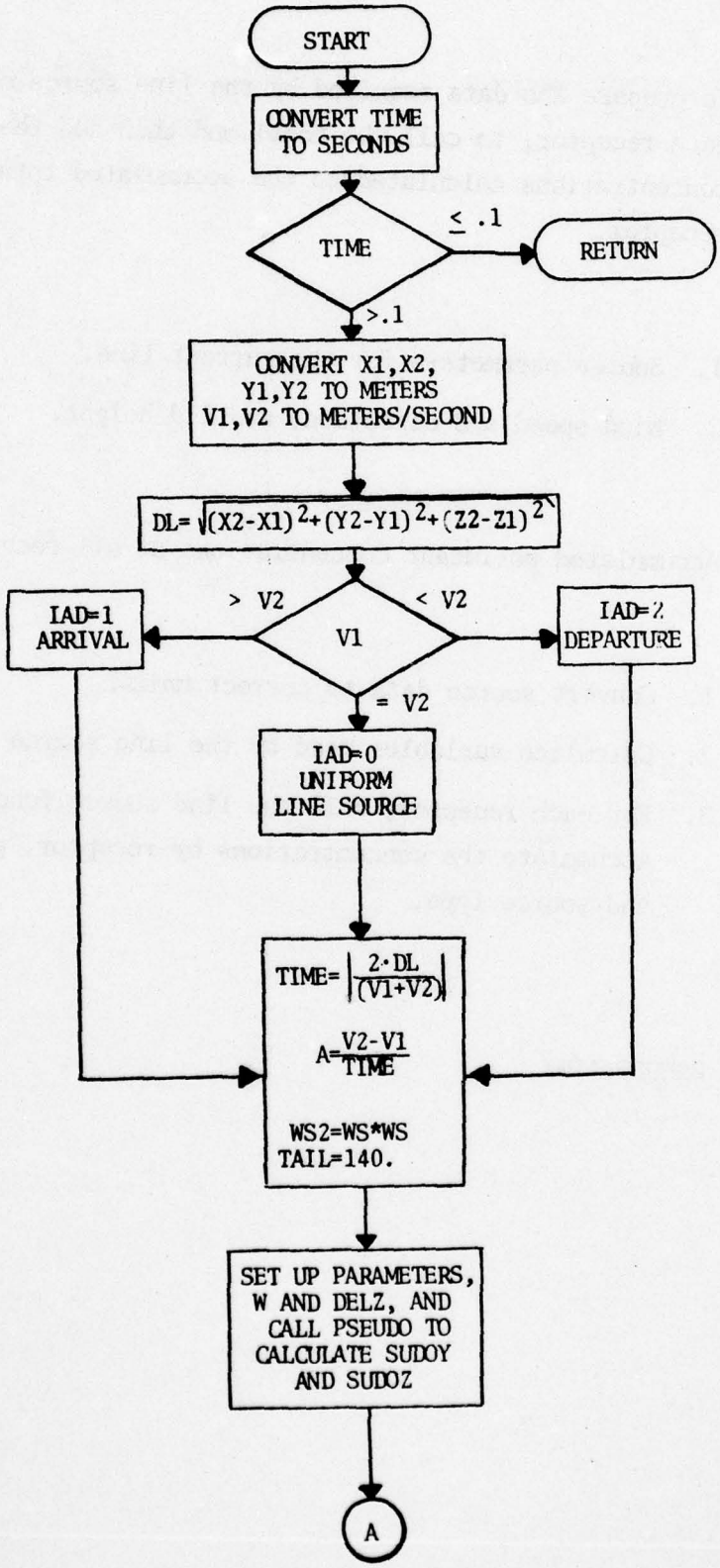
Procedure:

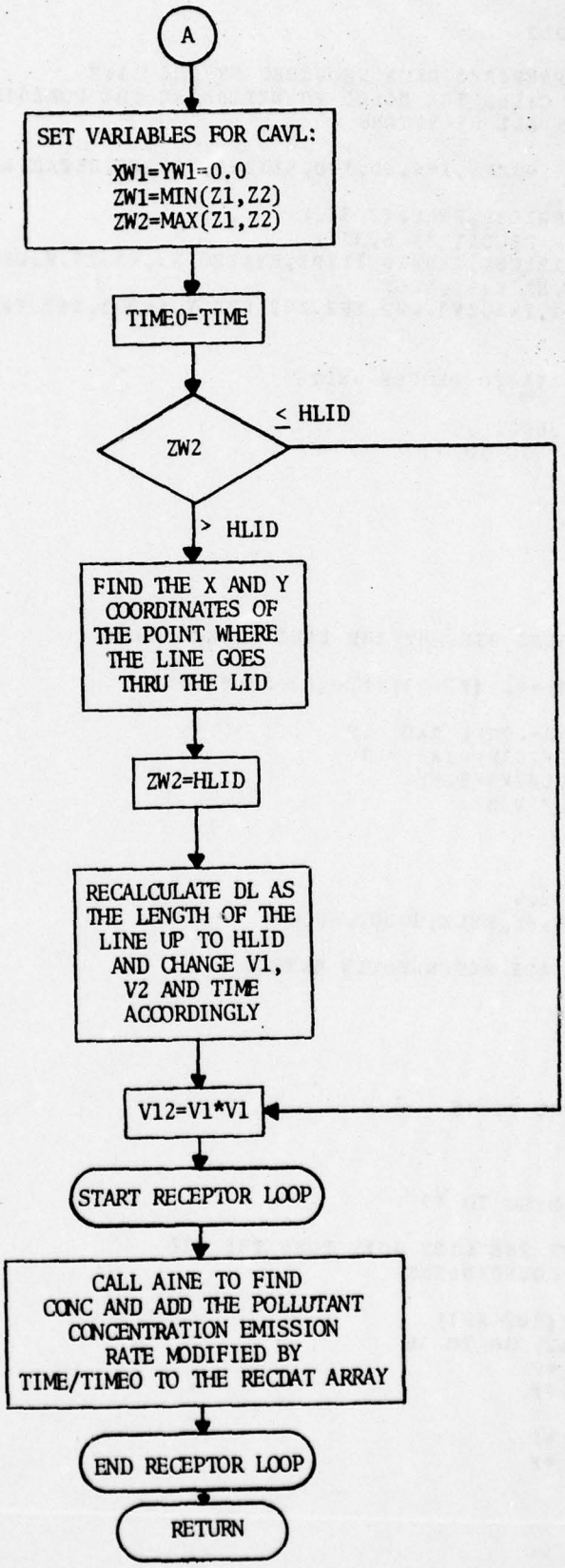
1. Convert source data to correct units.
2. Calculate variables used by the line source model.
3. For each receptor, call the line source function and accumulate the concentrations by receptor, pollutant, and source type.

