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AIRCRAFT CONFIGURATION NOISE REDUCTION

VOLUME III
Computer Program Source Listing

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June 1976

FINAL REPORT

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Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Systems Research & Development Service
Washington, D.C. 20590

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TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. FAA-RD-76-76-III	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle AIRCRAFT CONFIGURATION NOISE REDUCTION Vol. III–Computer Program Source Listing		5. Report Date June 1976
		6. Performing Organization Code
7. Author(s) D. G. Dunn and D. J. Cecil		8. Performing Organization Report No. D6-42849-3
9. Performing Organization Name and Address Boeing Commercial Airplane Company P.O. Box 3707 Seattle, Washington 98124		10. Work Unit No.
		11. Contract or Grant No. DOT-FA74WA-3497
12. Sponsoring Agency Name and Address Federal Aviation Administration 800 Independence Avenue S.W. Washington, D.C. 20591		13. Type of Report and Period Covered Contractor Final Report (August 1974–June 1976)
		14. Sponsoring Agency Code

15. Supplementary Notes

H. C. True, DOT/FAA Technical Monitor

16. Abstract

This report discusses use of wing and fuselage structures as noise barriers for shielding aircraft engine noise from the community. The report concerns use of favorable aircraft configurations for community noise reduction of turbojet and turbofan powered aircraft. Significant noise reduction potential is illustrated on a hypothetical engine-over-wing (EOW) configuration using high bypass ratio turbofan engines. Noise shielding estimation procedures are developed for two types of configuration noise reduction concepts; i.e., the EOW and the engine-over-fuselage (EOF).

Results are described for a theoretical analysis, a major Boeing/Aeritalia test program, and an empirical analysis of test data. As a result, analytical prediction procedures are defined, computerized, and added to the software previously developed under NASA contract NAS2-6969. The shielding prediction procedures consider individual noise components: inlet fan, compressor, exit fan, core, turbine, and jet noise. A new source, jet/edge interaction noise, can also be predicted using the procedures. The collective software, incorporating the shielding package of this report, can be used to estimate community noise levels of wing and fuselage shielded turbofan or turbojet noise.

This report is presented in three volumes. Volume I contains the engineering analysis. Volume II contains a User's Guide for computer programs and other appendices. Volume III contains the complete computer program listing.

17. Key Words Noise reduction, Noise suppression, Wing shielding, Fuselage shielding, Diffraction, Refraction, Scattering, Community noise, Fan noise, Core noise, Turbine noise, Jet noise, Jet/edge noise		18. Distribution Statement Document is available to the public through the National Technical Information Service, Springfield, Virginia 22151.

19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 297	22. Price

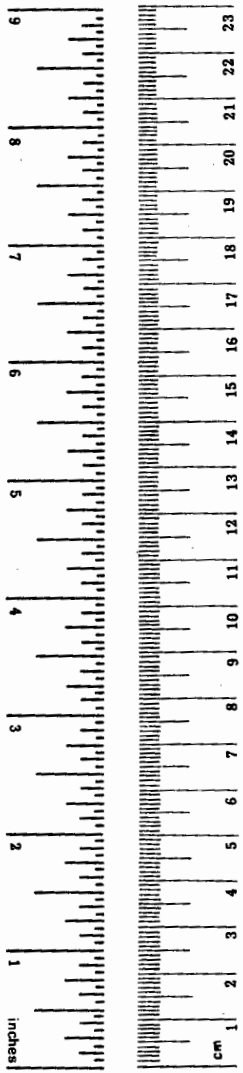
Form DOT F 1700.7 (8-69)

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

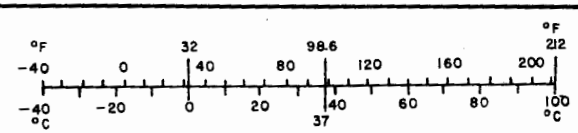
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

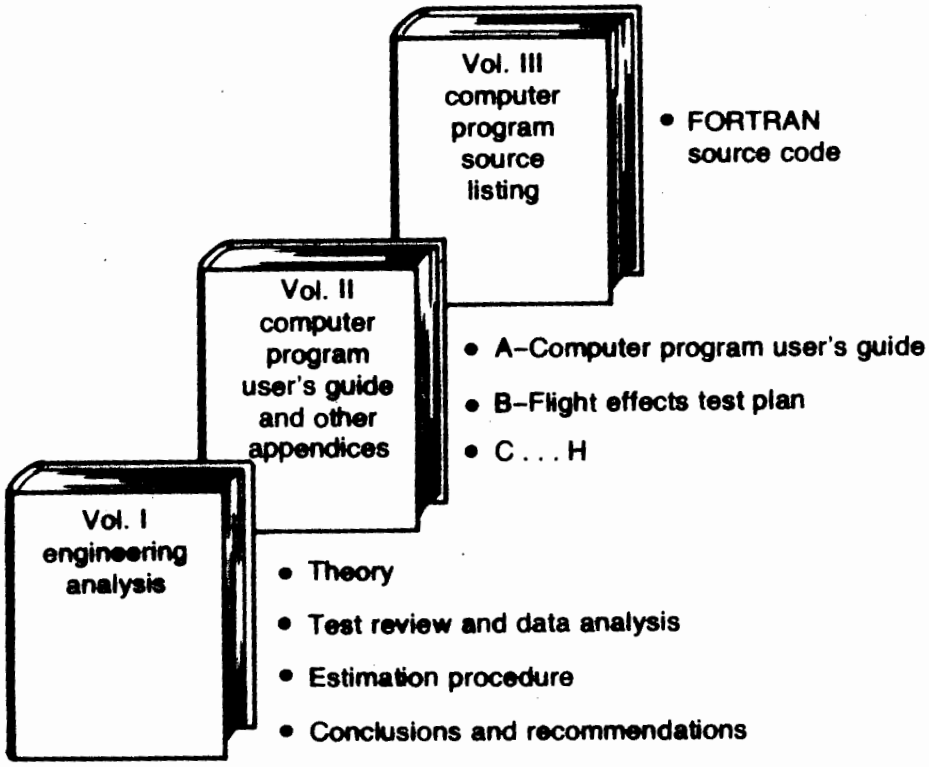
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



PREFACE

This is one of three volumes of the final report on "Aircraft Configuration Noise Reduction" submitted by the Boeing Commercial Airplane Company, Seattle, Washington, 98124, in fulfillment of Department of Transportation contract DOT-FA74WA-3497, dated 1 August 1974. This work was completed for the ATC Airport Facilities section of the Federal Aviation Adminstration (DOT). Mr. H. C. True was the Contract Technical Monitor.

The report is divided into three volumes for easy use as shown below:



This report is volume III of the series and was jointly prepared by the Noise Technology Staff of the Boeing Commercial Airplane Company and the Noise Systems Group of Boeing Comptuer Services, Inc. This volume contains the source code listing of the computer programs for evaluating "Aircraft Configuration Noise Reduction" as defined in the engineering document, volume I. The User's Guide for the programs is contained in appendix A of volume II. The material presented herein is reference data for use in conjunction with the material presented in volumes I and II.

The source code presented is written in FORTRAN IV (ANSI standard) for compilation using the FTN compiler on the CDC6600 KRONOS 2.1 Operating System. The actual program was delivered to the Federal Aviation Administration (DOT) on magnetic tape. The order of the programs listed herein corresponds to that on the tape.

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*MO = Main Overlay Program
SO = Secondary Overlay Program
M = Main Program
S = Subroutine
F = Function