Subroutines Called:

PSEUDO,AINE

SUBROUTINE STPOL2

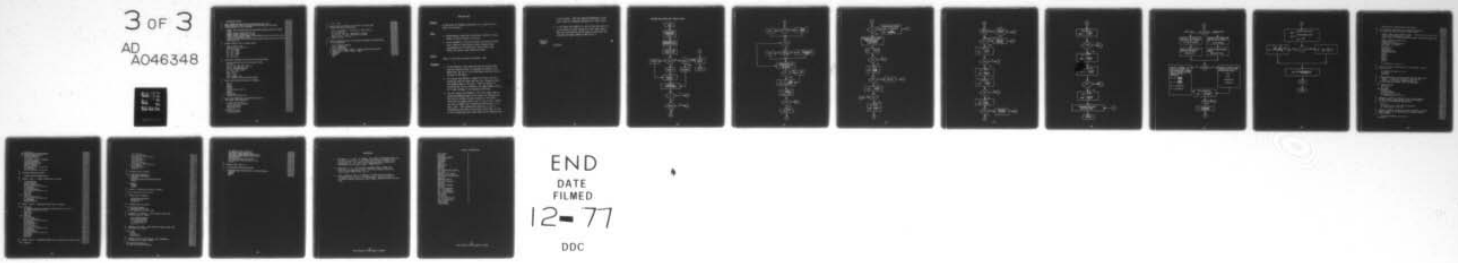



A
SET VARIABLES FOR CAVL:
XW1=YW1=0.0
ZW1=MIN(Z1,Z2)
ZW2=MAX(Z1,Z2)
TIME0=TIME
ZW2
≤ HLID
> HLID
FIND THE X AND Y COORDINATES OF THE POINT WHERE THE LINE GOES THRU THE LID
ZW2=HLID
RECALCULATE DL AS THE LENGTH OF THE LINE UP TO HLID AND CHANGE V1, V2 AND TIME ACCORDINGLY
V12=V1*V1
START RECEPTOR LOOP
CALL AINE TO FIND CONC AND ADD THE POLLUTANT CONCENTRATION EMISSION RATE MODIFIED BY TIME/TIME0 TO THE RECDAT ARRAY
END RECEPTOR LOOP
RETURN

AD-A046 348 ARGONNE NATIONAL LAB ILL F/G 13/2
AIR QUALITY ASSESSMENT MODEL FOR AIR FORCE OPERATIONS - SHORT-T--ETC(U)
APR 77 D J BINGAMAN

UNCLASSIFIED CEEDO-TR-76-34 NL

3 OF 3
AD A046348



END
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```
      SUBROUTINE STPOL2                                                 STPL2000
C                                                                       STPL2001
C     THIS SUBROUTINE PREPARES DATA REQUIRED BY THE LINE                STPL2002
C     SOURCE MODEL AND CALLS THE MODEL TO DETERMINE THE POLLUTANT       STPL2003
C     CONCENTRATIONS AT ALL RECEPTORS                                   STPL2004
C                                                                       STPL2005
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HLID,TEMP,   STPL2006
     . TEMK                                                             STPL2007
      COMMON /RCPT/ NRECEP,RECEP(2,312)                                 STPL2008
      COMMON /AIRQAL/ RECDAT(3, 6,312)                                  STPL2009
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE,HTAERO,X1,Y1,Z1,W,DELZ,X2,Y2,Z2,STPL2010
     . V1,V2,DL,TIME,EMIS(6),NPOL                                       STPL2011
      COMMON /LN/ XW1,YW1,ZW1,XW2,YW2,ZW2,SUDOY,SUDOZ,IAD,TAIL,A,V12,VS,STPL2012
     . WS2,WSC,RR,SP                                                    STPL2013
C                                                                       STPL2014
C     CONVERT SOURCE DATA TO PROPER UNITS                               STPL2015
C                                                                       STPL2016
      TIME = TIME * 3600.                                               STPL2017
      IF(TIME.LE.0.1) GO TO 11                                          STPL2018
      X1 = X1 * 1000.                                                   STPL2019
      Y1 = Y1 * 1000.                                                   STPL2020
      X2 = X2 * 1000.                                                   STPL2021
      Y2 = Y2 * 1000.                                                   STPL2022
      V1 = V1 / 3.6                                                     STPL2023
      V2 = V2 / 3.6                                                     STPL2024
C                                                                       STPL2025
C     CALCULATE VARIABLES USED BY THE LINE SOURCE MODEL                 STPL2026
C                                                                       STPL2027
      DL=SQRT((X2-X1)**2+(Y2-Y1)**2+(Z2-Z1)**2)                         STPL2028
      IAD = 0                                                           STPL2029
      IF (V1 .LT. (V2-.01)) IAD = 2                                     STPL2030
      IF (V1 .GT.(V2+.01)) IAD = 1                                      STPL2031
      TIME = ABS(2*DL/(V1+V2))                                          STPL2032
      A = (V2 - V1) / TIME                                              STPL2033
      WS2 = WS * WS                                                     STPL2034
      TAIL = 140.                                                       STPL2035
      W = W / 2.4                                                       STPL2036
      DELZ = DELZ / 2.4                                                 STPL2037
      CALL PSEUDO (W,WS,DELZ,SUDOY,SUDOZ)                               STPL2038
C                                                                       STPL2039
C     SUDOY AND SUDOZ ARE RETURNED IN METERS                            STPL2040
C                                                                       STPL2041
      XW1=0.                                                            STPL2042
      YW1=0.                                                            STPL2043
      ZW1=Z1                                                            STPL2044
      ZW2=Z2                                                            STPL2045
      IF(Z1.LE.Z2) GO TO 15                                             STPL2046
      ZW1=Z2                                                            STPL2047
      ZW2=Z1                                                            STPL2048
   15 TIMEO=TIME                                                        STPL2049
      IF(ZW2.LE.HLID)GO TO 18                                           STPL2050
C                                                                       STPL2051
C     FIND POINT WHERE THE LINE GOES THRU THE LID                       STPL2052
C     AND CHANGE THE COORDINATES                                        STPL2053
C                                                                       STPL2054
      F=(HLID-ZW1)/(ZW2-ZW1)                                            STPL2055
      IF (Z1 .GT. Z2) GO TO 16                                          STPL2056
      X2=X1+(X2-X1)*F                                                   STPL2057
      Y2=Y1+(Y2-Y1)*F                                                   STPL2058
      GO TO 17                                                          STPL2059
   16 X1=X2+(X1-X2)*F                                                   STPL2060
      Y1=Y2+(Y1-Y2)*F                                                   STPL2061
```

```
   17  ZW2 = HLID                                                        STPL2062
C                                                                        STPL2063
C    RECALCULATE THE LENGTH OF THE LINE UP TO HLID AND                   STPL2064
C    CHANGE VELOCITIES ACCORDINGLY                                       STPL2065
C                                                                        STPL2066
       DLSQ = (X1-X2)**2 + (Y1-Y2)**2 + (ZW1-ZW2)**2                     STPL2067
       DL = SQRT(DLSQ)                                                   STPL2068
       IF (Z2 .GT. Z1) V2 = SQRT(V1*V1+2.*A*DL)                          STPL2069
       IF (Z2 .LT. Z1) V1 = SQRT(V2*V2-2.*A*DL)                          STPL2070
       TIME = 2* DL / (V1+V2)                                            STPL2071
   18  V12 = V1 * V1                                                     STPL2072
C                                                                        STPL2073
C    CALL THE LINE FUNCTION TO DETERMINE POLLUTANT CONCENTRATIONS        STPL2074
C    AT ALL RECEPTORS                                                    STPL2075
C                                                                        STPL2076
       DO 10 IRECEP=1,NRECEP                                             STPL2077
       CONC = AINE(WD)                                                   STPL2078
       DO 10 IPOL=1,NPOL                                                 STPL2079
    10 RECDAT (ITYPE,IPOL,IRECEP) = RECDAT(ITYPE,IPOL,IRECEP) +          STPL2080