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     *     4HENTE,4HR-WI,4HNG J,2HET,2*1H ,4HBLOW,4HN-FL,4HAP J,2HET,   PHBNAC    156
     *     3*1H ,4HLIFT,4H-FAN,5*1H ,4HEJEC,4HTOR ,4H- SU,4HPPRE,       PHBNAC    157
     *     4HSSOR,4H JET,1H ,4HPROP,4HELLE,1HR,4*1H ,4HHELI,4HCOPT,2HER, PHBNAC    158
     *     4*1H ,4HMEAS,4HURED,4H DAT,1HA,3*1H ,                        PHBNAC    159
     *     4HJET ,4HEDGE,4H INT,4HERAC,4HTION,2*1H /                    PHBNAC    160
      DATA ALPH/1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM/    PHBNAC    161
      DATA PT/1H./,YES/3HYES /,YNO/2HNO/                                PHBNAC    162
      DATA XL/2HM.,2HFT/                                                PHBNAC    163
      DATA FTKM/3HKM),4H1000,1H ,4H FT)/,CO/1H,/,PL/1H(/,PR/1H)/        PHBNAC    164
C     SUBR. ABSORP, ANGLES, CORSPL, ERRSET                              PHBNAC    165
C     HAVE BEEN CALLED TO INCLUDE THEM IN THE (0,0) OVERLAY             PHBNAC    166
C     ALTHO THEY ARE NOT USED IN THE (0,0) OVERLAY.                     PHBNAC    167
C     THEY HAVE VARIABLES IN DATA STATEMENTS THAT CHANGE                PHBNAC    168
C     AFTER FIRST LOADING ,AND THESE VALLESARE                          PHBNAC    169
C     OVERRIDEN WITH INITIAL VALUES WHEN THE OVERLAYS ARE               PHBNAC    170
C     RELOADED ,HENCE THEIR REMOVAL TO (0,0)OVERLAY                     PHBNAC    171
      IF(IGRD(1).EQ.IGRD(2))CALL ABSORP                                 PHBNAC    172
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      IF(IGRD(1).EQ.IGRD(2))CALL ANGLES                                 PHBNAC    173
      IF(IGRD(1).EQ.IGRD(2))CALL CORSPL                                 PHBNAC    174
      IF(IGRD(1).EQ.IGRD(2))CALL LININS                                 PHBNAC    175
      IF(IGRD(1).EQ.IGRD(2))CALL ERRSET(0,0)                            PHBNAC    176
C     CALL TO INITIALIZING ROUTINE                                      PHBNAC    177
    5 CALL INITL                                                        PHBNAC    178
C     INPUT ALL PARAMETERS RELATED TO THE GENERAL FORMAT OF THE PROGRAM PHBNAC    179
C     THESE INPUTS INCLUDE THE FOLLOWING PARAMETERS IN THE GPRAM BLOCK  PHBNAC    180
C                                                                       PHBNAC    181
C         ALTP          -      ALTITUDE OF THE AIRPLANE                 PHBNAC    182
C         ALTR          -      ALTITUDE OF THE SIDELINE OBSERVATIONS    PHBNAC    183
C         SLOPE         -      CLIMB  GRADIENT (TANGENT OF THETA)       PHBNAC    184
C         AMACH         -      AIRCRAFT MACH NUMBER                     PHBNAC    185
C         NOBS          -      NUMBER OF SIDELINE OBSERVATIONS (MAX. OF 1 PHBNAC  186
C         SLDIST(1-10)   -      SIDELINE DISTANCES                      PHBNAC    187
C         NTENG         -      NUMBER OF DIFFERNT TYPES OF ENGINES (MAX.O PHBNAC  188
C         IUNIT      - DEFAULT =0 ALL DIMENTIONAL INPUTS AND OUTPUTS IN M PHBNAC  189
C                              =1 IN ENGLISH UNITS                      PHBNAC    190
C     READ IN GENERAL INITIALIZING DATA                                 PHBNAC    191
      CALL INPUTG                                                       PHBNAC    192
      IF  (IOD - 1)  7, 7, 5000                                         PHBNAC    193
    7 CONTINUE                                                          PHBNAC    194
C      THIS SECTION CALCULATES THE DOPLER SHIFT                         PHBNAC    195
C                                                                       PHBNAC    196
C     CONVERT $GDATA PARAMETERS TO ENGLISH UNITS FOR COMPUTATION        PHBNAC    197
C                                                                       PHBNAC    198
      IF(IUNIT.EQ.IO)CALL CONVR(20,I1,I1)                               PHBNAC    199
      DO 52 I=I1,I17                                                    PHBNAC    200
      DOPSF(I)=F1                                                       PHBNAC    201
      IF(IDOP.EQ.IO)GO TO 52                                            PHBNAC    202
   51 DOPSF(I)=F1-AMACH*COS(RETA(I))                                    PHBNAC    203
   52 CONTINUE                                                          PHBNAC    204
      NCAS=NCAS+I1                                                      PHBNAC    205
      DO 4     K=1,ND                                                   PHBNAC    206
      IF(FLD(K+25).NE.0.)FLD(K)=ALOG10(FLD(K+25))                       PHBNAC    207
    4 ZNI(K)=-ZNI(K+25)                                                 PHBNAC    208
   45 CONTINUE                                                          PHBNAC    209
      IF(NCAS.NE.I1)GO TO 150                                           PHBNAC    210
C     DETERMINE AND STORE 1/3 OR FULL OCTAVE FREQUENCIES                PHBNAC    211
      IF(ISPTRM.EQ.I1)GO TO 20                                          PHBNAC    212
      NCF=24                                                            PHBNAC    213
      NK=I3                                                             PHBNAC    214
      DO 10 I=I1,NCF                                                    PHBNAC    215
      BUF(I)=UFREQ(I)                                                   PHBNAC    216
   10 BCF(I)=CFREQ(I)                                                   PHBNAC    217
      BUF(25)=UFREQ(25)                                                 PHBNAC    218
      GO TO 40                                                          PHBNAC    219
   20 NCF=I8                                                            PHBNAC    220
      NK=I1                                                             PHBNAC    221
      J=I2                                                              PHBNAC    222
      DO 30 I=I1,NCF                                                    PHBNAC    223
      BCF(I)=CFREQ(J)                                                   PHBNAC    224
      BUF(I)=UFREQ(J-1)                                                 PHBNAC    225
   30 J=J+3                                                             PHBNAC    226
      BUF(I9)=UFREQ(25)                                                 PHBNAC    227
   40 CONTINUE                                                          PHBNAC    228
      DO 50 I=I1,NCF                                                    PHBNAC    229
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 50    PFREQ(I)=BCF(I)/1000.                                            PHBNAC    230
 150   CONTINUE                                                         PHBNAC    231
C      CONVERT INPUT  DATA AND CALCULATE AIRCRAT-OBSERVER GEOMETRY IF IUN PHBNAC  232
 200   CONTINUE                                                         PHBNAC    233
C      PERFORM THE GEOMETRY CALCULATIONS FOR THE CURRENT CASE           PHBNAC    234
       ICALL =0                                                         PHBNAC    235
C                                                                       PHBNAC    236
       CALL OVERLAY(6HEXEC10,1,0,6HRECALL)                              PHBNAC    237
       ICALL=1                                                          PHBNAC    238
C      IS TYPE 4 REPORT SPECIFIED ( FLIGHTPATH/OBSERVER GEOMETRY)       PHBNAC    239
       IF(IPRT(4).NE.4)GO TO 250                                        PHBNAC    240
C                                                                       PHBNAC    241
C      CONVERT $GDATA PARAMETERS TO M.K.S. UNITS FOR OUTPUT             PHBNAC    242
C                                                                       PHBNAC    243
       IF(IUNIT.EQ.10)CALL CONVR(19,12,12)                              PHBNAC    244
 4835  CALL PRINTH(IPRT(4),LCT,8)                                       PHBNAC    245
       WRITE(8,4841)                                                    PHBNAC    246
 4841  FORMAT(37X,40HF L I G H T  P A T H  /  O B S E R V E R,          PHBNAC    247
      *2X,16HG E O M E T R Y )                                          PHBNAC    248
       WRITE(8,4842)AALT,CH(IUNIT+1,1),AMACH,SLOPE                      PHBNAC    249
 4842  FORMAT(//10X,16HAIRPORT ALTITUDE,9X,1H=,1X,1PE10.3,A3//         PHBNAC    250
      *10X,20HAIRCRAFT MACH NUMBER,5X,1H=,1X,E10.3,13X,1H,,2X,          PHBNAC    251
      *17HCLIMB    GRADIENT,5X,1H=,1X,E10.3,17H FOR (Z .GT. ZR)       )  PHBNAC    252
       WRITE(8,4843) ALTP,CH(IUNIT+1,1),ALTR,CH(IUNIT+1,1)              PHBNAC    253
 4843  FORMAT(10X,20HAIRCRAFT HEIGHT (ZO),5X,1H=,1X,1PE10.3,A3,2X,     PHBNAC    254
      *34HAT T = 0,  OBSERVER HEIGHT (ZR)  =,1X,E10.3,A3 )              PHBNAC    255
       WRITE(8,4845) CZ,CH(IUNIT+1,8),CCV,CH(IUNIT+1,8)                 PHBNAC    256
 4845  FORMAT(10X,14HSPEED OF SOUND,11X,1H=,1X,1PE10.3,1X,A3,          PHBNAC    257
      1  10H AT (ZO) ,,                                                 PHBNAC    258
      *2X,14HSPEED OF SOUND,8X,1H=,1X,E10.3,1X,A3,8H AT (ZR)  )         PHBNAC    259
       WRITE(8,4846) CA,CH(IUNIT+1,8)                                   PHBNAC    260
 4846  FORMAT(10X,26HAVERAGE  SPEED OF SOUND  =,1X,1PE10.3,1X,A3,       PHBNAC    261
      *38H FOR SOUND  PROPAGATION OVER RANGE (P) )                      PHBNAC    262
 4847  FORMAT(/47X,24HSIDELINE DISTANCE (X)  =,1X,1PE11.3,A3//12X,      PHBNAC    263
      *  10HTIME (SEC),                                                 PHBNAC    264
      *10X,5HANGLE,8X,15HA/C COORDINATES,5X,21HPROPAGATION  DP/P FOR,    PHBNAC    265
      *5X,30HANGLES FOR NOISE EXTRAPOLATION /9X,5HSOUND,7X,5HSOUND,8X,  PHBNAC    266
      *2HXI,10X,1HY,11X,1HZ,6X,10HDISTANCE P,3X,10HGRD.REFLX.,7X,6HBETA 1 PHBNAC  267
      *,9X,6HBETA 2 /10X,4HREC.,7X,5HXMIT.,6X,6H(DEG.),7X,1H(,A2,1H),   PHBNAC    268
      *8X,1H(,A2,1H),8X,1H(,A2,1H),22X,6H(DEG.),9X,6H(DEG.)/)           PHBNAC    269
 4848  FORMAT(8X,F6.1,6X,F6.1,4X,F7.0,4X,1PE11.3,3(2X,E10.3),2(5X,E10.3)) PHBNAC  270
       LCT=14                                                           PHBNAC    271
       DO 4860 I=1,NOBS                                                 PHBNAC    272
       DO 4860 J=1,17                                                   PHBNAC    273
       IF(LCT.GE.54)GO TO 4851                                          PHBNAC    274
       IF((J.EQ.11).AND.(LCT.LE.47))GO TO 4852                          PHBNAC    275
       IF(J.EQ.1) GO TO 4851                                            PHBNAC    276
       GO TO 4853                                                       PHBNAC    277
 4851  CALL PRINTH(IPRT(4),LCT,8)                                       PHBNAC    278
       WRITE(8,4841)                                                    PHBNAC    279
       LCT=LCT+1                                                        PHBNAC    280
 4852  WRITE(8,4847)SLDISX(I),CH(IUNIT+1,1),XL(IUNIT+1),XL(IUNIT+1),    PHBNAC    281
      *              XL(IUNIT+1)                                        PHBNAC    282
       LCT=LCT+7                                                        PHBNAC    283
 4853  WRITE(8,4848) TPD(J,I),TDS(J,I),ETA(J),APY(I,J),APZ(I,J),PD(I,J), PHBNAC   284
      *               DPND(I,J),B1(I,J),B2(I,J)                         PHBNAC    285
       LCT=LCT+1                                                        PHBNAC    286
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 4860 CONTINUE                                                          PHBNAC   287
C                                                                       PHBNAC   288
C     CONVERT $GDATA PARAMETERS TO ENGLISH UNITS FOR COMPUTATION        PHBNAC   289
C                                                                       PHBNAC   290
      IF(IUNIT.EQ.IO)CALL CONVR(19,I1,I1)                               PHBNAC   291
 250  CONTINUE                                                          PHBNAC   292
 350  CONTINUE                                                          PHBNAC   293
      CALL OVERLAY(6HEXEC10,1,0,6HRECALL)                               PHBNAC   294
C      SECTION FOR SETTING UP LINKAGE TO THE VARIOUS NOISE              PHBNAC   295
C      COMPONENT MODULES THAT HANDLE BOTH THE INPUT AND CALCULATIONS    PHBNAC   296
      IC=IO                                                             PHBNAC   297
      DO 4000 NC=1,NTENG                                                PHBNAC   298
      NTYP=IO                                                           PHBNAC   299
      NCOF=NC                                                           PHBNAC   300
C                                                                       PHBNAC   301
C     IF SHIELDING IS REQUIESTED FOR THAT PARTICULAR                    PHBNAC   302
C     CONFIGURATION,READ IN ENGINE/WING GEOM DATA                       PHBNAC   303
C                                                                       PHBNAC   304
      IF(INSEOW(NC).NE.0)CALL EWGIC                                     PHBNAC   305
 500  CONTINUE                                                          PHBNAC   306
      IF(NTYP.GE.NTYPE)GO TO 4000                                       PHBNAC   307
      IC=IC+I1                                                          PHBNAC   308
C                                                                       PHBNAC   309
C     GET $NOISIN DATA AND CONVERT TO ENGLISH UNITS FOR COMPUTATION     PHBNAC   310
C                                                                       PHBNAC   311
      CALL NINPUT                                                       PHBNAC   312
C                                                                       PHBNAC   313
C     PRINT OUT ENG/WING GEOMETRY IF SHIELDING SPECIFIED                PHBNAC   314
C                                                                       PHBNAC   315
      IF(NTYP.NE.I1)GO TO 530                                           PHBNAC   316
      IF(INSEOW(NCOF).NE.0)CALL EWGOUT(IPRT,IUNIT)                      PHBNAC   317
  530 CONTINUE                                                          PHBNAC   318
C                                                                       PHBNAC   319
C                                                                       PHBNAC   320
C     TEST FOR JET EDGE INTERACTION NOISE COMPONENT                     PHBNAC   321
C                                                                       PHBNAC   322
      IF(ITYPE.EQ.13) GO TO 888                                         PHBNAC   323
C                                                                       PHBNAC   324
C     IF NOISE COMPONENT JET FLOW REFRACTION EFFECTS AND SHIELDING      PHBNAC   325
C     FOR THE PARTICULAR CONFIGURATION IS REQUIRED READ IN COMPONENT    PHBNAC   326
C     SHIELDING DATA. A CONFLICT OCCURS WHEN SHIELDING IS REQUESTED     PHBNAC   327
C     FOR THE COMPONENT AND NOT THE CONFIGURATION.                      PHBNAC   328
C                                                                       PHBNAC   329
      IF(INSHLD.EQ.0)GO TO 888                                          PHBNAC   330
      IF(INSEOW(NC).NE.0.AND.INSHLD.NE.0)GO TO 878                      PHBNAC   331
      IF(INSEOW(NC).EQ.0.AND.INSHLD.NE.0)WRITE(6,777)ITYPE              PHBNAC   332
  777 FORMAT(1H0,60H    SHIELDING REQUEST CONFLICT  NO ENG/WNG GEOM     PHBNAC   333
     *ITYPE=  ,I2)                                                      PHBNAC   334
C      IF PRIMARY AND SECONDARY READ SHIELDING DATA                     PHBNAC   335
      IF(ITYPE.LE.2)GO TO 878                                           PHBNAC   336
      IF(ITYPE.GT.2)INSHLD=0                                            PHBNAC   337
      GO TO 888                                                         PHBNAC   338
C                                                                       PHBNAC   339
  878 CALL NSRIO                                                        PHBNAC   340
C                                                                       PHBNAC   341
  888 GO TO (1100, 1100, 1200, 1100, 1100, 1200, 1500,                  PHBNAC   342
     *       1300, 1200, 1300, 1300, 1400, 1500), ITYPE                 PHBNAC   343
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 1100 CONTINUE                                                          PHBNAC   344
      CALL OVERLAY(6HEXEC20,2,0,6HRECALL)                               PHBNAC   345
      GO TO 500                                                         PHBNAC   346
 1200 CONTINUE                                                          PHBNAC   347
      CALL OVERLAY(6HEXEC30, 3, 0, 6HRECALL)                            PHBNAC   348
      GO TO 500                                                         PHBNAC   349
 1300 CONTINUE                                                          PHBNAC   350
      CALL OVERLAY(6HEXEC40, 4, 0, 6HRECALL)                            PHBNAC   351
      GO TO 500                                                         PHBNAC   352
 1400 CONTINUE                                                          PHBNAC   353
      CALL OVERLAY(6HEXEC50, 5, 0, 6HRECALL)                            PHBNAC   354
      GO TO 500                                                         PHBNAC   355
 1500 CONTINUE                                                          PHBNAC   356
      CALL OVERLAY(6HEXEC60, 6, 0, 6HRECALL)                            PHBNAC   357
      GO TO 500                                                         PHBNAC   358
 4000 CONTINUE                                                          PHBNAC   359
C                                                                       PHBNAC   360
C     ENG/WIN GEOMETRY DATA IS OUTPUT ON FILE 8 FOR ALL CONFIGURATIONS  PHBNAC   361
C     AFTER FLIGHT PATH/OBSERVER GEOMETRY DATA. HENCE THE FILE MARK AND PHBNAC   362
      ENDFILE 8                                                         PHBNAC   363
      REWIND 8                                                          PHBNAC   364
C                                                                       PHBNAC   365
C     CONVERT ALL PARAMETERS $GDATA AND $NOISIN TO MKS UNITS FOR OUTPUT PHBNAC   366
C                                                                       PHBNAC   367
      IF(IUNIT.EQ.I0)CALL CONVR(I1,I2,I3)                               PHBNAC   368
      DO 4600 K2=I1,NOBS                                                PHBNAC   369
      DO 4500 K1=I1,NCF                                                 PHBNAC   370
      DO 4500 K3=I1,17                                                  PHBNAC   371
      TSPL(K1,K2,K3)=SSPL(K1,K2,K3)-TSPL(K1,K2,K3)                      PHBNAC   372
 4500 SPLT(K1,K3)=TSPL(K1,K2,K3)                                        PHBNAC   373
      CALL PNLSUB(SPLT(1,1),PSPL(1,K2),TPD(1,K2),EPNL(1,K2),            PHBNAC   374
     1      SPL2,TEPNL(1,K2),NK,BCG,TCG,FLR,K2,NOBS,IRR(K2,1))          PHBNAC   375
C      CALL NOISO PRINT ROUTINE TO PRINT EITHER TYPE 1 OR DEFAULT       PHBNAC   376
C          REPORT ON THE OUTPUT FILE                                    PHBNAC   377
      CALL NOISO(IPRT(1),K2,NK,6,CHIN,IUNIT,SLDISX(K2),PFREQ,SPLT(1,1), PHBNAC   378
     *NCF,14)                                                           PHBNAC   379
 4600 CONTINUE                                                          PHBNAC   380
C     IS THE TYPE 2 REPORT SPECIFIED (ASSUMPTIONS ON WHICH THE PREDICTIO PHBNAC   381
C                IS BASED)                                              PHBNAC   382
 4810 IF(IPRT(2).EQ.2)GO TO 4311                                        PHBNAC   383
      IF(IPRT(1).NE.I8)GO TO 4767                                       PHBNAC   384
 4311 CONTINUE                                                          PHBNAC   385
      EGP=YES                                                           PHBNAC   386
      GRD=YES                                                           PHBNAC   387
      CALL PRINTH(IPRT(2),LCT,6)                                        PHBNAC   388
      WRITE(6,4820)                                                     PHBNAC   389
 4820 FORMAT(50X,32HASSUMPTIONS FOR NOISE PREDICTION //)                PHBNAC   390
      LCT=8                                                             PHBNAC   391
      WRITE(6,4821)                                                     PHBNAC   392
 4821 FORMAT(2X,44H1) GEOMETRIC-MEAN PASSBAND FREQUENCIES (KHZ)    )    PHBNAC   393
      WRITE(6,4822) (PFREQ(I),I=1,NCF)                                  PHBNAC   394
 4822 FORMAT(6X,1PE10.3,11(E10.3)/6X,12E10.3)                           PHBNAC   395
      WRITE(6,4823)                                                     PHBNAC   396
 4823 FORMAT(1H )                                                       PHBNAC   397
      DO 4825 I=1,NCF                                                   PHBNAC   398
      TGAGR(I)=DAIRAB(I)                                                PHBNAC   399
 4825 CONTINUE                                                          PHBNAC   400
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      WRITE(6,4824) (FTKM(IUNIT+1,I),I=1,2)                              PHBNAC    401
 4824 FORMAT(2X,44H2) ATMOSPHERIC ABSORPTION COEFFICIENTS (DB /,2A4)     PHBNAC    402
      WRITE(6,4826)(TGAGR(I),I=1,NCF)                                    PHBNAC    403
 4826 FORMAT(6X,12F10.2)                                                 PHBNAC    404
      WRITE(6,4827)                                                      PHBNAC    405
 4827 FORMAT(/ 2X,25H3) ATMOSPHERIC CONDITIONS  )                        PHBNAC    406
      IG=IATMOS+I1                                                       PHBNAC    407
      GO TO(4828,4729,4731,4736,4742),IG                                 PHBNAC    408
 4828 WRITE(6,4829)                                                      PHBNAC    409
 4829 FORMAT(8X,33HINTERNATIONAL STANDARD ATMOSPHERE )                   PHBNAC    410
      GO TO 47 50                                                        PHBNAC    411
 4729 WRITE(6,4730)DTEMP,CH(IUNIT+1,6),DPRES,CH(IUNIT+1,7),DHUMID        PHBNAC    412
 4730 FORMAT(7X,40HINTERNATIONAL STANDARD ATMOSPHERE PLUS (,F6.2,        PHBNAC    413
     *5H DEG ,A1,1H,,F7.2,1X,A4,1H,,F7.2,8H PCT RH) )                    PHBNAC    414
      GO TO 4750                                                         PHBNAC    415
 4731 WRITE(6,4732) CH(IUNIT+1,6),CH(IUNIT+1,1)                          PHBNAC    416
 4732 FORMAT(7X,31HTEMPERATURE  VS. ALTITUDE (DEG ,A1,1H,,A3,1H))        PHBNAC    417
      WRITE(6,4733)(PL,TEMP(I),CO,TALT(I),PR,CC,I=1,NTEMP)               PHBNAC    418
 4733 FORMAT(7X,A1,1PE10.3,A1,E10.3,2A1,1X,A1,E10.3,A1,E10.3,2A1,1X,A1,  PHBNAC    419
     1 E10.3,A1,E10.3,2A1,1X,A1,E10.3,A1,E10.3,2A1,1X,A1,E10.3,A1,E10.3, PHBNAC    420
     2 2A1)                                                              PHBNAC    421
      WRITE(6,4734) CH(IUNIT+1,7),CH(IUNIT+1,1)                          PHBNAC    422
 4734 FORMAT(7X,27HPRESSURE      VS. ALTITUDE (,A4,1H,,A3,1H))           PHBNAC    423
      WRITE(6,4733)(PL,PRES(I),CC,PALT(I),PR,CC,I=1,NPRES)               PHBNAC    424
      WRITE(6,4735) CH(IUNIT+1,1)                                        PHBNAC    425
 4735 FORMAT(7X,32HREL.HUMIDITY VS. ALTITUDE (PCT ,,A3,1H))              PHBNAC    426
      WRITE(6,4733)(PL,RHUMID(I),CC,RALT(I),PR,CC,I=1,NHUMID)            PHBNAC    427
      CALL PRINTH(IPRT(2),LCT,6)                                         PHBNAC    428
      WRITE(6,4820)                                                      PHBNAC    429
      GO TO 4750                                                         PHBNAC    430
 4736 IF(IUNIT.EQ.1) GO TO 4738                                          PHBNAC    431
      CPRES=1.0                                                          PHBNAC    432
      CTEMP=288.16                                                       PHBNAC    433
      GO TO 4740                                                         PHBNAC    434
 4738 CPRES=14.696                                                       PHBNAC    435
      CTEMP=518.688                                                      PHBNAC    436
 4740 CRHUMD=70.0                                                        PHBNAC    437
 4742 WRITE(6,4737) CTEMP,CH(IUNIT+1,6),CPRES,CH(IUNIT+1,7),CRHUMD       PHBNAC    438
 4737 FORMAT(7X,27HHOMOGENEOUS ATMOSPHERE OF (,F6.2,5H DEG ,A1,1H,,F8.2, PHBNAC    439
     *1X,A4,1H,,F7.2,6H PCT RH) )                                        PHBNAC    440
 4750 WRITE(6,4751)                                                      PHBNAC    441
 4751 FORMAT(/2X,42H4) ITEMS CONSIDERED IN NOISE EXTRAPOLATION       )   PHBNAC    442
      WRITE(6,4752)(PT,I=1,17),(PT,I=1,16)                               PHBNAC    443
 4752 FORMAT(5X,26HA) SPHERICAL DIVERGENCE    ,17A1,5H  YES/5X,          PHBNAC    444
     * 27HB) ATMOSPHERIC ABSORPTION  ,16A1,5H  YES)                      PHBNAC    445
      GRP=YES                                                            PHBNAC    446
      IF(IEGA.NE.0)EGP=YNO                                               PHBNAC    447
      WRITE(6,4753)(PT,I=1,14),EGP                                       PHBNAC    448
 4753 FORMAT(5X,29HC) EXTRA-GROUND ATTENUATION  ,14A1,2X,A3 )            PHBNAC    449
      WRITE(6,4754)IGRD(IUNIT+1),GRT(IUNIT+1)                            PHBNAC    450
 4754 FORMAT(8X,31HSOUND PROPAGATION IS DOWNWIND (,I2,1X,A4,7H).      ) PHBNAC    451
      IF(IGDR.NE.0)GRP=YNO                                               PHBNAC    452
      WRITE(6,4755) (PT,I=1,21),GRP                                      PHBNAC    453
 4755 FORMAT(5X,22HD) GROUND REFLECTION  ,21A1,2X,A3)                    PHBNAC    454
      IF(IGDR.NE.0) GO TO 4757                                           PHBNAC    455
 4756 FORMAT(8X,42H3 DB ADDED TO FREE FIELD SPECTRA INSTEAD.    )        PHBNAC    456
      GO TO 4758                                                         PHBNAC    457
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 4757 WRITE(6,4756)                                                     PHBNAC    458
      GO TO 4762                                                        PHBNAC    459
 4758 WRITE(6,4759)XKN                                                  PHBNAC    460
 4759 FORMAT(8X,6HK1/KO=,1PE10.3,58H AND GROUND IMPEDANCE VS. FREQUENCY PHBNAC    461
     *IN  HZ DATA CURVES ARE      )                                     PHBNAC    462
      WRITE(6,4760)                                                     PHBNAC    463
 4760 FORMAT(8X,23H(RE(Z1/ZO), F) DATA ... )                            PHBNAC    464
      WRITE(6,4733)(PL,ZNR(I),CO,FLO(I+25),PR,CO,I=1,ND)                PHBNAC    465
      WRITE(6,4761)                                                     PHBNAC    466
 4761 FORMAT(8X, 23H(IM(Z1/ZO), F) DATA ... )                           PHBNAC    467
      WRITE(6,4733)(PL,ZNI(I)    ,CC,FLO(I+25),PR,CO,I=1,ND)            PHBNAC    468
 4762 WRITE(6,4763)                                                     PHBNAC    469
 4763 FORMAT(/2X,30H5) NOISE COMPONENTS CONSIDERED,28X,12HNO. OF TIMES ) PHBNAC    470
      NJ=0                                                              PHBNAC    471
      DO 4765 I=1,13                                                    PHBNAC    472
      IF(ICN(I).EQ.0)GO TO 4765                                         PHBNAC    473
      NJ=NJ+1                                                           PHBNAC    474
      WRITE(6,4766)  ALPH(NJ),PR,(XNAME(J,I),J=1,7),ICN(I)              PHBNAC    475
 4766 FORMAT(5X,2A1,1X,7A4,2X,6HMODULE,19X,I3)                          PHBNAC    476
 4765 CONTINUE                                                          PHBNAC    477
 4767 CONTINUE                                                          PHBNAC    478
C     IS TYPE 3 REPORT SPECIFIED (OBSERVED NOISE PER COMPONENTS)        PHBNAC    479
      IF(IPRT(3).NE.3)GO TO 4840                                        PHBNAC    480
      ENDFILE 12                                                        PHBNAC    481
      REWIND 12                                                         PHBNAC    482
 4830 READ(12,4831) BUFP                                                PHBNAC    483
 4831 FORMAT(33A4)                                                      PHBNAC    484
      IF  (EOF(12))  4840, 4832                                         PHBNAC    485
C360  READ(12,4831,END=4840)BUFP                                        PHBNAC    486
 4832 WRITE(6,4831)BUFP                                                 PHBNAC    487
      GO TO 4830                                                        PHBNAC    488
 4840 IF(IPRT(4).NE.4)GO TO 4870                                        PHBNAC    489
 4854 READ(8,4831)BUFP                                                  PHBNAC    490
      IF  (EOF(8))  4870, 4855                                          PHBNAC    491
C360  READ(8,4831,END=4870)BUFP                                         PHBNAC    492
 4855 WRITE(6,4831)BUFP                                                 PHBNAC    493
      GO TO 4854                                                        PHBNAC    494
C     IS TYPE 5 REPORT SPECIFIED &NOISE EXTRAPOLATION CORRECTIONS)      PHBNAC    495
 4870 IF(IPRT(5).NE.5)GO TO 4880                                        PHBNAC    496
 4874 READ(9,4831)BUFP                                                  PHBNAC    497
      IF  (EOF(9))  4880, 4875                                          PHBNAC    498
C360  READ(9,4831,END=4880)BUFP                                         PHBNAC    499
 4875 WRITE(6,4831)BUFP                                                 PHBNAC    500
      GO TO 4874                                                        PHBNAC    501
C     IS TYPE 6 REPORT SPECIFIED (TOTAL NOISE ALL COMPONENTS- FREE-FIELD PHBNAC    502
 4880 IF(IPRT(6).NE.6)GO TO 4890                                        PHBNAC    503
      DO 4882 I=I1,NOBS                                                 PHBNAC    504
      DO 4881 J=I1,I17                                                  PHBNAC    505
      DO 4881 L=I1,NCF                                                  PHBNAC    506
      SPLT(L,J)=SSPL(L,I,J)                                             PHBNAC    507
 4881 CONTINUE                                                          PHBNAC    508
      CALL NOISO(IPRT(6),I,NK,I6,CHIN,IUNIT,SLOISX(I),PFREQ,SPLT(1,1),  PHBNAC    509
     *NCF,14)                                                           PHBNAC    510
 4882 CONTINUE                                                          PHBNAC    511
C     IS TYPE 7 REPORT SPECIFIED (FREE-FIELD NOISE PER NOISE COMPONENT) PHBNAC    512
 4890 IF(IPRT(7).NE.7)GO TO 4900                                        PHBNAC    513
      ENDFILE 10                                                        PHBNAC    514
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      REWIND 10                                                         PHBNAC    515
 4894 READ(10,4831)BUFP                                                 PHBNAC    516
      IF  (EOF(10))  4900, 4895                                         PHBNAC    517
C360  READ(10,4831,END=4870)BUFP                                        PHBNAC    518
 4895 WRITE(6,4831)BUFP                                                 PHBNAC    519
      GO TO 4894                                                        PHBNAC    520
 4900 CONTINUE                                                          PHBNAC    521
C     TRANSFER TO PICK UP A NEW CASE                                    PHBNAC    522
      GO TO  5                                                          PHBNAC    523
 5000 CONTINUE                                                          PHBNAC    524
      ENDFILE 20                                                        PHBNAC    525
      REWIND 20                                                         PHBNAC    526
      IF(NRN.EQ.0)STOP                                                  PHBNAC    527
C360  CALL LOGDSK                                                       PHBNAC    528
      IF  (IOPEN .NE. 0)  CALL CLOSMS(13)                               PHBNAC    529
      STOP                                                              PHBNAC    530
      END                                                               PHBNAC    531
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      BLOCK DATA                                                        BLKDATA    2
C                                                                       BLKDATA    3
C ITYPE=1  PRIMARY JET                                                  BLKDATA    4
C  =2      PRIMARY AND SECONDARY JET                                    BLKDATA    5
      COMMON/JETDAT/NJET1,MCODE1,AP1,WP1,VP1,AS2,WS2,VS2,PR1,PA1,       BLKDATA    6
     1     TT1,VA1,DIAMT1,ANGJT1,ICCR1                                  BLKDATA    7
C                                                                       BLKDATA    8
C  =3      CORE AND TURBINE                                             BLKDATA    9
      COMMON/COREIN/TT3,PP3,CMF3,EK3,DELT3,JB3,                         BLKDATA   10
     *  ICOR3,LIN3,NTF3,IMA3,LGM3,NWL3,IDP3,ILAY3,TF3(10),              BLKDATA   11
     *  PCTA3(10),PLA3(10),ELOH3,EDH3,R1W3(10),TL3(10),CF3,FM3          BLKDATA   12
C                                                                       BLKDATA   13
C                                                                       BLKDATA   14
      COMMON/TURBIN/BN3,SS3,VTR3,CLS3,DT3,TU3,PMF3,CS3,IC3,ISW3         BLKDATA   15
C                                                                       BLKDATA   16
C  =4      COMPRESSOR AND INLET FAN                                     BLKDATA   17
C  =5      EXIT FAN                                                     BLKDATA   18
      COMMON/FANDAT/NSTG45,NLET45,NAFT45,IDP45,NB45(3),FPR45(3),        BLKDATA   19
     1  DIAM4(3),RSS45(3),AREA5(3),RN145,RTS4,CFPR45,DELT45,            BLKDATA   20
     *  NI5,BPR5,ICOR4,LIN4,NTF4,IMA4,LGM4,NWL4,IDP4,ILAY4,TF4(10),     BLKDATA   21
     *  PCTA4(10),PLA4(10),ELOH4,EDH4,R1W4(10),TL4(10),CF4,FM4,         BLKDATA   22
     *  ICOR5,LIN5,NTF5,IMA5,LGM5,NWL5,IDP5,ILAY5,TF5(10),              BLKDATA   23
     *  PCTA5(10),PLA5(10),ELOH5,EDH5,R1W5(10),TL5(10),CF5,FM5          BLKDATA   24
C                                                                       BLKDATA   25
C  =6      AUGMENTER-WING JET                                           BLKDATA   26
      COMMON/AUGWNG/GAMA6,TT6,NPR6,DELT6,AD6,DE6,                       BLKDATA   27
     *  ICOR6,LIN6,NTF6,IMA6,LGM6,NWL6,IDP6,ILAY6,TF6(10),              BLKDATA   28
     *  PCTA6(10),PLA6(10),ELOH6,EDH6,R1W6(10),TL6(10),CF6,FM6          BLKDATA   29
C                                                                       BLKDATA   30
C  =7      BLOWN-FLAP JET                                               BLKDATA   31
      COMMON/BLOWIN/PR7,TT7,AN7,DN7,FANG7,DELT7,DL7,HD7,ICCR7           BLKDATA   32
C                                                                       BLKDATA   33
C  =8       LIFT-FAN                                                    BLKDATA   34
      COMMON/LFTFAN/NB8,FPR8,DIAM8,RSS8,AREA8,RN18,RTS8,CRFPR8,DELTA8,  BLKDATA   35
     *  ICOR8,LIN8,NTF8,IMA8,LGM8,NWL8,IDP8,ILAY8,TF8(10),PCTA8(10),    BLKDATA   36
     *  PLA8(10),ELOH8,EDH8,R1W8(10),TL8(10),CF8,FM8                    BLKDATA   37
C                                                                       BLKDATA   38
C  =9      EJECTOR - SUPPRESSOR JET                                     BLKDATA   39
      COMMON /EJECTD/ IEJECT,NUMTBS,AREA,AR,TS,AMACHJ,AMACHS,CV,        BLKDATA   40
     *  PS,PAREA,PTS,PMACHJ,PCV,EJANG,                                  BLKDATA   41
     *ICOR9,LIN9,NTF9,IMA9,LGM9,NWL9,IDP9,ILAY9,                        BLKDATA   42
     *TF9(10),PCTA9(10),PLA9(10),                                       BLKDATA   43
     *ELOH9,EDH9,R1W9(10),TL9(10),CF9,FM9                               BLKDATA   44
C                                                                       BLKDATA   45
C  =10     PROPELLER                                                    BLKDATA   46
      COMMON/PROPIN/T10,W10,RPM10,D10,DSUB10,ASUB10,B10,DELT10,         BLKDATA   47
     *ICOR10                                                            BLKDATA   48
C                                                                       BLKDATA   49
C  =11     HELICOPTER AND TILT ROTOR                                    BLKDATA   50
      COMMON/COPTER/T11,Q11,RPM11,B11,DT11,AB11,DE11,RN11,              BLKDATA   51
     1        S11,CEE11,DELT11,XLMC11,XM11,NRTR11,LLF11,IRR11,          BLKDATA   52
     *ICOR11                                                            BLKDATA   53
C                                                                       BLKDATA   54
C                                                                       BLKDATA   55
C  =12     MEASURED DATA INPUTS                                         BLKDATA   56
      COMMON/MEASIN/NEP12,NPSI12,NBTA12,DELT12,EP12(5),PSI12(17),       BLKDATA   57
     *   BETA12(5),                                                     BLKDATA   58
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     *ICOR12                                                            BLKDATA
C                                                                       BLKDATA
C                                                                       BLKDATA
C     ITYPE = 13  JET EDGE INTERACTION                                  BLKDATA
      COMMON/JETEDG/AJS13,DDA13,DDNE13,DHNL13,DJCL13,                   BLKDATA
     *FLAP13,HD13,EMJ13,TSR13,ICOR13                                    BLKDATA
C                                                                       BLKDATA
C                                                                       BLKDATA
C     ENG/WING GEOMETRY AND SHIELDING DATA                              BLKDATA
      COMMON/EWGEO/SWPTE,SWLE,DIHED,DDSD,DDX1D,DDX2D,DDXOD,             BLKDATA
     *DDY1D,DDY2D,DDYOD,DDLD,DIANI,IES                                  BLKDATA
C                                                                       BLKDATA
C                                                                       BLKDATA
      COMMON/REFRAC/EMJ,TSTSO                                           BLKDATA
C                                                                       BLKDATA
      COMMON/UNSHLD/USPLA(19),FSI(19),NLSPL,INUSP                       BLKDATA
      COMMON/CLABEL/ CH(2,8)                                            BLKDATA
C                                                                       BLKDATA
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           BLKDATA
C                                                                       BLKDATA
      COMMON /GCONST/ IN,IO,IT1,IT2,FO,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  BLKDATA
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001, BLKDATA
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI  BLKDATA
      DIMENSION CFO(11),IOC(11),CP1(4)                                  BLKDATA
      EQUIVALENCE (CFO(1),FO),(IOC(1),IO),(CP1(1),P1)                   BLKDATA
C                                                                       BLKDATA
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 BLKDATA
C                                                                       BLKDATA
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),        BLKDATA
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                     BLKDATA
C                                                                       BLKDATA
C                                                                       BLKDATA
C     FREQUENCY BANDS USED BY PROGRAM                                   BLKDATA
C                                                                       BLKDATA
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)                      BLKDATA
C                                                                       BLKDATA
C                                                                       BLKDATA
C     GENERAL INPUT PARAMETERS                                          BLKDATA
C                                                                       BLKDATA
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT   BLKDATA
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)        BLKDATA
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP     BLKDATA
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),    BLKDATA
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         BLKDATA
C                                                                       BLKDATA
C                                                                       BLKDATA
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                BLKDATA
C                                                                       BLKDATA
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),       BLKDATA
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)              BLKDATA
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),COV                       BLKDATA
C                                                                       BLKDATA
      COMMON/SUMSPL/SSPL(24,10,17)                                      BLKDATA
C                                                                       BLKDATA
      COMMON/ONECAL/ICALL                                               BLKDATA
C                                                                       BLKDATA
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    BLKDATA
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      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                BLKDATA
C                                                                       BLKDATA
      COMMON/ISWK/ISWT(3,13)                                            BLKDATA
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)                   BLKDATA
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                             BLKDATA
C                                                                       BLKDATA
C     CONVERSION CONSTANTS                                              BLKDATA
C                                                                       BLKDATA
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  BLKDATA
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR                     BLKDATA
C       INTERNAL INDICATORS FOR DETERMINING WHERE THE INSTRUCTION       BLKDATA
C        COUNTER IS LOCATED                                             BLKDATA
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)                     BLKDATA
C             NCAS  IS THE NUMBER OF THE CURRENT CASE BEING PROCESSED   BLKDATA
C             NCOF  IS THE NUMBER OF THE CURRENT CONFIGURATION BEING    BLKDATA
C                     PROCESSED                                         BLKDATA
C             NTYP  IS THE TOTAL NUMBER OF NOISE COMPONENTS PROCESSED   BLKDATA
C                     FOR THE CURRENT CONFIGURATION                     BLKDATA
C                                                                       BLKDATA
C                                                                       BLKDATA
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICOP,IPRT(7),ICN(13),NLOPT         BLKDATA
     *,INSEOW(3),INSHLD                                                 BLKDATA
C                                                                       BLKDATA
C MASS STORAGE (RANDOM DISK I/O) INDECES, COUNTER, AND FLAG             BLKDATA
      COMMON /MSIO/ INDX1(40), INDX2(3), INDX3(36), IC1, ICPEN          BLKDATA
C /JETDAT/ DATA                                                         BLKDATA
      DATA NJET1,MCODE1,AP1,WP1,VP1,AS2,WS2,VS2,PR1,PA1,TT1,VA1,DIAMT1, BLKDATA
     *     ANGJT1,ICOR1 /0,1,12*0.0,0/                                  BLKDATA
C /COREIN/ DATA                                                         BLKDATA
      DATA           TT3,PP3,CMF3,EK3,DELT3,JB3,                        BLKDATA
     *  ICOR3,LIN3,NTF3,IMA3,LGM3,NWL3,IDP3,ILAY3,TF3     ,             BLKDATA
     *  PCTA3     ,PLA3     ,ELCH3,EDH3,R1W3     ,TL3     ,CF3,FM3      BLKDATA
     * /5*0.0,3*0,0,3*0,2,1,10*0.0,100.,9*0.0,34*0.0/                   BLKDATA
C /TURBIN/ DATA                                                         BLKDATA
      DATA           BN3,SS3,VTR3,CLS3,CT3,TU3,PMF3,CS3,IC3,ISW3        BLKDATA
     * / 8*0.0,2*0/                                                     BLKDATA
C /FANDAT/ DATA                                                         BLKDATA
      DATA           NSTG45,NLET45,NAFT45,IDP45,NB45    ,FPR45          BLKDATA
     *  /0,0,0,0,3*0,3*0./,                                             BLKDATA
     1  DIAM4    ,RSS45    ,AREA5    ,RN145,RTS4,CFPR45,DELT45          BLKDATA
     * /3*0.,3*0.,3*0.,0.,0.,0.,0./,                                    BLKDATA
     *  NI5,BPR5,ICOR4,LIN4,NTF4,IMA4,LGM4,NWL4,IDP4,ILAY4,TF4          BLKDATA
     */0,1.,0,0,0,0,0,0,2,1,10*0./,                                     BLKDATA
     *  PCTA4     ,PLA4     ,ELCH4,EDH4,R1W4     ,TL4     ,CF4,FM4      BLKDATA
     * /100.,9*0.,10*0.,0.,0.,10*0.,10*0.,0.,0./,                       BLKDATA
     *  ICOR5,LIN5,NTF5,IMA5,LGM5,NWL5,IDP5,ILAY5,TF5                   BLKDATA
     * /0,0,0,0,0,0,2,1,10*0./,                                         BLKDATA
     *  PCTA5     ,PLA5     ,ELCH5,EDH5,R1W5     ,TL5     ,CF5,FM5      BLKDATA
     * / 10*0.,10*0.,0.,0.,10*0.,10*0.,0.,0./                           BLKDATA
C /AUGWNG/ DATA                                                         BLKDATA
      DATA           GAMA6,TT6,NPR6,DELT6,AD6,DE6                       BLKDATA
     * / 1.4,0.,0,0.,0.,0./,                                            BLKDATA
     *  ICOR6,LIN6,NTF6,IMA6,LGM6,NWL6,IDP6,ILAY6,TF6                   BLKDATA
     * /0,0,0,0,0,0,2,1,10*0./,                                         BLKDATA
     *  PCTA6     ,PLA6     ,ELCH6,EDH6,R1W6     ,TL6     ,CF6,FM6      BLKDATA
     * /100.,9*0.,10*0.,0.,0.,10*0.,10*0.,0.,0./                        BLKDATA
C /BLOWIN/ DATA                                                         BLKDATA
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      DATA          PR7,TT7,AN7,DN7,FANG7,DELT7,DL7,HD7,ICCR7
     * / 8*0.,0 /
C /LFTFAN/ DATA
      DATA          NB8,FPR8,DIAM8,RSS8,AREA8,RN18,RTS8,CRFPR8,DELTA8,
     *  ICOR8,LIN8,NTF8,IMA8,LGM8,NWL8,IDP8,ILAY8,TF8     ,PCTA8     ,
     *  PLA8     ,ELOH8,EDH8,R1W8     ,TL8     ,CF8,FM8
     *  /0,8*0.,0,5*0,2,1,10*0.,100.,9*0.,34*0./
C /EJECTD/ DATA
      DATA            IEJECT,NUMTBS,AREA,AR,TS,AMACHJ,AMACHS,CV,
     *  PS,PAREA,PTS,PMACHJ,PCV,EJANG,
     *ICOR9,LIN9,NTF9,IMA9,LGM9,NWL9,IDP9,ILAY9,
     *TF9     ,PCTA9     ,PLA9     ,
     *ELOH9,EDH9,R1W9     ,TL9     ,CF9,FM9
     * /2*0,12*0.,3*0,0,2*0,2,1,10*0.,100.,9*0.,34*0./
C /PROPIN/ DATA
      DATA          T10,W10,RPM10,D10,CSUB10,ASUB10,B10,DELT10,
     *ICOR10/8*0.0,0/
C /CCPTER/ DATA
      DATA          T11,Q11,RPM11,B11,CT11,AB11,DE11,RN11,
     1        S11,CEE11,DELT11,XLMC11,XM11,NRTR11,LLF11,IRR11,
     *ICOR11     / 13*0.,4*0/
C /MEASIN/ DATA
      DATA          NEP12,NPSI12,NBTA12,DELT12,EP12    ,PSI12     ,
     *   BETA12    ,
     *ICOR12        / 3*0,28*0.,0/
C /JETEDG/ DATA
      DATA AJS13/5.7/,DDA13/.7854/,DDNE13/0./,DHNL13/0./,DJCL13/5./,
     *FLAP13/0./,HD13/4.0/,EMJ13/0./,TSR13/1./,ICOR13/0/
C /EWGIC/ DATA
      DATA SWPTE,SWPLE,DIHED,DDXOD,DDYCD,DIANI,IES/
     *            0.,0.,0.,0.,.1,.3048,0/
C /REFRAC/ DATA
      DATA EMJ,TSTSO/0.,1./
C /UNSHLD/ DATA
      DATA INUSP/0/
C /CLABEL/ DATA
      DATA CH/4H M. ,4H FT ,4H MIC,4HO PI,4HRC-N,4HCCBA,4H/SC.,4HR)  ,
     *         4HM.) ,1H ,1HK,1HR,4HATM.,4HPSIA,3HM/S,3HFPS/
C /GCONST/ DATA
      DATA UNDEF/177700000000000000000B/
C
      DATA IN/5/,IO/6/,IT1/8/,IT2/9/,CFC/0.0,1.0,2.0,3.0,4.0,5.0,6.0,
     *      7.0,8.0,9.0,10.0/, IOC/0,1,2,3,4,5,6,7,8,9,10/,CP1/.1,
     *      .33333333,.5,.CC1/,EPS/1.2E-3/,
     *      BL/4H    /,IOD/1/, DPR/57.29578/,RPD/1.745329E-2/,ETA/10.,
     *      20.,30.,40.,50.,60.,70.,80.,90.,100.,110.,120.,130.,140.,
     *      150.,160.,170./,M1/-1/,FM1/-1.0/,I17/17/,A/49.02142/
     *,PI/3.141592653898/
C /GCOMON/ DATA
      DATA            NCF,NK,BCF     ,TSPL          ,SPLT        ,
     *BUF     ,RETA     ,SPL2     ,TGAGR     ,DCPSF
     * /2*0,4595*0.,17*1.0/
C /GFREQ/ DATA
      DATA CFREQ /50.11872,63.09573,79.43282,100.0000,125.8925,158.4893,
     *199.5262,251.1886,316.2278,398.1072,501.1872,630.9573,794.3282,
     *1000.000,1258.925,1584.893,1995.262,2511.886,3162.278,3981.072,
     *5011.872,6309.573,7943.282,10000.00/
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      DATA UFREQ /44.66836,56.23413,70.79458,89.12509,112.2018,141.2538,  BLKDATA   230
     *177.8279,223.8721,281.8383,354.8134,446.6836,562.3413,707.9458,     BLKDATA   231
     *891.2509,1122.018,1412.538,1778.279,2238.721,2818.383,              BLKDATA   232
     *3548.134,4466.836,5623.413,7079.458,8912.509,11220.18/              BLKDATA   233
      DATA PFREQ/24*0./                                                   BLKDATA   234
C /GPRAM/ DATA                                                            BLKDATA   235
      DATA          ALTP,ALTR,SLOPE,AMACH,NCBS,SLDIST     ,NTENG,IUNIT    BLKDATA   236
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB     ,NTEMP,TEMP     ,TALT          BLKDATA   237
     *     ,NPRES,PRES     ,PALT     ,NHUMID,RALT     ,RHUMID     ,CTEMP  BLKDATA   238
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD     ,    BLKDATA   239
     * ZNR     ,ZNI     ,LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         BLKDATA   240
     */ 4*0.,1,10*0.,1,0,3*0,24*0.,0,100*0.,0,100*0.,0,100*0.,3*0.,0,1,   BLKDATA   241
     *3*0.,4.2,2,150*0.,0,56,0,10.,10.,90.,0.,0./                         BLKDATA   242
C /GEOMO/ DATA                                                            BLKDATA   243
      DATA            APY        ,APZ        ,PD        ,DPND        ,   BLKDATA   244
     * B1        ,B2        ,TDS        ,TPD        ,IRR                  BLKDATA   245
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP        ,COV                       BLKDATA   246
     * /170*0.,170*0.,170*0.,170*0.,170*0.,170*0.,170*0.,170*0.,170*0,    BLKDATA   247
     * 8*0.,171*0./                                                       BLKDATA   248
C /SUMSPL/ DATA                                                           BLKDATA   249
      DATA SSPL/4080*0./                                                  BLKDATA   250
C /ONECAL/ DATA                                                           BLKDATA   251
      DATA ICALL/0/                                                       BLKDATA   252
C /PNLD/ DATA                                                             BLKDATA   253
      DATA PSPL/340*0./,EPNL/50*0./,IEPNL/50*0./                          BLKDATA   254
C /TMSPL/ DATA                                                            BLKDATA   255
      DATA SPZ/408*0/,IB/78*0/                                            BLKDATA   256
C /ISWK/ DATA                                                             BLKDATA   257
      DATA ISWT/39*0/                                                     BLKDATA   258
C /ANGLE/ DATA                                                            BLKDATA   259
      DATA PSI/170*0./,PSIO/170*0./,BETA/170*0./                          BLKDATA   260
C /HEAD/ DATA                                                             BLKDATA   261
      DATA HIN/20*0./,HOUT/20*0./,CHIN/20*0./                             BLKDATA   262
C /GCONVC/ DATA                                                           BLKDATA   263
      DATA C /3.280833,.3048006,.224805,4.4483,2.204616,.4535937,         BLKDATA   264
     * 1.341011,.7457061,1.8,.5555555,14.696,6.804573E-2,8*0./            BLKDATA   265
C /CRSPLS/ DATA                                                           BLKDATA   266
      DATA COB/17*0./,PSCR/17*0./,DPB/408*0./,NPSCR/0/                    BLKDATA   267
C /ICPATH/ DATA                                                           BLKDATA   268
      DATA NCAS, NCOF, NTYP, IC, NRN, IARRAY /0,1,3*0,1,-13/              BLKDATA   269
C /SWITCH/ DATA                                                           BLKDATA   270
      DATA NTYPE/1/,ITYPE/0/,NENG/1/,ICOP/0/,IPRT/7*0/,ICN/13*0/,         BLKDATA   271
     *NLOPT/0/,INSEOW/3*0/,INSHLD/0/                                      BLKDATA   272
C /MSIO/ DATA                                                             BLKDATA   273
      DATA INDX1 /40*0/, INDX2 /3*0/, INDX3 /36*0/, IC1 /0/, IOPEN /0/    BLKDATA   274
      END                                                                 BLKDATA   275
```


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```
      OVERLAY(EXEC10,1,0)                                               ONE        2
      PROGRAM ONE                                                       ONE        3
      COMMON/ONECAL/ICALL                                               ONE        4
      IF(ICALL.EQ.0)GO TO 10                                            ONE        5
      CALL NEXTCR                                                       ONE        6
      RETURN                                                            ONE        7
10    CALL FLTGEO(IECE)                                                 ONE        8
      IF(IECE.NE.0)CALL ERROR(13,7,15)                                  ONE        9
      RETURN                                                            ONE       10
      END                                                               ONE       11
```

```
      OVERLAY(EXEC20,2,0)                                               TWO        2
      PROGRAM TWO                                                       TWO        3
      COMMON/SWITCH/NTYPE,ITYPE                                         TWO        4
      IF  ((ITYPE .EQ. 1) .OR. (ITYPE .EQ. 2))  GO TO 12                TWO        5
      IF  (ITYPE .EQ. 4)  GO TO 4                                       TWO        6
      IF  (ITYPE .EQ. 5)  GO TO 5                                       TWO        7
      GO TO 100                                                         TWO        8
   12 CALL JET                                                          TWO        9
      GO TO 100                                                         TWO       10
    4 CALL INLET                                                        TWO       11
      GO TO 100                                                         TWO       12
    5 CALL AFT                                                          TWO       13
  100 CONTINUE                                                          TWO       14
      RETURN                                                            TWO       15
      END                                                               TWO       16
```

```
      OVERLAY(EXEC30,3,0)                                               THREE      2
      PROGRAM THREE                                                     THREE      3
      COMMON/SWITCH/NTYPE,ITYPE                                         THREE      4
      IF  (ITYPE .EQ. 3)  GO TO 3                                       THREE      5
      IF  (ITYPE .EQ. 6)  GO TO 6                                       THREE      6
      IF  (ITYPE .EQ. 9)  GO TO 9                                       THREE      7
      GO TO 100                                                         THREE      8
    3 CALL COREN                                                        THREE      9
      GO TO 100                                                         THREE     10
    6 CALL SPECAN                                                       THREE     11
      GO TO 100                                                         THREE     12
    9 CALL EJECT                                                        THREE     13
  100 CONTINUE                                                          THREE     14
      RETURN                                                            THREE     15
      END                                                               THREE     16
```

```
      OVERLAY(EXEC40,4,0)                                               FOUR        2
      PROGRAM FOUR                                                      FOUR        3
      COMMON/SWITCH/NTYPE,ITYPE                                         FOUR        4
      IF  (ITYPE .EQ. 8)  GO TO 8                                       FOUR        5
      IF  (ITYPE .EQ. 10)  GO TO 10                                     FOUR        6
      IF  (ITYPE .EQ. 11)  GO TO 11                                     FOUR        7
      GO TO 100                                                         FOUR        8
    8 CALL LIFTFN                                                       FOUR        9
      GO TO 100                                                         FOUR       10
   10 CALL PROP                                                         FOUR       11
      GO TO 100                                                         FOUR       12
   11 CALL COPTR                                                        FOUR       13
  100 CONTINUE                                                          FOUR       14
      RETURN                                                            FOUR       15
      END                                                               FOUR       16
```

```
OVERLAY(EXEC50,5,0)                                    FIVE      2
PROGRAM FIVE                                           FIVE      3
COMMON/SWITCH/NTYPE,ITYPE                              FIVE      4
IF(ITYPE.EQ.12)CALL MEASRD                             FIVE      5
RETURN                                                 FIVE      6
END                                                    FIVE      7
```

```
      OVERLAY(EXEC60,6,0)                                               SIX
      PROGRAM SIX                                                       SIX
      COMMON /SWITCH/ NTYPE, ITYPE                                      SIX
      IF  (ITYPE .EQ. 7)  GO TO 7                                       SIX
      IF  (ITYPE .EQ. 13)  GO TO 13                                     SIX
      GO TO 100                                                         SIX
    7 CALL BLWFLP                                                       SIX
      GO TO 100                                                         SIX
   13 CALL JEINT                                                        SIX
  100 CONTINUE                                                          SIX
      RETURN                                                            SIX
      END                                                               SIX
```

```
      PROGRAM DATGEN(OUTPUT=2002B,TAPE6=OUTPUT,TAPE20=104B,TAPE21=104B,
     1               TAPE22=104B)
C     THIS PROGRAM GENERATES A SUBROUTINE FOR THE FOOTPRINT
C     PROGRAM WITH THE NOISE DATA FROM TEE187C STORED IN A DATA
C     STATEMENT, THE SIZE AND NAME OF WHICH IS PASSED TO THE
C     FTPRT   ROUTINE AS ARGUMENTS -E.G.  CALL FTPRT( N,DATN)
      DIMENSION  DI(216),X(18)
      DATA IT/0/
      DATA KF/22/
      DATA KI,KO,KB/20,21,0/
      DATA IC,IS,IE,IG/0,0,0,1/
      DATA A/1HA/
      REWIND KI
      REWIND KF
      REWIND KO
      N1=0
      WRITE (6,103)
103   FORMAT(44H  IS       IE       J1       N1       IC       IW          )
C     READ DATA FROM  OUTPUT FROM TEE187C (TAPE 20) AND WRITE THIS DATA
C     OUT ON TAPE 21  AS DATA STATEMENTS
C     IC IS THE COUNT OF THE NUMBER OF DATAARRAYS
C     IS IS EQUAL TO 1 AT START OF EACHARRAY
C     IE IS EQUAL TO THE LAST ELEMENT OF EACH ARRAY
C     IG INDICATES THE END OF THE INPUT FILE
      DO 1000 I=1,20000,216
      J1=0
      IC=IC+1
      IS=I
      IE=IS+215
 25   I1=1+J1
      I2=I1+11
0360  READ(KI,100,END=40)(DI(J),J=I1,I2)
      READ(KI,100) (DI(J),J=I1,I2)
      IF  (EOF(KI))  40, 20
  100 FORMAT (12A4)
 20   J1=J1+12
      IF(J1.EQ.216)GO TO 60
      GO TO 25
 40   IE=J1+IS-1
      IW=1
      WRITE (6,102) IS, IE, J1, N1, IC, IW
102   FORMAT(6I8)
      IF(IS.GT.IE)GO TO 1050
      IG=2
 60   CALL WRDATA(DI,1,J1,KO,IT)
      IF  (IG - 1)  1000, 1000, 1100
 1000 CONTINUE
      IW=2
      WRITE (6,102) IS, IE, J1, N1, IC, IW
 1050 IC=IC-1
      IW=3
      WRITE (6,102) IS, IE, J1, N1, IC, IW
      J1=216
 1100 CONTINUE
      IW=4
      WRITE (6,102) IS, IE, J1, N1, IC, IW
      REWIND KO
```

```
C WRITE PROGRAM HEADER FOR MAIN PROGRAM OF FOOT PRINT                   DATGEN
      WRITE(KF,241)                                                     DATGEN
  241 FORMAT(6X,28HSUBROUTINE TEE227(INCDE,NLN)    )                    DATGEN
      WRITE(KF,300)                                                     DATGEN
  300 FORMAT(52HC      PROGRAM TEE227A(INPUT,OUTPUT,TAPE5=INPUT,TAPE6,  DATGEN
     X 8H=OUTPUT))                                                      DATGEN
C     WRITE A COMMENT OF EXPLAINATION                                   DATGEN
      WRITE(KF,400)                                                     DATGEN
  400 FORMAT(52HC      THIS PROGRAM HAS BEEN GENERATED AS A MEANS OF   /DATGEN
     X60HC      CIRCUMVENTING THE NEED FOR INPUT TO TEE227 WHICH IS TO  /DATGEN
     X      52HC   BE RUN UNDER CONTROL OF A REAL TIME SIMULATOR ON    /DATGEN
     X60HC      THE SIGMA 7.                                           /DATGEN
     X60HC      THE 4 NUMBERS REPRESENTED ON EACH LINE OF THE DATA     /DATGEN
     X62HC      STATEMENT ARE THE OUTPUT OF NOISE LEVEL, ENGINE PRESSURE/DATGEN
     X60HC      RATIO, ELEVATION ANGLE, LOG10 OF RANGE, GENERATED BY   /DATGEN
     X60HC      THE NOISE PREDICTION PROGRAM, TEE187 PER INPUT CASE    /DATGEN
     X60HC      AND PLACED ON FILE TAPE20, WHICH HAVE BEEN PROCESSED   /DATGEN
     X60HC      BY THE TEE187C POST-PROCESSOR.  THE POST-PROCESSOR     /DATGEN
     X60HC      INCORPORATES THIS DATA DURING THE GENERATION OF THE    /DATGEN
     X60HC      MAIN PROGRAM OF TEE227, THE NOISE CONTOUR PROGRAM      /DATGEN
     X62HC      WHICH THE POST-PROCESSOR HAS OUTPUT IN SOURCE CODING ON /DATGEN
     X60HC      FILE TAPE22                                            )DATGEN
      WRITE(KF,242)                                                     DATGEN
  242 FORMAT(6X,23HCOMMON/COUNT/NEPR,    NL )                           DATGEN
      WRITE(KF,243)                                                     DATGEN
  243 FORMAT(6X,38HCOMMON/CONTNT/AEPR(6),ALRO(9),AALFA(6)     )         DATGEN
      N1=72                                                             DATGEN
C     WRITE DIMENSION STATEMENTS FOR DATA ARRAYS                        DATGEN
      IDI=-71                                                           DATGEN
      DO 1200 I=1,IC                                                    DATGEN
      IW=5                                                              DATGEN
      WRITE (6,102) IS, IE, J1, N1, IC, IW                              DATGEN
      ID=I+9                                                            DATGEN
      IF(I.EQ.IC.AND.IE.EQ.0)GO TO 1300                                 DATGEN
      IF(I.EQ.IC)N1=J1/3                                                DATGEN
      IW=6                                                              DATGEN
      WRITE (6,102) IS, IE, J1, N1, IC, IW                              DATGEN
      WRITE(KF,700)A,ID,N1                                              DATGEN
  700 FORMAT(6X,10HDIMENSION ,A1,I2,1H(,I2,1H))                         DATGEN
      IDI=IDI+72                                                        DATGEN
      WRITE(KF,800)IDI,ID                                               DATGEN
  800 FORMAT(6X,18HEQUIVALENCE (DATN(,I4,3H),A,I2,4H(1)))               DATGEN
 1200 CONTINUE                                                          DATGEN
 1300 CONTINUE                                                          DATGEN
      N=72*(IC-1)+N1                                                    DATGEN
      N4=N/4                                                            DATGEN
      WRITE(KF,750)N                                                    DATGEN
  750 FORMAT(6X,15HDIMENSION DATN(,I4,1H))                              DATGEN
      WRITE(KF,850)N4,N4,N4,N4                                          DATGEN
  850 FORMAT(6X,13HDIMENSION D1(,I3,2H),,3HD2(,I3,2H),,3HD3(,I3,        DATGEN
     X2H),,3HD4(,I3,1H))                                                DATGEN
      DO 950 I=1,II                                                     DATGEN
      READ(KD,900)X                                                     DATGEN
  900 FORMAT(18A4)                                                      DATGEN
      WRITE(KF,900)X                                                    DATGEN
  950 CONTINUE                                                          DATGEN
C     WRITE CALL TO FOOT PRINT SUBROUTINE AND STOP/END                  DATGEN
```

```
      WRITE(KF,500)N,N4                                                 DATGEN    116
500   FORMAT(6X,2HN=,I4/6X,3HN4=,I4)                                    DATGEN    117
      WRITE(KF,550)                                                     DATGEN    118
 550  FORMAT(6X,45HCALL FTPRT(N,DATN,N4,D1,D2,D3,D4,IMODE,NLN)     ,    DATGEN    119
     X/6X,6HRETURN/6X,3HEND)                                            DATGEN    120
      REWIND KF                                                         DATGEN    121
      STOP                                                              DATGEN    122
      END                                                               DATGEN    123
```

```
      SUBROUTINE WRDATA(X,IS,IE,KC,IT)                                  WRDATA     2
C     X IS THE DATA ARRAY CONTAINING THE VAKUES TO BE WRITTEN OUT       WRDATA     3
C    IS IS THE STARTING ELEMENT OF THE ARRAY                            WRDATA     4
C    IE IS THE END ELEMENT  OF THE ARRAY                                WRDATA     5
C     KO IS THE OUTPUT FILE WHICH THE DATA STATEMENT IS WRITTEM ON      WRDATA     6
      DIMENSION X(1),Y(3,4),XM(2),XMX(2)                                WRDATA     7
      DATA XM,XMX,DAT,C,BL,SL,A,NA,N/1H ,1H ,1H ,2H X,4HDATA,1H,,1H ,    WRDATA     8
     X     1H/,1HA,9,0/                                                 WRDATA     9
      NA=NA+1                                                           WRDATA    10
      WRITE(KO,8001)XM,DAT,BL,A,NA,BL,SL                                WRDATA    11
 8001 FORMAT(A4,A2,A4,A1,A1,I2,A1,A1)                                   WRDATA    12
      IT=IT+1                                                           WRDATA    13
C     WRITE UP TO 18 CONTINUATION CARDS                                 WRDATA    14
      JK=-14                                                            WRDATA    15
      DO 1000 I=1,18                                                    WRDATA    16
      JK=JK+12                                                          WRDATA    17
      J=JK                                                              WRDATA    18
      DO 100 K=1,4                                                      WRDATA    19
      K1=K                                                              WRDATA    20
      J=J+3                                                             WRDATA    21
      Y(1,K1)=X(J)                                                      WRDATA    22
      Y(2,K1)=X(J+1)                                                    WRDATA    23
 100  Y(3,K1)=X(J+2)                                                    WRDATA    24
      CH=C                                                              WRDATA    25
      IF(IE.EQ.J+2)CH=SL                                                WRDATA    26
      WRITE(KO,8003)XMX,(BL,(Y(I1,I2),I1=1,3),C,I2=1,3),BL,(Y(I1,4),    WRDATA    27
     X I1=1,3),CH                                                       WRDATA    28
      IT=IT+1                                                           WRDATA    29
 8003 FORMAT(A4,A2,4(A1,3A4,A1))                                        WRDATA    30
      IF(CH.EQ.SL)GO TO 1100                                            WRDATA    31
 1000 CONTINUE                                                          WRDATA    32
 1100 CONTINUE                                                          WRDATA    33
      RETURN                                                            WRDATA    34
      END                                                               WRDATA    35
```

```
      PROGRAM TEX227(INPUT=104B,OUTPUT=2002B,TAPE5=INPUT,TAPE6=OUTPUT,    TEX227     2
     1               TAPE2=104B,TAPE99=2002B)                             TEX227     3
      READ(5,9000)IPLOT                                                   TEX227     4
 9000 FORMAT(I3)                                                          TEX227     5
      IF(IPLOT.NE.-1)GO TO  1000                                          TEX227     6
C  THIS IS AN OPTION TO PLOT WITH THE EXISTING TAPE 2                     TEX227     7
C  THE ENTRY INTO DRIVER BY THIS METHOD GIVES IMODE                       TEX227     8
C     A VALUE  FOR TESTING  THA T IT COULDN&T NORMALLY HAVE IN DRIVER     TEX227     9
C     THIS ALLOWS A TEST FOR  A PLOT OPTION                               TEX227    10
C                                                                         TEX227    11
      CALL DRIVES(D,D,D,D,D,D,D,D,-1)                                     TEX227    12
      GO TO  1010                                                         TEX227    13
 1000 CALL TEE227(1,0)                                                    TEX227    14
 1010 STOP                                                                TEX227    15
      END                                                                 TEX227    16
```

```
      INTEGER FUNCTION SEARCH(Z,X,ND,M,IS)                              TEARCH     2
C     SC0931   SEARCH    PS-471    WILINSKI,R.M.    690304 6600        TEARCH     3
C                              BINARY SEARCH                           TEARCH     4
C                                                                      TEARCH     5
      DIMENSION X(2)                                                   TEARCH     6
C     FUNCTION TO HALVE INDEX DURING BINARY SEARCH                     TEARCH     7
      IHALF(I) = (I + 1)/2                                             TEARCH     8
C                                                                      TEARCH     9
      N = IABS(M)                                                      TEARCH    10
      SEARCH = 1                                                       TEARCH    11
      I = 1                                                            TEARCH    12
      IF(N .LE. 1)GO TO 24                                             TEARCH    13
C     INPUT PARAMETER ND MAY BE CHANGED BECAUSE DEG. IS TOO LARGE      TEARCH    14
      ND = MINO(ND,N-1)                                                TEARCH    15
      IF(M .GE. 0)GO TO 445                                            TEARCH    16
C     TEST TO PREVENT EXTRAPOLATION WHEN N IS NEGATIVE                 TEARCH    17
      IF(ABS(Z+Z-X(1)-X(N)) .LE. ABS(X(1)-X(N)))GO TO 445              TEARCH    18
      IF(ABS(Z -X(1)) .GE. ABS(Z - X(N)))I = N                         TEARCH    19
      GO TO 24                                                         TEARCH    20
  445 IGO = 1                                                          TEARCH    21
      IF(X(1) .GT. X(2))IGO = 0                                        TEARCH    22
C     DESCENDING X ARRAY                                               TEARCH    23
C     BINARY SEARCH TO BRACKET Z BETWEEN X(I) AND X(I+1)               TEARCH    24
      I = IHALF(N)                                                     TEARCH    25
      IDLT = I                                                         TEARCH    26
C     MAIN SEARCH LOOP                                                 TEARCH    27
    5 IDLT = IHALF(IDLT)                                               TEARCH    28
      DIF = X(I) - Z                                                   TEARCH    29
      IF(IGO .EQ. 0)DIF = -DIF                                         TEARCH    30
      IF(DIF)30,24,20                                                  TEARCH    31
C     X(I) IS EXACT VALUE                                              TEARCH    32
   24 IS = I                                                           TEARCH    33
      GO TO 52                                                         TEARCH    34
C     I TOO LARGE (UNLESS I = 1)                                       TEARCH    35
   20 IF(I - 1)40,40,21                                                TEARCH    36
   21 IF(I - IDLT)22,22,23                                             TEARCH    37
C     IDLT TOO LARGE (BECAUSE N NOT POWER OF 2)                        TEARCH    38
   22 IDLT = IHALF(IDLT)                                               TEARCH    39
   23 I = I - IDLT                                                     TEARCH    40
      I=MAX0(I,1)                                                      TEARCH    41
      GO TO 5                                                          TEARCH    42
C     I OK OR TOO SMALL (UNLESS I = N)                                 TEARCH    43
   30 IF(I - N)31,40,40                                                TEARCH    44
C     Z NOT OUTSIDE RIGHT END OF TABLE                                 TEARCH    45
   31 DIF = X(I+1) - Z                                                 TEARCH    46
      IF(IGO .EQ. 0)DIF = -DIF                                         TEARCH    47
      IF(DIF)34,36,40                                                  TEARCH    48
C     X(I+1) IS EXACT VALUE                                            TEARCH    49
   36 IS = I + 1                                                       TEARCH    50
      GO TO 52                                                         TEARCH    51
C     I TOO SMALL                                                      TEARCH    52
   34 I = I + IDLT                                                     TEARCH    53
      IF(I - N)5,5,35                                                  TEARCH    54
C     IDLT WAS TOO LARGE (BECAUSE N NOT POWER OF 2)                    TEARCH    55
   35 I = I - IDLT                                                     TEARCH    56
      IDLT = IHALF(IDLT)                                               TEARCH    57
      GO TO 34                                                         TEARCH    58
```

```
C     Z BRACKETED BY X(I), X(I+1)                                       TEARCH     59
   40 IF(ND)44,44,43                                                    TEARCH     60
C     ND .LE. 0 - - RETURN NEAREST POINT IN TABLE                       TEARCH     61
   44 IF(I .EQ. N)GO TO 24                                              TEARCH     62
      IF(ABS(Z - X(I)) .LE. ABS(Z - X(I+1)))GO TO 24                    TEARCH     63
      GO TO 36                                                          TEARCH     64
C     FIND ND + 1 POINTS CENTERED (IF POSSIBLE) AROUND Z                TEARCH     65
   43 I = MINO(MAXO(1, I - (ND - 1)/2), N - ND)                         TEARCH     66
      IS = I                                                            TEARCH     67
      SEARCH = 0                                                        TEARCH     68
   52 RETURN                                                            TEARCH     69
      END                                                               TEARCH     70
```

```
      SUBROUTINE ABSORP(RH, T, NBW, NFB, BCF, ALPHA)                    ABSORP
C     PROGRAM TO COMPUTE ABSORPTION COEFFICIENTS AS DEFINED BY          ABSORP
C     SAE-ARP866. THE (RMS) ERROR IN COMPUTING THE COEFFICIENTS IS LESS ABSORP
C     THAN 0.1 DB/1000FT.                                               ABSORP
C                                                                       ABSORP
C AUTHOR            D. G. DUNN                                          ABSORP
C                                                                       ABSORP
C                                                                       ABSORP
C                                                                       ABSORP
C     INPUTS ARE-                                                       ABSORP
C            RH = RELATIVE HUMIDITY IN PERCENT.                         ABSORP
C            NBW = BANDWIDTH INDICATOR (NBW = 1 FOR FULL OCTAVE-BANDS,  ABSORP
C                                       (NBW = 3 FOR THIRD OCTAVE-BANDS) ABSORP
C            NFB = NUMBER OF FREQUENCY BANDS.                           ABSORP
C            BCF = THE ARRAY OF BAND CENTER FREQUENCIES.                ABSORP
C            T = AMBIENT TEMPERATURE IN DEGREES FARENHEIT               ABSORP
C                                                                       ABSORP
C     OUTPUT IS THE ARRAY OF ABSORPTION COEFFICIENTS (ALPHA)            ABSORP
C                                                                       ABSORP
C     RESTRICTIONS                                                      ABSORP
C                                                                       ABSORP
C            APPLICABLE ONLY TO                                         ABSORP
C             1) STANDARD COMMERCIAL OCTAVES                            ABSORP
C             2) STANDARD PREFERRED OCTAVES                             ABSORP
C             3) STANDARD PREFERRED (1/3) OCTAVES                       ABSORP
C            AND NOT APPLICABLE TO GENERALIZED FREQUENCY BANDS, I.E.    ABSORP
C             1) OCTAVES OR (.3)TH DECADE BANDS NOT DEFINED FOR (BCF)   ABSORP
C                CONTAINED IN OPEN SET (4000,6788) HZ                   ABSORP
C             2) (1/3) OCTAVES OR (.1)TH DECADE BANDS NOT DEFINED FOR   ABSORP
C                (BCF) CONTAINED IN OPEN SET (4000,5000) HZ             ABSORP
C                                                                       ABSORP
C     ALLOCATE STORAGE FOR OTHER ARRAYS                                 ABSORP
      DIMENSION ALPHA(1), BCF(1)                                        ABSORP
      DIMENSION DX1(11), DY1(11), DX2(21), DY2(21), XD(33), YD(33)      ABSORP
C     DEFINE CONSTANTS                                                  ABSORP
      DIMENSION XYD9(66),DXY19(22),DXY29(42)                            ABSORP
      DATA  XYD9                        / 0., 0., 0.25, 0.313, 0.5, 0.704,  ABSORP
     10.75, 0.957, 1.0, 1.0, 1.25, 0.87, 1.5, 0.75, 1.75, 0.65, 2.0,0.57 ABSORP
     2, 2.25, 0.506, 2.5, 0.45, 2.75, 0.408, 3.0, 0.37, 3.25, 0.337,    ABSORP
     3 3.5, 0.308, 3.75, 0.286, 4.0, 0.269, 4.25, 0.253, 4.5, 0.241,    ABSORP
     4 4.75, 0.232, 5.0, 0.225, 5.25, 0.22, 5.5, 0.214, 5.75, 0.21,     ABSORP
     5 6.0, 0.205, 6.25, 0.201, 6.5, 0.2, 0.125,0.148, 0.375,0.506,     ABSORP
     6 0.625,0.874, 0.875,0.992, 1.125,0.95, 1.375,0.803 /              ABSORP
      DATA  DXY19                       /  0.0,-2.457, 10.,-2.3889,       ABSORP
     1 20.,-2.3236, 30.,-2.2708, 40.,-2.2165, 50.,-2.1748, 60.,-2.1247,  ABSORP
     2 70.,-2.0825, 80.,-2.032, 90.,-1.9824, 100.,-1.9046 /             ABSORP
      DATA DXY29                        / 0.0,-1.9482, 5.,-1.8426,       ABSORP
     1 10.,-1.739, 15.0,-1.6358, 20.,-1.5411, 25.,-1.4393, 30.,-1.341,  ABSORP
     2 35.,-1.2562, 40.,-1.1716, 45.,-1.088, 50.,-1.0098, 55.,-0.9391,  ABSORP
     3 60.,-0.8725, 65.,-0.7949, 70.,-0.7264, 75.,-0.6541, 80., -0.5812, ABSORP
     4 85.,-0.5214, 90.,-0.4575, 95.,-0.389, 100.,-0.3298 /             ABSORP
      DATA ISET9/1/                                                     ABSORP
      IF  (ISET9 - 1)  19, 19, 29                                       ABSORP
19    ISET9=2                                                           ABSORP
      I=0                                                               ABSORP
      DO 21 K=1,66,2                                                    ABSORP
      I=I+1                                                             ABSORP
```

```
      XD(I)=XYD9(K)                                                     ABSORP
21    YD(I)=XYD9(K+1)                                                   ABSORP
      I=0                                                               ABSORP
      DO 23 K=1,22,2                                                    ABSORP
      I=I+1                                                             ABSORP
      DX1(I)=DXY19(K)                                                   ABSORP
  23  DY1(I)=DXY19(K+1)                                                 ABSORP
      I=0                                                               ABSORP
      DO 25 K=1,42,2                                                    ABSORP
      I=I+1                                                             ABSORP
      DX2(I)=DXY29(K)                                                   ABSORP
25    DY2(I)=DXY29(K+1)                                                 ABSORP
29    CONTINUE                                                          ABSORP
      G1  =  TBLU1(T, DX1, DY1, 3, 11)                                  ABSORP
      G2  =  TBLU1(T, DX2, DY2, 3, 21)                                  ABSORP
      HA  =  (RH**.9881) * (10.**G2)                                    ABSORP
      SA1  =  (T + 459.688)**0.678674                                   ABSORP
      IF  (NBW - 1)  2, 1, 3                                            ABSORP
    1 DLF  =  .1290682                                                  ABSORP
      FO  =  5198.5                                                     ABSORP
      GO TO 4                                                           ABSORP
    2 WRITE (6,11) NBW                                                  ABSORP
    3 DLF  =  .05                                                       ABSORP
      FO  =  4466.8                                                     ABSORP
    4 DO  9  I = 1,NFB                                                  ABSORP
      ALPHA(I)  =  0.0                                                  ABSORP
      IF  (BCF(I))  5, 9, 5                                             ABSORP
    5 F  =  ABS(BCF(I))                                                 ABSORP
      X  =  ALOG10(F)                                                   ABSORP
      IF  (F .GT. FO)  X = X - DLF                                      ABSORP
      A1  =  SA1 * (10.**(2.045 * X - 9.38939))                         ABSORP
      HMOMAX  =  10.**(.49658 * X - 1.48974)                            ABSORP
      AMOMAX  =  10.**(.997 * X + G1)                                   ABSORP
      XX  =  HA / HMOMAX                                                ABSORP
      IF  (XX - 6.4)  6, 7, 7                                           ABSORP
    6 AMOL  =  TBLU1(XX, XD, YD, 3, 33)                                 ABSORP
      GO TO 8                                                           ABSORP
    7 AMOL  =  .2                                                       ABSORP
    8 AMOL  =  AMOL * AMOMAX                                            ABSORP
      ALPHA(I)  =  A1 + AMOL                                            ABSORP
    9 CONTINUE                                                          ABSORP
C                                                                       ABSORP
      RETURN                                                            ABSORP
   11 FORMAT(//2X60HTROUBLE IN SUBROUTINE ABSORP, NO STANDARDS DEFINED F ABSORP
     *OR NBW =,I3/2X37HTHIRD OCTAVE-BAND TYPE NOISE ASSUMED./)          ABSORP
      END                                                               ABSORP
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```
      SUBROUTINE AFT                                                    AFT
C AUTHOR            D. F. MELDRUM                                       AFT
C                                                                       AFT
C PURPOSE           TO PREDICT AFT FAN NOISE FOR THE PHASE B            AFT
C                   NASA-AMES FOOTPRINT CONTRACT NAS2-6969.             AFT
C                                                                       AFT
C METHOD            AS DESCRIBED IN REFERENCE 1).                       AFT
C                                                                       AFT
C INPUTS            VIA LABLED COMMON FANDAT                            AFT
C                                                                       AFT
C                   NUMSTG     NUMBER OF FAN STAGES                     AFT
C                              1 & NUMSTG & 3                           AFT
C                   NINLET     SWITCH FOR INLET FAN NOISE               AFT
C                              PREDICTION IF POSITIVE.                  AFT
C                   NAFT       SWITCH FOR AFT FAN NOISE                 AFT
C                              PREDICTION IF POSITIVE.                  AFT
C                   IDOPP      SWITCH FOR THE DOPPLAR SHIFT             AFT
C                              FLIGHT EFFECTS.                          AFT
C                              0  NO FLIGHT EFFECTS OR DOPPLAR SHIFT.   AFT
C                              1  DOPPLAR SHIFT FOR THE FREQUENCY       AFT
C                                 CORRECTION ONLY.                      AFT
C                              2  DOPPLAR SHIFT FOR THE FREQUENCY       AFT
C                                 AND LEVEL CORRECTION.                 AFT
C                   NB(I)      NUMBER OF FAN BLADES FOR EACH STAGE      AFT
C                              WHERE 1 & I & NUMSTG                     AFT
C                   FPR(I)     FAN PRESSURE RATIO                       AFT
C                   DIAM(I)    FAN INLET DIAMETER (INLET ONLY)  FT      AFT
C                   RSS(I)     MINIMUM ROTOR/STATOR SPACING     PERCENT AFT
C                   AREA(I)    FAN DISCHARGE AREA (AFT ONLY)    FT*FT   AFT
C                   RN1        ROTOR SPEED                      RPM     AFT
C                   RTS        RELATIVE TIP MACH NUMBER OF THE          AFT
C                              FIRST STAGE WITHOUT INLET GUIDE          AFT
C                              VANES (IGV).  IF LESS THAN 1             AFT
C                              IGV WILL BE ASSUMED FOR THE FIRST        AFT
C                              STAGE (INLET FAN ONLY).                  AFT
C                   CRTFPR     FAN PRESSURE RATIO FOR THE               AFT
C                              RELATIVE TIP MACH NUMBER OF              AFT
C                              1.025 (INLET FAN ONLY)                   AFT
C                   ANGFAN     ENGINE INCLINATION ANGLE                 AFT
C                                                                       AFT
C                   VIA LABLED COMMON SWITCH                            AFT
C                                                                       AFT
C                   NUMENG     NUMBER OF NOISE SOURCES OF THE SAME      AFT
C                              NOISE TYPE.                              AFT
C                                                                       AFT
C                   VIA LABLED COMMON OCOMON                            AFT
C                                                                       AFT
C                   NOF        1/3 OCTAVE OF FULL OCTAVE SWITCH         AFT
C                              OR NUMBER OF FREQUENCY BANDS (8 OR 24)   AFT
C                   RETA(24)   DIRECTIVITY ANGLES                       AFT
C                                                                       AFT
C                   VIA LABLED COMMON OPRAM                             AFT
C                                                                       AFT
C                   AMACH      MACH NUMBER OF THE AIRCRAFT              AFT
C                   NOBS       NUMBER OF OBSERVER POSITIONS             AFT
C                                                                       AFT
C                   VIA LABLED COMMON SUMSPL                            AFT
```

```
C                                                                       AFT
C                    SSPL       CURRENT TOTAL PREDICTED NOISE FOR NOF   AFT
C                               (8 OR 24) FREQUENCIES, AT NOBS OBSERVER AFT
C                               POSITIONS FOR 17 DIRECTIVITY ANGLES.    AFT
C                                                                       AFT
C                    VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES AFT
C                                                                       AFT
C                    PSI        17 DIRECTIVITY ANGLES FOR EACH OF       AFT
C                               NOBS OBSERVER POSITIONS.                AFT
C                    PSIO       17 DIRECTIVITY ANGLE PROJECTIONS FOR    AFT
C                               EACH OF NOBS OBSERVER POSITIONS         AFT
C                    BETA       ELEVATION ANGLE PROJEDTION FOR EACH     AFT
C                               OF NOBS OBSERVER POSITIONS.             AFT
C                                                                       AFT
C                    EACH COMPONENT IS WRITTEN ON TAPE OR FILE 10       AFT
C                    FOR EACH OF NOF BANDS FOR EACH OF NOBS OBSERVER    AFT
C                    POSITIONS.                                         AFT
C                                                                       AFT
C OUTPUTS            VIA LABLED COMMON SUMSPL                           AFT
C                                                                       AFT
C                    SSPL       CURRENT TOTAL PREDICTED NOISE FOR       AFT
C                               8 OR 24 FREQUENCIES, AT NOBS OBSERVER   AFT
C                               POSITIONS FOR 17 DIRECTIVITY ANGLES.    AFT
C                                                                       AFT
C                    VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES AFT
C                                                                       AFT
C                    PSI        17 DIRECTIVITY ANGLES FOR EACH OF       AFT
C                               NOBS OBSERVER POSITIONS.                AFT
C                    PSIO       17 DIRECTIVITY ANGLE PROJECTIONS FOR    AFT
C                               EACH OF NOBS OBSERVER POSITIONS         AFT
C                    BETA       ELEVATION ANGLE PROJEDTION FOR EACH     AFT
C                               OF NOBS OBSERVER POSITIONS.             AFT
C                                                                       AFT
C                                                                       AFT
C REFERENCES         1)  R. J. SAXBY,  NASA-AMES FOOTPRINT CONTRACT     AFT
C                        NAS2-6969  FAN NOISE MODULE,   UN-NUMBERED     AFT
C                        COORDINATION SHEET,  DATED 19 JANUARY 1973.    AFT
C                                                                       AFT
C FUNCTION SUBPRGM   COS        ESHLOG     PWRSUM                       AFT
C                                                                       AFT
C SUBROUTINES        ANGLES     UNIT       FANNOS     ZERO              AFT
C                    WSHOUT     SHLDSP                                  AFT
C                                                                       AFT
C                                                                       AFT
C                                                                       AFT
      COMMON /FANDAT/ NUMSTG,NINLET,NAFT,IDOPP,NB(3),FPR(3),            AFT
     *                DIAM(3),RSS(3),AREA(3),RN1,RTS,CRTFPR,ANGFAN,     AFT
     *NI5,BPR5,ICOR4,LIN4,NTF4,IMA4,LGM4,NWL4,IDP4,ILAY4,TF4(10),       AFT
     *PCTA4(10),PLA4(10),ELOH4,EDH4,RLW4(10),TL4(10),CF4,FM4,           AFT
     *ICOR5,LIN5,NTF5,IMA5,LGM5,NWL5,IDP5,ILAY5,TF5(10),                AFT
     *PCTA5(10),PLA5(10),ELOH5,EDH5,RLW5(10),TL5(10),CF5,FM5            AFT
C                                                                       AFT
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDOP,IPRT(7),ICN(13),NLOPT         AFT
     *,INSEOW(3),INSHLD                                                 AFT
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           AFT
C                                                                       AFT
      COMMON /GCONST/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  AFT
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     *                 I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,   AFT
     *                 EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI    AFT
C                                                                          AFT
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                    AFT
C                                                                          AFT
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),           AFT
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                        AFT
      COMMON/SUMSPL/SSPL(24,10,17)                                         AFT
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                       AFT
C                                                                          AFT
C     FREQUENCY BANDS USED BY PROGRAM                                      AFT
C                                                                          AFT
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)                         AFT
C                                                                          AFT
C     GENERAL INPUT PARAMETERS                                             AFT
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)                      AFT
C                                                                          AFT
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),ITENG,IUNIT      AFT
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)           AFT
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP        AFT
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),       AFT
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF            AFT
C                                                                          AFT
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                   AFT
C                                                                          AFT
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),          AFT
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)                AFT
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CCV                          AFT
C                                                                          AFT
C     CONVERSION CONSTANTS                                                 AFT
C                                                                          AFT
      COMMON/GCONVC/C(2,10),SLDISX(10)                                     AFT
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                   AFT
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR                        AFT
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                                AFT
C     SHIELDING DATA. REQUIRED FOR PRINT OUT                               AFT
      COMMON/UNSHLD/USPLA(19),FSI(19),NUSPL,INUSP                          AFT
C                                                                          AFT
C                                                                          AFT
C                                                                          AFT
      ICN(5)=ICN(5)+1                                                      AFT
C                                                                          AFT
C                                                                          AFT
      DELTA=ANGFAN*RPD                                                     AFT
      CALL ANGLES(NOBS,DELTA)                                              AFT
C                                                                          AFT
C                                                                          AFT
C     LOOP FOR THE NUMBER OF OBSERVER POSITIONS                            AFT
C                                                                          AFT
      FBPF  =  FLOAT(NB(1)) * RN1 / 60.                                    AFT
C                                                                          AFT
C     TEST FOR SHIELDING AND EXIT TO PRINT OUT WING                        AFT
C     SHIELDING DATA ONCE FOR ALL SIDELINE POSITIONS                       AFT
      IF(INSHLD.NE.0)CALL WSHOUT(IPRT(7),10,ITYPE,USPLA,NUSPL,FSI,INUSP)   AFT
   40 DO 1000 M=1,NOBS                                                     AFT
      CALL LINCOR(SPZ(1,1),IMA5,LGM5,ELCH5,EDH5,NWL5,R1W5,TL5,             AFT
     *ILAY5,FM5,IDP5,PSI(1,M),NCF,BCF,PLA5,CF5,PCTA5,NTF5,                 AFT
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     *TF5,DOPSF,SPL2,ICOR5,IB(1,1,ITYPE),LIN5,FBPF)                    AFT
C                                                                      AFT
      CALL ZERO(SPLT,408)                                              AFT
C                                                                      AFT
C                                                                      AFT
C                                                                      AFT
C     CALCULATE THE AFT FAN NOISE PREDICTION                           AFT
C                                                                      AFT
      CALL FANNOS(DOPSF, PSI(1,M),SPLT(1,1),IDCP,NUMSTG,0,1,NB,FPR,    AFT
     *            DIAM,RSS,AREA,RN1,RTS,CRTFPR,0.0,BPR5,NI5)           AFT
C                                                                      AFT
C                                                                      AFT
   45 CONTINUE                                                         AFT
C                                                                      AFT
C     CONVERT TO A UNIT OR INDEXED SPECTRA                             AFT
C                                                                      AFT
      CALL UNIT(150.,17,SPLT(1,1))                                     AFT
      ENG=NENG                                                         AFT
      IF(ENG.LE.0.0) ENG=1.C                                           AFT
      DO 50 J=1,17                                                     AFT
      DANGLE=PSIO(J,M)                                                 AFT
      ELVANG=BETA(J,M)                                                 AFT
      ENS=ESHLDG(DANGLE,ELVANG,ENG)                                    AFT
      DO 50 K=1,24                                                     AFT
   50 SPLT(K,J)=SPLT(K,J)-ENS                                          AFT
      IF(NCF.EQ.24) GO TO 300                                          AFT
C                                                                      AFT
C     CONVERT 1/3 OCTAVE TO FULL OCTAVE                                AFT
C                                                                      AFT
      DO 200 J=1,17                                                    AFT
      DC 200 K=1,8                                                     AFT
      TMP  =  0.0                                                      AFT
      DO 100 L=1,3                                                     AFT
      JC  =  3*K + L - 3                                               AFT
  100 TMP  =  PWRSUM(TMP, SPLT(JC,J))                                  AFT
  200 SPLT(K,J)  =  TMP                                                AFT
C                                                                      AFT
C                                                                      AFT
C     ADD TO CURRENT TOTAL AND WRITE ON TAPE 10                        AFT
C                                                                      AFT
C                                                                      AFT
  300 DC 400 J=1,NCF                                                   AFT
      DO 400 K=1,17                                                    AFT
  400 SPLT(J,K)=SPLT(J,K)-SPZ(J,K)                                     AFT
C                                                                      AFT
      IF(INSHLD.NE.0)CALL SHLDSP(AMACH,ALTR,ISPTRM,CZ,SLDIST,M,        AFT
     *APY,APZ,DOPSF,SPLT,NCF,BCF,SPZ,PSI,ITYPE,ANGFAN,XX)              AFT
C                                                                      AFT
      DO 405 J=1,NCF                                                   AFT
      DO 405 K=1,17                                                    AFT
  405 SSPL(J,M,K)=PWRSUM(SSPL(J,M,K),SPLT(J,K))                        AFT
      IF(IPRT(7).NE.7)GO TO 410                                        AFT
      CALL NOISO(IPRT(7),M,NK,10,CHIN,IUNIT,SLDISX(M),PFREQ,SPLT(1,1), AFT
     *  NCF,ITYPE)                                                     AFT
 410  CONTINUE                                                         AFT
      DC 360 JC=1,NCF                                                  AFT
      DO 360 KC=1,17                                                   AFT
```

```
 360  SPLT(JC,KC)=SPLT(JC,KC)-TSPL(JC,M,KC)                              AFT      230
      CALL PNLSUB(SPLT(1,1),PSPL(1,M),IPD(1,M),EPNL(1,M),SPL2,           AFT      231
     *TEPNL(1,M),NK,BCG,TCG,FLR,M,NCBS,IRR(M,1))                         AFT      232
      IF(IPRT(3).NE.3)GO TO 1000                                         AFT      233
      CALL NOISO(IPRT(3),M,NK,12,CHIN,ILNIT,SLDISX(M),PFREQ,             AFT      234
     *   SPLT(1,1),NCF,ITYPE)                                            AFT      235
C                                                                        AFT      236
C                                                                        AFT      237
C                                                                        AFT      238
 1000 CONTINUE                                                           AFT      239
      RETURN                                                             AFT      240
      END                                                                AFT      241
```

```
      SUBROUTINE ANGLES(NOB,DELTA)                                      ANGLES     2
C                                                                       ANGLES     3
C     GENERAL INPUT PARAMETERS                                          ANGLES     4
C                                                                       ANGLES     5
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,X(10),NTENG,IUNIT        ANGLES     6
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)       ANGLES     7
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP    ANGLES     8
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),   ANGLES     9
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         ANGLES    10
C                                                                       ANGLES    11
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                ANGLES    12
C                                                                       ANGLES    13
      COMMON /GEOMO/ Y(10,17),Z(10,17),P(10,17),DPND(10,17),            ANGLES    14
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             ANGLES    15
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),COV                       ANGLES    16
C                                                                       ANGLES    17
C                                                                       ANGLES    18
C                                                                       ANGLES    19
      COMMON/ANGLE/ PSI(17,10),PSIO(17,10),BETA(17,10)                  ANGLES    20
      COMMON/SDELT/DT                                                   ANGLES    21
C                                                                       ANGLES    22
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLOPT         ANGLES    23
C                                                                       ANGLES    24
C                                                                       ANGLES    25
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)                     ANGLES    26
C                                                                       ANGLES    27
      DATA IGO/1/                                                       ANGLES    28
      IF(NTYP.NE.1)GO TO 2                                              ANGLES    29
      IGO=1                                                             ANGLES    30
      IF(ITYPE.EQ.11)IGO=2                                              ANGLES    31
      GO TO 10                                                          ANGLES    32
    2 CONTINUE                                                          ANGLES    33
      IF(ITYPE.NE.11)GO TO 4                                            ANGLES    34
      IGO=2                                                             ANGLES    35
      GO TO 8                                                           ANGLES    36
    4 IF  (IGO - 1)  8, 8, 5                                            ANGLES    37
    5 IGO=1                                                             ANGLES    38
      GO TO 10                                                          ANGLES    39
    8 CONTINUE                                                          ANGLES    40
      IF(DT.EQ.DELTA) GO TO 2000                                        ANGLES    41
   10 DT=DELTA                                                          ANGLES    42
   30 CSDE=COS(DELTA)                                                   ANGLES    43
      SNDE=SIN(DELTA)                                                   ANGLES    44
      DO 100 I=1,NOB                                                    ANGLES    45
      DO 100 J=1,17                                                     ANGLES    46
      TEMP1=-(Y(I,J)*CSDE+ (Z(I,J)-ALTR)*SNDE)/ABS(P(I,J))              ANGLES    47
      IF(TEMP1.GT.1.1.OR.TEMP1.LT.-1.1) GO TO 1000                      ANGLES    48
      IF(TEMP1.GT.1.0) TEMP1=1.0                                        ANGLES    49
      IF(TEMP1.LT.-1.0) TEMP1=-1.0                                      ANGLES    50
      PSI(J,I)=ACOS(TEMP1)*57.296                                       ANGLES    51
      XTNA=-(Y(I,J)*CSDE+(Z(I,J)-ALTR)*SNDE)                            ANGLES    52
      IF(XTNA.NE.0.)GO TO 50                                            ANGLES    53
      PSIO(J,I)=0.                                                      ANGLES    54
      GO TO 60                                                          ANGLES    55
   50 CONTINUE                                                          ANGLES    56
      PSIO(J,I)=ATAN2(ABS(X(I)),XTNA)                                   ANGLES    57
     *   *57.296                                                        ANGLES    58
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60    CONTINUE                                                          ANGLES     59
      ATEM=ABS(Y(I,J)*SNDE-(Z(I,J)-ALTR)*CSDE)                          ANGLES     60
      IF(X(I).GT.0.)GO TO 90                                            ANGLES     61
      BETA(J,I)=90.                                                     ANGLES     62
      IF(ATEM.GT.0.)GO TO 100                                           ANGLES     63
      BETA(J,I)=0.                                                      ANGLES     64
      GO TO 100                                                         ANGLES     65
90    CONTINUE                                                          ANGLES     66
      BETA(J,I)=ATAN2(ATEM,ABS                                          ANGLES     67
     *   (X(I)))*57.296                                                 ANGLES     68
100   CONTINUE                                                          ANGLES     69
      GO TO 2000                                                        ANGLES     70
1000  WRITE(6,1500)                                                     ANGLES     71
1500  FORMAT(40H THE ARCCOS FOR PSI IS OUT OF RANGE                  )  ANGLES     72
      STOP                                                              ANGLES     73
2000  RETURN                                                            ANGLES     74
      END                                                               ANGLES     75
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      SUBROUTINE ATMOSP(HGT,PRESUR,TEMPER,RELHUM)                       ATMOSP     2
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLOPT         ATMOSP     3
C                                                                       ATMOSP     4
C AUTHOR              G. A. WEST                                        ATMOSP     5
C                                                                       ATMOSP     6
C PURPOSE             TO DETERMINE THE PRESSURE, TEMPERATURE AND RELATIVE ATMOSP   7
C                     HUMIDITY AT A GIVEN ALTITUDE USING EITHER U.S.    ATMOSP     8
C                     STANDARD ATMOSPHERIC CONDITIONS OR USER DEFINED   ATMOSP     9
C                     ATMOSPHERE.                                       ATMOSP    10
C                                                                       ATMOSP    11
C DESCRIPTION OF VARIABLES                                              ATMOSP    12
C                                                                       ATMOSP    13
C     VARIABLES IN COMMON - SEE MAIN PROGRAM                            ATMOSP    14
C                                                                       ATMOSP    15
C     VARIABLES IN CALLING SEQUENCE                                     ATMOSP    16
C                                                                       ATMOSP    17
C      INPUT                                                            ATMOSP    18
C                                                                       ATMOSP    19
C        HGT        - ALTITUDE                                          ATMOSP    20
C                                                                       ATMOSP    21
C      OUTPUT                                                           ATMOSP    22
C                                                                       ATMOSP    23
C        PRESUR     - ATMOSPHERIC PRESSURE                              ATMOSP    24
C        TEMPER     - TEMPERATURE                                       ATMOSP    25
C        RELHUM     - PERCENT RELATIVE HUMIDITY                         ATMOSP    26
C                                                                       ATMOSP    27
C     LOCAL VARIABLES                                                   ATMOSP    28
C                                                                       ATMOSP    29
C        DUM        - WORKING STORAGE FOR SORTING ROUTINE               ATMOSP    30
C        K          - WORKING STORAGE FOR SORTING ROUTINE               ATMOSP    31
C        NSHUMD     - NUMBER OF ENTRIES IN ISA RELATIVE HUMIDITY TABLE  ATMOSP    32
C        NSPRES     - NUMBER OF ENTRIES IN ISA PRESSURE TABLE           ATMOSP    33
C        NSTEMP     - NUMBER OF ENTRIES IN ISA TEMPERATURE TABLE        ATMOSP    34
C        SAVNAM     - CONTAINS THE NAME OF THE CALLING ROUTINE          ATMOSP    35
C        SNAME      - CONTAINS THE NAME OF THIS ROUTINE                 ATMOSP    36
C        SPALT      - TABLE OF ALTITUDES FOR ISA PRESSURES DEFINED IN   ATMOSP    37
C                     ARRAY SPRES                                       ATMOSP    38
C        SPRES      - TABLE OF PRESSURES FOR ALTITUDES DEFINED IN       ATMOSP    39
C                     ARRAY SPALT                                       ATMOSP    40
C        SRALT      - TABLE OF ALTITUDES FOR ISA RELATIVE HUMIDITIES    ATMOSP    41
C                    DEFINED IN ARRAY SRHUMD                            ATMOSP    42
C        SRHUMD     - TABLE OF RELATIVE HUMIDITIES FOR ALTITUDES DEFINED ATMOSP   43
C                     ARRAY SRALT                                       ATMOSP    44
C        STALT      - TABLE OF ALTITUDES FOR ISA TEMPERATURES DEFINED IN ATMOSP   45
C                     ARRAY STEMP                                       ATMOSP    46
C        STEMP      - TABLE OF TEMPERATURES FOR ALTITUDES DEFINED IN    ATMOSP    47
C                     ARRAY STALT                                       ATMOSP    48
C                                                                       ATMOSP    49
C                                                                       ATMOSP    50
C                                                                       ATMOSP    51
C                                                                       ATMOSP    52
C                                                                       ATMOSP    53
C     GENERAL INPUT PARAMETERS                                          ATMOSP    54
C                                                                       ATMOSP    55
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),ITENG,IUNIT   ATMOSP    56
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)       ATMOSP    57
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP    ATMOSP    58
```