      - EMIS(IPOL) * CONC * TIME / TIMEO                                 STPL2081
    11 CONTINUE                                                          STPL2082
       RETURN                                                            STPL2083
       END                                                               STPL2084
```

FUNCTION TRAN

Purpose:

To calculate the coupling coefficient at a receptor due to a point or area source.

Input:

1. Meteorological conditions: wind speed, stability, mixing height, critical distance for mixing.
2. Source parameters: initial horizontal and vertical dispersion; effective stack height; pseudo transport times corresponding to the dispersions; plume height flag, KSTAB; area source flags, NRFLAG and IBACK.

Output:

Point or area source coupling coefficient, TRAN.

Procedure:

1. If the effective stack height exceeds the mixing height, then the stability index is reassigned according to the KSTAB flag, the lid is set at 3050 meters and the critical distance at 100 meters.
2. For sources with NRFLAG=0, compute the travel time for z dispersion from the center and that for y dispersion from the downwind edge of the source. Then the effects of ground and sky lid are treated by the image method, with up to 6 terms included in the coupling coefficient.
3. For area sources with NRFLAG=1, the travel times from the upwind and downwind edges of the source are determined on the basis of receptor location relative to the source. These plus the pseudo travel time, TZ, due to the z spread are used to compute the z-dispersion coefficients σ_z (T1) and σ_z (T2). The y-dispersion coefficient σ_y (TT) is determined on the basis of the pseudo travel time, TY, due to the y-spread plus the travel time from the downwind edge

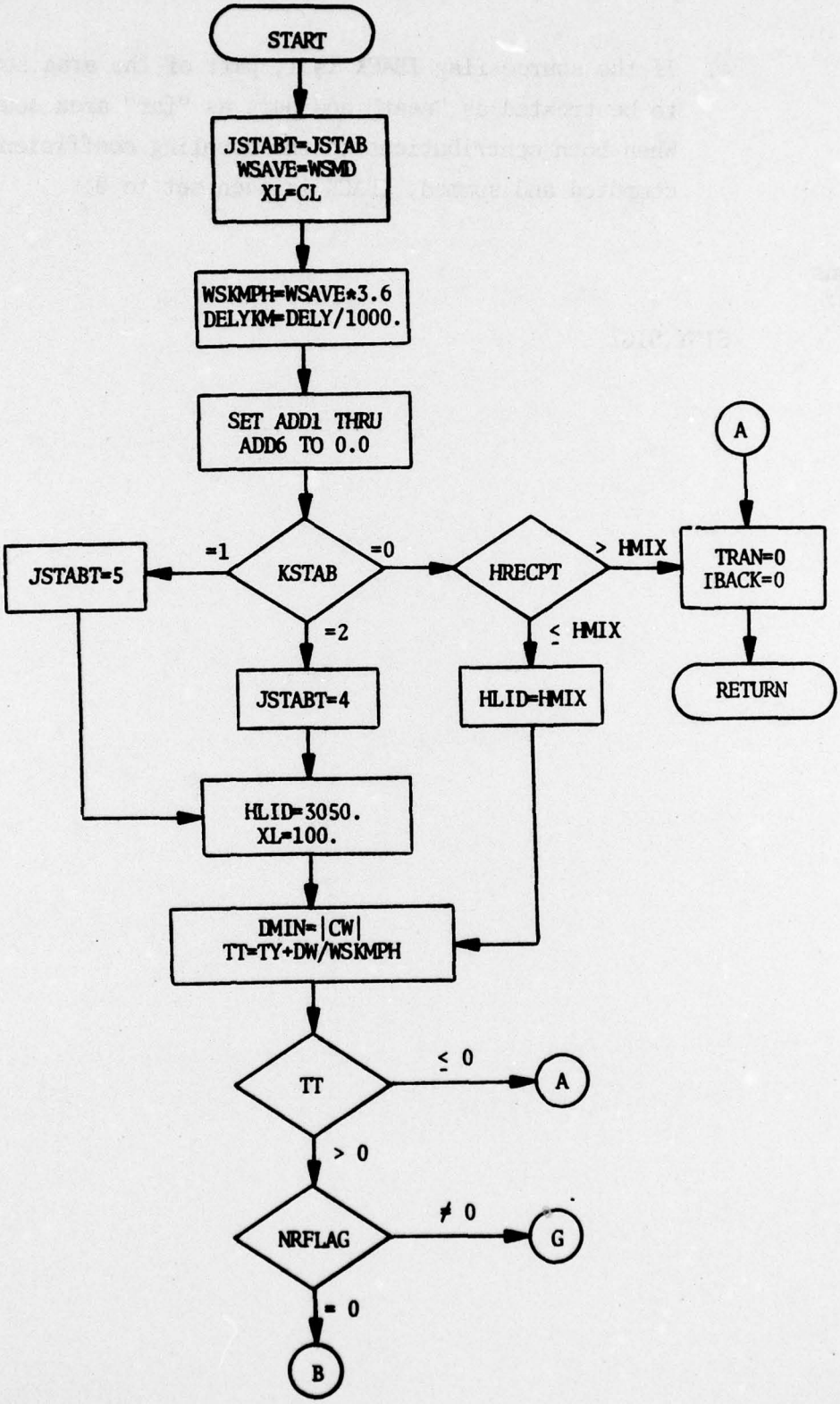
to the receptor. Then the coupling coefficient is computed using the integrated expression for "near" source.

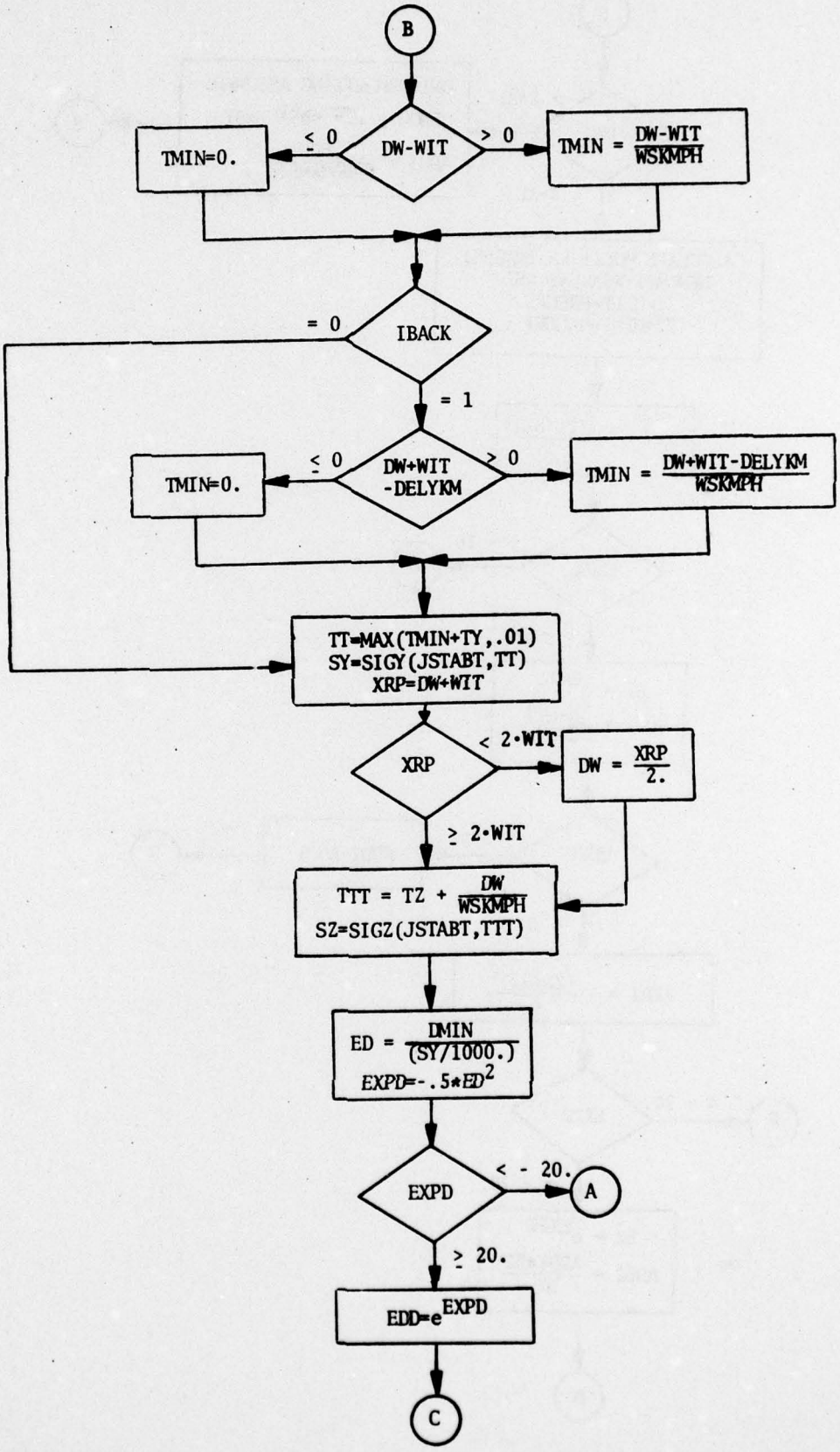
4. If the source flag IBACK is 1, part of the area source is to be treated as "near" and part as "far" area sources. When both contributions to the coupling coefficient are computed and summed, IBACK is then set to 0.

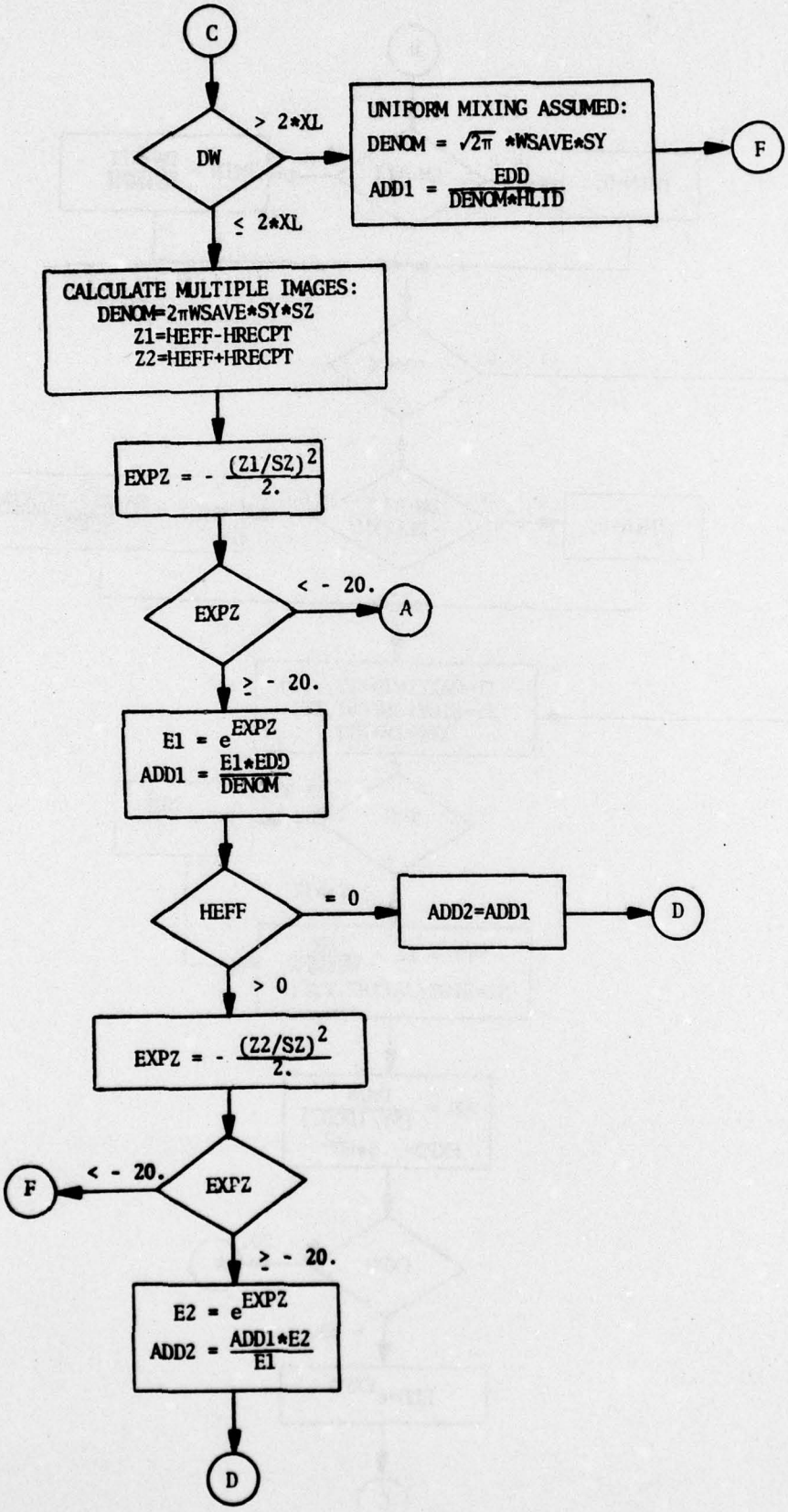
Functions Called:

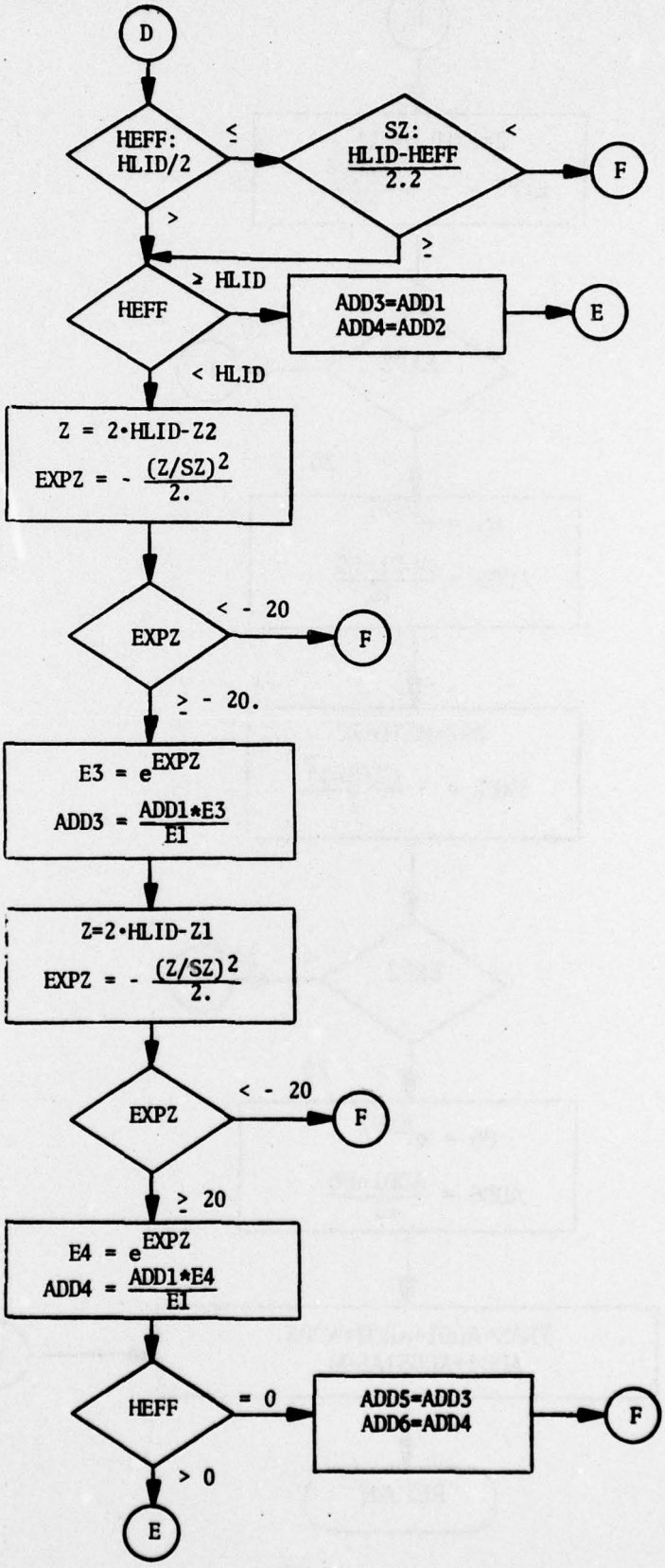
SIGY,SIGZ

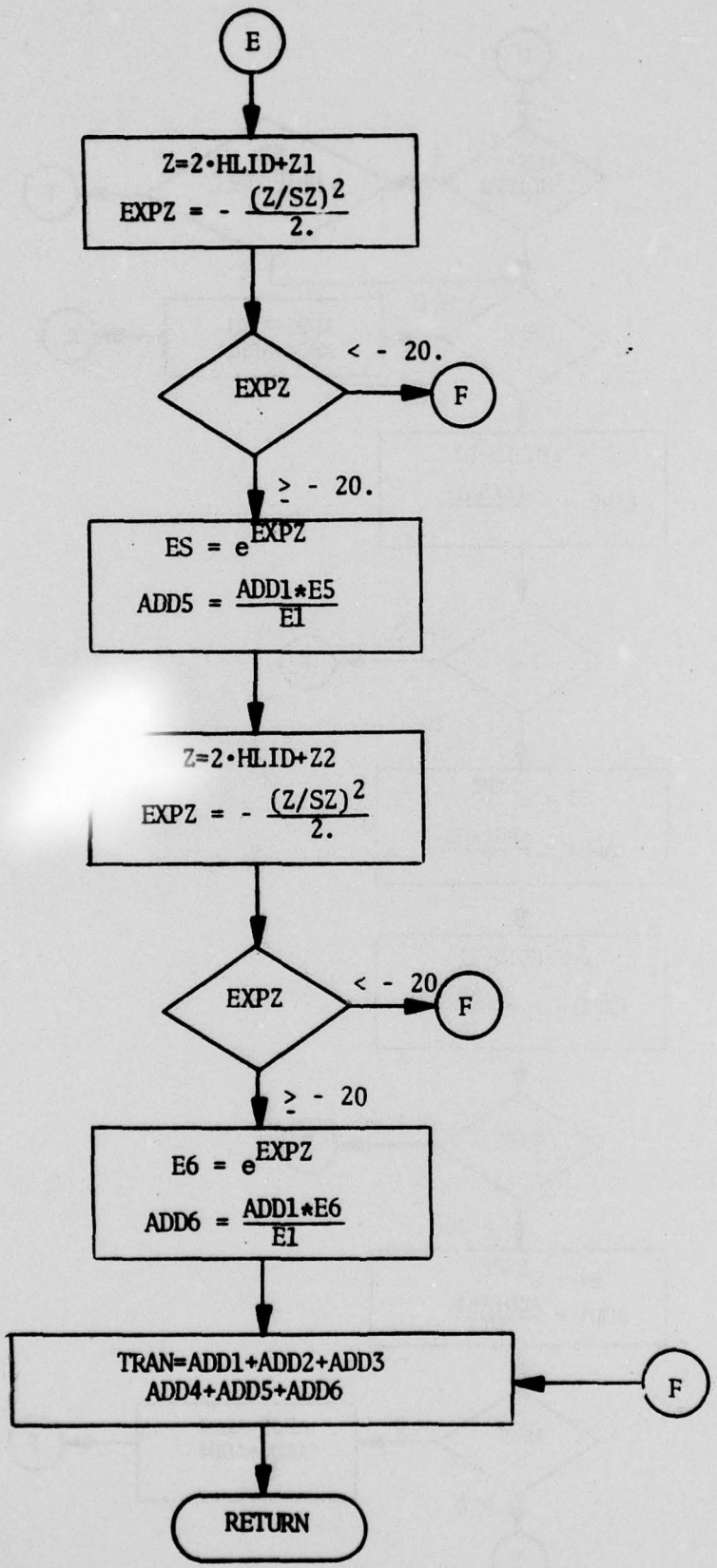
FUNCTION TRAN (KSTAB, HEFF, NRFLAG, IBACK)

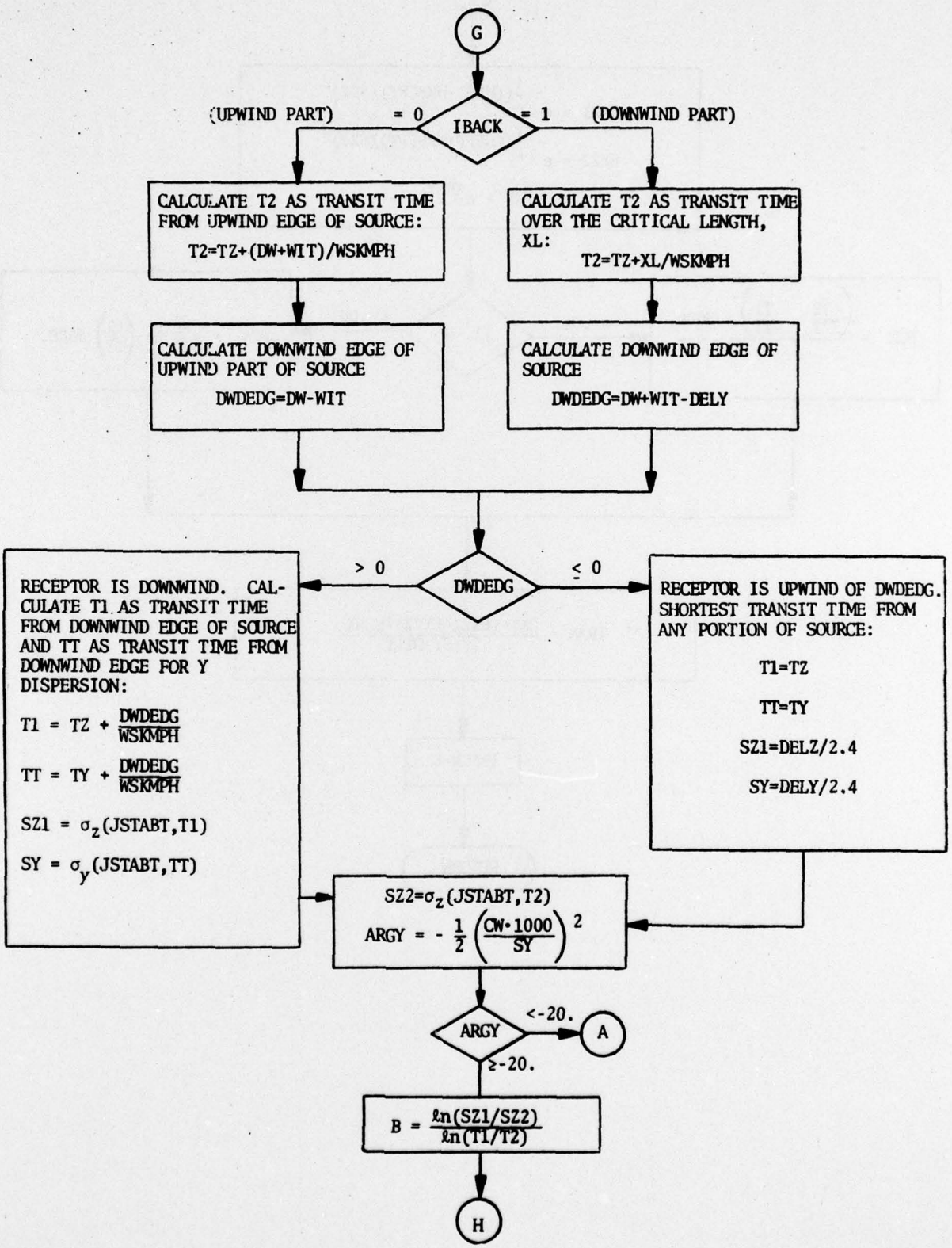


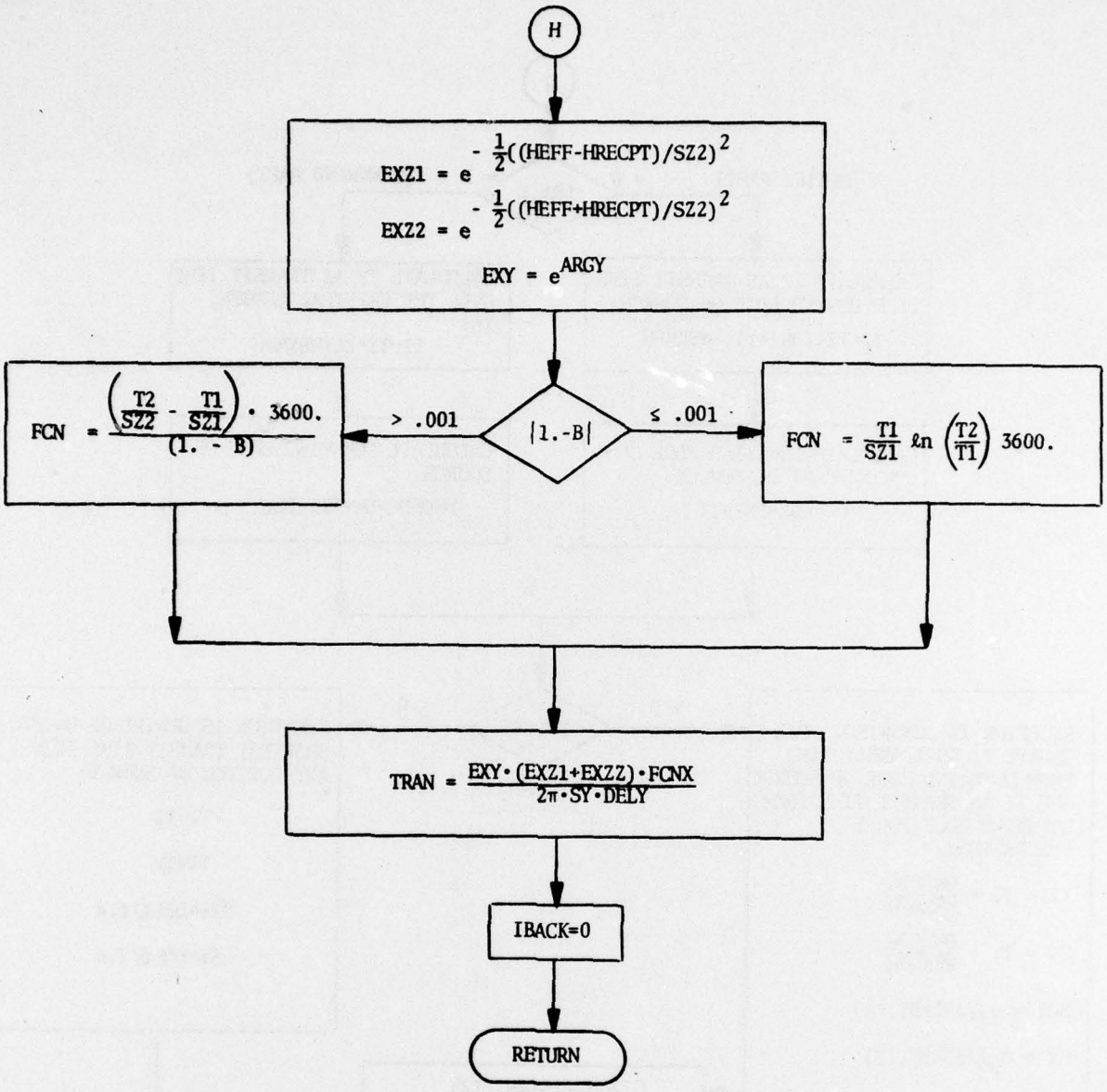

B
DW-WIT
≤ 0
TMIN=0.
> 0
TMIN = DW-WIT / WSKMPH
IBACK
= 0
= 1
DW+WIT -DELYKM
≤ 0
TMIN=0.
> 0
TMIN = DW+WIT-DELYKM / WSKMPH
TT=MAX(TMIN+TY,.01)
SY=SIGY(JSTABT,TT)
XRP=DW+WIT
XRP
< 2•WIT
DW = XRP / 2.
≥ 2•WIT
TTT = TZ + DW / WSKMPH
SZ=SIGZ(JSTABT,TTT)
ED = DMIN / (SY/1000.)
EXPD=-.5*ED^2
EXPD
< - 20.
A
≥ 20.
EDD=e^EXPD
C


C
DW
> 2*XL
UNIFORM MIXING ASSUMED:
DENOM = √2π *WSAVE*SY
ADD1 = EDD / DENOM*HLID
F
≤ 2*XL
CALCULATE MULTIPLE IMAGES:
DENOM=2πWSAVE*SY*SZ
Z1=HEFF-HRECPT
Z2=HEFF+HRECPT
EXPZ = - (Z1/SZ)^2 / 2.
EXPZ
< - 20.
A
≥ - 20.
E1 = e^EXPZ
ADD1 = E1*EDD / DENOM
HEFF
= 0
ADD2=ADD1
D
> 0
EXPZ = - (Z2/SZ)^2 / 2.
F
< - 20.
EXPZ
≥ - 20.
E2 = e^EXPZ