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     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF
C
C
C  *  *  *  *  *  *    STANDARD ATMOSPHERIC TABLES   *  *  *  *  *  *  *
C
      DIMENSION STALT(50),STEMP(50),SPALT(50),SPRES(50),SRALT(50),
     1          SRHUMD(50)
      DATA NSTEMP,NSPRES,NSHUMD/21,21,7/
      DATA STALT/     0.0, 2000.0, 4000.0, 6000.0, 8000.0,10000.0,
     1           12000.0,14000.0,16000.0,18000.0,20000.0,22000.0,
     2           24000.0,26000.0,28000.0,30000.0,32000.0,34000.0,
     3           36000.0,38000.0,40000.0,29*0.0/
      DATA STEMP/518.688,507.99,504.43,497.30,490.17,483.04,
     1            475.92,468.80,461.67,454.55,447.43,440.32,
     2            433.20,426.08,418.97,411.86,404.75,397.64,
     3            390.53,389.99,389.99,29*0.0/
      DATA SPALT/     0.0, 2000.0, 4000.0, 6000.0, 8000.0,10000.0,
     1           12000.0,14000.0,16000.0,18000.0,20000.0,22000.0,
     2           24000.0,26000.0,28000.0,30000.0,32000.0,34000.0,
     3           36000.0,38000.0,40000.0,29*0.0/
      DATA SPRES/14.696,13.664,12.692,11.778,10.917,10.108,9.3486,
     1           8.6361,7.9688,7.3438,6.7588,6.2124,5.7025,5.2272,
     2           4.7844,4.3726,3.9901,3.6352,3.3064,3.0044,2.7300,
     3           29*0.0/
      DATA SRALT/     0.0, 6561.6,13123.2,19684.8,26246.4,32808.0,
     1           39369.6,43*0.0/
      DATA SRHUMD/70.0,57.0,44.0,38.0,34.0,23.0,13.0,43*0.0/
C
C                                        HAS USER DEFINED HIS OWN
C                                         ATMOSPHERIC CONDITIONS
      IF (IATMOS .EQ. 2) GO TO 10
      IF (IATMOS .EQ. 3) GO TO 20
      IF (IATMOS .EQ. 4) GO TO 30
C                                        USE U.S. STANDARD CONDITIONS
C                                         OBTAIN STANDARD PRESSURE
    5 PRESUR = TBLU1(HGT,SPALT,SPRES,1,NSPRES)
C                                         OBTAIN STANDARD TEMPERATURE
      TEMPER = TBLU1(HGT,STALT,STEMP,1,NSTEMP)
C                                         OBTAIN STANDARD RELATIVE
C                                          HUMIDITY
      RELHUM = TBLU1(HGT,SRALT,SRHUMD,2,NSHUMD)
C                                        DOES USER WISH TO ADD CONSTANT
C                                         GRADIENTS TO U.S. STANDARD
C                                         CONDITIONS
      IF (IATMOS .EQ. 0) GO TO 40
C
      PRESUR = PRESUR + DPRES
      TEMPER = TEMPER + DTEMP
      RELHUM = RELHUM + DHUMID
      GO TO 40
C                                        ATMOSPHERIC CONDITIONS DEFINED
C                                         BY USER
C
C                                        IS NPRES WITHIN RANGE
   10 IF (NPRES .LE. 50) GO TO 11
      CALL ERROR(ITYPE,1,1)
```