ADD2 = ADD1*E2 / E1
D


D
HEFF: HLID/2
≤
SZ: HLID-HEFF / 2.2
<
F
>
≥
HEFF
≥ HLID
ADD3=ADD1
ADD4=ADD2
E
< HLID
Z = 2•HLID-Z2
EXPZ = - (Z/SZ)^2 / 2.
EXPZ
< - 20
F
≥ - 20.
E3 = e^EXPZ
ADD3 = ADD1*E3 / E1
Z=2•HLID-Z1
EXPZ = - (Z/SZ)^2 / 2.
EXPZ
< - 20
F
≥ 20
E4 = e^EXPZ
ADD4 = ADD1*E4 / E1
HEFF
= 0
ADD5=ADD3
ADD6=ADD4
F
> 0
E


E
Z=2•HLID+Z1
EXPZ = - (Z/SZ)^2 / 2.
EXPZ
< - 20.
F
≥ - 20.
ES = e^EXPZ
ADD5 = ADD1*E5 / E1
Z=2•HLID+Z2
EXPZ = - (Z/SZ)^2 / 2.
EXPZ
< - 20
F
≥ - 20
E6 = e^EXPZ
ADD6 = ADD1*E6 / E1
TRAN=ADD1+ADD2+ADD3
ADD4+ADD5+ADD6
F
RETURN


G
IBACK
(UPWIND PART)
= 0
= 1
(DOWNWIND PART)
CALCULATE T2 AS TRANSIT TIME FROM UPWIND EDGE OF SOURCE:
T2=TZ+(DW+WIT)/WSKMPH
CALCULATE T2 AS TRANSIT TIME OVER THE CRITICAL LENGTH, XL:
T2=TZ+XL/WSKMPH
CALCULATE DOWNWIND EDGE OF UPWIND PART OF SOURCE
DWDEDG=DW-WIT
CALCULATE DOWNWIND EDGE OF SOURCE
DWDEDG=DW+WIT-DELY
DWDEDG
> 0
≤ 0
RECEPTOR IS DOWNWIND. CALCULATE T1 AS TRANSIT TIME FROM DOWNWIND EDGE OF SOURCE AND TT AS TRANSIT TIME FROM DOWNWIND EDGE FOR Y DISPERSION:
T1 = TZ + DWDEDG/WSKMPH
TT = TY + DWDEDG/WSKMPH
SZ1 = σz(JSTABT,T1)
SY = σy(JSTABT,TT)
RECEPTOR IS UPWIND OF DWDEDG. SHORTEST TRANSIT TIME FROM ANY PORTION OF SOURCE:
T1=TZ
TT=TY
SZ1=DELZ/2.4
SY=DELY/2.4
SZ2=σz(JSTABT,T2)
ARGY = -1/2 (CW·1000/SY)^2
ARGY
<-20.
≥-20.
A
B = ln(SZ1/SZ2)/ln(T1/T2)
H


H
EXZ1 = e^{-½((HEFF-HRECPT)/SZ2)^2}
EXZ2 = e^{-½((HEFF+HRECPT)/SZ2)^2}
EXY = e^{ARGY}
|1.-B|
> .001
≤ .001
FCN = ((T2/SZ2 - T1/SZ1) · 3600.)/(1. - B)
FCN = (T1/SZ1) ℓn (T2/T1) 3600.
TRAN = (EXY·(EXZ1+EXZ2)·FCNX)/(2π·SY·DELY)
IBACK=0
RETURN

```
      FUNCTION TRAN (KSTAB,HEFF,NRFLAG,IBACK)                          TRAN0000
C                                                                      TRAN0001
C   THIS FUNCTION CALCULATES THE COUPLING COEFFICIENT                  TRAN0002
C   AT A RECEPTOR DUE TO A POINT OR AREA SOURCE                        TRAN0003
C                                                                      TRAN0004
      COMMON /INFO/ IRECEP,IWNDIR,ITYPE     ,HTAERO,XS,YS,ZS,DELY,DELZ,  TRAN0005
     . TS,VS,DS,HB,PRFLAG,EMIS( 8),NPOL                               TRAN0006
      COMMON /MET/ WS,WSMPH,IWS,WD,IWD,SINEWD,COSEWD,JSTAB,HMIX,TEMF,  TRAN0007
     . T3MF                                                           TRAN0008
      COMMON /XTRAN/ CL,WSMD,TY,TZ                                     TRAN0009
      COMMON/WDUH/WSAVE                                                TRAN0010
      COMMON/LOC/DW,CW,HRECPT,WIT                                      TRAN0011
      DATA SQ2PI /2.5066283/                                           TRAN0012
      XL = CL                                                          TRAN0013
      JSTABT=JSTAB                                                     TRAN0014
      WSAVE=WSMD                                                       TRAN0015
      WSKMPH=WSAVE*3.6                                                 TRAN0016
      DELYKM=DELY/1000.                                                TRAN0017
      ADD1=0.                                                          TRAN0018
      ADD2=0.                                                          TRAN0019
      ADD3=0.                                                          TRAN0020
      ADD4=0.                                                          TRAN0021
      ADD5=0.                                                          TRAN0022
      ADD6=0.                                                          TRAN0023
C                                                                      TRAN0024
      IF (KSTAB.GT.0) GO TO 121                                        TRAN0025
C                                                                      TRAN0026
C   KSTAB=0, PLUME IS BELOW THE LID, IF RECEPTOR IS ABOVE              TRAN0027
C   LID, TRAN = 0.                                                     TRAN0028
C                                                                      TRAN0029
      IF (HRECPT.GT.HMIX) GO TO 76                                     TRAN0030
      HLID=HMIX                                                        TRAN0031
      GOTO 140                                                         TRAN0032
C                                                                      TRAN0033
C   ASSUME ARBITRARILY HIGH LID HEIGHT FOR TWO CASES WHEN:             TRAN0034
C      KSTAB = 1, PLUME IS INITIALLLY ABOVE THE LID                    TRAN0035
C      KSTAB = 2, PLUME WILL PENETRATE THE LID                         TRAN0036
C   ASSIGN STABILITY CLASSES 5 AND 4 RESPECTIVELY                      TRAN0037
C                                                                      TRAN0038
 121  JSTABT=6-KSTAB                                                   TRAN0039
      HLID=3050.                                                       TRAN0040
      XL = 100.                                                        TRAN0041
 140  CONTINUE                                                         TRAN0042
      DMIN=ABS(CW)                                                     TRAN0043
      TT=TY+DW/WSKMPH                                                  TRAN0044
      IF (TT.LE.0.) GO TO 76                                           TRAN0045
      IF (NRFLAG.NE.0) GO TO 143                                       TRAN0046
C                                                                      TRAN0047
C   NRFLAG=0, EFFECTS OF GROUND AND SKY LID ARE TREATED                TRAN0048
C   BY THE MULTIPLE IMAGE METHOD, WITH UP TO 6 TERMS                   TRAN0049
C   INCLUDED IN THE COUPLING COEFFICIENT                               TRAN0050
C                                                                      TRAN0051
      TMIN = 0.                                                        TRAN0052
      IF (DW-WIT.GT.0.) TMIN=(DW-WIT)/WSKMPH                           TRAN0053
      IF (IBACK.EQ.0) GO TO 131                                        TRAN0054
C                                                                      TRAN0055
C   IBACK=1, RECEPTOR IS WITHIN CRITICAL DOWNWIND DISTANCE.            TRAN0056
C   TREAT PORTIONS OF SOURCE UPWIND OF CRITICAL LENGTH                 TRAN0057
C   FROM RECEPTOR                                                      TRAN0058
C                                                                      TRAN0059
      IF (DW+WIT-DELYKM) 132,132,133                                   TRAN0060
 132  TMIN=0.                                                          TRAN0061
```