```
      GO TO 16                                                          ATMOSP    116
   11 IF (NPRES .GE. 2) GO TO 12                                        ATMOSP    117
      CALL ERROR(ITYPE,1,2)                                             ATMOSP    118
      GO TO 16                                                          ATMOSP    119
C                                       SORT PRESSURES TO INSURE THAT   ATMOSP    120
C                                        THEY ARE IN ASCENDING ORDER    ATMOSP    121
C                                        OF ALTITUDE                    ATMOSP    122
12    CALL SORTX(PALT,PRES,NPRES)                                       ATMOSP    123
C                                       OBTAIN PRESSURE                 ATMOSP    124
      PRESUR = TBLU1(HGT,PALT,PRES,1,NPRES)                             ATMOSP    125
C                                       IS NTEMP WITHIN RANGE           ATMOSP    126
      IF (NTEMP .LE. 50) GO TO 13                                       ATMOSP    127
      CALL ERROR(ITYPE,1,3)                                             ATMOSP    128
      GO TO 16                                                          ATMOSP    129
   13 IF (NTEMP .GE. 2) GO TO 14                                        ATMOSP    130
      CALL ERROR(ITYPE,1,4)                                             ATMOSP    131
      GO TO 16                                                          ATMOSP    132
C                                       SORT TEMPERATURES TO INSURE THAT ATMOSP   133
C                                        THEY ARE IN ASCENDING ORDER OF ATMOSP    134
C                                        ALTITUDE                       ATMOSP    135
14    CALL SORTX(TALT,TEMP,NTEMP)                                       ATMOSP    136
C                                       OBTAIN TEMPERATURE              ATMOSP    137
      TEMPER = TBLU1(HGT,TALT,TEMP,1,NTEMP)                             ATMOSP    138
C                                       IS NHUMID WITHIN RANGE          ATMOSP    139
      IF (NHUMID .LE. 50) GO TO 15                                      ATMOSP    140
      CALL ERROR(ITYPE,1,5)                                             ATMOSP    141
      GO TO 16                                                          ATMOSP    142
   15 IF (NHUMID .GE. 2) GO TO 17                                       ATMOSP    143
      CALL ERROR(ITYPE,1,6)                                             ATMOSP    144
   16 IATMOS = 0                                                        ATMOSP    145
      GO TO 5                                                           ATMOSP    146
C                                       SORT RELATIVE HUMIDITITES TO    ATMOSP    147
C                                        INSURE THAT THEY ARE IN        ATMOSP    148
C                                        ASCENDING ORDER OF ALTITUDE    ATMOSP    149
17    CALL SORTX(RALT,RHUMID,NHUMID)                                    ATMOSP    150
C                                       OBTAIN RELATIVE HUMIDITY        ATMOSP    151
      RELHUM = TBLU1(HGT,RALT,RHUMID,1,NHUMID)                          ATMOSP    152
      GO TO 40                                                          ATMOSP    153
C                                                                       ATMOSP    154
C                                       USE STANDARD DAY CONDITIONS FOR ATMOSP    155
C                                        HOMOGENEOUS ATMOSPHERE AS      ATMOSP    156
C                                        DEFINED BY FEDERAL AVIATION    ATMOSP    157
C                                        REGULATION                     ATMOSP    158
   20 PRESUR = 14.696                                                   ATMOSP    159
      TEMPER = 518.688                                                  ATMOSP    160
      RELHUM = 70.0                                                     ATMOSP    161
      GO TO 40                                                          ATMOSP    162
C                                       USE HOMOGENEOUS ATMOSPHERE      ATMOSP    163
C                                        AS DEFINED BY USER             ATMOSP    164
   30 PRESUR = CPRES                                                    ATMOSP    165
      TEMPER = CTEMP                                                    ATMOSP    166
      RELHUM = CRHUMD                                                   ATMOSP    167
C                                                                       ATMOSP    168
40    CONTINUE                                                          ATMOSP    169
      RETURN                                                            ATMOSP    170
      END                                                               ATMOSP    171
```

```
      SUBROUTINE AVGALF(Z1,ZN,NBW,NFB,BCF,ALFA,IATMCS)
C
C PURPOSE            TO CALCULATE THE AVERAGE AIR ABSORBPTION COEFFICIENT
C
C AUTHOR             D. G. DUNN
C
C
      DIMENSION BCF(1),ALFA(1)
      DIMENSION SUM(31)
      DATA TO/459.688/
      DATA SNAME/8HAVGALF  /
C
      DZ = ZN - Z1
      CALL ATMOSP(Z1,DUM,T1,RH1)
      T1 = T1 - TO
      CALL ABSORP(RH1,T1,NBW,NFB,BCF,ALFA)
C                                    TEST FOR HOMOGENEOUS ATMOSPHERE
      IF (IATMCS .GE. 3) GO TO 6
      IF (DZ) 2, 6, 2
    2 CALL ATMOSP(ZN,DUM,TN,RHN)
      TN = TN - TO
      CALL ABSORP(RHN,TN,NBW,NFB,BCF,SLM)
      N = 0.5 * AMAX1(ABS(TN-T1) + ABS(RHN-RH1),20.0)
      M = N-1
      FM = M
      DZ = DZ/FM
      DO 3 J=1,NFB
      SUM(J) = 0.5 * (SUM(J) + ALFA(J))
    3 CONTINUE
      DO 4 I=2,M
      Z = Z1 + DZ * FLOAT(I-1)
      CALL ATMOSP(Z,DUM,T,RH)
      T = T - TO
      CALL ABSORP(RH,T,NBW,NFB,BCF,ALFA)
      DO 4 J=1,NFB
      SUM(J) = SUM(J) + ALFA(J)
    4 CONTINUE
      DO 5 I=1,NFB
      ALFA(I) = SUM(I)/FM
    5 CONTINUE
6     CONTINUE
      RETURN
      END
```

```
      SUBROUTINE BESJ(X, N, BJ, D, IER)                                 BESJ
C                                                                       BESJ
C  PURPOSE-                                                             BESJ
C     COMPUTE THE J BESSEL FUNCTION FOR A GIVEN ARGUMENT AND ORDER.     BESJ
C                                                                       BESJ
C  USAGE-                                                               BESJ
C     CALL BESJ(X, N, BJ, D, IER)                                       BESJ
C                                                                       BESJ
C  DESCRIPTION OF PARAMETERS-                                           BESJ
C     X  -THE ARGUMENT OF THE J BESSEL FUNCTION DESIRED                 BESJ
C     N  -THE ORDER OF THE J BESSEL FUNCTION DESIRED                    BESJ
C     BJ -THE RESULTANT J BESSEL FUNCTION                               BESJ
C     D  -THE REQUIRED ACCURACY- SOME FRACTION OF THE J BESSEL FUNCTION BESJ
C     IER-RESULTANT ERROR CODE WHERE                                    BESJ
C        IER = 0 ... NO ERROR                                           BESJ
C        IER = 1 ... REQUIRED ACCURACY NOT OBTAINED                     BESJ
C        IER = 2 ... RANGE OF N COMPARED TO X NOT CORRECT (SEE REMARKS) BESJ
C                                                                       BESJ
C  REMARKS-                                                             BESJ
C     MAGNITUDE OF (N) MUST BE LESS THAN                                BESJ
C        20 + ABS(X) * (10 - ABS(X) / 3) ... FOR ABS(X) .LE. 15         BESJ
C        90 + ABS(X) / 2                 ... FOR ABS(X) .GT. 15         BESJ
C                                                                       BESJ
C  SUBPROGRAMS REQUIRED-                                                BESJ
C     NONE                                                              BESJ
C                                                                       BESJ
C  METHOD-                                                              BESJ
C     RECURRENCE RELATION TECHNIQUE DESCRIBED BY H. GOLDSTEIN AND       BESJ
C     R.M. THALER,/RECURRENCE TECHNIQUES FOR THE CALCULATION OF         BESJ
C     BESSEL FUNCTIONS/, M.T.A.C.,V13,PP 102-108 AND I.A. STEGUN        BESJ
C     AND M. ABRAMOWITZ,/GENERATION OF BESSEL FUNCTIONS ON HIGH         BESJ
C     SPEED COMPUTERS/, M.T.A.C.,V11,1957,PP 255-257.                   BESJ
C                                                                       BESJ
C  REFERENCE-                                                           BESJ
C     THE FORTRAN PROGRAM WAS TAKEN FROM ...                            BESJ
C     IBM,/SYSTEM 360 SCIENTIFIC SUBROUTINE PACKAGE (360A-CM-03X)       BESJ
C     VERSION III PROGRAMMERS MANUAL/,IBM APPLICATION PROGRAM H20-0205-3 BESJ
C                                                                       BESJ
C.......................................................................BESJ
C                                                                       BESJ
      IER  =  0                                                         BESJ
      BJ   =  0.                                                        BESJ
      XT   =  X                                                         BESJ
      X    =  ABS(XT)                                                   BESJ
      NT   =  N                                                         BESJ
      N    =  IABS(NT)                                                  BESJ
      IS   =  MOD(N, 2)                                                 BESJ
      SS   =  1.                                                        BESJ
      IF   (XT)  20, 10, 30                                             BESJ
   10 IF   (NT)  210, 15, 210                                           BESJ
   15 BJ   =  SS                                                        BESJ
      GO TO 210                                                         BESJ
   20 IF   (IS)  25, 31, 25                                             BESJ
   25 SS   =  -SS                                                       BESJ
      GO TO 31                                                          BESJ
   30 IF   (NT)  20, 31, 31                                             BESJ
   31 IF   (X - 15.)  32, 32, 34                                        BESJ
```

```
   32 NTEST  =  20. + X * (10. - .3333333 * X)                    BESJ
      GO TO 36                                                    BESJ
   34 NTEST  =  90. + .5 * X                                      BESJ
   36 IF  (N - NTEST)  40, 38, 38                                 BESJ
   38 IER  =  2                                                   BESJ
      GO TO 210                                                   BESJ
   40 N1  =  N + 1                                                BESJ
      BPREV  =  0.                                                BESJ
C                                                                 BESJ
C  COMPUTE STARTING VALUE OF M                                    BESJ
      IF  (X - 5.)  50, 60, 60                                    BESJ
   50 MA  =  X + 6.                                               BESJ
      GO TO 70                                                    BESJ
   60 MA  =  1.4 * X + 60. / X                                    BESJ
   70 MB  =  N + 2 + IFIX(X) / 4                                  BESJ
      MZERO  =  MAX0(MA, MB)                                      BESJ
C                                                                 BESJ
C  SET UPPER LIMIT OF M                                           BESJ
C                                                                 BESJ
      MMAX  =  NTEST                                              BESJ
  100 DO  190  M = MZERO,MMAX,3                                   BESJ
C                                                                 BESJ
C  SET F(M), F(M-1)                                               BESJ
C                                                                 BESJ
      FM1  =  1.0E-28                                             BESJ
      FM  =  0.                                                   BESJ
      ALPHA  =  0.                                                BESJ
      IF  (MOD(M, 2))  120, 110, 120                              BESJ
  110 JT  =  -1                                                   BESJ
      GO TO 130                                                   BESJ
  120 JT  =  1                                                    BESJ
  130 M2  =  M - 2                                                BESJ
      DO  160  K = 1,M2                                           BESJ
      MK  =  M - K                                                BESJ
      BMK  = FLOAT(MK+MK) * FM1 / X - FM                          BESJ
      FM  =  FM1                                                  BESJ
      FM1  =  BMK                                                 BESJ
      IF  (MK - N - 1)  150, 140, 150                             BESJ
  140 BJ  =  BMK                                                  BESJ
  150 JT  =  -JT                                                  BESJ
      S  =  JT + 1                                                BESJ
  160 ALPHA  =  ALPHA + BMK * S                                   BESJ
      BMK  =  (FM1+FM1) / X - FM                                  BESJ
      IF  (N)  180, 170, 180                                      BESJ
  170 BJ  =  BMK                                                  BESJ
  180 ALPHA  =  ALPHA + BMK                                       BESJ
      BJ  =  BJ / ALPHA                                           BESJ
      IF  (ABS(BJ - BPREV) - ABS(D * BJ))  200, 200, 190          BESJ
  190 BPREV  =  BJ                                                BESJ
      IER  =  1                                                   BESJ
  200 BJ  =  SS * BJ                                              BESJ
  210 N  =  NT                                                    BESJ
      X  =  XT                                                    BESJ
      RETURN                                                      BESJ
      END                                                         BESJ
```

```
      SUBROUTINE BLWFLP                                                 BLWFLP     2
C         COMMON  STORAGE                                               BLWFLP     3
      DIMENSION PR7(1)                                                  BLWFLP     4
      COMMON/BLOWIN/PR7,TT7,AN7,DN7,FANG7,DELT7,DL7,HD7,ICOR7           BLWFLP     5
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),        BLWFLP     6
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                     BLWFLP     7
C                                                                       BLWFLP     8
C     GENERAL INPUT PARAMETERS                                          BLWFLP     9
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT   BLWFLP    10
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)        BLWFLP    11
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP     BLWFLP    12
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),    BLWFLP    13
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         BLWFLP    14
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                BLWFLP    15
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),       BLWFLP    16
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             BLWFLP    17
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CCV                       BLWFLP    18
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLCPT         BLWFLP    19
      COMMON/SUMSPL/SSPL(24,10,17)                                      BLWFLP    20
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    BLWFLP    21
      COMMON/ANGLE/PSI(17,10),PSIC(17,10),BETA(17,10)                   BLWFLP    22
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                             BLWFLP    23
      COMMON/GFREQ/CFREQ(24),UFREQ(25),PFREQ(24)                        BLWFLP    24
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  BLWFLP    25
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                BLWFLP    26
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR                     BLWFLP    27
C                                                                       BLWFLP    28
C         PR7        PRESSURE RATIO                                     BLWFLP    29
C                                                                       BLWFLP    30
C         TT7        TOTAL TEMPERATURE ( R)                             BLWFLP    31
C                                                                       BLWFLP    32
C         AN7       NOZZLE AREA IN SQ. FT.                              BLWFLP    33
C                                                                       BLWFLP    34
C         DN7        NOZZLE DIAMETER (FT.)                              BLWFLP    35
C                                                                       BLWFLP    36
C         FANG7      FLAP ANGLE ( DEG.)                                 BLWFLP    37
C         DELT7      ENGINE ATTITUDE ANGLE                              BLWFLP    38
C                                                                       BLWFLP    39
C         DL7        DIMENSIONLESS DISTANCE BETWEEN NOZZLE AND TARGET POI BLWFLP  40
C                                                                       BLWFLP    41
C         HD7        DIMENSIONLESS HEIGHT I.E., DISTANCE BETWEEN NOZZLE BLWFLP    42
C                    CENTERLINE AND MEAN CHORD LINE                     BLWFLP    43
C         ICOR7      CONFIGURATION CORRECTIONS INDICATOR                BLWFLP    44
      DIMENSION FT1(9),SP1(9),XDN( 6),VXVO( 6),VFA(9),FLA(3),FN3(9),    BLWFLP    45
     * FTH4(14),FVJ4(3),FN4(14,3,3)                                     BLWFLP    46
      DIMENSION PT3(5),PVJ3(5)                                          BLWFLP    47
      DIMENSION AZ5(2),FN5(19,3,2),FTH5(19),FTH6(10),FLDLHR(2),FN6(10,2) BLWFLP   48
      DIMENSIONFL7(9),FN7(9)                                            BLWFLP    49
      DIMENSION STN8(25),FN8(25)                                        BLWFLP    50
      DATA RPD/.017453/,DPR/57.2957/                                    BLWFLP    51
      DATA R/53.345/,G/32.174/,PI/3.14159/                              BLWFLP    52
      DATA FT1/800.,900.,1000.,1200.,1400.,1600.,1800.,2000.,2500./     BLWFLP    53
      DATA SP1/1.382,1.376,1.369,1.357,1.344,1.333,1.324,1.316,1.302/   BLWFLP    54
      DATA XDN/5.,5.5,6.,6.5,7.,7.2/                                    BLWFLP    55
      DATA VXVO/1.,.99,.98,.97,.95,.93/                                 BLWFLP    56
      DATA FLA/0.,15.,45./                                              BLWFLP    57
      DATA FN3/153.2,157.4,160.,162.6,165.1,167.2,169.2,                BLWFLP    58
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     *   171.2,172.8/                                                    BLWFLP     59
C                                                                        BLWFLP     60
      DATA PT3/553.,495.,474.,439.,404./                                 BLWFLP     61
      DATA PVJ3/426.,624.,758.,925.,1126./                               BLWFLP     62
      DATA FTH4/0.,30.,60.,80.,90.,100.,110.,120.,130.,140.,150.,        BLWFLP     63
     *  160.,170.,180./                                                  BLWFLP     64
      DATA FVJ4/2.79588,2.96614,3.05115/                                 BLWFLP     65
      DATA FN4 /-5.,-3.,-.5,0.,0.,-.3,-.5,-.8,-1.,-1.2,-1.7,             BLWFLP     66
     *  -2.5,-3.,-3.5,                                                   BLWFLP     67
     2    -4.,-2.,-.5,0.,-.5,-.6,-1.,-1.4,-1.6,-2.4,-3.2,-5.,-4.7,-3.2, BLWFLP     68
     3    -3.,0.,1.,0.,-1.,-1.8,-3.5,-5.7,-6.5,-5.,-.8,-.2,-.1,-.2,     BLWFLP     69
     4    -4.,-1.5,-.5,0.,.5,.5,.8,1.,1.3,2.,2.7,3.,2.5,2.,             BLWFLP     70
     5    -2.6,-1.6,-.6,0.,.2,0.,.2,1.,2.,2.2,1.5,0.,-.4,0.,            BLWFLP     71
     6    -4.5,-.3,.1,0.,-.1,-.3,-3.1,-5.6,-7.1,-7.6,-.6,.6,.1,-.1,     BLWFLP     72
     7    .4,.6,.1,0.,.1,.3,.4,.5,1.5,2.6,4.,4.2,4.4,4.,                BLWFLP     73
     8    -2.5,-.8,0.,0.,0., .5,.7,1.,1.5,2.1,2.8,1.3,-.4,.2,           BLWFLP     74
     9    -5.4,-1.0,-.2,0.,-.5,-.4,-2.2,-4.5,-6.2,-5.9,-1.,.6,.8,.2/    BLWFLP     75
      DATA AZ5/0.,90./                                                   BLWFLP     76
      DATA FTH5/0.,10.,20.,30.,40.,50.,60.,70.,80.,90.,100.,110.,120.,   BLWFLP     77
     *         130.,140.,150.,160.,170.,180./                            BLWFLP     78
      DATA FN5 /57 *0.,                                                  BLWFLP     79
     1 3.5,4.3,5.2,5.8,6.9,6.5,6.8,6.,5.2,6.8,5.,5.8,5.4,4.,2.4,1.8,     BLWFLP     80
     * 1.6,1.3,2.6,                                                      BLWFLP     81
     2 3.8,4.5,4.8,5.6,6.2,6.3,7.2,7.4,7.6,8.2,8.5,7.4,8.,6.4,6.8,4.4,   BLWFLP     82
     * 2.5,2.5,3.7,                                                      BLWFLP     83
     3 3.3,5.2,6.2,7.,5.5,9.2,10.3,11.3,11.5,13.4,10.9,8.4,4.6,-.5,-1.5, BLWFLP     84
     * 3.8,4.9,2.6,2.8/                                                  BLWFLP     85
      DATA RL/.37/,HR/.078/,DR/.052/                                     BLWFLP     86
      DATA FTH6/0.,30.,60.,80.,90.,100.,120.,150.,170.,180./             BLWFLP     87
      DATA FLDLHR/ .12,1.0 /                                             BLWFLP     88
      DATA FN6/2.3,1.6,2.8,3.9,4.1,4.4,4.4,4.1,3.9,3.1,10*0.0 /          BLWFLP     89
      DATA FL7/0.,5.,10.,15.,20.,30.,40.,45.,67.5/                       BLWFLP     90
      DATA FN7/.48,.51,.55,.6,.665,.8,.93,1.0,1.31/                      BLWFLP     91
      DATA VFA/2.692,2.771,2.817,2.868,2.914,2.955,2.993,3.028,3.060  /  BLWFLP     92
      DATA STN8/-1.8239,-1.4815,-1.301,-1.222,-1.155,-1.097,-1.046,-1.,  BLWFLP     93
     *    -.824,-.699,-.602,-.523,-.456,-.398,-.301,-.222,-.155,         BLWFLP     94
     *    -.097,-.046,0.,.176,.301,.477,.699,.778    /                   BLWFLP     95
      DATA FN8/-60.,-40.,-29.5,-25.,-22.,-19.7,-18.,-16.6,-12.4,-10.6,   BLWFLP     96
     *   -9.7,                                                           BLWFLP     97
     *     -9.2,-9.,-9.1,-9.6,-10.3,-10.8,-11.3,-11.9,-12.4,-14.7,-16.4, BLWFLP     98
     *      -19.,-22.5,-23.7  /                                          BLWFLP     99
      DATA  C1/3HC1)/                                                    BLWFLP    100
      DATA C25/5HC1-4)/                                                  BLWFLP    101
      DATA CI/3HCI)/,CII/4HCII)/,CIII/5HCIII)/,CIV/4HCIV)/,              BLWFLP    102
     *  CV/3HCV)/,CEND/4HCEND/                                           BLWFLP    103
      SP7=APO*144.                                                       BLWFLP    104
C2.   CALCULATE   DENSITY                                                BLWFLP    105
      ICN(7)=ICN(7)+1                                                    BLWFLP    106
      DELTA=DELT7*.01745                                                 BLWFLP    107
      CALL ANGLES(NOBS,DELTA)                                            BLWFLP    108
      GAMA=TBLU1(TT7,FT1,SP1,1,9)                                        BLWFLP    109
      RT=R*TT7                                                           BLWFLP    110
      RHOS  = (SP7 / RT) * PR7(1)**((GAMA-1.)/GAMA)                      BLWFLP    111
C3.   VALCULATE JET VELOCITY VJ                                          BLWFLP    112
      VJ  = SQRT((2.*G*RT*GAMA/(GAMA-1.))*(1.-PR7(1)**((1.-GAMA)/GAMA))) BLWFLP    113
C4.   CALCULATE JET MACH NUMBER AMJ                                      BLWFLP    114
      AMJ  = SQRT((2./(GAMA-1.))*(PR7(1)**((GAMA-1.)/GAMA) - 1.))        BLWFLP    115
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      TS  =  TT7 * PR7(1)**((1.-GAMA)/GAMA)                             BLWFLP    116
      ALPHA=DELTA-ATAN(SLOPE)                                           BLWFLP    117
C5.                                                                     BLWFLP    118
      VA=CZ*AMACH                                                       BLWFLP    119
      IF(DL7.GT.5.)GO TO 10                                             BLWFLP    120
      VXVJ=1.0                                                          BLWFLP    121
      GO TO 30                                                          BLWFLP    122
 10   IF(DL7.GT.7.4)GO TO 20                                            BLWFLP    123
      VXVJ=TBLU1(DL7,XDN,VXVC,2,6)                                      BLWFLP    124
      GO TO 30                                                          BLWFLP    125
 20   VXVJ=6.768*DL7*.1                                                 BLWFLP    126
 30   CONTINUE                                                          BLWFLP    127
      VX=VXVJ*VJ                                                        BLWFLP    128
      VF=SQRT(VX**2+(1.0-VXVJ)**2*VA**2+2.*VX*VA*(1.-VXVJ)*COS(ALPHA))  BLWFLP    129
C6.   CALCULATE OVERALL SOUND PRESSURE LEVEL  DB                        BLWFLP    130
CI)   **  NORMALIZED OVERALL SPL AS A FUNCTION OF VF AT PSI=80, AZANG7=0 BLWFLP    131
      AVF=ALOG10(VF)                                                    BLWFLP    132
      VFNI=TBLU1(AVF,VFA,FN3,1,9)                                       BLWFLP    133
      TSZ=TBLU1(VJ,PVJ3,PT3,1,5)                                        BLWFLP    134
      SPLI=VFNI+15.*ALOG10(TS/TSZ)+10.*ALOG10(RHOS**2*AN7)              BLWFLP    135
     *   +10.*ALOG10((.0526+(SIN(FANG7*RPD)**2))/1.0526)                BLWFLP    136
      DO 4000 I=1,NOBS                                                  BLWFLP    137
      CALL LINCOR(SPZ(1,1),C,X,X,X,X,X,X,X,X,X,PSI(1,I),NCF,BCF,        BLWFLP    138
     * X,X,X,X,X,X,X,ICOR7,IB(1,1,ITYPE),0,X)                           BLWFLP    139
      DO 1000 J=1,17                                                    BLWFLP    140
C                                                                       BLWFLP    141
CII)  **  CORRECTION OVERALL SPL AT GIVEN PSI AND  AZANG7=0             BLWFLP    142
C                                                                       BLWFLP    143
      VVJ=ALOG10(VJ)                                                    BLWFLP    144
      SPLII=TBLU3(PSI(J,I),FANG7,VVJ,FTH4,FLA,FVJ4,FN4,1,1,1,           BLWFLP    145
     *   14,3,3,14,3,3)                                                 BLWFLP    146
C                                                                       BLWFLP    147
CIII) **  CORRECTION TO OVERALL SPL FOR  CHANGE IN  AZANG7              BLWFLP    148
C                                                                       BLWFLP    149
      AZANG7=90.-BETA(J,I)                                              BLWFLP    150
      SPLIII=TBLU3(PSI(J,I),FANG7,AZANG7,FTH5,FLA,AZ5,FN5,1,1,1,        BLWFLP    151
     * 19,3,2,19,3,2)                                                   BLWFLP    152
C                                                                       BLWFLP    153
CIV)      CORRECTION TO OVERALL SPL FOR CHANGES IN RELATIVE LOCATIONS   BLWFLP    154
C                   OF NOZZLE AND WING                                  BLWFLP    155
      HL=DL7*HD7                                                        BLWFLP    156
      SPLP=HL/(RL*HR/DR**2)                                             BLWFLP    157
          ETAS= TBLU1(FANG7,FL7,FN7,1,9)                                BLWFLP    158
      CPSZ=PSI(J,I)-ALPHA*DPR                                           BLWFLP    159
      SPLIV=TBLU2(CPSZ,SPLP,FTH6,FLDLHR,FN6,1,1,10,2,10,2)              BLWFLP    160
      SPLIV=SPLIV*ETAS                                                  BLWFLP    161
CV)       CHANGES IN SOUND INTENSITY DUE TO FLIGHT EFFECTS              BLWFLP    162
      ONEM=1.-AMACH*COS(BETA(J))                                        BLWFLP    163
      SPLV=-30.*ALOG10(ONEM)                                            BLWFLP    164
C       OVERALL SPL                                                     BLWFLP    165
      OASPL=SPLI+SPLII-SPLIII+SPLIV+SPLV-3.                             BLWFLP    166
      XENG=NENG                                                         BLWFLP    167
                          ENS = ESHLDG(PSIO(J,I),BETA(J,I),XENG)        BLWFLP    168
      DO  800  NB=1,NCF                                                 BLWFLP    169
      TGAGR(NB)=BCF(NB)*DN7*ONEM/(VF*SQRT(1.+(SIN(RPD*FANG7)            BLWFLP    170
     *    **2)*.5))                                                     BLWFLP    171
      TTEMP=TGAGR(NB)                                                   BLWFLP    172
```