```
      GO TO 131                                                          TRAN0062
  133 TMIN=(DW+WIT-DELYKM)/WSKMPH                                        TRAN0063
  131 TT=AMAX1(TMIN+TY,.01)                                              TRAN0064
      SY=SIGY(JSTABT,TT)                                                 TRAN0065
      XRP = WIT + DW                                                     TRAN0066
      IF (XRP.LT.2.*WIT) DW=XRP/2.                                       TRAN0067
      TTT=TZ+DW/WSKMPH                                                   TRAN0068
      SZ=SIGZ(JSTABT,TTT)                                                TRAN0069
      ED=DMIN/(SY/1000.)                                                 TRAN0070
      EXPD=-.5*ED*ED                                                     TRAN0071
      IF (EXPD.LT.-20.) GO TO 76                                         TRAN0072
      EDD=EXP(EXPD)                                                      TRAN0073
      IF (DW.GT.2.*XL) GO TO 153                                         TRAN0074
C                                                                        TRAN0075
C   CALCULATE MULTIPLE IMAGES                                            TRAN0076
C                                                                        TRAN0077
      DENOM=6.2831853*WSAVE*SY*SZ                                        TRAN0078
C                                                                        TRAN0079
C   IMAGES 1 AND 2:  GROUND REFLECTION OF SOURCE                         TRAN0080
C                                                                        TRAN0081
      Z2=HEFF+HRECPT                                                     TRAN0082
      Z1=HEFF-HRECPT                                                     TRAN0083
      EXPZ=-(Z1/SZ)**2/2.                                                TRAN0084
      IF (EXPZ.LT.-20.) GO TO 76                                         TRAN0085
      E1=EXP(EXPZ)                                                       TRAN0086
      ADD1=E1*EDD/DENOM                                                  TRAN0087
      IF (HEFF.GT.0.0) GO TO 171                                         TRAN0088
      ADD2=ADD1                                                          TRAN0089
      GOTO 172                                                           TRAN0090
  171 CONTINUE                                                           TRAN0091
      EXPZ=-(Z2/SZ)**2/2.                                                TRAN0092
      IF (EXPZ.LT.-20.) GO TO 61                                         TRAN0093
      E2=EXP(EXPZ)                                                       TRAN0094
      ADD2=ADD1*E2/E1                                                    TRAN0095
C                                                                        TRAN0096
C   IMAGES 3 AND 4:  REFLECTION ABOUT HLID OF SOURCE                     TRAN0097
C                                                                        TRAN0098
  172 CONTINUE                                                           TRAN0099
      IF (HEFF.LE.HLID/2.0.AND.SZ.LT.(HLID-HEFF)/2.2) GO TO 61           TRAN0100
      IF (HEFF.LT.HLID) GO TO 174                                        TRAN0101
      ADD3=ADD1                                                          TRAN0102
      ADD4=ADD2                                                          TRAN0103
      GOTO 173                                                           TRAN0104
  174 CONTINUE                                                           TRAN0105
      Z=2.*HLID-Z2                                                       TRAN0106
      EXPZ=-(Z/SZ)**2/2.                                                 TRAN0107
      IF (EXPZ.LT.-20.) GO TO 61                                         TRAN0108
      E3=EXP(EXPZ)                                                       TRAN0109
      ADD3=ADD1*E3/E1                                                    TRAN0110
      Z=2.*HLID-Z1                                                       TRAN0111
      EXPZ=-(Z/SZ)**2/2.                                                 TRAN0112
      IF (EXPZ.LT.-20.) GO TO 61                                         TRAN0113
      E4=EXP(EXPZ)                                                       TRAN0114
      ADD4=ADD1*E4/E1                                                    TRAN0115
      IF (HEFF.GT.0.0) GO TO 173                                         TRAN0116
      ADD5=ADD3                                                          TRAN0117
      ADD6=ADD4                                                          TRAN0118
      GO TO 61                                                           TRAN0119
C                                                                        TRAN0120
C   IMAGES 5 AND 6:  REFLECTION ABOUT HLID OF FIRST BELOW GROUND IMAGE   TRAN0121
C                                                                        TRAN0122
  173 CONTINUE                                                           TRAN0123
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```
      Z=2.*HLID+Z1                                                      TRAN0124
      EXPZ=-(Z/SZ)**2/2.                                                TRAN0125
      IF (EXPZ.LT.-20.) GO TO 61                                        TRAN0126
      E5=EXP(EXPZ)                                                      TRAN0127
      ADD5=ADD1*E5/E1                                                   TRAN0128
      Z=2.*HLID+Z2                                                      TRAN0129
      EXPZ=-(Z/SZ)**2/2.                                                TRAN0130
      IF (EXPZ.LT.-20.) GO TO 61                                        TRAN0131
      E6=EXP(EXPZ)                                                      TRAN0132
      ADD6=ADD1*E6/E1                                                   TRAN0133
      GO TO 61                                                          TRAN0134
C                                                                       TRAN0135
C   UNIFORM MIXING ASSUMED                                              TRAN0136
C                                                                       TRAN0137
 153  DENOM=SQ2PI*WSAVE*SY                                              TRAN0138
      ADD1=EDD/(DENOM*HLID)                                             TRAN0139
  61  CONTINUE                                                          TRAN0140
      TRAN=ADD1+ADD2+ADD3+ADD4+ADD5+ADD6                                TRAN0141
      RETURN                                                            TRAN0142
C                                                                       TRAN0143
  76  TRAN=0.                                                           TRAN0144
      IBACK=0                                                           TRAN0145
      RETURN                                                            TRAN0146
C                                                                       TRAN0147
C   NRFLAG=1, RECEPTOR IS CLOSE TO SOURCE                               TRAN0148
C                                                                       TRAN0149
 143  IF (IBACK.EQ.1) GO TO 144                                         TRAN0150
C                                                                       TRAN0151
C   UPWIND PART OF SOURCE                                               TRAN0152
C                                                                       TRAN0153
      T2=(DW+WIT)/WSKMPH+TZ                                             TRAN0154
      DWDEDG=DW-WIT                                                     TRAN0155
      GO TO 145                                                         TRAN0156
C                                                                       TRAN0157
C   DOWNWIND PART OF SOURCE                                             TRAN0158
C                                                                       TRAN0159
 144  T2=TZ+XL/WSKMPH                                                   TRAN0160
      DWDEDG=DW+WIT-DELYKM                                              TRAN0161
 145  IF (DWDEDG.LE.0.) GO TO 146                                       TRAN0162
C                                                                       TRAN0163
C   RECEPTOR IS DOWNWIND .  FIND TRANSIT TIMES FROM                     TRAN0164
C   DOWNWIND EDGE OF SOURCE                                             TRAN0165
C                                                                       TRAN0166
      T1=TZ+DWDEDG/WSKMPH                                               TRAN0167
      TT=TY+DWDEDG/WSKMPH                                               TRAN0168
      SZ1=SIGZ(JSTABT,T1)                                               TRAN0169
      SY=SIGY(JSTABT,TT)                                                TRAN0170
      GO TO 147                                                         TRAN0171
C                                                                       TRAN0172
C   RECEPTOR IS UPWIND.  FIND SHORTEST TRANSIT TIME FROM                TRAN0173
C   ANY PORTION OF SOURCE                                               TRAN0174
C                                                                       TRAN0175
 146  T1=TZ                                                             TRAN0176
      TT=TY                                                             TRAN0177
      SZ1=DELZ/2.4                                                      TRAN0178
      SY=DELY/2.4                                                       TRAN0179
C                                                                       TRAN0180
C   COMPUTE COUPLING COEFFICIENT USING INTEGRATED                       TRAN0181
C   EXPRESSION FOR 'NEAR' SOURCE                                        TRAN0182
C                                                                       TRAN0183
 147  SZ2=SIGZ(JSTABT,T2)                                               TRAN0184
 155  ARGY=-(CW*1000./SY)**2/2.                                         TRAN0185
```

```
      IF (ARGY.LT.-20.) GO TO 76                                        TRAN0186
      B=ALOG(SZ1/SZ2)/ALOG(T1/T2)                                       TRAN0187
      EXZ1=EXP(-((HEPP-HRECPT)/SZ2)**2/2.)                              TRAN0188
      EXZ2=EXP(-((HEPP+HRECPT)/SZ2)**2/2.)                              TRAN0189
      EXY=EXP(ARGY)                                                     TRAN0190
      IF (ABS(1.-B).LE..001) GO TO 2                                    TRAN0191
      FCNX=(T2/SZ2-T1/SZ1)*3600./(1.-B)                                 TRAN0192
      GO TO 3                                                           TRAN0193
C                                                                       TRAN0194
C   SPECIAL CASE  FOR B = 1.                                            TRAN0195
C                                                                       TRAN0196
    2 FCNX=T1/SZ1*ALOG(T2/T1)*3600.                                     TRAN0197
C                                                                       TRAN0198
    3 TRAN=EXY*(EXZ1+EXZ2)*FCNX/(6.2831853*SY*DELY)                     TRAN0199
      IBACK=0                                                           TRAN0200
      RETURN                                                            TRAN0201
      END                                                               TRAN0202
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REFERENCES

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