```
      TGAGR(NB)=TBLU1(ALOG1C(TGAGR(NB)),STN8,FN8,1,24)                  BLWFLP    173
      IF(NCF.EQ.8)TGAGR(NB)=TGAGR(NB)+ 4.8                              BLWFLP    174
      SPLT(NB,J)=DASPL+TGAGR(NB)-EAS-SPZ(NB,J)                          BLWFLP    175
      SSPL(NB,I,J)=PWRSUM(SSPL(NB,I,J),SPLT(NB,J))                      BLWFLP    176
800   CONTINUE                                                          BLWFLP    177
1000  CONTINUE                                                          BLWFLP    178
      IF(IPRT(7).NE.7)GO TO 2200                                        BLWFLP    179
      CALL NOISO(IPRT(7),I,NK,10,CHIN,IUNIT,SLDISX(I),PFREQ,            BLWFLP    180
     1     SPLT(1,1),NCF,ITYPE)                                         BLWFLP    181
2200  CONTINUE                                                          BLWFLP    182
      DO 2500  K=1,NCF                                                  BLWFLP    183
      DO 2500  J=1,17                                                   BLWFLP    184
2500  SPLT(K,J)=SPLT(K,J)-TSPL(K,I,J)                                   BLWFLP    185
      IF(IPRT(3).NE.3)GO TO 3000                                        BLWFLP    186
      CALL  PNLSUB(SPLT(1,1),PSPL(1,I),TPD(1,I),EPNL(1,I),SPL2,         BLWFLP    187
     *      TEPNL(1,I),NK,BCG,TCG,FLR, I,NOBS,IRR(I,1))                 BLWFLP    188
      CALL NOISO(IPRT(3),I,NK,12,CHIN,IUNIT,SLDISX(I),                  BLWFLP    189
     1   PFREQ,SPLT(1,1),NCF,ITYPE)                                     BLWFLP    190
3000  CONTINUE                                                          BLWFLP    191
4000  CONTINUE                                                          BLWFLP    192
      RETURN                                                            BLWFLP    193
      END                                                               BLWFLP    194
```

```
      SUBROUTINE BUZSAW(RTS,FBPF,DIAM,XSF,ANGLES,ILEVEL,IDOP,          BUZSAW
     *                  BSCR1,BSCR3,BSARAY)                            BUZSAW
C AUTHOR              D. F. MELDRUM                                    BUZSAW
C                                                                      BUZSAW
C METHOD              THE BUZZSAW NOISE IS PREDICTED BY THE USE OF CURVES BUZSAW
C                     AS PER THE REFERENCE GIVEN.                      BUZSAW
C                     THESE CURVES ARE INTERPOLATED OR EXTRAPOLATED AS BUZSAW
C                     NEEDED INORDER TO PREDICT THE NOISE AT 150 FT RADIUS BUZSAW
C                                                                      BUZSAW
C PURPOSE             TO PREDICT THE BUZZSAW NOISE COMPONENT FOR EACH  BUZSAW
C                     STAGE OF THE INLET FAN.                          BUZSAW
C                                                                      BUZSAW
C INPUTS              RTS        RELATIVE FAN TIP SPEED IN FT/SEC.     BUZSAW
C                     FBPF       FUNDAMENTAL BLADE PASSING FREQUENCY HERTZ BUZSAW
C                     DIAM       FAN INLET DIAMETER IN FEET            BUZSAW
C                     XSF        SCALE FACTOR FOR THE DOPPLAR SHIFT    BUZSAW
C                     ANGLES     DIRECTIVITY ANGLES FOR NOISE PREDICTION BUZSAW
C                     ILEVEL     SWITCH FOR THE DOPPLAR SHIFT LEVEL    BUZSAW
C                                CORRECTION IF NON ZERO                BUZSAW
C                     IDOP       SWITCH FOR THE DOPPLAR SHIFT FREQUENCY BUZSAW
C                                CORRECTION IF IT SET NON ZERO         BUZSAW
C                     BSCR1      CURVE - BUZZSAW - BASIC DATA          BUZSAW
C                     BSCR3      CURVE - BUZZSAW - DIRECTIVITY ANGLE   BUZSAW
C                                                                      BUZSAW
C                     INPUT VIA LABLED COMMON - GFREQ                  BUZSAW
C                     BANDLM     1/3 OCTAVE BAND LIMITS                BUZSAW
C                                                                      BUZSAW
C OUTPUTS             BSARAY     TABLE OF BUZZSAW NOISE COMPONENT      BUZSAW
C                                THIS NOISE IS ADDED TO ANY NOISE WHICH BUZSAW
C                                MAY ALREADY BE IN BSARAY.  THEREFORE IF BUZSAW
C                                ONLY THE BUZZSAW NOISE IS DESIRED THIS BUZSAW
C                                ARRAY MUST BE SET TO ZERO BEFOR CALLING BUZSAW
C                                THIS SUBROUTINE.                      BUZSAW
C                                                                      BUZSAW
C MODIFICATIONS       FROM TEE205 INTO TEE215 - THIS WAS TAKEN FROM    BUZSAW
C                     TEE215 AND CHANGES MADE FOR THE NASA-AMES CONTRACT BUZSAW
C                                                                      BUZSAW
C REFERENCES          COORD SHEET AMEP-M-367  3/17/72  D. MELDRUM  TEE205A BUZSAW
C                     ANS-RES-F-327           5/30/72  D. SCHRANK     BUZSAW
C                     R. J. SAXBY,  NASA-AMES FOOTPRINT CONTRACT       BUZSAW
C                         NAS2-6969  FAN NOISE MODULE,   UN-NUMBERED   BUZSAW
C                         COORDINATION SHEET,  DATED 19 JANUARY 1973.  BUZSAW
C                                                                      BUZSAW
C FUNCTION SUBPRGM  ALOG10     TBLL1      PWRSUM                        BUZSAW
C                                                                      BUZSAW
C                                                                      BUZSAW
      COMMON /GFREQ/ CFREQ(24),BANDLM(25)                              BUZSAW
C                                                                      BUZSAW
      DIMENSION BSARAY(24,1),BSCR1(1),BSCR3(1)                         BUZSAW
      DIMENSION ANGLES(1),XSF(1)                                       BUZSAW
      DATA NFREQ/24/                                                   BUZSAW
C                                                                      BUZSAW
C     CALCULATE THE ENGINE SIZE CORRECTION                             BUZSAW
C                                                                      BUZSAW
      BS=20.0*ALOG10(DIAM)                                             BUZSAW
C                                                                      BUZSAW
C     CALCULATE THE BASIC NOISE FOR THE BUZZSAW NOISE                  BUZSAW
```

```
C
      IX=2
      NUM=BSCR1(IX-1)
      IY=NUM+IX
      BS2=BS+TBLU1(RTS,BSCR1(IX),BSCR1(IY),1,NUM)
      IX=NUM*2+IX+1
      NUM=BSCR1(IX-1)
      IY=NUM+IX
      BS4= BS+TBLU1(RTS,BSCR1(IX),BSCR1(IY),1,NUM)
      IX=NUM*2+IX+1
      NUM=BSCR1(IX-1)
      IY=NUM+IX
      BS8= BS+TBLU1(RTS,BSCR1(IX),BSCR1(IY),1,NUM)
C
C     IDENTIFY THE BANDS WITH DISCRETE TONES
C
      DO 100 K=1,17
      IF(ANGLES(K).LT.0.0-.01) GO TO 100
      IF(ANGLES(K).GT.100.0+.01) GO TO 100
      SF=0.0
      IF(ILEVEL.NE.0) SF=-40.0*ALOG10(XSF(K))
      FREQ=FBPF
      IF(IDOP.NE.0) FREQ=FREQ/XSF(K)
   65 AN=10.0*ALOG10(FREQ/10000.)+24.
C
C     CALCULATE THE BASIC SPECTRUM
C
      DO  200  J = 1,NFREQ
      A=J
      ABAND2=A-AN+3.0
      ABAND4=A-AN+6.0
      ABAND8=A-AN+9.0
      DELTA1  =  ABS(ABAND2) * 3.
      DELTA2  =  ABS(ABAND4) * 5.
      DELTA3=-5.0*ABAND8
      IF(ABAND8.GT.0.0) DELTA3=3.0*ABAND8
      SPLTOT=BS2+SF-DELTA1
      SPLTMP=BS4+SF-DELTA2
      SPLTOT=PWRSUM(SPLTOT,SPLTMP)
      SPLTMP=BS8+SF-DELTA3
      SPLTOT=PWRSUM(SPLTOT,SPLTMP)
C
      IX=2
      NUM=BSCR3(IX-1)
      IY=NUM+IX
C
C     GENERATE THE TABLE OF BUZZSAW NOISE
C
      BSDATA=SPLTOT+TBLU1(ANGLES(K),BSCR3(IX),BSCR3(IY),1,NUM)
      BSARAY(J,K)=PWRSUM(BSARAY(J,K),BSDATA)
  200 CONTINUE
  100 CONTINUE
      RETURN
      END
```

```
      COMPLEX FUNCTION CFI(X)
C
C PURPOSE-
C     COMPUTES THE COMPLEX FRESNEL INTEGRAL OF THE FORM-
C
C     SQRT(I*PI) * F(X)  =  INTEGRAL( EXP(I * Z**2) * DZ )  OVER THE
C                           LIMITS  (X, +INF.)
C INPUT-
C     X  ...  ANY REAL VARIABLE (POSITIVE, ZERO, OR NEGATIVE)
C
C OUTPUT-
C     F  ...  COMPLEX RESULT FOR FUNCTION IN THE FORM (A + I*B) WHERE
C             (A, B) ARE REAL NUMBERS.
C
C AUTHOR-  D.G. DUNN      (5 SEP. 1974)
C
C REFERENCE-
C     1) IBM CORP., /SCIENTIFIC SUBROUTINE PACKAGE/, IBM APPLICATION
C        PROGRAM H20-0166-5, 1968, P.371
C     2) BOERSMA, /COMPUTATION OF FRESNEL INTEGRAL/, MATHEMATICAL TABLES
C        AND OTHER AIDS TO COMPUTATION, VOL.14, NO.72, 1960, P.380
C     3) M. ABRAMOWITZ AND I.A. SEGAN, /HANDBOOK OF MATHEMATICAL
C        FUNCTIONS/, DOVER PUBLICATIONS,INC., NEW YORK, 5TH EDIT.,1968
C
C  COMMENTS-
C    1) ARGUMENT (X) REMAINS UNCHANGED
C    2) NO OTHER SUBPROGRAMS REQUIRED OVER STANDARD FORTRAN IV LIBRARY.
C    3) ABSOLUTE ERROR IS LESS THAN 1.2E-7
C.......................................................................
      DATA P5, F4 /0.5, 4.0/
      CFI  =  (0.5, 0.0)
      Z    =  X*X
      IF  (Z)  50, 50, 10
   10 IF  (Z - F4)  20, 20, 30
   20 C  =  ABS(X)
      S  =  Z * C
      Z  =  16. - Z*Z
      C  = C * (((((((5.100785E-11 * Z + 5.244297E-9) * Z + 5.451182E-7)
     1* Z + 3.273308E-5) * Z + 1.020418E-3) * Z + 1.102544E-2) * Z +
     2 1.840962E-1)
      S  = S * (((((6.677681E-10 * Z + 5.883158E-8) * Z + 5.051141E-6)
     1* Z + 2.441816E-4) * Z + 6.121320E-3) * Z + 8.026490E-2)
      GO TO 40
   30 D  =  COS(Z)
      S  =  SIN(Z)
      Z  =  F4 / Z
      A  =  (((((((8.768258E-4 * Z - 4.169289E-3) * Z + 7.970943E-3) *
     1Z - 6.792801E-3) * Z - 3.095341E-4) * Z + 5.972151E-3) * Z -
     2 1.606428E-5) * Z - 2.493322E-2) * Z - 4.444091E-9
      B  =  (((((((-6.633926E-4 * Z + 3.401409E-3) * Z - 7.271690E-3) *
     1Z + 7.428246E-3) * Z - 4.027145E-4) * Z - 9.314910E-3) * Z -
     2 1.207998E-6) * Z + 1.994711E-1
      Z  =  SQRT(Z)
      C  =  P5  + Z * (D * A + S * B)
      S  =  P5  + Z * (S * A - D * B)
   40 C  =  SIGN(C, X)
      S  =  SIGN(S, X)
```

```
      CFI  =  CMPLX(P5 - P5 * (C + S), P5 * (C - S))                    CFI
   50 RETURN                                                            CFI
      END                                                               CFI
```

```
      SUBROUTINE CMAXIS(X,Y,IBCD,NCHAR,AXLEN,ANGLE,FIRST,DELTV)
C
C AUTHOR              K.D. JOHNSON
C
C PURPOSE             PLOT AXIS BEGINNING AT(XP,YP)IN ANGLE THETA
C                     DIRECTION
C                     TIC MARKS ARE AT CENTIMETER INCREMENTS
C                     AXIS IS LABELED AT EVERYOTHER TIC MARK
C
C INPUTS              X = BEGINNING X COORDINATE IN CM
C                     Y = BEGINNING Y COORDINATE IN CM
C                     IBCD = THE TITLE WHICH IS PLACED AT THE FAR END OF
C                              THE AXIS
C                     NCHAR= THE NUMBER OF CHARACTERS IN THE TITLE IBCD
C                             IF NCHAR  0 THE TITLE APPEARS ON POSITIVE SI
C                             OF AXIS
C                             IF NCHAR )0  THE TITLE APPEARS ON NEGATIVE
C                             SIDE OF AXIS
C                     AXLEN=AXIS LENGTH IN CM
C                     FIRST = VALUE OF AXIS AT(XP,YP)
C                     DELTV = INCREMENT VALUE(UNITS/CM)
C                     ANGLE = ANGLE, IN POSITIVE OR NEGATIVE DEGRESS AT
C                             WHICH THE AXIS IS DRAWN (+X=0.+Y=90.)
C
C 360
C     DIMENSION IBCD(1),PLABL(2)
      DIMENSION IBCD(1),PLABL(1)
      INTEGER CMOV
C     DATA PLABL(1)/4H  * /, PLABL(2)/4H10** /
      DATA PLABL/8H * 10**  /
      DATA CMPIN /2.54001/
      DATA  RADIAN/ 57.29577/
C
C  CONVERT ANGLE TO RADIANS
C
      THETA=ANGLE/RADIAN
C
C
C  CONVERT SCALE TO UNITS/INCH
      DELCM=DELTV*CMPIN
C
C MOVE TO START OF AXIS
      XP=X/CMPIN
      YP=Y/CMPIN
      CALL PLOT(XP,YP,3)
      LINC=AXLEN
      COSTH=COS(THETA)
      SINTH=SIN(THETA)
      CMCSTH=COSTH/CMPIN
      CMSNTH=SINTH/CMPIN
      XTIC=.07*SINTH
      YTIC=.07*COSTH
      CALL PLOT(XP+XTIC,YP+YTIC,2)
      CALL PLOT(XP-XTIC,YP-YTIC,2)
      CALL PLOT (XP,YP,2)
      DO 25 I=1,LINC
      XP=XP+CMCSTH
```

```
      YP=YP+CMSNTH                                                      CMAXIS     59
      CALL PLOT(XP,YP,2)                                                CMAXIS     60
      CALL PLOT(XP+XTIC,YP+YTIC,2)                                      CMAXIS     61
      CALL PLOT(XP-XTIC,YP-YTIC,2)                                      CMAXIS     62
      CALL PLOT(XP,YP,2)                                                CMAXIS     63
25    CONTINUE                                                          CMAXIS     64
C  FIND POWER DIVISOR NECESSARY FOR F XX.X LABEL FORMAT                 CMAXIS     65
      AMAX=DELTV*AXLEN+FIRST                                            CMAXIS     66
      IP=MCHAR(AMAX)-2                                                  CMAXIS     67
      INCHR=IABS(NCHAR)                                                 CMAXIS     68
      RINCH  =  INCHR                                                   CMAXIS     69
      NADD=0                                                            CMAXIS     70
      IF(IP.EQ.0)GO TO 28                                               CMAXIS     71
      NADD=10                                                           CMAXIS     72
28    NTCHAR=INCHR+NADD                                                 CMAXIS     73
      TNCHAR  =  NTCHAR                                                 CMAXIS     74
      ISCHAR=ISIGN(1,NCHAR)                                             CMAXIS     75
      SICHAR  =  ISCHAR                                                 CMAXIS     76
      XPL  =  XP - .13 * TNCHAR * COSTH                                 CMAXIS     77
      YPL  =  YP - .13 * TNCHAR * SINTH                                 CMAXIS     78
      XPL  =  XPL - .42 * SICHAR * SINTH                                CMAXIS     79
      YPL  =  YPL + .42 * SICHAR * COSTH                                CMAXIS     80
      CALL SYMBOL(XPL,YPL,.14,IBCD,ANGLE,INCHR)                         CMAXIS     81
      IF(NADD.EQ.0)GO TO 29                                             CMAXIS     82
      XPL  =  XPL + .13 * RINCH * COSTH                                 CMAXIS     83
      YPL  =  YPL + .13 * RINCH * SINTH                                 CMAXIS     84
      CALL SYMBOL(XPL,YPL,.14,PLABL,ANGLE,8)                            CMAXIS     85
      XPL=XPL+1.04*COSTH                                                CMAXIS     86
      YPL=YPL+1.04*SINTH                                                CMAXIS     87
      FPN=IP                                                            CMAXIS     88
      CALL NUMBER(XPL,YPL,.14,FPN,ANGLE,-1)                             CMAXIS     89
C                                                                       CMAXIS     90
C LABEL VALUES EVERYOTHER CM TIC MARK                                   CMAXIS     91
C                                                                       CMAXIS     92
29    XMAX=0.                                                           CMAXIS     93
      TWODLT=DELTV*2.                                                   CMAXIS     94
30    XMAX=XMAX+TWODLT                                                  CMAXIS     95
      IF(XMAX.LT.AMAX) GO TO 30                                         CMAXIS     96
      AMAX=XMAX-TWODLT                                                  CMAXIS     97
      XMAX=(AMAX-FIRST)/DELCM                                           CMAXIS     98
      XP=X/CMPIN                                                        CMAXIS     99
      YP=Y/CMPIN                                                        CMAXIS    100
      XP=XP+XMAX*COSTH                                                  CMAXIS    101
      YP=YP+XMAX*SINTH                                                  CMAXIS    102
      XP  =  XP - 3. * XTIC * SICHAR                                    CMAXIS    103
      YP  =  YP + 3. * YTIC * SICHAR                                    CMAXIS    104
      POWR=10.**IP                                                      CMAXIS    105
35    FPN=AMAX/POWR                                                     CMAXIS    106
      FP=ABS(FPN)                                                       CMAXIS    107
      NDEC=1                                                            CMAXIS    108
      IF  (FP .NE. 0.)  GO TO 40                                        CMAXIS    109
      CMOV=1                                                            CMAXIS    110
      GO TO 42                                                          CMAXIS    111
40    CMOV=MCHAR(FP)                                                    CMAXIS    112
      IF  (CMOV .GT. 0)  GO TO 42                                       CMAXIS    113
      CMOV=2                                                            CMAXIS    114
      NDEC=3                                                            CMAXIS    115
```

```
42    IF(FPN.LT.0.) CMOV=CMOV+1                                  CMAXIS    116
      XPN  =  XP - .07 * COSTH * FLOAT(CMOV)                     CMAXIS    117
      YPN  =  YP - .07 * SINTH * FLOAT(CMOV)                     CMAXIS    118
      CALL NUMBER(XPN,YPN,.07,FPN,ANGLE,NDEC)                    CMAXIS    119
      AMAX=AMAX-2.*DELTV                                         CMAXIS    120
      XP=XP-2.*CMCSTH                                            CMAXIS    121
      YP=YP-2.*CMSNTH                                            CMAXIS    122
      IF(AMAX.GE.FIRST) GO TO 35                                 CMAXIS    123
      RETURN                                                     CMAXIS    124
      END                                                        CMAXIS    125
```

```
      SUBROUTINE CONVR(IENTRY,N,L)
C
C     INPUT DATA BLOCKS FOR NOISE COMPONENTS
C     ITYPE DEFINES THE TYPE OF NOISE COMPONENT
C ITYPE=1  PRIMARY JET
C  =2      PRIMARY AND SECONDARY JET
      COMMON/JETDAT/NJET1,MODE1,AP1,WP1,VP1,AS2,WS2,VS2,PR1,PA1,
     1     TT1,VA1,DIAMT1,ANGJT1,ICOR1
      DIMENSION JETD(12)
      EQUIVALENCE (JETD(1),AP1)
C  =3      CORE AND TURBINE
      COMMON/COREIN/TT3,PP3,CMF3,EK3,DELT3,JB3,
     *  ICOR3,LIN3,NTF3,IMA3,LGM3,NWL3,ICP3,ILAY3,TF3(10),
     *  PCTA3(10),PLA3(10),ELCH3,EDH3,R1W3(10),TL3(10),CF3,FM3
C
      COMMON/TURBIN/BN3,SS3,VTR3,CLS3,CT3,TU3,FMF3,CS3,IC3,ISW3
C  =4      COMPRESSOR AND INLET FAN
C  =5      EXIT FAN
      COMMON/FANDAT/NSTG45,NLET45,NAFT45,ICP45,NB45(3),FPR45(3),
     1  DIAM4(3),RSS45(3),AREA5(3),RN145,RTS4,CFPR45,DELT45,
     *  NI5,BPR5,ICOR4,LIN4,NTF4,IMA4,LGM4,NWL4,ICP4,ILAY4,TF4(10),
     *  PCTA4(10),PLA4(10),ELCH4,EDH4,R1W4(10),TL4(10),CF4,FM4,
     *  ICOR5,LIN5,NTF5,IMA5,LGM5,NWL5,ICP5,ILAY5,TF5(10),
     *  PCTA5(10),PLA5(10),ELCH5,EDH5,R1W5(10),TL5(10),CF5,FM5
C  =6      AUGMENTER-WING JET
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICCP,IPRT(7),ICN(13),NLGPT
      COMMON/AUGWNG/GAMA6,TT6,XNPR6,DELT6,AL6,CE6,
     *  ICOR6,LIN6,NTF6,IMA6,LGM6,NWL6,ICP6,ILAY6,TF6(10),
     *  PCTA6(10),PLA6(10),ELCH6,EDH6,R1W6(10),TL6(10),CF6,FM6
C  =7      BLOWN-FLAP JET
      COMMON/BLOWIN/PR7,TT7,AN7,DN7,FANG7,DELT7,DL7,HD7,ICOR7
C  =8      LIFT FAN
      COMMON/LFTFAN/NB8,FPR8,DIAM8,RSSE,AREA8,RN18,RTS8,CRFPR8,DELTA8,
     *  ICOR8,LIN8,NTF8,IMA8,LGM8,NWL8,ICP8,ILAY8,TF8(10),PCTA8(10),
     *  PLA8(10),ELCH8,EDH8,R1W8(10),TL8(10),CF8,FM8
C  =9      EJECTOR-SUPRESSOR
      COMMON /EJECTD/ IEJ9,NUM9,AREA9,AR9,TT9,EXNM9,SMACH9,CV9,PS9,
     *  PA9,PTS9,EMACH9,PCV9,DELT9,
     *  ICOR9,LIN9,NTF9,IMA9,LGM9,NWL9,ICP9,ILAY9,TF9(10),PCTA9(10),
     *  PLA9(10),ELCH9,EDH9,R1W9(10),TL9(10),CF9,FM9
C  =9      LIFT-FAN
C  =10     PROPELLER
      COMMON/PROPIN/T10,W10,RPM10,D10,DSLB10,ASUB10,B10,DELT10,
     *ICOR10
C  =11     HELICOPTER AND TILT ROTOR
      COMMON/COPTER/T11,Q11,RPM11,B11,CT11,AB11,CE11,RN11,
     1        SI11,CEE11,DELT11,XLMC11,XM11,NRTR11,LLF11,
     *IRR11,ICOR11
C
C  =12     MEASURED DATA INPUTS
      COMMON/MEASIN/NEP12,NPSI12,NBTA12,DELT12,EP12(5),PSI12(17),
     *   BETA12(5),
     *ICOR12
C
C IBM360
C     THIS ROUTINE HANDLES LINKAGE TO INPUT MODULES  FLIGHT-PATH
C     OBSERVER GEOMETRY MODULE  VARIOUS NOISE ESTIMATION MODULES
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```
C     EXTRAPOLATION MODULE  HUMAN RESPONSE MEASUREMENT MODULE
C     INTERGER XTRANSF
C
C     CONSTANTS USED IN INTERNAL CALCULATIONS
C
      COMMON /GCONST/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI
C
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING
C
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)
C
C     FREQUENCY BANDS USED BY PROGRAM
C
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)
C
C     GENERAL INPUT PARAMETERS
C
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT
     *    ,ISPTRM,IATMOS,IAIR,LAIRAB(24),NTEMP,TEMP(50),TALT(50)
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF
C
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS
C
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)
     *,APP,TP,RHP,APO,TC,RHO,CA,CZ,TSP(17,10),CCV
C
C     CONVERSION CONSTANTS
C
      COMMON/GCONVC/C(2,10),SLDISX(10)
      COMMON/CRSPLS/DUB(17),PSCR(17),DPB(408),NPSCR
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)
C
C
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)
C
C           C(1,1)      FEET PER METER
C
C           C(1,2)      LBF PER NEWTON
C
C           C(1,3)      LBS PER KG
C
C           C(1,4)      HP. PER KILOWATT
C           C(1,6)      LBS. PER SQ. IN PER ATMOSPHERE
C
C           C(1,5)      RANKIN PER KEVIN DEGREE
C
      REAL JETD
      LM2  =  L - 2
      IF  (LM2)  1000, 1000, 2
 1000 CONTINUE
      GO TO(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20),IENTRY
```

```
2     CONTINUE                                                          CONVR    116
      JETD(4)=JETD(4)*C(N,1)**2                                         CONVR    117
      JETD(5)=JETD(5)*C(N,3)                                            CONVR    118
      JETD(6)=JETD(6)*C(N,1)                                            CONVR    119
1     CONTINUE                                                          CONVR    120
      JETD(1)=JETD(1)*C(N,1)**2                                         CONVR    121
      JETD(2)=JETD(2)*C(N,3)                                            CONVR    122
      JETD(3)=JETD(3)*C(N,1)                                            CONVR    123
      JETD(9)=JETD(9)*C(N,5)                                            CONVR    124
      JETD(11)=JETD(11)*C(N,1)                                          CONVR    125
      IF  (LM2)  2000, 2000, 3                                          CONVR    126
3     CONTINUE                                                          CONVR    127
      TT3=TT3*C(N,5)                                                    CONVR    128
      CMF3=CMF3*C(N,3)                                                  CONVR    129
      VTR3=VTR3*C(N,1)                                                  CONVR    130
      CLS3=CLS3*C(N,1)                                                  CONVR    131
      DT3=DT3*C(N,1)                                                    CONVR    132
      TU3=TU3*C(N,5)                                                    CONVR    133
      PMF3=PMF3*C(N,3)                                                  CONVR    134
      EDH3=EDH3*C(N,1)                                                  CONVR    135
      DO 301 I=1,21                                                     CONVR    136
301   R1W3(I)=R1W3(I)*C(N,1)                                            CONVR    137
      IF  (LM2)  2000, 2000, 4                                          CONVR    138
4     CONTINUE                                                          CONVR    139
      DO 41 I=I1,NSTG45                                                 CONVR    140
41    DIAM4(I)=DIAM4(I)*C(N,I1)                                         CONVR    141
      EDH4=EDH4*C(N,1)                                                  CONVR    142
      DO 401 I=1,21                                                     CONVR    143
401   R1W4(I)=R1W4(I)*C(N,1)                                            CONVR    144
      IF  (LM2)  2000, 2000, 5                                          CONVR    145
5     CONTINUE                                                          CONVR    146
      DO 51 I=1,NSTG45                                                  CONVR    147
51    AREA5(I)=AREA5(I)*C(N,1)**2                                       CONVR    148
      EDH5=EDH5*C(N,1)                                                  CONVR    149
      DO 501 I=1,21                                                     CONVR    150
501   R1W5(I)=R1W5(I)*C(N,1)                                            CONVR    151
      IF  (LM2)  2000, 2000, 6                                          CONVR    152
6     TT6=TT6*C(N,5)                                                    CONVR    153
      AD6=AD6*C(N,1)**2                                                 CONVR    154
      DE6=DE6*C(N,1)                                                    CONVR    155
      EDH6=EDH6*C(N,1)                                                  CONVR    156
      DO 601 I=1,21                                                     CONVR    157
601   R1W6(I)=R1W6(I)*C(N,1)                                            CONVR    158
      IF  (LM2)  2000, 2000, 7                                          CONVR    159
7     CONTINUE                                                          CONVR    160
      TT7=TT7*C(N,5)                                                    CONVR    161
      AN7=AN7*C(N,1)**2                                                 CONVR    162
      DN7=DN7*C(N,1)                                                    CONVR    163
      IF  (LM2)  2000, 2000, 8                                          CONVR    164
8     CONTINUE                                                          CONVR    165
      DIAM8=DIAM8*C(N,1)                                                CONVR    166
      AREA8=AREA8*C(N,1)**2                                             CONVR    167
      EDH8=EDH8*C(N,1)                                                  CONVR    168
      DO 801 I=1,21                                                     CONVR    169
801   R1W8(I)=R1W8(I)*C(N,1)                                            CONVR    170
      IF  (LM2)  2000, 2000, 9                                          CONVR    171
    9 CONTINUE                                                          CONVR    172
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      EDH9=EDH9*C(N,1)                                                  CONVR    173
      DO 901 I=1,21                                                     CONVR    174
  901 R1W9(I)=R1W9(I)*C(N,1)                                            CONVR    175
      TT9=TT9*C(N,5)                                                    CONVR    176
      AREA9=AREA9*C(N,1)**2                                             CONVR    177
      PA9=PA9*C(N,1)**2                                                 CONVR    178
      PS9=PS9*C(N,I6)                                                   CONVR    179
      PTS9=PTS9*C(N,5)                                                  CONVR    180
      IF  (LM2)  2000, 2000, 10                                         CONVR    181
   10 CONTINUE                                                          CONVR    182
      T10=T10*C(N,2)                                                    CONVR    183
      W10=W10*C(N,4)                                                    CONVR    184
      D10=D10*C(N,1)                                                    CONVR    185
      DSUB10=DSUB10*C(N,1)                                              CONVR    186
      ASUB10=ASUB10*C(N,1)**2                                           CONVR    187
      IF  (LM2)  2000, 2000, 11                                         CONVR    188
   11 CONTINUE                                                          CONVR    189
      T11=T11*C(N,2)                                                    CONVR    190
      Q11=Q11*C(N,1)*C(N,2)                                             CONVR    191
      DT11=DT11*C(N,1)                                                  CONVR    192
      AB11=AB11*C(N,1)**2                                               CONVR    193
      DE11=DE11*C(N,I1)                                                 CONVR    194
      IF  (LM2)  2000, 2000, 12                                         CONVR    195
   12 CONTINUE                                                          CONVR    196
      IF  (LM2)  2000, 2000, 13                                         CONVR    197
   13 CONTINUE                                                          CONVR    198
      IF  (LM2)  2000, 2000, 14                                         CONVR    199
   14 CONTINUE                                                          CONVR    200
   15 CONTINUE                                                          CONVR    201
   16 CONTINUE                                                          CONVR    202
   17 CONTINUE                                                          CONVR    203
   18 CONTINUE                                                          CONVR    204
   19 CONTINUE                                                          CONVR    205
  200 DO 250 I=I1,NOBS                                                  CONVR    206
      DO 250 J=I1,I17                                                   CONVR    207
      APY(I,J)=C(N,I1)*APY(I,J)                                         CONVR    208
      APZ(I,J)=C(N,I1)*APZ(I,J)                                         CONVR    209
      PD(I,J)=C(N,I1)*PD(I,J)                                           CONVR    210
  250 CONTINUE                                                          CONVR    211
      CA=CA*C(N,I1)                                                     CONVR    212
      CZ=CZ*C(N,I1)                                                     CONVR    213
      COV=COV*C(N,I1)                                                   CONVR    214
C                                                                       CONVR    215
   20 CONTINUE                                                          CONVR    216
      ALTP=C(N, I1)*ALTP                                                CONVR    217
      AALT=C(N,I1)*AALT                                                 CONVR    218
      ALTR=C(N,I1)*ALTR                                                 CONVR    219
      DO 110 I=I1,NOBS                                                  CONVR    220
  110 SLDIST(I)=C(N,I1)*SLDIST(I)                                       CONVR    221
      DO 112 I=I1,NTEMP                                                 CONVR    222
      TEMP(I)=C(N,I5)*TEMP(I)                                           CONVR    223
  112 TALT(I)=C(N,I1)*TALT(I)                                           CONVR    224
      DO 113 I=I1,NPRES                                                 CONVR    225
      PRES(I)=C(N,I6)*PRES(I)                                           CONVR    226
  113 PALT(I)=C(N,I1)*PALT(I)                                           CONVR    227
      DO 114 I=I1,NHUMID                                                CONVR    228
  114 RALT(I)=C(N,I1)*RALT(I)                                           CONVR    229
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```
      CTEMP=C(N,I5)*CTEMP                                               CONVR     230
      CPRES=C(N,I6)*CPRES                                               CONVR     231
      DTEMP=C(N,I5)*DTEMP                                               CONVR     232
      DPRES=C(N,I6)*DPRES                                               CONVR     233
      DO 125 I=1,24                                                     CONVR     234
125   UAIRAB(I)=UAIRAB(I)/C(N,I1)                                       CONVR     235
2000  RETURN                                                            CONVR     236
      END                                                               CONVR     237
```

```
      SUBROUTINE COPTR                                                  COPTR      2
C                                                                       COPTR      3
C                                                                       COPTR      4
      COMMON /COPTER/ T, Q, THETA, NBL, DT, AB, DE, RN, S, XC, DELTA,   COPTR      5
     * XLC, XM, NROT, LLF, ITR, ICCR                                    COPTR      6
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLOPT         COPTR      7
      COMMON /GCONST/ IN, IO, WK1(29), INDEF, BL, ICD, WK2(24)          COPTR      8
      COMMON /GCOMON/ NFB, NK, BCF(24), XDB(24,10,17), SPL(24,17), F(25) COPTR     9
     * , RETA(17), SPL2(17), PS(24), SF(17)                             COPTR     10
      COMMON /SUMSPL/ TSPL(24,10,17)                                    COPTR     11
      COMMON /PNLD/ PNL(17,20), EPNL(5,10), TEPNL(5,10)                 COPTR     12
      COMMON /GFREQ/ WK3(49), PFREC(24)                                 COPTR     13
      COMMON /ANGLE/ PSI(17,10), PSIC(17,10), BETA(17,10)               COPTR     14
      COMMON /GPRAM/ ALTP, ALTR, GRAD, MO, NOBS, X(10), ITENG, IUNIT,   COPTR     15
     * WK4(493), BCG, TCG, FLR, AALT, EPP                               COPTR     16
      COMMON /GEOMO/ Y(10,17), ZN(10,17), P(10,17), WK5(680), TPD(17,10) COPTR    17
     * , IRR(10,17), WK6(3), PSO, TSO, WK7(2), AO, WK8(171)             COPTR     18
      COMMON /GCONVC/ WK9(20), CX(10)                                   COPTR     19
      COMMON/TMSPL/CDB(24,17),IB(2,3,13)                                COPTR     20
      COMMON /HEAD/ WK10(40), CHIN(20)                                  COPTR     21
      REAL       NBL, MC, MT, MOX, MTE, KM, INDEF, ME                   COPTR     22
C                                                                       COPTR     23
C  AUTHOR-  D.G. DUNN                 DATE -  6 AUG 73                  COPTR     24
C                                                                       COPTR     25
C  PURPOSE-                                                             COPTR     26
C       TO COMPUTE THE ROTOR NOISE AS DEFINED IN REF. 2                 COPTR     27
C                                                                       COPTR     28
C  INPUTS-  VIA COMMON BLOCKS                                           COPTR     29
C    0) X      ... AIRCRAFT COORDINATES, REF.1                          COPTR     30
C    1) Y      ... AIRCRAFT COORDINATES, REF. 1                         COPTR     31
C    2) ZN     ... AIRCRAFT COORDINATES, REF. 1                         COPTR     32
C    3) P      ... PROPAGATION DISTANCES,REF. 1                         COPTR     33
C    4) SF     ... DOPPLER-SHIFT FACTORS,REFS. 1 AND 2.  SF  .GT. 0.    COPTR     34
C    5) F      ... CUTOFF-FREQUENCIES FOR PASSBAND FILTERS, HZ. REF.1   COPTR     35
C    8) NFB    ... NUMBER OF PASSBANDS. 1 .LE. NFB .LE. 24              COPTR     36
C   10) NOBS   ... NUMBER OF OBSERVER POSITIONS.  NOBS .GE. 1           COPTR     37
C   11) T      ... THRUST PER ROTOR, LBF                                COPTR     38
C   12) Q      ... SHAFT TORQUE, FT-LBF                                 COPTR     39
C   13) THETA  ... SHAFT SPEED, RPM                                     COPTR     40
C   14) NROT   ... NUMBER OF ROTORS                                     COPTR     41
C   15) NBL    ... NUMBER OF BLADES PER ROTOR                           COPTR     42
C   16) DT     ... TIP DIAMETER, FT.                                    COPTR     43
C   17) AB     ... BLADE-AREA OF ROTOR, SQ.FT. ... ONE SIDE ONLY        COPTR     44
C   18) DE     ... MEAN-AXIAL PROJECTED CHORD AT 0.7 SPAN, FT.          COPTR     45
C   19) RN     ... DIMENSIONLESS CENTROID FOR EQUIVALENT POINT LOAD,REF.2 COPTR    46
C   20) LLF    ... LOADING-LAW INDICATOR, REF.2                         COPTR     47
C   21) S      ... LIFT-CURVE SLOPE, REF.2                              COPTR     48
C   22) XC     ... CONSTANT, C, IN LOADING LAW. REF.2                   COPTR     49
C   23) XM     ... CONSTANT, M, IN LOADING LAW. REF.2                   COPTR     50
C   24) XLC    ... CONSTANT, LC, IN LOADING LAW. REF.2                  COPTR     51
C   25) MO     ... AIRCRAFT MACH NUMBER                                 COPTR     52
C   26) GRAD   ... CLIMB GRADIENT                                       COPTR     53
C   27) DELTA  ... ANGLE IN DEGREES BETWEEN THRUST VECTOR AND HORIZON.  COPTR     54
C   28) PSO    ... STATIC PRESSURE, PSIA                                COPTR     55
C   29) TSO    ... STATIC TEMPERATURE, DEG.R                            COPTR     56
C   30) AO     ... SPEED OF SOUND, FPS.                                 COPTR     57
C   31) ITR    ... INDICATOR TO SPECIFY IF THE ROTOR BEING CONSIDERED IS COPTR     58
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C                 MAIN ROTOR OR TAIL ROTOR. IT EQUALS ZERO FOR MAIN ROTO COPTR
C                 IS NON-ZERO FOR THE TAIL ROTOR.                       COPTR
C                                                                       COPTR
C  OUTPUT                                                               COPTR
C    1) SPL    ... SOUND PRESSURE LEVEL SPECTRA IN DB RE. 20 MICRO-N/SQ.M COPTR
C                 AT FREE-FIELD, INDEX (R = 1 M) CONDITIONS.            COPTR
C    2) PSI    ... DIRECTIVITY ANGLES CORRESPONDING TO EACH SPECTRUM.   COPTR
C    3) IEC    ... ERROR CODE (PRESENTLY THIS IS A LOCAL VARIABLE)      COPTR
C                 IEC = 0, NO ERRORS DETECTED                           COPTR
C                 IEC = 1, FOR HELICAL-TIP-MACH NUMBER .GT. 0.93        COPTR
C                 IEC = 2, FOR (ME*SIN(PSI)/SF) .GT. 1)                 COPTR
C                 IEC = 3, FOR BAD INPUTS                               COPTR
C                                                                       COPTR
C  REFERENCE                                                            COPTR
C    1) D.G. DUNN,/MASTER FLOW CHART FOR NASA CONTRACT NAS 2-6969       COPTR
C       (PHASE B) COMPUTING REQUIREMENTS/, BOEING C/S ANS-RES-F-336,    COPTR
C       6 DEC 1972.                                                     COPTR
C    2) D.G. DUNN,/NOISE PREDICTION FOR HELICOPTERS, TILT-ROTOR, AND    COPTR
C       PROPELLER AIRCRAFT/, BOEING C/S ANS-RES-F-415, AUGUST 1973      COPTR
C                                                                       COPTR
      DIMENSION        G(24), BES(130), JD(8), XJD(8), DLJ(8), KM(4)    COPTR
      DATA P5,RO,R1,R2,R5,R10,RPD,PI,SC,RQ,A1,EPS/.5,0.,1.,2.,5.,10.,   COPTR
     * 1.745329E-2,3.141593,5.0,3.280833,30.35438,1.E-5/                 COPTR
      DATA I1,I2,JD /1,2,1,2,3,5,7,10,15,21/                            COPTR
      DATA XJD /0.,.30103,.4771212,.69897,.845098,1.,1.176091,1.322219/ COPTR
C                                                                       COPTR
C  CONSTANTS KM = PI/60, 1.+ COS(70 DEG)**2, 4*PI, 10.**.57             COPTR
      DATA KM /5.235988E-2,.21698,12.56637,3.715352/                    COPTR
C                                                                       COPTR
      ICN(11)  =  ICN(11) + I1                                          COPTR
      NANG  =  17                                                       COPTR
      NROT  =  NENG                                                     COPTR
      ROTN  =  NROT                                                     COPTR
C  ERROR CHECK OF INPUT ARGUMENTS                                       COPTR
      IEC  =  3                                                         COPTR
      IF ((T .LE. RO) .OR. (Q .LE. RO) .OR. (THETA .LE. RO) .OR.        COPTR
     1 (ROTN .LT. R1) .OR. (NBL .LT. R2) .OR. (NBL .GT. 6.) .OR.        COPTR
     2 (DT .LE. RO) .OR. (AB .LE. RO) .OR. (DE .LE. RO) .OR.            COPTR
     3 (RN .LE. RO) .OR. (RN .GT. R1) .OR. (LLF .LT. I1) .OR.           COPTR
     4 (LLF .GT. 6) .OR. (S .LE. RO) .OR. (XC .LE. RO) .OR. (XM .LE. RO) COPTR
     5 .OR. (MO .LT. RO) .OR. (MC .GE. R1) .OR. (PSO .LE. RO) .OR.      COPTR
     6 (TSO .LE. RO) .OR. (AO .LE. RO))  GO TO 135                      COPTR
      DO  200  I = 1,NANG                                               COPTR
      IF  (SF(I) .LE. RO)  GO TO 135                                    COPTR
  200 CONTINUE                                                          COPTR
      XX =  RO                                                          COPTR
      N  =  NFB + I1                                                    COPTR
      DO  210  I = 1,N                                                  COPTR
      IF  (F(I) .LE.XX)  GO TO 135                                      COPTR
  210 XX =  F(I)                                                        COPTR
C                                                                       COPTR
C  INITIALIZATION                                                       COPTR
      IF  (ITR)  211, 213, 211                                          COPTR
  211 ALFA  =  1.570796                                                 COPTR
      DO  212  I = 1,NANG                                               COPTR
      DO  212  J = 1,NOBS                                               COPTR
      PSI(I,J)  =  ACOS(X(J) / P(J,I)) * 57.29578                       COPTR
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212 CONTINUE                                                          COPTR    116
    GO TO 214                                                         COPTR    117
213 AN  =  DELTA * RPD                                                COPTR    118
    ALFA  =  AN - ATAN(GRAD)                                          COPTR    119
    CALL ANGLES(NOBS, AN)                                             COPTR    120
214 VT  =  KM(1) * THETA * DT                                         COPTR    121
    MT  =  VT / AO                                                    COPTR    122
    MOX  =  MO * COS(ALFA)                                            COPTR    123
    SMOX  =  MOX*MOX                                                  COPTR    124
    XX  =  MT*MT + MO*MO                                              COPTR    125
    YY  =  MT*MO * SIN(ALFA)                                          COPTR    126
    MTE  =  (XX * (XX*XX + 6.*YY*YY))**.1666667                       COPTR    127
    IF  ((MTE .LE. RC) .OR. (MTE .GT. 0.93))  GO TO 130               COPTR    128
    A  =  R1 + MTE                                                    COPTR    129
    B  =  R1 - MTE                                                    COPTR    130
    C  =  R2 * ALOG(A / B)                                            COPTR    131
    VTE  =  AO * MTE                                                  COPTR    132
    R  =  P5 * RN * DT                                                COPTR    133
    HO  =  Q / (T * R)                                                COPTR    134
    ME  =  RN * MT                                                    COPTR    135
    XX  =  ME*ME + MO*MO                                              COPTR    136
    YY  =  ME * YY / MT                                               COPTR    137
    ME  =  (XX * (XX*XX + 6.*YY*YY))**.1666667                        COPTR    138
    VOX  =  AO * MOX                                                  COPTR    139
    SVOX  =  VOX*VOX                                                  COPTR    140
    V  =  0.7 * VT                                                    COPTR    141
    XX  =  V*V + (AO*MO)**2                                           COPTR    142
    YY  =  V * YY / (RN * MT)                                         COPTR    143
    V  =  (XX * (XX*XX + 6.*YY*YY))**.1666667                         COPTR    144
  1 CS  =  R1                                                         COPTR    145
    TMPI  =  R5                                                       COPTR    146
    GO TO (10, 2, 3, 4, 5, 6), LLF                                    COPTR    147
  2 SDT  =  DT*DT                                                     COPTR    148
    VI  =  P5 * (VOX + SQRT(SVOX + A1 * TSO * T / (PSO * SDT)))       COPTR    149
    SIG  =  1.2732395 * AB / SDT                                      COPTR    150
    XM  =  1.3 + 0.4876 * (VI * SO / (S * SIG * VT))                  COPTR    151
    TMPI  =  R1 + XM+XM                                               COPTR    152
    GO TO 10                                                          COPTR    153
  3 CS  =  0.7396                                                     COPTR    154
    TMPI  =  3.86                                                     COPTR    155
    GO TO 10                                                          COPTR    156
  4 CS  =  1936.                                                      COPTR    157
    HO  =  36.                                                        COPTR    158
    GO TO 10                                                          COPTR    159
  5 CS  =  595.36                                                     COPTR    160
    HO  =  30.                                                        COPTR    161
    GO TO 10                                                          COPTR    162
  6 CS  =  XO*XO                                                      COPTR    163
    TMPI  =  R1 + XM+XM                                               COPTR    164
    HO  =  XLO                                                        COPTR    165
 10 CONTINUE                                                          COPTR    166
    FVT  =  0.28 * V / DE                                             COPTR    167
    FOT  =  NBL * THETA / 60.                                         COPTR    168
    UVT  =  VTE * T                                                   COPTR    169
    UVT  =  UVT*UVT / (AB * KM(2))                                    COPTR    170
    URT  =  ME * T / (KM(3) * RO * R)                                 COPTR    171
    HOT  =  HD / ME                                                   COPTR    172
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      IEC  =  0                                                         COPTR     173
C                                                                       COPTR     174
C  LOOP FOR EACH OBSERVER POSITION                                      COPTR     175
      DO  115  JJ = 1,NOBS                                              COPTR     176
      CALL LINCOR(COB(1,1),0,0,0,0,0,0,0,0,0,0,PSI(1,JJ),NFB,BCF,       COPTR     177
     *            0,0,0,0,0,0,0,ICCR,IB(1,1,ITYPE),0,0)                 COPTR     178
C                                                                       COPTR     179
C  LOOP FOR EACH ANGULAR POSITION RELATIVE TO FLT. PATH                 COPTR     180
      DO  110  II = 1,NANG                                              COPTR     181
      FV  =  FVT / SF(II)                                               COPTR     182
      FO  =  FOT / SF(II)                                               COPTR     183
      UV  =  UVT / SF(II)                                               COPTR     184
      UR  =  URT / (SF(II)*SF(II))                                      COPTR     185
      HO  =  HOT * SF(II)                                               COPTR     186
C                                                                       COPTR     187
C  CALCULATE VORTEX NOISE PRESSURE SPECTRUM SHAPE.                      COPTR     188
      S1  =  F(1) / FV                                                  COPTR     189
      DO  15  K = 1,NFB                                                 COPTR     190
      S2  =  F(K+1) / FV                                                COPTR     191
      AS1  =  A * S1                                                    COPTR     192
      BS1  =  B * S1                                                    COPTR     193
      AS2  =  A * S2                                                    COPTR     194
      BS2  =  B * S2                                                    COPTR     195
      G(K)  =  ALOG(((R1 + AS2*AS2) / (R1 + BS2*BS2)) * (R1 + BS1*BS1)  COPTR     196
     * / (R1 + AS1*AS1)) / C                                            COPTR     197
   15 S1  =  S2                                                         COPTR     198
      XX  =  PSI(II,JJ) * RPD                                           COPTR     199
      CPSI  =  COS(XX)                                                  COPTR     200
      SPSI  =  SQRT(R1 - CPSI*CPSI)                                     COPTR     201
C                                                                       COPTR     202
C  FINISH-UP VORTEX NOISE PRESSURE SPECTRUM CALCULATION                 COPTR     203
      POA  =  KM(4) * UV * (0.1 + CPSI*CPSI)                            COPTR     204
      DO  20  K = 1,NFB                                                 COPTR     205
      PS(K)  =  POA * G(K)                                              COPTR     206
   20 CONTINUE                                                          COPTR     207
C                                                                       COPTR     208
C  ROTATIONAL NOISE CALCULATION                                         COPTR     209
      QQ  =  ME * SPSI / SF(II)                                         COPTR     210
      IF  (QQ .LE. R1)  GO TO 40                                        COPTR     211
      DO  30  K = 1,NFB                                                 COPTR     212
      SPL(K,II)      =  RO                                              COPTR     213
   30 CONTINUE                                                          COPTR     214
      IEC  =  I2                                                        COPTR     215
      CALL ERROR(ITYPE, 3, 16)                                          COPTR     216
      GO TO 110                                                         COPTR     217
C                                                                       COPTR     218
C  FORM HARMONIC LEVEL DATA CURVE                                       COPTR     219
   40 DO  60  K = 1,8                                                   COPTR     220
      N  =  JD(K) * IFIX(NBL+P5)                                        COPTR     221
      NP1  =  N + I1                                                    COPTR     222
      FN  =  N                                                          COPTR     223
      XX =  FN * QQ                                                     COPTR     224
      L1  =  FN - XX- P5                                                COPTR     225
      L1  =  MAX0(L1, I1)                                               COPTR     226
      LN  =  FN + XX+ P5                                                COPTR     227
C                                                                       COPTR     228
C  CALCULATE BESSEL FUNCTIONS                                           COPTR     229
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      CALL JBES(XX,NP1, EPS, BES)                                       COPTR     230
C                                                                       COPTR     231
C  SUM LOADING HARMONIC NOISE COMPONENTS                                COPTR     232
      AN  =  (CPSI - HO) * BES(NP1)                                     COPTR     233
      AN  =  AN+AN                                                      COPTR     234
      DLJ(K)  =  AN * AN                                                COPTR     235
      DO  50  L = L1,LN                                                 COPTR     236
      FL  =  L                                                          COPTR     237
      NML  =  N - L                                                     COPTR     238
      J  =  IABS(NML) + I1                                              COPTR     239
      AN  =  (CPSI - HO * FLOAT(NML) / FN) * BES(J)                     COPTR     240
      HN  =  AN*AN * CS * FL**(-TMPI)                                   COPTR     241
      IF  (LLF .GT. 3)  HN  =  HN / (R1 + (HC/FL)*(HC/FL))              COPTR     242
   50 DLJ(K)  =  DLJ(K) + HN                                            COPTR     243
      FL  =  UR * FLOAT(JD(K))                                          COPTR     244
      DLJ(K)  =  124.57 + R10 * ALOG10(DLJ(K) * FL*FL)                  COPTR     245
   60 CONTINUE                                                          COPTR     246
C                                                                       COPTR     247
C  NOW THAT DATA CURVE IS FORMED, ADD TONES TO VORTEX NOISE SPECTRUM.   COPTR     248
      N1  =  R1 + F(1) / FO                                             COPTR     249
      DO  105  I = 1,NFB                                                COPTR     250
      N2  =  F(I+1) / FO                                                COPTR     251
      IF  (N2 - N1)  90, 70, 70                                         COPTR     252
   70 DO  80  J = N1,N2                                                 COPTR     253
      XJ  =  ALOG10(FLOAT(J))                                           COPTR     254
      PS(I)  =  PS(I) + R10**(.1 * TBLL1(XJ, XJD, DLJ, 1, 8))           COPTR     255
   80 CONTINUE                                                          COPTR     256
   90 XJ  =  PS(I) * ROTN                                               COPTR     257
      IF  (XJ)  100, 100, 95                                            COPTR     258
   95 SPL(I,II)  =  R10 * ALOG10(XJ) - CDB(I,II)                        COPTR     259
      TSPL(I,JJ,II)  =  PWRSUM(TSPL(I,JJ,II), SPL(I,II))                COPTR     260
      GO TO 105                                                         COPTR     261
  100 SPL(I,II)  =  -CDB(I,II)                                          COPTR     262
  105 N1  =  N2 + I1                                                    COPTR     263
  110 BETA(II,JJ)  =  INDEF                                             COPTR     264
      IF  (IPRT(7) .NE. 7)  GO TO 106                                   COPTR     265
      CALL NOISO(IPRT(7),JJ,NK,10,CHIN,ILNIT,CX(JJ),PFREQ,SPL(1,1),NFB, COPTR     266
     *           ITYPE)                                                 COPTR     267
  106 CONTINUE                                                          COPTR     268
      DO  107  J = 1,NANG                                               COPTR     269
      DO  107  I = 1,NFB                                                COPTR     270
  107 SPL(I,J)  =  SPL(I,J) - XDB(I,JJ,J)                               COPTR     271
      IF  (IPRT(3) .NE. 3)  GO TO 115                                   COPTR     272
      CALL PNLSUB(SPL(1,1),PNL(1,JJ),TPD(1,JJ),EPNL(1,JJ),SPL2,         COPTR     273
     *            TEPNL(1,JJ),NK,BCG,TCG,FLR,JJ,NOBS,IRR(JJ,1))         COPTR     274
      CALL NOISO(IPRT(3),JJ,NK,12,CHIN,ILNIT,CX(JJ),PFREQ,SPL(1,1),NFB, COPTR     275
     *           ITYPE)                                                 COPTR     276
  115 CONTINUE                                                          COPTR     277
  120 RETURN                                                            COPTR     278
  130 IEC  =  I1                                                        COPTR     279
  135 CALL ERROR(ITYPE,3,8)                                             COPTR     280
      GO TO 120                                                         COPTR     281
      END                                                               COPTR     282
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      SUBROUTINE COREN                                                  COREN      2
C                                                                       COREN      3
      COMMON /COREIN/ TT3,PP3,CMF3,EK3,DELT3,JB3,                       COREN      4
     *  ICOR3,LIN3,NTF3,IMA3,LGM3,NWL3,ICP3,ILAY3,TF3(10),              COREN      5
     *  PCTA3(10),PLA3(10),ELCH3,EDH3,RIW3(10),TL3(10),CF3,FM3          COREN      6
      COMMON/TURBIN/BN3,SS3,VTR3,CLS3,DT3,TU3,PMF3,CS3,IC3,ISW3         COREN      7
C                                                                       COREN      8
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 COREN      9
C                                                                       COREN     10
      COMMON /GCOMON/ NCF,NK,BCF(24),TSFL(24,10,17),SPLT(24,17),        COREN     11
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                     COREN     12
C                                                                       COREN     13
C     GENERAL INPUT PARAMETERS                                          COREN     14
C                                                                       COREN     15
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NCBS,SLDIST(10),NTENG,IUNIT   COREN     16
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)        COREN     17
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP     COREN     18
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,NC,FLD(50),    COREN     19
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         COREN     20
C                                                                       COREN     21
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                COREN     22
C                                                                       COREN     23
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PC(10,17),DPND(10,17),       COREN     24
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             COREN     25
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSF(17,10),CCV                       COREN     26
C                                                                       COREN     27
C                                                                       COREN     28
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICCP,IPRT(7),ICN(13),NLOPT         COREN     29
     *,INSEOW(3),INSHLD                                                 COREN     30
      COMMON/SUMSPL/SSPL(24,10,17)                                      COREN     31
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    COREN     32
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)                   COREN     33
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                             COREN     34
      COMMON/GFREQ/CFREQ(24),OFREQ(25),PFREQ(24)                        COREN     35
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  COREN     36
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                COREN     37
      COMMON/UNSHLD/USPLA(19),FSI(19),NLSPL,INOSP                       COREN     38
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR                     COREN     39
      DIMENSION PS3(13),F3(13),SNI(24),F2SN(24)                         COREN     40
      DIMENSION FI1(8),FD1(8),FI2(8),FD2(8),TB1(24),TB2(8)              COREN     41
      DIMENSION TT3(1)                                                  COREN     42
      DATA V03/1./,RM3/1./,C03/1116./                                   COREN     43
      DATA FD1/-21.,-13.,-4.,-1.5,0.,-1.5,-9.,-19./                     COREN     44
      DATA FI1/40.,60.,90.,100.,110.,120.,140.,160./                    COREN     45
      DATA FD2/-28.,-22.,-6.,-2.5,0.,-2.5,-8.,-26./                     COREN     46
      DATA FI2/40.,50.,90.,100.,110.,120.,130.,160./                    COREN     47
      DATA TB1/7*0.,5*.1,2*.2,.3,.4,.5,.6,.8,1.2,1.4,2.,2.9,4.2/        COREN     48
      DATA TB2/3*0.,.1,.2,.5,1.2,2.2/                                   COREN     49
      DATA RPD/1.745329E-2/,DPR/57.29578/                               COREN     50
      DATA PS3/40.,50.,60.,70.,80.,90.,100.,110.,120.,                  COREN     51
     *   130.,140.,150.,160./                                           COREN     52
      DATA F3/-7.7,-6.2,-5.3,-4.5,-3.4,-2.0,-0.9,0.,.2,.3,.1,-.1,-.2/   COREN     53
      DATA SNI/-2.0,-1.699,-1.5229,-1.3979,-1.30103,-1.2218,-1.1549,    COREN     54
     1         -1.0706,-1.0,-0.82391,-0.69897,-0.52288,-0.39794,        COREN     55
     2         -0.30103,-0.22185,-0.1549,-0.07058,0.0,0.17609,0.30103,  COREN     56
     3         0.47712,0.60206,0.69897,2.30103/                         COREN     57
      DATA F2SN/-38.2,-29.7,-24.7,-21.1,-18.4,-16.3,-14.7,-12.5,-11.0,  COREN     58
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     1          -7.8,-6.3,-5.3,-5.2,-5.5,-5.8,-6.2,-6.8,-7.3,-9.2,-10.8,   CDREN      59
     2          -13.3,-15.3,-16.9,-45.0 /                                  CDREN      60
      ICN(3)=ICN(3)+1                                                       CDREN      61
      CLS=CLS3                                                              CDREN      62
      VTR=VTR3                                                              CDREN      63
      IF(ISW3 .EQ. 2)FBPF=555./SQRT(CMF3)                                   CDREN      64
      IF(ISW3 .EQ.3)FBPF=BN3*SS3/60.0                                       CDREN      65
      IF((ISW3 .NE. 2) .AND. (ISW3 .NE. 3))FBPF=SQRT(9.25*BN3*SS3/          CDREN      66
     *    SQRT(CMF3))                                                       CDREN      67
      DELTX=DELT3*RPD                                                       CDREN      68
      CALL ANGLES(NOBS,DELTX)                                               CDREN      69
      XENG=NENG                                                             CDREN      70
      AJ=21.7                                                               CDREN      71
      IF(JB3.EQ.2) AJ=30.7                                                  CDREN      72
C                                                                           CDREN      73
C     TEST FOR SHIELDING AND EXIT TO PRINT OUT WING                         CDREN      74
C     SHIELDING DATA ONCE FOR ALL SIDELINE POSITIONS                        CDREN      75
C                                                                           CDREN      76
      IF(INSHLD.NE.0)CALL WSHOUT(IPRT(7),10,ITYPE,USPLA,NUSPL,FSI,INUSP)    CDREN      77
      DO  3000 I=1,NOBS                                                     CDREN      78
      CALL LINCOR(SPZ(1,1),IMA3,LGM3,ELCH3,EDH3,NWL3,R1W3,                  CDREN      79
     *  TL3,ILAY3,FM3,IDP3,PSI(1,I),NCF,BCF,PLA3,CF3,PCTA3,                 CDREN      80
     *  NTF3,TF3,DOPSF,SPL2,ICOR3,IB(1,1,ITYPE),LIN3,FBPF)                  CDREN      81
      IF(ISW3.EQ.2)GO TO 950                                                CDREN      82
      IF(VTR3.EQ.0.)VTR=.7*3.1415926*SS3*DT3/60.                            CDREN      83
      IF(CLS3.EQ.0.)CLS=48.5*SQRT(TL3)                                      CDREN      84
      DO 10 J=1,17                                                          CDREN      85
   10 SPL2(J)=BN3*SS3/(60.*DOPSF(J))                                        CDREN      86
      XNCF=NCF                                                              CDREN      87
      W=10./XNCF*ALOG10(BUF(NCF+1)/BUF(1))                                  CDREN      88
      DO 900 J=1,17                                                         CDREN      89
      TEMP1=10.*ALOG10((VTR*CC3/(VC3*CLS))**3*PMF3/RM3*                     CDREN      90
     *    W/DOPSF(J)**4)                                                    CDREN      91
     *    + TBLU1(PSI(J,I),FI1,FD1,1,8)-10.                                 CDREN      92
      DO 100 N=1,NCF                                                        CDREN      93
      BSPL=ALOG10(BCF(N)/SPL2(J))                                           CDREN      94
      TEMX=BSPL                                                             CDREN      95
      BSPL=TEMP1-20.*TEMX                                                   CDREN      96
      IF(TEMX.LT.0.)BSPL=TEMP1+10.*TEMX                                     CDREN      97
      TGAGR(N)=10.**(.1*BSPL)                                               CDREN      98
  100 CONTINUE                                                              CDREN      99
C                                                                           CDREN     100
      TEMP2=10.*ALOG10((VTR/VC3)**.6*(CO3/CLS)**3*(PMF3                     CDREN     101
     *    /RM3)*CS3/DOPSF(J)**4)                                            CDREN     102
     *    + TBLU1(PSI(J,I),FI2,FD2,1,8) + 56.                               CDREN     103
      XK3=0.                                                                CDREN     104
      IF(IC3.NE.0)XK3=-10.                                                  CDREN     105
      TEMP2=TEMP2+XK3                                                       CDREN     106
      C3=.1*TEMP2+1.                                                        CDREN     107
  125 CONTINUE                                                              CDREN     108
      ESN=ESHLDG(PSIO(J,I),BETA(J,I),XENG)                                  CDREN     109
      N1=1.+BUF(1)/SPL2(J)                                                  CDREN     110
      DO 200 N=1,NCF                                                        CDREN     111
      N2=BUF(N+1)/SPL2(J)                                                   CDREN     112
      IF((N2-N1).LT.0)GO TO 175                                             CDREN     113
      IF(N1.GT.10)GO TO 175                                                 CDREN     114
      DO 150 K=N1,N2                                                        CDREN     115
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      XK=K                                                              CORE N     116
 150  TGAGR(N)=TGAGR(N)+10.**(C3-XK)                                    CORE N     117
 175  SPLT(N,J)=TGAGR(N)                                                CORE N     118
      IF(SPLT(N,J).LE.0.)GO TO 176                                      CORE N     119
      SPLT(N,J)=10.*ALOG10(SPLT(N,J))                                   CORE N     120
  176 N1=N2+1                                                           CORE N     121
  180 CONTINUE                                                          CORE N     122
      IF(NCF.EQ.24)GO TO 190                                            CORE N     123
      DB=TB2(N)                                                         CORE N     124
      GO TO 195                                                         CORE N     125
 190  DB=TB1(N)                                                         CORE N     126
  195 SPLT(N,J)=SPLT(N,J)+DB+33.2-ESN-SPZ(N,J)                          CORE N     127
 200  CONTINUE                                                          CORE N     128
 900  CONTINUE                                                          CORE N     129
C                                                                       CORE N     130
      IF(INSHLD.NE.0.AND.ISW3.EQ.3)CALL SHLDSP(AMACH,ALTR,ISPTRM,CZ,    CORE N     131
     *SLDIST,I,APY,APZ,DOPSF,SPLT,NCF,BCF,SPZ,PSI,ITYPE,DELT3,ISW3)     CORE N     132
C                                                                       CORE N     133
      IF(ISW3.EQ.3)GO TO 2010                                           CORE N     134
C                                                                       CORE N     135
 950  CONTINUE                                                          CORE N     136
C                                                                       CORE N     137
      DO  2000 J=1,17                                                   CORE N     138
      ESN=ESHLDG(PSIO(J,I),BETA(J,I),XENG)                              CORE N     139
      F1PSI=TBLU1(PSI(J,I),PS3,F3,1,13)                                 CORE N     140
      OA = 10.*ALOG10(CMF3*TT3(1)*TT3(1) * PP3**3 / (DOPSF(J)*DOPSF(J)))CORE N     141
     1        + F1PSI + AJ + EK3                                        CORE N     142
      SNTZ=1850./(DOPSF(J)*SQRT(CMF3))                                  CORE N     143
 975  CONTINUE                                                          CORE N     144
      DO 1000  K=1,NCF                                                  CORE N     145
      SNT=BCF(K)/SNTZ                                                   CORE N     146
      SNL=ALOG10(SNT)                                                   CORE N     147
      F2SNI=TBLU1(SNL,SNI,F2SN,1,24)                                    CORE N     148
      IF(NK.EQ.3) F2SNI=F2SNI-4.8                                       CORE N     149
      TEMPXX=SPLT(K,J)                                                  CORE N     150
C                                                                       CORE N     151
      SPLT(K,J)=OA+F2SNI-ESN-SPZ(K,J)                                   CORE N     152
      IF(ISW3.EQ.2)GO TO 980                                            CORE N     153
      SPLT(K,J)=PWRSUM(SPLT(K,J),TEMPXX)                                CORE N     154
 980  CONTINUE                                                          CORE N     155
 1000 CONTINUE                                                          CORE N     156
 2000 CONTINUE                                                          CORE N     157
C                                                                       CORE N     158
      IF(INSHLD.NE.0)                CALL SHLDSP(AMACH,ALTR,ISPTRM,CZ,  CORE N     159
     *SLDIST,I,APY,APZ,DOPSF,SPLT,NCF,BCF,SPZ,PSI,ITYPE,DELT3,ISW3)     CORE N     160
C                                                                       CORE N     161
 2010 DO 2050 J=1,17                                                    CORE N     162
      DO 2050 K=1,NCF                                                   CORE N     163
 2050 SSPL(K,I,J)=PWRSUM(SSPL(K,I,J),SPLT(K,J))                         CORE N     164
C                                                                       CORE N     165
 2100 IF(IPRT(7).NE.7)GO TO 2200                                        CORE N     166
      CALL NOISO(IPRT(7),I,NK,10,CHIN,ILNIT,SLDISX(I),PFREQ,            CORE N     167
     1    SPLT(1,1),NCF,ITYPE)                                          CORE N     168
 2200 CONTINUE                                                          CORE N     169
      DO 2500  K=1,NCF                                                  CORE N     170
      DO 2500  J=1,17                                                   CORE N     171
 2500 SPLT(K,J)=SPLT(K,J)-TSPL(K,I,J)                                   CORE N     172
```

```
      IF(IPRT(3).NE.3)GO TO 3000                                        CORREN     173
      CALL  PNLSUB(SPLT(1,1),PSPL(1,I),TPD(1,I),EPNL(1,I),SPL2,         CORREN     174
     *      TEPNL(1,I),NK,BCG,TCG,FLR, I,NOBS,IRR(I,1))                 CORREN     175
      CALL NOISO(IPRT(3),I,NK,12,CHIN,IUNIT,SLDISX(I),                  CORREN     176
     1   PFREQ,SPLT(1,1),NCF,ITYPE)                                     CORREN     177
 3000 CONTINUE                                                          CORREN     178
      RETURN                                                            CORREN     179
      END                                                               CORREN     180
```

```
      SUBROUTINE CORSPL(ICOR,IB,NB,PA,SP)                               CORSPL     2
C                                                                       CORSPL     3
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),        CORSPL     4
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                     CORSPL     5
      COMMON/ICPATH/NCAS,NCCF,NTYP,IC,NRN,IARRAY(2)                     CORSPL     6
      COMMON/CRSPLS/DO(17),PS(17),DP(408),NPSCR                         CORSPL     7
      COMMON/SWITCH/NTYPE,ITYPE                                         CORSPL     8
C                                                                       CORSPL     9
C         THIS ROUTINE ALLOWS DB  CORRECTION TABLES TO BE PLACED ON FILE CORSPL    10
C         UPDATED PER CASE PER CONFIGURATION PER NOISE COMPONENT        CORSPL    11
C                                                                       CORSPL    12
C       INPUTS                                                          CORSPL    13
C                                                                       CORSPL    14
C         ICOR =1  17 VALUE TABLE IS BUILT FOR A SINGLE DB  CORRECTION P CORSPL    15
C                  ANGLE FOR ALL BANDS                                  CORSPL    16
C              =2  24,NPSCR  OR  8,NPSCR TABLE OF  DB CORRECTIONS TO ALL CORSPL    17
C                  FOR BOTH DIRECTIVITY AND SOUND LEVEL CHANGES         CORSPL    18
C         NB        NUMBER OF FREQUENCY BANDS  24 OR 8                  CORSPL    19
C         PA(1-17)   17 DIRECTIVITY ANGLES                              CORSPL    20
C                                                                       CORSPL    21
C       OUTPUT                                                          CORSPL    22
C                                                                       CORSPL    23
C         SP(24,17) ARRAY OF DB CORRECTIONS                             CORSPL    24
      DIMENSION IB(2,3),DBT(24,17),DCT(17),PST(17),SP(24,17),PA(17)     CORSPL    25
      DIMENSION RBUX(10)                                                CORSPL    26
      DIMENSION RBUF(14)                                                CORSPL    27
      DIMENSION DSPL(24),DBN(17),BN(24)                                 CORSPL    28
C360  REAL*8 FNAM                                                       CORSPL    29
C                                                                       CORSPL    30
C MASS STORAGE (RANDOM DISK I/O) INDECES, COUNTER, AND FLAG             CORSPL    31
      COMMON /MSIO/ INDX1(40), INDX2(3), INDX3(36), IC1, IOPEN          CORSPL    32
      DATA IL1, IL2, IL3, IRR /40, 3, 36, 0/                            CORSPL    33
      DATA ET/1.2E-3/                                                   CORSPL    34
      DATA IOP/0/                                                       CORSPL    35
      IRP=1                                                             CORSPL    36
      IGO=1                                                             CORSPL    37
      IF(IOP.NE.0)GO TO 1                                               CORSPL    38
      W=1.                                                              CORSPL    39
      IF(NB.EQ.24)W=.3333                                               CORSPL    40
      DO 1000 J=1,17                                                    CORSPL    41
 1000 DBN(J)=1.442695041*ALOG(DOPSF(J))/W                               CORSPL    42
      IOP=1                                                             CORSPL    43
      NRN=1                                                             CORSPL    44
      IC1  =  1                                                         CORSPL    45
C360  CALL GETPAR(FNAM,1)                                               CORSPL    46
C360  CALL DEFINE(13,FNAM,&SPLCOR  &,NRN,140)                           CORSPL    47
C                                                                       CORSPL    48
C OPEN RANDOM DISK FILE 13 AND SET FLAG, IOPEN, TO INDICATE THE FILE    CORSPL    49
C IS OPENED.                                                            CORSPL    50
      CALL OPENMS(13, INDX1, IL1, 0)                                    CORSPL    51
      IOPEN  =  1                                                       CORSPL    52
C                                                                       CORSPL    53
C TURN-OFF FATAL READ ERROR 78 AND 79 SENSE SWITCHES AND TURN-ON        CORSPL    54
C ERROR COUNTER, IRR                                                    CORSPL    55
    1 CALL ERRSET(IRR, 1)                                               CORSPL    56
      IF(IB(1,NCOF).EQ.0)GO TO 5                                        CORSPL    57
      IR=IB(1,NCOF)                                                     CORSPL    58
```

```
      IGO=2                                                             CORSPL    59
      IF  (IR-1)  20, 20, 50                                            CORSPL    60
C         BUILD CORRECTION TABLES                                       CORSPL    61
 5    CONTINUE                                                          CORSPL    62
      IB(1,NCOF)=ICOR                                                   CORSPL    63
C                                                                       CORSPL    64
C SAVE MAJOR INDEX COUNTER IN STORAGE PROVIDED BY NOISE COMP. ROUTINE   CORSPL    65
      IB(2,NCOF)  =  IC1                                                CORSPL    66
C                                                                       CORSPL    67
C IBM360                                                                CORSPL    68
C360  IB(2,NCOF)  =  NRN                                                CORSPL    69
      IF  (ICOR-1)  10, 10, 40                                          CORSPL    70
 10   CONTINUE                                                          CORSPL    71
C                                                                       CORSPL    72
C IBM360                                                                CORSPL    73
C  14 NRN  =  IB(2,NCOF)                                                CORSPL    74
C360  WRITE(13,15)(DO(J),J=1,NPSCR)                                     CORSPL    75
C360  WRITE(13,15)(PS(J),J=1,NPSCR)                                     CORSPL    76
C                                                                       CORSPL    77
C INITIALIZE MINOR AND MAJOR INDEX COUNTERS                             CORSPL    78
   14 NRN  =  1                                                         CORSPL    79
      IC1  =  IB(2,NCOF)                                                CORSPL    80
      IF  (IGO .GT. 1)  GO TO 105                                       CORSPL    81
C                                                                       CORSPL    82
C ZERO OUT MINOR INDEX BEFORE WRITING ON DISK FOR 1ST TIME FOR THIS     CORSPL    83
C NOISE COMPONENT                                                       CORSPL    84
   95 DO  100  J = 1,IL2                                                CORSPL    85
      INDX2(J)  =  0                                                    CORSPL    86
  100 CONTINUE                                                          CORSPL    87
C                                                                       CORSPL    88
C SET INDICATOR TO WRITE AT END-OF-INFORMATION                          CORSPL    89
      IW  =  0                                                          CORSPL    90
      GO TO 110                                                         CORSPL    91
C                                                                       CORSPL    92
C SET INDICATOR TO WRITE IN-PLACE                                       CORSPL    93
  105 IW  =  1                                                          CORSPL    94
C                                                                       CORSPL    95
C USE MINOR INDEX                                                       CORSPL    96
  110 CALL STINDX(13, INDX2, IL2)                                       CORSPL    97
      ENCODE(140,15,RBUF)(DO(J),J=1,NPSCR)                              CORSPL    98
 15   FORMAT(17F8.3,4X)                                                 CORSPL    99
C                                                                       CORSPL   100
C WRITE DATA ON DISK                                                    CORSPL   101
      CALL WRITMS(13, RBUF, 14, NRN, IW)                                CORSPL   102
      NRN=NRN+1                                                         CORSPL   103
      ENCODE(140,15,RBUF)(PS(J),J=1,NPSCR)                              CORSPL   104
      CALL WRITMS(13, RBUF, 14, NRN, IW)                                CORSPL   105
C                                                                       CORSPL   106
C USE MAJOR INDEX                                                       CORSPL   107
      CALL STINDX(13, INDX1, IL1)                                       CORSPL   108
C                                                                       CORSPL   109
C WRITE MINOR INDECES ON DISK                                           CORSPL   110
      CALL WRITMS(13, INDX2, IL2, IC1, IW)                              CORSPL   111
      IC1  =  IC1 + 1                                                   CORSPL   112
      IF  (IGO-1)  20, 20, 30                                           CORSPL   113
   20 NRS  =  1                                                         CORSPL   114
C                                                                       CORSPL   115
```

```
C READ MINOR INDECES FROM DISK                                          CORSPL    116
      CALL READMS(13, INDX2, IL2, IB(2,NCCF))                           CORSPL    117
C                                                                       CORSPL    118
C USE MINOR INDEX                                                       CORSPL    119
      CALL STINDX(13, INDX2, IL2)                                       CORSPL    120
C360  READ(13,15)(DOT(J),J=1,NPSCR)                                     CORSPL    121
C360  READ(13,15)(PST(J),J=1,NPSCR)                                     CORSPL    122
C                                                                       CORSPL    123
C READ DATA FROM DISK                                                   CORSPL    124
      CALL READMS(13, RBUF, 14, NRS)                                    CORSPL    125
      DECODE(140,15,RBUF)(DOT(J),J=1,NPSCR)                             CORSPL    126
      IF  (IRR .GT. 0)  GO TO 3000                                      CORSPL    127
      NRS=NRS+1                                                         CORSPL    128
      CALL READMS(13, RBUF, 14, NRS)                                    CORSPL    129
C                                                                       CORSPL    130
C USE MAJOR INDEX                                                       CORSPL    131
      CALL STINDX(13, INDX1, IL1)                                       CORSPL    132
      DECODE(140,15,RBUF)(PST(J),J=1,NPSCR)                             CORSPL    133
      IF  (IRR .GT. 0)  GO TO 3000                                      CORSPL    134
      IF  (IGO-1)  30, 30, 25                                           CORSPL    135
 25   DO 29 J=1,NPSCR                                                   CORSPL    136
      IF(DO(J).EQ.ET)GO TO 27                                           CORSPL    137
      IF(DO(J).EQ.DOT(J))GO TO 27                                       CORSPL    138
      DOT(J)=DO(J)                                                      CORSPL    139
      IRP=2                                                             CORSPL    140
 27   DO(J)=DOT(J)                                                      CORSPL    141
      IF(PS(J).EQ.ET)GO TO 28                                           CORSPL    142
      IF(PS(J).EQ.PST(J))GO TO 28                                       CORSPL    143
      PST(J)=PS(J)                                                      CORSPL    144
      IRP=2                                                             CORSPL    145
 28   PS(J)=PST(J)                                                      CORSPL    146
 29   CONTINUE                                                          CORSPL    147
      IF  (IRP-1)  30, 30, 14                                           CORSPL    148
   30 CONTINUE                                                          CORSPL    149
       DO 39 J=1,17                                                     CORSPL    150
      TSPX=TBLU1(PA(J),PST,DOT,1,NPSCR)                                 CORSPL    151
      DO 38 N=1,NB                                                      CORSPL    152
      SP(N,J)=SP(N,J)+TSPX                                              CORSPL    153
 38   CONTINUE                                                          CORSPL    154
 39   CONTINUE                                                          CORSPL    155
      GO TO 4000                                                        CORSPL    156
 40   IGO=1                                                             CORSPL    157
C                                                                       CORSPL    158
C IBM360                                                                CORSPL    159
C  42 NRN  =  IB(2,NCCF)                                                CORSPL    160
   42 NRN  =  1                                                         CORSPL    161
      IC1  =  IB(2,NCCF)                                                CORSPL    162
      NMI  =  NPSCR + 2                                                 CORSPL    163
      IF  (NB .GT. 12)  NMI = NMI + NPSCR                               CORSPL    164
      IF  (IGO .GT. 1)  GO TO 205                                       CORSPL    165
  195 DO  200  J = 1,NMI                                                CORSPL    166
      INDX3(J)  =  0                                                    CORSPL    167
  200 CONTINUE                                                          CORSPL    168
      IW  =  0                                                          CORSPL    169
      GO TO 210                                                         CORSPL    170
  205 IW  =  1                                                          CORSPL    171
  210 CALL STINDX(13, INDX3, NMI)                                       CORSPL    172
```

```
      NS=1-NB                                                           CORSPL    173
      N2=NS                                                             CORSPL    174
      DO 45 J=1,NPSCR                                                   CORSPL    175
      NS=NS+NB                                                          CORSPL    176
      NE=NS-N2                                                          CORSPL    177
      IF  (NB .GT. 12)  GO TO 43                                        CORSPL    178
C360  WRITE(13,17)(DP(N),N=NS,NE)                                       CORSPL    179
C  17 FORMAT(24F8.3,8X)                                                 CORSPL    180
      ENCODE(100,16,RBUX)(DP(N),N=NS,NE)                                CORSPL    181
 16   FORMAT(12F8.3,4X)                                                 CORSPL    182
      CALL WRITMS(13, RBUX, 10, NRN, IW)                                CORSPL    183
      NRN=NRN+1                                                         CORSPL    184
      GO TO 45                                                          CORSPL    185
 43   NM=NS+11                                                          CORSPL    186
      NF=NM+1                                                           CORSPL    187
      ENCODE(100,16,RBUX)(DP(N),N=NS,NM)                                CORSPL    188
      CALL WRITMS(13, RBUX, 10, NRN, IW)                                CORSPL    189
      NRN=NRN+1                                                         CORSPL    190
      ENCODE(100,16,RBUX)(DP(N),N=NF,NE)                                CORSPL    191
      CALL WRITMS(13, RBUX, 10, NRN, IW)                                CORSPL    192
      NRN=NRN+1                                                         CORSPL    193
 45   CONTINUE                                                          CORSPL    194
C360  WRITE(13,15)(PS(J),J=1,NPSCR)                                     CORSPL    195
      ENCODE(140,15,RBUF)(PS(J),J=1,NPSCR)                              CORSPL    196
      CALL WRITMS(13, RBUF, 14, NRN, IW)                                CORSPL    197
      CALL STINDX(13, INDX1, IL1)                                       CORSPL    198
      CALL WRITMS(13, INDX3, NMI, IC1, IW)                              CORSPL    199
      IC1  =  IC1 + 1                                                   CORSPL    200
      IF  (IGO-1)  50, 50, 70                                           CORSPL    201
   50 NRS  =  1                                                         CORSPL    202
      CALL READMS(13, INDX3, NMI, IB(2,NCOF))                           CORSPL    203
      CALL STINDX(13, INDX3, NMI)                                       CORSPL    204
      DO 55 J=1,NPSCR                                                   CORSPL    205
      IF(NB.EQ.24)GO TO 53                                              CORSPL    206
C360  READ(13,17)(DBT(N,J),N=1,NB)                                      CORSPL    207
      CALL READMS(13, RBUX, 10, NRS)                                    CORSPL    208
      DECODE(100,16,RBUX)(DBT(N,J),N=1,NB)                              CORSPL    209
      IF  (IRR .GT. 0)  GO TO 3000                                      CORSPL    210
      NRS=NRS+1                                                         CORSPL    211
      GO TO 54                                                          CORSPL    212
 53   CONTINUE                                                          CORSPL    213
      CALL READMS(13, RBUX, 10, NRS)                                    CORSPL    214
      DECODE(100,16,RBUX)(DBT(N,J),N=1,12)                              CORSPL    215
      IF  (IRR .GT. 0)  GO TO 3000                                      CORSPL    216
      NRS=NRS+1                                                         CORSPL    217
      CALL READMS(13, RBUX, 10, NRS)                                    CORSPL    218
      DECODE(100,16,RBUX)(DBT(N,J),N=13,24)                             CORSPL    219
      IF  (IRR .GT. 0)  GO TO 3000                                      CORSPL    220
      NRS=NRS+1                                                         CORSPL    221
 54   CONTINUE                                                          CORSPL    222
 55   CONTINUE                                                          CORSPL    223
C360  READ(13,15)(PST(J),J=1,NPSCR)                                     CORSPL    224
      CALL READMS(13, RBUF, 14, NRS)                                    CORSPL    225
      CALL STINDX(13, INDX1, IL1)                                       CORSPL    226
      DECODE(140,15,RBUF)(PST(J),J=1,NPSCR)                             CORSPL    227
      IF  (IRR .GT. 0)  GO TO 3000                                      CORSPL    228
      IF  (IGO-1)  70, 70, 60                                           CORSPL    229
```

```
 60    CONTINUE                                                          CORSPL    230
       DO 64 J=1,NPSCR                                                   CORSPL    231
       DO 62 N=1,NB                                                      CORSPL    232
       I=(J-1)*NB+N                                                      CORSPL    233
       IF(DP(I).EQ.ET)GO TO 61                                           CORSPL    234
       IF(DBT(N,J).EQ.DP(I))GO TO 62                                     CORSPL    235
       DBT(N,J)=DP(I)                                                    CORSPL    236
       IRP=2                                                             CORSPL    237
 61    DP(I)=DBT(N,J)                                                    CORSPL    238
 62    CONTINUE                                                          CORSPL    239
       IF(PS(J).EQ.ET)GO TO 63                                           CORSPL    240
       IF(PS(J).EQ.PST(J))GO TO 64                                       CORSPL    241
       PST(J)=PS(J)                                                      CORSPL    242
       IRP=2                                                             CORSPL    243
 63    PS(J)=PST(J)                                                      CORSPL    244
 64    CONTINUE                                                          CORSPL    245
       IF  (IRP-1)  70, 70, 42                                           CORSPL    246
 70    CONTINUE                                                          CORSPL    247
       DO  90  J=1,17                                                    CORSPL    248
       DO  75  N=1,NB                                                    CORSPL    249
       DSPL(N)= TBLU2(BCF(N),PA(J),BCF,FST,DBT,1,1,NB,NPSCR,24,17)       CORSPL    250
       DBFC=DBN(J)                                                       CORSPL    251
       IF(ITYPE.EQ.1.OR.ITYPE.EQ.2.OR.ITYPE.EQ.6.OR.ITYPE.EQ.9.OR.ITYPE. CORSPL    252
     *  EQ.12)DBFC=0.                                                    CORSPL    253
 75    BN(N)=FLOAT(N)-DBFC                                               CORSPL    254
       DO  80  N=1,NB                                                    CORSPL    255
 80    SP(N,J)=SP(N,J)+TBLU1(FLOAT(N),BN,DSPL,1,NB)                      CORSPL    256
 90    CONTINUE                                                          CORSPL    257
       GO TO 4000                                                        CORSPL    258
 3000  CALL ERROR(ITYPE,6,14)                                            CORSPL    259
       STOP                                                              CORSPL    260
C                                                                        CORSPL    261
C TURN-ON FATAL READ ERROR 78 AND 79 SENSE SWITCHES                      CORSPL    262
 4000  CALL ERRSET(IRR, 0)                                               CORSPL    263
       DO 4100 J=1,17                                                    CORSPL    264
       DC(J)=ET                                                          CORSPL    265
 4100  PS(J)=ET                                                          CORSPL    266
       DO 4200 N=1,408                                                   CORSPL    267
 4200  DP(N)=ET                                                          CORSPL    268
       RETURN                                                            CORSPL    269
       END                                                               CORSPL    270
```

```
      COMPLEX FUNCTION CPOLAR(A)                                        CPOLAR     2
C                                                                       CPOLAR     3
C  COMPUTES THE POLAR FORM (MAGNITUDE, ANGLE) FOR THE COMPLEX QUANTITY  CPOLAR     4
C  A, (REAL PART, IMAGINARY PART).                                      CPOLAR     5
C                                                                       CPOLAR     6
      COMPLEX A                                                         CPOLAR     7
      DATA PI2 / 1.57079632679494 /                                     CPOLAR     8
      AMP(X, Y)  =  ABS(X) * SQRT(1. + (Y/X)*(Y/X))                     CPOLAR     9
      AR  =  REAL(A)                                                    CPOLAR    10
      AI  =  AIMAG(A)                                                   CPOLAR    11
      T  =  0.0                                                         CPOLAR    12
      IF  (AR)  20, 10, 20                                              CPOLAR    13
   10 IF  (AI)  20, 50, 20                                              CPOLAR    14
   20 T  =  ATAN2(AI, AR)                                               CPOLAR    15
      J  =  ABS(T / PI2) + 0.5                                          CPOLAR    16
      IF  (J - 2 * (J / 2))  30, 40, 30                                 CPOLAR    17
   30 AR  =  AMP(AI, AR)                                                CPOLAR    18
      GO TO 50                                                          CPOLAR    19
   40 AR  =  AMP(AR, AI)                                                CPOLAR    20
   50 CPOLAR  =  CMPLX(AR, T)                                           CPOLAR    21
      RETURN                                                            CPOLAR    22
      END                                                               CPOLAR    23
```

```
      SUBROUTINE DATAIN(N,DATN,N4,D1,D2,D3,D4,IMODE)
C
C     PURPOSE TO READ IN VARIABLES AND ARRAYS
C        ANS   DUMMY VALUES OF ANL TO ELIMINATE BLOCK DATA REQUIRED BY 3
C           ALSO TO SORT AND REARANGE THE BASIC DATA FROM TEE187C
      COMMON/COUNT/NEPR,NL
      COMMON/DIGI/IUNIT,IPNDB,IPLOT
      COMMON/CONTNT/AEPR(6),ALRO(9),AALFA(6)
      COMMON/SIZE/NLRO,NALFA
C
      COMMON/LEVELS/ANL( 5 )
      DIMENSION DATN(1)
      DIMENSION ANS(5)
      DIMENSION D1(1),D2(1),D3(1),D4(1)
      DIMENSION ARG(324)
C  IBM SYS360 + 370
C     REAL*8 ARG
C
C        DATA WILL BE LOADED BY DATA STATEMENTS TO CONSERVE TIME AND
C
C     READ THE SPECIFIC NOISE CONTOUR VALUES TO BE EXAMINED
C       AND THE NUMBER OF CONTOUR VALUES
      NAMELIST/DIGINT/ANL,NL,IUNIT,IPNDB,IPLOT
      DATA ANS/85.,90.,95.,100.,105./
C
      NL=5
      DO  1000  I=1,NL
 1000 ANL(I)=ANS(I)
      IF(IMODE.EQ.-1)GO TO  1010
      IPNDB=0
      IPLOT=0
      IUNIT=0
      READ(5,DIGINT)
 1010 CONTINUE
C
C
C
C     READ NUMBER OF NOISE FUNCTION VALUES TO BE READ
C
C     READ THE ARRAYS OF NOISE LEVEL PARAMETERS NL=FUN(EPR.,ALPHA,LRO)
C        D1, D2, D3. D4
C    DATN IS AN ARRAY SUPPLIED BY TEE187 OF NOISE VALUES
C  EPR VALUES, ALPHA VALUES AND VALUES OF LOG10 RO IN A ONE DIMENSIONAL
C    STRING SUCH THAT THE SETS REPEAT THEIR ORDER
      J=0
      DO  1020  I=1,N,4
      J=J+1
      D1(J)=DATN(I)
      D2(J)=DATN(I+1)
      D3(J)=DATN(I+2)
      D4(J)=DATN(I+3)
 1020 CONTINUE
C       SORTS INTO INCREASING ORDER
C     SORT WITH RESPECT TO EPR
      CALL SORRTR(D2,D3,D4,N4,D1,DATN(N4+1),DATN(1),ARG)
C     GET THE NUMBER OF DISTINCT EPR&S,ALPHA&S ,LRO&S AND THEIR
C        VALUES AND STORE THEM
```

```
C                                                                       DATAIN     59
      CALL SQUASH (D2,N4,AEPR,NEPR)                                     DATAIN     60
      CALL SQUASH(D3,N4,AALFA,NALFA)                                    DATAIN     61
      CALL SQUASH(D4,N4,ALRC,NLRC)                                      DATAIN     62
C                                                                       DATAIN     63
C                                                                       DATAIN     64
C                                                                       DATAIN     65
C        OUTPUT SECTION FOR INPUT ACCUSTIC DATA                         DATAIN     66
C                                                                       DATAIN     67
C                                                                       DATAIN     68
      I2=0                                                              DATAIN     69
      DO  1040  I=1,NEPR                                                DATAIN     70
      IF  (MOD(I-1, 2))  9007, 9006, 9007                               DATAIN     71
 9006 WRITE (6,8999)                                                    DATAIN     72
 8999 FORMAT(1H1,//54X,22HACOUSTIC DATA FUNCTION,/53X,24HNOISE LEVEL VAL DATAIN     73
     *UES  (DB) )                                                       DATAIN     74
 9007 WRITE (6,9008) AEPR(I)                                            DATAIN     75
 9008 FORMAT(//10X,34HAT ENGINE PERFORMANCE PARAMETER = ,1PE10.3)       DATAIN     76
      WRITE(6, 9009 )                                                   DATAIN     77
 9009 FORMAT(/55X,24HLOG10 OF RANGE AT CPA    )                         DATAIN     78
      WRITE (6,9010)                                                    DATAIN     79
 9010 FORMAT(5X,10HELEVATION )                                          DATAIN     80
      WRITE (6,9011) (ALRC(J), J = 1,NLRC)                              DATAIN     81
 9011 FORMAT(7X,5HANGLE,5X,1PE12.3,8E12.3)                              DATAIN     82
 9012 FORMAT(5X,9H(DEGREES)     )                                       DATAIN     83
      DO  1030  N=1,NALFA                                               DATAIN     84
      I1=I2+1                                                           DATAIN     85
      I2=I1+NLRC-1                                                      DATAIN     86
      WRITE(6, 9013 ) AALFA(N),(D1(K),K=I1,I2)                          DATAIN     87
 9013 FORMAT(/4X,1PE10.3,2X,0PF10.1,8F12.1)                             DATAIN     88
 1030 CONTINUE                                                          DATAIN     89
 1040 CONTINUE                                                          DATAIN     90
C                                                                       DATAIN     91
C                                                                       DATAIN     92
      CALL SWITCH(NEPR, NL, NLRC, NALFA, D1, D2)                        DATAIN     93
C                                                                       DATAIN     94
C                                                                       DATAIN     95
C        OUTPUT SECTION FOR TRANSFORMED INPUT ARRAY                     DATAIN     96
C                                                                       DATAIN     97
C                                                                       DATAIN     98
      WRITE (6,9016)                                                    DATAIN     99
 9016 FORMAT(1H1,///)                                                   DATAIN    100
      WRITE(6, 9014 )                                                   DATAIN    101
 9014 FORMAT(40X,51HTABLE OF DEVELOPED VALUES FOR LOG10 OF RANGE AT CPA) DATAIN    102
      WRITE(6, 9015 )                                                   DATAIN    103
 9015 FORMAT(46X,43HBASED ON THE PRECEDING INPUT ACCUSTIC DATA      )   DATAIN    104
      I4=0                                                              DATAIN    105
      DO  1060  I=1,NL                                                  DATAIN    106
      WRITE(6, 9017 )ANL(I)                                             DATAIN    107
 9017 FORMAT(///,44X,26HVALUES FOR NOISE LEVEL OF  ,F5.1,5H  DB  )      DATAIN    108
      WRITE(6, 9018 )                                                   DATAIN    109
 9018 FORMAT(//, 7X,9HELEVATION,30X,28HENGINE PERFORMANCE PARAMETER    ) DATAIN    110
      WRITE(6, 9019 )                                                   DATAIN    111
 9019 FORMAT(9X,5HANGLE)                                                DATAIN    112
      WRITE(6, 9020 ) (AEPR(J),J=1,NEPR)                                DATAIN    113
 9020 FORMAT(7X,9H(DEGREES),2X,1PE15.3,5E15.3)                          DATAIN    114
      WRITE (6,9013)                                                    DATAIN    115
```

```
      DO  1050  K=1,NALFA                                               DATAIN    116
      I3=I4+1                                                           DATAIN    117
      I4=I3+NEPR-1                                                      DATAIN    118
      WRITE(6,9021) AALFA(K),(D2(L),L=I3,I4)                            DATAIN    119
 9021 FORMAT(6X,1H(,1PE10.3,2H) ,4X,E10.3,(5E15.3))                     DATAIN    120
 1050 CONTINUE                                                          DATAIN    121
 1060 CONTINUE                                                          DATAIN    122
C                                                                       DATAIN    123
C                                                                       DATAIN    124
      RETURN                                                            DATAIN    125
      END                                                               DATAIN    126
```

```
      FUNCTION DPSD(F,SBO,CBO,SB1,TA,SB1S,R,DRN,CO,KN,LDF,ZNR,ZNI,ND)
C
C  COMPUTES THE ACOUSTIC GROUND REFLECTION ANOMALY FOR POWER SPECTRAL
C  DENSITIES
C
      REAL KN, KOR, LF, LDF
      DIMENSION LDF(1),ZNR(1),ZNI(1)
      DIMENSION RPX(2), WX(2), Z(2)
      COMPLEX FW, W, RP, ZN, FX, DP, SB1, TA
      COMMON/BLK97/ZN,RP,W,FX
      EQUIVALENCE (RPX(1), RP), (WX(1), W), (Z(1), ZN)
      DATA ZERO, ONE, EPS, TPI /0.,1.,1.2E-5,6.2831853071796/
      TA  =  (0.,0.)
      DPSD  =  ONE
      TSBOS  =  ONE - KN*KN
      KOR  =  TPI * F * R / CO
      DA  =  KOR * DRN
      LF  =  ALOG10(F)
      Z(1)=  TBLU1(LF, LDF, ZNR, 2, ND)
      Z(2)=  TBLU1(LF, LDF, ZNI, 2, ND)
      IF ((ABS(Z(1))-ONE) .LE. EPS .AND. ABS(Z(2)) .LE. EPS)  GO TO 9
    1 RP  =  ZN * SBO + SB1
      IF  (ABS(RPX(1))+ABS(RPX(2)) - EPS)  2, 2, 4
    2 IF  (ABS(TSBOS) - EPS)  10, 10, 11
   10 RP  =  (ZN - ONE) / (ZN + ONE)
      GO TO 5
   11 RP  =  (-1.,0.)
      GO TO 5
    4 RP  =  (RP - (SB1+SB1)) / RP
    5 W  =  ZN * (ONE - RP) * CBO
      W  =  W * W
      IF  (ABS(WX(1))+ABS(WX(2)) - EPS) 6, 6, 7
    6 FX  =  (0.,0.)
      GO TO 8
    7 W  =  (0.,1.) * ((KOR+KOR)*SB1S) / W
      FX  =  FW(W)
    8 TA  =  (RP + FX * (ONE - RP)) / (ONE + DRN)
      DP  =  ONE + TA * CMPLX(COS(DA), -SIN(DA))
      DPSD  =  REAL(DP * CONJG(DP))
    9 RETURN
      END
```

```
      SUBROUTINE DRIVES(D1,D2,X1,X2,Y1,Y2,SUM,SLNL,IMODE)                DRIVES     2
C     PURPOSE  TO SIMULATE THE OUTPUT OF THE AMES FSAA SIMULATOR         DRIVES     3
C       BY GIVING COORDINATES OF THE FLIGHT PATH (Y,Z),THE ENGINE        DRIVES     4
C       PRESSURE RATIO(EPR),THE DIRECTIVITY ANGLE(SCI) AND THE ENGINE    DRIVES     5
C       ATTITUDE ANGLE(DE)                                               DRIVES     6
      COMMON/COUNT/NEPR,NL                                               DRIVES     7
      COMMON/DIGI/IUNIT,IPNDB,IPLOT                                      DRIVES     8
      COMMON/CONTNT/AEPR(6),ALRO(9),AALFA(6)                             DRIVES     9
      COMMON/LEVELS/ANL(5)                                               DRIVES    10
      COMMON/ASD/SD(3),NSL                                               DRIVES    11
      COMMON/SIZE/NLRO,NALFA                                             DRIVES    12
      COMMON/FLIGHT/IMODEQ,DXQ,DYQ,DZQ,DSCIQ,DDEQ,DEPRQ                  DRIVES    13
      COMMON/RESULT/X1Q,X2Q,Y1Q,Y2Q,SUMQ,SLNLQ,IECQ                      DRIVES    14
      DIMENSION X1Q(5),X2Q(5),Y1Q(5),Y2Q(5),SUMQ(5),SLNLQ(3),IECQ(5)     DRIVES    15
      DIMENSION XP(1020),YP(1020),PS(306),FP(306)                        DRIVES    16
      DIMENSION DX(100),DY(100),DZ(100),DEPR(100),DDE(100)               DRIVES    17
      DIMENSION S(20),DDX(20),DDY(20),DDZ(20),DDEPR(20),DDDE(20)         DRIVES    18
      DIMENSION D1(1),D2(1),TITLE(18)                                    DRIVES    19
      DIMENSION X1(5),X2(5),Y1(5),Y2(5)                                  DRIVES    20
      DIMENSION IEC(5),SUM(5),SDS(3),SLNL(3)                             DRIVES    21
      DIMENSION PN(2),EM(2)                                              DRIVES    22
      DIMENSION SPP(100)                                                 DRIVES    23
      DATA II,III/ 1,1/                                                  DRIVES    24
      DATA EM /3HEPN, 3H PN/                                             DRIVES    25
      DATA PN/3H M.,3HFT./                                               DRIVES    26
      NAMELIST/DIGSIM/NFPP,DX,DY,DZ,DEPR,DDE,DSCI,SD,NSL                 DRIVES    27
     1,ND,DS,DDX,DDY,DDZ,DDEPR,DDDE,NLS,NLF,ISTOP                        DRIVES    28
C                INITIALIZE  THE  FLIGHT PATH VALUES                    DRIVES    29
      DATA ND,S(1)/0,0.0/                                                DRIVES    30
      DATA NFPP,NLN/25,5/                                                DRIVES    31
      DATA DX/100*0.0/                                                   DRIVES    32
      DATA DY/100.,200.,300.,400.,500.,600.,700.,800.,900.,1000.,1200.,  DRIVES    33
     11400.,1600.,1800.,2000.,2300.,2600.,3000.,4000., 5000.,6000.,7000. DRIVES    34
     2,8000.,9000.,10000.,75*10000.0/                                    DRIVES    35
      DATA DZ/1.0,1.0,1.0,50.,100.,150.,200.,300.,400.,500.,600.,700.,  DRIVES    36
     1800.,900.,1000.,1200.,1400.,1800.,1900.,2000.,2100.,2200.,2300.,  DRIVES    37
     22400.,2500.,75*0.0/                                                DRIVES    38
      DATA DEPR/15*2.0,1.9,1.8,1.7,1.6,1.5,1.6,1.7,1.8,1.9,2.0,75*1.9/  DRIVES    39
      DATA DDE /10*20.0,5*15.0,5*10.0,5*0.0,75*0.0/                      DRIVES    40
      DATA DSCI/110.0/                                                   DRIVES    41
      DATA NSL1,SDS/3,1.0,152.4,463.3/                                   DRIVES    42
      DATA ISTOP/0/                                                      DRIVES    43
C                                                                        DRIVES    44
C     PUSH FLIGHT PARAMETERS INTO SUBROUTINE VALUES                      DRIVES    45
      IF (IMODE .EQ. -1) GO TO  1100                                     DRIVES    46
      NSL=NSL1                                                           DRIVES    47
      NLS=1                                                              DRIVES    48
      NLF=NL                                                             DRIVES    49
      IF (IPNDB .EQ. 1) III=2                                            DRIVES    50
      IF (IUNIT .EQ. 1) II=2                                             DRIVES    51
      IC=0                                                               DRIVES    52
      DO 999 I=1,NSL                                                     DRIVES    53
  999 SD(I)=SDS(I)                                                       DRIVES    54
 1000 CONTINUE                                                           DRIVES    55
      READ(5, 9000 ) TITLE                                               DRIVES    56
      IC=IC+1                                                            DRIVES    57
      READ(5,DIGSIM)                                                     DRIVES    58
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      NLN=NLF-NLS+1                                                     DRIVES     59
      IF(IC.EQ.1)GO TO  1010                                            DRIVES     60
      CALL RESTRT(D1,D2,NEPR,NL,NLRC,NALFA,NLS,NLF)                     DRIVES     61
 1010 CONTINUE                                                          DRIVES     62
      IF ( ND .EQ. 0) GO TO  1040                                       DRIVES     63
      DO  1020  I=2,ND                                                  DRIVES     64
 1020 S(I)=S(I-1)+SQRT((DDX(I)-DDX(I-1))**2+(DDY(I)-DDY(I-1))**2)       DRIVES     65
      SP=S(1)                                                           DRIVES     66
      DX(1)=DDX(1)                                                      DRIVES     67
      DY(1)=DDY(1)                                                      DRIVES     68
       DZ(1)=DDZ(1)                                                     DRIVES     69
      DEPR(1)=DDEPR(1)                                                  DRIVES     70
      DDE(1)=DDDE(1)                                                    DRIVES     71
      SPP(1)=0.0                                                        DRIVES     72
      DO  1030  I=2,NFPP                                                DRIVES     73
      SP=SP+DS                                                          DRIVES     74
      SPP(I)=SP                                                         DRIVES     75
      DX(I)=TBLU1(SP,S,DDX,1,ND)                                        DRIVES     76
      DY(I)=TBLU1(SP,S,DDY,1,ND)                                        DRIVES     77
      DZ(I)=TBLU1(SP,S,DDZ,1,ND)                                        DRIVES     78
      DEPR(I)=TBLU1(SP,S,DDEPR,1,ND)                                    DRIVES     79
      DDE(I)=TBLU1(SP,S,DDDE,1,ND)                                      DRIVES     80
 1030 CONTINUE                                                          DRIVES     81
 1040 CONTINUE                                                          DRIVES     82
      CALL VDIM(D1,D2,NEPR,NL,NLRC,NALFA,NLS,NLF)                       DRIVES     83
      IF(IPLOT.EQ.0) GO TO  1050                                        DRIVES     84
      WRITE(2, 9000 )TITLE                                              DRIVES     85
 9000 FORMAT(18A4)                                                      DRIVES     86
      NFF=NFPP-1                                                        DRIVES     87
      WRITE (2,9001)NFF,NLN,NSL,(SC(K2),K2=1,NSL)                       DRIVES     88
 9001 FORMAT (3I5,3F10.0)                                               DRIVES     89
      WRITE (2,9002) (ANL(K3),K3=NLS,NLF)                               DRIVES     90
 9002 FORMAT(1PE15.6,4E15.6,I5)                                         DRIVES     91
 1050 CONTINUE                                                          DRIVES     92
      DO  1080  I=1,NFPP                                                DRIVES     93
      IF(I/2*2.EQ.I) GO TO  1060                                        DRIVES     94
      WRITE(6, 9003 )TITLE                                              DRIVES     95
 1060 CONTINUE                                                          DRIVES     96
 9003 FORMAT(1H1,30X,18A4)                                              DRIVES     97
C                                                                       DRIVES     98
      DSCIQ=DSCI                                                        DRIVES     99
      IMODEQ=IMODE                                                      DRIVES    100
      DXQ=DX(I)                                                         DRIVES    101
      DYQ=DY(I)                                                         DRIVES    102
      DZQ=DZ(I)                                                         DRIVES    103
      DEPRQ=DEPR(I)                                                     DRIVES    104
      DDEQ=DDE(I)                                                       DRIVES    105
      CALL VALUE2(D1,D2,NEPR,NL,NLRC,NALFA,NLS,NLF)                     DRIVES    106
      DO 1031 J=NLS,NLF                                                 DRIVES    107
      X1(J)=X1Q(J)                                                      DRIVES    108
      X2(J)=X2Q(J)                                                      DRIVES    109
      Y1(J)=Y1Q(J)                                                      DRIVES    110
      Y2(J)=Y2Q(J)                                                      DRIVES    111
      SUM(J)=SUMQ(J)                                                    DRIVES    112
      IEC(J)=IECQ(J)                                                    DRIVES    113
 1031 CONTINUE                                                          DRIVES    114
      DO 1032 J=1,NSL                                                   DRIVES    115
```

```
1032 SLNL(J)=SLNLQ(J)                                                  DRIVES    116
     IF (I .EQ. 1 ) GO TO 1070                                         DRIVES    117
     IF(IPLOT.EQ.0) GO TO  1070                                        DRIVES    118
     WRITE (2,9022) DX(I),DY(I),SPP(I),(SLNL(IZ),IZ=1,NSL)             DRIVES    119
9022 FORMAT(1PE15.6,5E15.6)                                            DRIVES    120
     WRITE(2, 9002 )(X1(K),X2(K),Y1(K),Y2(K),SUM(K),IEC(K),K=NLS,NLF)  DRIVES    121
1070 CONTINUE                                                          DRIVES    122
     WRITE(6, 9004 )                                                   DRIVES    123
9004 FORMAT(1H )                                                       DRIVES    124
     WRITE(6, 9004 )                                                   DRIVES    125
     WRITE(6, 9005 ) DX(I),DY(I),DZ(I),PN(II)                          DRIVES    126
9005 FORMAT(10X,30HAIRCRAFT COORDINATES (X,Y,Z) =,1PE10.3,3H , ,E10.3, DRIVES    127
    * 3H , ,E10.3,5H     (,A3,2H) )                                    DRIVES    128
     WRITE (6,9004)                                                    DRIVES    129
     WRITE(6,8998)SPP(I),PN(II)                                        DRIVES    130
8998 FORMAT(9X,31H DISTANCE ALONG FLIGHT TRACK = ,1PE10.3,2X,A3)       DRIVES    131
     WRITE(6, 9004 )                                                   DRIVES    132
     WRITE (6, 9006 ) DDE(I),DSCI                                      DRIVES    133
9006 FORMAT(10X,23HENGINE ATTITUDE ANGLE =,1PE10.2,33H (DEGREES) , DIRE DRIVES    134
    *CTIVITY ANGLE = ,E10.2,11H (DEGREES)       )                      DRIVES    135
     WRITE(6, 9004 )                                                   DRIVES    136
     WRITE (6, 9007 ) DEPR(I)                                          DRIVES    137
9007 FORMAT(10X,31HENGINE PERFORMANCE PARAMETER = ,1PE10.3)            DRIVES    138
     WRITE(6, 9004 )                                                   DRIVES    139
     DO 1075 JKL=1,NSL                                                 DRIVES    140
     WRITE (6,9008) EM(III),SLNL(JKL),SD(JKL),PN(II)                   DRIVES    141
9008 FORMAT(10X,15HNOISE LEVEL IN ,A3,5HDB = ,F6.1,16H  AT A SIDELINE , DRIVES    142
    *11HDISTANCE OF,1PE10.3,1X,A3)                                     DRIVES    143
1075 CONTINUE                                                          DRIVES    144
     WRITE(6, 9004 )                                                   DRIVES    145
     WRITE(6, 9004 )                                                   DRIVES    146
     WRITE (6, 9009 )                                                  DRIVES    147
9009 FORMAT(34X,14HCONTOUR POINTS    )                                 DRIVES    148
     WRITE(6, 9004 )                                                   DRIVES    149
     WRITE (6, 9010 )                                                  DRIVES    150
9010 FORMAT(2X,                                                        DRIVES    151
    *        110H  NOISE LEVEL      LEFT CONTOUR POINT          RIGHT CONT DRIVES    152
    1OUR POINT          ACCUMULATED AREA          ERROR CODE          )  DRIVES    153
     WRITE (6, 9011 ) EM(III),PN(II),PN(II),PN(II),PN(II),PN(II)        DRIVES    154
9011 FORMAT(5X,1H(,A3,3HDB),10X,1H(,A3,1H),7X,1H(,A3,1H),11X,1H(,A3,   DRIVES    155
    * 1H),7X,1H(,A3,1H),10X,8H(SQUARE ,A3,3H ) )                       DRIVES    156
     WRITE(6, 9004 )                                                   DRIVES    157
     WRITE (6, 9012 )(ANL(J),X1(J),Y1(J),X2(J),Y2(J),SUM(J),IEC(J),J=NL DRIVES    158
    1S,NLF)                                                            DRIVES    159
9012 FORMAT(4X,0PF8.1,7X,1PE10.3,2X,E10.3,6X,E10.3,2X,E10.3,8X,E10.3,  DRIVES    160
    * 14X,I5 )                                                         DRIVES    161
1080 CONTINUE                                                          DRIVES    162
     IF(ISTOP .EQ. 1 ) GO TO  1090                                     DRIVES    163
     GO TO  1000                                                       DRIVES    164
1090 CONTINUE                                                          DRIVES    165
     IF (IPLOT .LE. 0) GO TO  1120                                     DRIVES    166
1100 CONTINUE                                                          DRIVES    167
1110 CONTINUE                                                          DRIVES    168
     CALL PLOTIT(XP,YP,PS,FP,102,2,5)                                  DRIVES    169
1120 CONTINUE                                                          DRIVES    170
     RETURN                                                            DRIVES    171
     END                                                               DRIVES    172
```

```
      SUBROUTINE EDGEDI(NPSIX,PSIX,BCFIF,      USPLIF,CZ,THP,
     1                  GAM,ROPP,THOPP,ETAP,PSIO,PSIOP,BW,TLE,
     2                  PS2)
C
C  TITLE
C     EDGE DIFFRACTION
C
C  PURPOSE
C     THIS SUBROUTINE CALCULATES THE EDGE DIFFRACTION BY THE FOLLOWING
C     CALCULATIONS
C         BANDWIDTH EFFECT TERMS
C         WAVE NUMBER
C         PATH LENGTH DIFFERENCES
C         PHASE DIFFERENCE FOR INCIDENT AND IMAGE FIELDS
C         REFERENCE PRESSURE FOR DIFFRACTED FIELD
C         DFIFRACTED PRESSURE FIELDS
C         LEADING EDGE ADDITIONAL DIFFRACTED PRESSURE FIELD
C         SUMMATION OF DIFFRACTED FIELDS THAT INCLUDES BANDWIDTH EFFECTS
C
C  INPUT - CALLING SEQUENCE
C     NPSIX     NUMBER OF DIRECTIVITY ANGLES PSIX
C     PSIX      DIRECTIVITY ANGLES AT WHICH USPLIF IS GIVEN
C     BCFIF     CENTER FREQUENCY
C     USPLIF    THE USPL FOR THE FREQUENCY BCF
C     CZ        AMBIENT SPEED OF SOUND
C     GAM       TRANSFORMED WAVE NUMBER
C     ROPP      MAGNITUDE OF TRANSFORMED SOURCE POSITION
C     THOPP     PHASE OF TRANSFORMED SOURCE POSITION
C     ETAP      TRANSFORMED OBSERVER ANGLE (ETA )
C     PSIO      DIRECTIVITY ANGLE FOR DIFFRACTED INCIDENT FIELD
C     PSIOP     DIRECTIVITY ANGLE FOR DIFFRACTED IMAGE FIELD
C     BW        FILTER BAND WIDTH
C     TLE       LEADING EDGE TERM
C
C OUTPUT
C     PS2       SHIELDED MEAN SQUARE PRESSURE
C
      DIMENSION PSIX(1),USPLIF(1),
     1          A(3),B(3),C(3),D(3)
      COMPLEX CFI,ALP1,BET1,BET2
      DIMENSION RALP1(2),RBET1(2),RBET2(2)
      EQUIVALENCE (RALP1(1),ALP1), (RBET1(1),BET1), (RBET2(1),BET2)
      COMPLEX CPOLAR
      DATA DEGRAD, RADDEG, PI, EPS /1.745329251943E-2, 57.295779513082,
     * 3.1415926535898, 1.E-10/
C
C     COMPUTE BANDWIDTH EFFECT ERM
C
      Q   = 10.**(.5*BW)
      FA  = .5*( Q + 1./Q )
      FB  = .5*( Q - 1./Q )
C
C     COMPUTE WAVENUMBER
C
      WKP = 2.*PI*GAM*BCFIF / CZ
C
C     COMPUTE PATHLENGTH DIFFERENCES
```

```
C
      A2=ABS(2.*WKP*RCPP*COS(ETAP*DEGRAD))
      BL  = SIN( .5*(THP - THOPP)*DEGRAD )
      CL  = SIN( .5*(THP + THOPP)*DEGRAD )
      AL  = SQRT( A2 )
      AB  =AL*BL
      AC  =AL*CL
C
C     COMPUTE PHASE DIFFERNECE FOR INCIDENT AND IMAGE FIELDS
C
      DL  = SIN( THP*DEGRAD ) * SIN( THCPP*DEGRAD )
      GAM1= A2*DL
C
C     COMPUTE REFERENCE PRESSURE FOR DIFFRACTED FIELD
C     A TABLE LOOK-UP IS PERFORMED ON PSIX VERSUS USPLIF USING TBLU1
C
      USPLO  = TBLU1(PSIC,PSIX,USPLIF,2,NPSIX)
      USPLOP = TBLU1(PSICP,PSIX,USPLIF,2,NPSIX)
      PO     = 10.**(.05*USPLO)
      POP    = 10.**(.05*USPLOP)
C
C     COMPUTE DIFFRACTED PRESSURE FIELDS WHERE SUBROUTINE CFI IS USED
C     WHICH COMPUTES THE FRESNEL INTEGRAL TIMES THE SQUARE ROOT OF
C     THE IMAGINARY UNIT TIMES PI
C
      ALP1= PO * CFI( AB )
      BET1= POP* CFI( AC )
C
C     CONTINUE WHEN A2 IS NOT NEAR ZERO
C
  100 ALP1=CPOLAR(ALP1)
      BET1=CPOLAR(BET1)
      N = 1
      A(1)=RALP1(1)*RALP1(1) + RBET1(1)*RBET1(1)
      B(1)= 2.* RALP1(1)*RBET1(1)
      C(1) = GAM1
      D(1) = RBET1(2) - RALP1(2)
C
C     COMPUTE LEADING EDGE ADDITIONAL DIFFRACTED PRESSURE FIELD
C
      IF(AL.EQ.0.)GO TO 200
      IF( TLE.EQ.0. ) GO TO 200
      N = 3
      BET2=0.3989423*TLE*( (PO*BL+POP*CL)/AL )*CMPLX(1.,1.)
      BET2=CPOLAR(BET2)
      A(1) = RALP1(1)*RALP1(1)
      A(2) = RBET1(1)*RBET1(1)
      A(3) = RBET2(1)*RBET2(1)
      B(2) = 2.*RALP1(1)*RBET2(1)
      B(3) = 2.*RBET1(1)*RBET2(1)
      C(2)=-A2*0.5
      C(3) = C(2) - C(1)
      D(2) = RBET2(2) - RALP1(2)
      D(3) = RBET2(2) - RBET1(2)
C
C     SUM DIFFRACTED FIELDS
C     DETERMINE SHIELDED MEAN SQUARE PRESSURE
```

```
C                                                                       EDGEDI    116
  200 PS2 = 0.                                                          EDGEDI    117
      DO 300 J=1,N                                                      EDGEDI    118
      TERM=B(J)*COS(C(J)*FA-D(J))                                       EDGEDI    119
      CJFB = C(J)*FB                                                    EDGEDI    120
      IF( CJFB.EQ.0.) GO TO 290                                         EDGEDI    121
      TERM = TERM * SIN( CJFB ) / CJFB                                  EDGEDI    122
  290 PS2=PS2+TERM+A(J)                                                 EDGEDI    123
  300 CONTINUE                                                          EDGEDI    124
C                                                                       EDGEDI    125
 1000 RETURN                                                            EDGEDI    126
      END                                                               EDGEDI    127
```

```
      SUBROUTINE EEGEOM(IEDGE,ITYPE,                                    EEGEOM
     1                  U,V,W,E1,E2,E3,RC,THO,ROV,Q,DLT,ALP,ALPO,AF)    EEGEOM
C                                                                       EEGEOM
C  TITLE                                                                EEGEOM
C     ENGINE EDGE GEOMETRY                                              EEGEOM
C                                                                       EEGEOM
C  PURPOSE                                                              EEGEOM
C     THIS SUBROUTINE CALCULATES ENGINE/EDGE GEOMETRY WHICH CONSISTS OF EEGEOM
C     CALCULATING THE FOLLOWING                                         EEGEOM
C         UNIT VECTORS FOR WING EDGES AND ENGINE RELATIVE TO HALF PLANE EEGEOM
C         ENGINE CENTERLINE ORIENTATION RELATIVE TO EDGES               EEGEOM
C         FLOW INCIDENT ANGLE                                           EEGEOM
C         INLET OR NOZZLE COORDINATES RELATIVE TO EDGE                  EEGEOM
C                                                                       EEGEOM
C  INPUT - CALL SEQUENCE                                                EEGEOM
C     IEDGE  - = 1 FOR TRAILING EDGE                                    EEGEOM
C                2 FOR  LEADING EDGE                                    EEGEOM
C                3 FOR TIP EDGE                                         EEGEOM
C     ITYPE  - = 4 FOR INLET FAN NOISE                                  EEGEOM
C              NOT 4 FOR DISCHARGE TURBOMACHINERY NOISE                 EEGEOM
C                                                                       EEGEOM
C  INPUT - COMMON                                                       EEGEOM
C         EWGEO  - ALL VARIABLES ARE USED                               EEGEOM
C     REFRAC - IWED ONLY IS USED                                        EEGEOM
C                                                                       EEGEOM
C  OUTPUT                                                               EEGEOM
C     U,V,W     UNIT VECTORS FOR WING EDGE                              EEGEOM
C     E1,E2,E3  COORDINATE SYSTEM UNIT VECTORS FIXED TO ENGINE SUCH THAT EEGEOM
C               E1 IS PARALLEL TO HALF-PLANE                            EEGEOM
C     RC,THO    POLAR COORDINATES OF INLET OR NOZZLE RELATIVE TO EDGE   EEGEOM
C     ROV       VECTOR OF INLET OR NOZZLE                               EEGEOM
C     Q         VECTOR DEPENDING ON EDGE TYPE                           EEGEOM
C     DLT,ALP   ENGINE CENTERLINE ORIENTATION ANGLES RELATIVE TO EDGE   EEGEOM
C     ALPO      FLOW  INCIDENT ANGLE                                    EEGEOM
C                                                                       EEGEOM
C  NOTE                                                                 EEGEOM
C     ALL ANGLES INPUT AND OUTPUT ARE IN DEGREES                        EEGEOM
C                                                                       EEGEOM
      DIMENSION U(3),V(3),W(3),E1(3),E2(3),E3(3),ROV(3),                EEGEOM
     1          Q(3),AF(3)                                              EEGEOM
C                                                                       EEGEOM
      COMMON/EWGEO/ SWPTE,SWPLE,DIHED,DDSD,DDX1D,DDX2D,DDXOD,DDY1D,     EEGEOM
     1              DDY2D,DDYOD,DDLD,DIANI                              EEGEOM
      COMMON/REFRAC/EMJ,TSTSO,IWED(3),CFASS,BETA(10),CPSIO(10),NASRC    EEGEOM
C                                                                       EEGEOM
      DATA DEGRAD, RADDEG /1.745329251943E-2, 57.295779513082/          EEGEOM
C                                                                       EEGEOM
C     UNIT VECTOR COMPUTATION                                           EEGEOM
C                                                                       EEGEOM
C         COMPUTE U AND V DEPENDING UPON EDGE TYPE                      EEGEOM
C                                                                       EEGEOM
      IF(       IEDGE -2 ) 100,200,400                                  EEGEOM
C                                                                       EEGEOM
C               COMPUTE Q VECTOR FOR THE TRAILING EDGE                  EEGEOM
C                                                                       EEGEOM
  100 Q(1) = 0.                                                         EEGEOM
      Q(2) = -DDX1D                                                     EEGEOM
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      Q(3) = -DDY1D                                                     EEGEOM
      ALP  = -SWPTE                                                     EEGEOM
      GO TO 300                                                         EEGEOM
C                                                                       EEGEOM
C               COMPUTE Q VECTOR FOR THE LEADING EDGE                   EEGEOM
C                                                                       EEGEOM
  200 Q(1) = 0.                                                         EEGEOM
      Q(2) = DDX2D                                                      EEGEOM
      Q(3) = -DDY2D                                                     EEGEOM
      ALP  = -SWPLE                                                     EEGEOM
C                                                                       EEGEOM
C               COMPUTE U AND V FOR TRAILING OR LEADING EDGE            EEGEOM
C                                                                       EEGEOM
  300 SN   = SIGN(1.,Q(2))                                              EEGEOM
      U(1) = SN*COS( ALP*DEGRAD )                                       EEGEOM
      U(2) = SN*SIN( ALP*DEGRAD )                                       EEGEOM
      U(3) = U(1) * TAN( DIHED*DEGRAD )                                 EEGEOM
      CALL VECN( U )                                                    EEGEOM
      DOT   = DOTP(Q,U)                                                 EEGEOM
      V(1) = Q(1) - DOT *U(1)                                           EEGEOM
      V(2) = Q(2) - DOT*U(2)                                            EEGEOM
      V(3) = Q(3) - DOT *U(3)                                           EEGEOM
      CALL VECN( V )                                                    EEGEOM
      GO TO 500                                                         EEGEOM
C                                                                       EEGEOM
C               COMPUTE U AND V FOR TIP EDGE                            EEGEOM
C                                                                       EEGEOM
  400 BETAX= ATAN( (DDY1D-DDY2D) / ( DDX1D+DDX2D ) )                    EEGEOM
      U(1) = 0.                                                         EEGEOM
      U(2) = - COS( BETAX)                                              EEGEOM
      U(3) = - SIN( BETAX)                                              EEGEOM
      V(1) = COS( DIHED*DEGRAD )                                        EEGEOM
      V(2) = 0.                                                         EEGEOM
      V(3) = SIN( DIHED*DEGRAD )                                        EEGEOM
C                                                                       EEGEOM
C          COMPUTE W, E1, E2 AND E3                                     EEGEOM
C                                                                       EEGEOM
  500 CALL CROSP(W,U,V)                                                 EEGEOM
      E2(1) = 0.                                                        EEGEOM
      E2(2) = 1.                                                        EEGEOM
      E2(3) = 0.                                                        EEGEOM
      CALL CROSP(E1,E2,W)                                               EEGEOM
      CALL VECN(E1)                                                     EEGEOM
      CALL CROSP(E3,E1,E2)                                              EEGEOM
C                                                                       EEGEOM
C     COMPUTE ENGINE CENTERLINE ORIENTATION ANGLES RELATIVE TO EDGE     EEGEOM
C                                                                       EEGEOM
      DLT = ATAN2( W(2), -V(2) ) *RADDEG                                EEGEOM
      ALP = ASIN( U(2) ) *RADDEG                                        EEGEOM
C                                                                       EEGEOM
C     COMPUTE FLOW INCIDENT ANGLE                                       EEGEOM
C                                                                       EEGEOM
      DOT   = DOTP(E2,W)                                                EEGEOM
      Q(1) = DOT   * W(1) - E2(1)                                       EEGEOM
      Q(2) = DOT    * W(2) - E2(2)                                      EEGEOM
      Q(3) = DOT   * W(3) - E2(3)                                       EEGEOM
      CALL VECN( Q )                                                    EEGEOM
```

```
      ALPO = ACOS( DOTP(Q,V) ) * RADDEG                                 EEGEOM    116
C                                                                       EEGEOM    117
C     STORE UNIT VECTOR IN DIRECTION OF AMBIENT FLOW                    EEGEOM    118
C                                                                       EEGEOM    119
      AF(1)=Q(1)                                                        EEGEOM    120
      AF(2)=Q(2)                                                        EEGEOM    121
      AF(3)=Q(3)                                                        EEGEOM    122
C                                                                       EEGEOM    123
C     COMPUTE NOZZLE OR INLET POLAR COORDINATES RELATIVE TO EDGE        EEGEOM    124
C                                                                       EEGEOM    125
      XOP = DDXOD                                                       EEGEOM    126
      IF( ITYPE.EQ.4 ) XOP = XOP - DDLC                                 EEGEOM    127
C                                                                       EEGEOM    128
C         COMPUTE VECTOR DEPENDING UPON EDGE TYPE                       EEGEOM    129
C                                                                       EEGEOM    130
      IF( IEDGE - 2 )700,800,900                                        EEGEOM    131
C                                                                       EEGEOM    132
C               TRAILING EDGE                                           EEGEOM    133
C                                                                       EEGEOM    134
  700 Q(1) = 0.                                                         EEGEOM    135
      Q(2) = -( DDX1D - XOP )                                           EEGEOM    136
      Q(3) = -( DDY1D + DDYOD )                                         EEGEOM    137
      GO TO 1000                                                        EEGEOM    138
C                                                                       EEGEOM    139
C               LEADING EDGE                                            EEGEOM    140
C                                                                       EEGEOM    141
  800 Q(1) = 0.                                                         EEGEOM    142
      Q(2) = DDX2D + XOP                                                EEGEOM    143
      Q(3) = -( DDY2D + DDYOD )                                         EEGEOM    144
      GO TO 1000                                                        EEGEOM    145
C                                                                       EEGEOM    146
C               TIP EDGE                                                EEGEOM    147
C                                                                       EEGEOM    148
  900 Q(1) = DDSD                                                       EEGEOM    149
      Q(2) = XOP                                                        EEGEOM    150
      Q(3) = - DDYOD + DDSD* TAN( DIHED*DEGRAD )                        EEGEOM    151
C                                                                       EEGEOM    152
C         COMPUTE THE COORDINATES                                       EEGEOM    153
C                                                                       EEGEOM    154
 1000 DOT  =  DOTP(Q, U) * DIANI                                        EEGEOM    155
      DO  1010  I = 1,3                                                 EEGEOM    156
      Q(I)  =  Q(I) * DIANI                                             EEGEOM    157
      ROV(I)  =  Q(I) - DOT * U(I)                                      EEGEOM    158
 1010 CONTINUE                                                          EEGEOM    159
      RO  =  SQRT(ROV(1)*ROV(1) + ROV(2)*ROV(2) + ROV(3)*ROV(3))        EEGEOM    160
      THO = ACOS( DOTP(ROV,V) / RO ) *RADDEG                            EEGEOM    161
C                                                                       EEGEOM    162
      RETURN                                                            EEGEOM    163
      END                                                               EEGEOM    164
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      SUBROUTINE EGACAL(D, BETA, NFB, F, ATN)                           EGACAL     2
C     VERSION B    DATE 19 DEC 72.                                      EGACAL     3
C                                                                       EGACAL     4
C     REFERENCE- D.G. DUNN, /NOTICE OF REVISIONS FOR EGA ROUTINES/,     EGACAL     5
C                TECHNICAL MEMO ANSFTM-2, 14 DEC 1972.                  EGACAL     6
C                                                                       EGACAL     7
C     PROGRAM TO CALCULATE THE EXTRA GROUND ATTENUATION DUE TO THE TUR- EGACAL     8
C     BULENT BOUNDARY LAYER OF THE AIR NEAR THE GROUND PLANE. REFER TO  EGACAL     9
C     FIGURE 3 OF SAE-AIR876A AND FIGURE 4 OF SAE-AIR923.               EGACAL    10
C     THE RMS CALCULATION ERROR IS LESS THAN 0.1 DB WITH RESPECT TO     EGACAL    11
C     FIGURE 3 OF SAE-AIR876A. THE DECAY TERM FOR ELEVATION ANGLE BETA  EGACAL    12
C     REPRESENTS THE BEST FIT FOR FIGURE 4 OF SAE-AIR923.               EGACAL    13
C                                                                       EGACAL    14
C     INPUTS. D = DISTANCE BETWEEN SOURCE AND OBSERVER IN FT.           EGACAL    15
C             BETA = ELEVATION ANGLE IN DEG BETWEEN THE HORIZONTAL      EGACAL    16
C                    GROUND PLANE AND THE OBSERVERS LINE OF SIGHT TO    EGACAL    17
C                    THE NOISE SOURCE (OBSERVER ON THE GROUND)          EGACAL    18
C             NFB =  NUMBER OF FREQUENCY BANDS                          EGACAL    19
C             F   =  AN ARRAY OF (NFB) BAND CENTER FREQUENCIES IN HZ.   EGACAL    20
C                                                                       EGACAL    21
C     OUTPUT. ATN =  THE ARRAY OF EXTRA GROUND ATTENUATION VALUES FOR   EGACAL    22
C                    EACH FREQUENCY BAND.                               EGACAL    23
C                                                                       EGACAL    24
C     ALLOCATE STORAGE FOR OTHER ARRAYS                                 EGACAL    25
      DIMENSION F(1),ATN(1), EGA(7),C1(6),C2(6),C3(6),C4(6),CO(6),C(8,6) EGACAL    26
     1,DANG(5),DF(5,6)                                                  EGACAL    27
      REAL LBCF(7)                                                      EGACAL    28
      DOUBLE PRECISION SUM, POW, DTERM                                  EGACAL    29
      DATA LBCF /0.,1.724546,2.025592,2.326602,2.627632,2.928667,       EGACAL    30
     1 3.229682/                                                        EGACAL    31
      DATA EGA /7*0./                                                   EGACAL    32
      DATA DANG /0., 2., 10., 20., 45./                                 EGACAL    33
      DATA DF /1.,1.,.186,.163,0., 1.,1.,.297,.183,0., 1.,1.,.352,.188, EGACAL    34
     1 0., 1.,1.,.406,.198,0., 1.,1.,.468,.214,0., 1.,1.,.534,.235,0./  EGACAL    35
      DATA CO /2.5500705,3.7005697,4.854333,6.1758828,7.3126577,        EGACAL    36
     1 8.7609923/                                                       EGACAL    37
      DATA C/7.4685316,9.8170563,-116.11669,-513.50033, 3598.272,25113.8 EGACAL    38
     227,-87306.197,-795555.28,9.0470852,20.067737,-121.04562,-1147.6826 EGACAL    39
     3,3896.0422,58647.28,-102929.41,-1900833.5, 11.494171, 22.452758,  EGACAL    40
     4-131.24292,-1178.1871, 4059.3326, 60285.99,-109376.69,-2006965.9, EGACAL    41
     514.933911, 23.003503,-202.45769,-1217.1785, 6686.1366, 60729.708, EGACAL    42
     6-178958.39,-1992028.1, 16.609834, 18.789958,-187.864,-797.87204,  EGACAL    43
     75607.9789, 35470.374,-139688.42,-1079105.8, 19.031016, 13.761267, EGACAL    44
     8-243.34348,-832.97531, 7773.8292, 45614.595,-203312.87,-1620027.1/ EGACAL    45
      DATA C1 /2.4072E-3,3.4204E-3,4.608E-3,5.872E-3,7.24E-3,8.192E-3/  EGACAL    46
      DATA C2 /5.0,7.2,10.0,12.0,15.0,16.0/                             EGACAL    47
      DATA C3 /-7.966,-10.276,-7.443,-8.124,-4.632,-5.356/              EGACAL    48
      DATA C4 /3.041,3.075,3.1303,3.1205,3.0196,2.9982/                 EGACAL    49
      X  =  ABS(D)                                                      EGACAL    50
      IF  (X - 1.)  2, 2, 1                                             EGACAL    51
    1 J  =  BETA / 90.                                                  EGACAL    52
      ANG  =  ABS(BETA - 90. * FLOAT(J))                                EGACAL    53
      IF  (MOD(J,2) .NE. 0)  ANG = 90. - ANG                            EGACAL    54
      IF  (ANG - 45.)  4, 2, 2                                          EGACAL    55
    2 DO  3  I = 1,NFB                                                  EGACAL    56
      ATN(I)  =  0.                                                     EGACAL    57
    3 CONTINUE                                                          EGACAL    58
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      GO TO 20                                                          EGACAL     59
    4 IF  (X - 250.)  5, 5, 7                                           EGACAL     60
    5 DO  6  J = 1,6                                                    EGACAL     61
      EGA(J+1)  =  C1(J) * X                                            EGACAL     62
    6 CONTINUE                                                          EGACAL     63
      GO TO 13                                                          EGACAL     64
    7 X = ALOG10(X)                                                     EGACAL     65
      IF  (X - 3.6)  10, 8, 8                                           EGACAL     66
    8 DO  9  J = 1,6                                                    EGACAL     67
      EGA(J+1)  =  C2(J) * (1. - EXP(C3(J) * (X - C4(J))))              EGACAL     68
    9 CONTINUE                                                          EGACAL     69
      GO TO 13                                                          EGACAL     70
C                                                                       EGACAL     71
C  COMPUTE EGA BY THE TAYLOR SERIES LEAST-SQUARE-FIT.                   EGACAL     72
   10 N  =  8                                                           EGACAL     73
      XX  =  X - 3.0789521                                              EGACAL     74
      DO  12  J = 1,6                                                   EGACAL     75
      POW  =  1.                                                        EGACAL     76
      SUM  =  CO(J)                                                     EGACAL     77
      DO  11  I = 1,N                                                   EGACAL     78
      POW  =  POW * XX / FLOAT(I)                                       EGACAL     79
      DTERM  =  POW * C(I,J)                                            EGACAL     80
   11 SUM  =  SUM + DTERM                                               EGACAL     81
      EGA(J+1)  =  SUM                                                  EGACAL     82
   12 CONTINUE                                                          EGACAL     83
   13 DO  14  J = 1,6                                                   EGACAL     84
      EGA(J+1)  =  EGA(J+1) * TBLL1(ANG, DANG, DF(1,J), 1, 5)           EGACAL     85
   14 CONTINUE                                                          EGACAL     86
      DO  19  I = 1,NFB                                                 EGACAL     87
      X  =  ABS(F(I))                                                   EGACAL     88
      IF  (X - 1.)  15, 15, 16                                          EGACAL     89
   15 ATN(I) = 0.                                                       EGACAL     90
      GO TO 19                                                          EGACAL     91
   16 X  =  ALOG10(X)                                                   EGACAL     92
      IF  (X - LBCF(7))  18, 17, 17                                     EGACAL     93
   17 ATN(I)  =  EGA(7)                                                 EGACAL     94
      GO TO 19                                                          EGACAL     95
   18 ATN(I)  =  TBLU1(X, LBCF, EGA, 1, 7)                              EGACAL     96
   19 CONTINUE                                                          EGACAL     97
   20 RETURN                                                            EGACAL     98
      END                                                               EGACAL     99
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      SUBROUTINE EJECT                                                  EJECT     2
C AUTHOR              D. F. MELDRUM                                     EJECT     3
C                                                                       EJECT     4
C PURPOSE             TO PREDICT JET NOISE FOR MULTIPLE ELEMENT/TUBE    EJECT     5
C                     NOZZLES FOR THE PHASE B                           EJECT     6
C                     NASA-AMES FOOTPRINT CONTRACT NAS2-6969.           EJECT     7
C                                                                       EJECT     8
C METHOD              AS DESCRIBED IN REFERENCE 1).                     EJECT     9
C                                                                       EJECT    10
C INPUTS              VIA LABLED COMMON                                 EJECT    11
C                                                                       EJECT    12
C                                                                       EJECT    13
C                     VIA LABLED COMMON SWITCH                          EJECT    14
C                                                                       EJECT    15
C                     NUMENG     NUMBER OF NOISE SOURCES OF THE SAME    EJECT    16
C                                NOISE TYPE.                            EJECT    17
C                                                                       EJECT    18
C                     VIA LABLED COMMON GCOMON                          EJECT    19
C                                                                       EJECT    20
C                     NOF        1/3 OCTAVE OF FULL OCTAVE SWITCH       EJECT    21
C                                OR NUMBER OF FREQUENCY BANDS (8 OR 24) EJECT    22
C                     RETA(24)   DIRECTIVITY ANGLES                     EJECT    23
C                                                                       EJECT    24
C                     VIA LABLED COMMON GPRAM                           EJECT    25
C                                                                       EJECT    26
C                     AMACH      MACH NUMBER OF THE AIRCRAFT            EJECT    27
C                     NOBS       NUMBER OF OBSERVER POSITIONS           EJECT    28
C                                                                       EJECT    29
C                     VIA LABLED COMMON SUMSPL                          EJECT    30
C                                                                       EJECT    31
C                     SSPL       CURRENT TOTAL PREDICTED NOISE FOR NOF  EJECT    32
C                                (8 OR 24) FREQUENCIES, AT NOBS OBSERVER EJECT   33
C                                POSITIONS FOR 17 DIRECTIVITY ANGLES.   EJECT    34
C                                                                       EJECT    35
C                     VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES EJECT 36
C                                                                       EJECT    37
C                     PSI        17 DIRECTIVITY ANGLES FOR EACH OF      EJECT    38
C                                NOBS OBSERVER POSITIONS.               EJECT    39
C                     PSIO       17 DIRECTIVITY ANGLE PROJECTIONS FOR   EJECT    40
C                                EACH OF NOBS OBSERVER POSITIONS        EJECT    41
C                     BETA       ELEVATION ANGLE PROJECTION FOR EACH    EJECT    42
C                                OF NOBS OBSERVER POSITIONS.            EJECT    43
C                                                                       EJECT    44
C                     EACH COMPONENT IS WRITTEN ON TAPE OR FILE 10      EJECT    45
C                     FOR EACH OF NOF BANDS FOR EACH OF NOBS OBSERVER   EJECT    46
C                     POSITIONS.                                        EJECT    47
C                                                                       EJECT    48
C OUTPUTS             VIA LABLED COMMON SUMSPL                          EJECT    49
C                                                                       EJECT    50
C                     SSPL       CURRENT TOTAL PREDICTED NOISE FOR      EJECT    51
C                                8 OR 24 FREQUENCIES, AT NOBS OBSERVER  EJECT    52
C                                POSITIONS FOR 17 DIRECTIVITY ANGLES.   EJECT    53
C                                                                       EJECT    54
C                     VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES EJECT 55
C                                                                       EJECT    56
C                     PSI        17 DIRECTIVITY ANGLES FOR EACH OF      EJECT    57
C                                NOBS OBSERVER POSITIONS.               EJECT    58
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C                    PSIO       17 DIRECTIVITY ANGLE PROJECTIONS FOR        EJECT      59
C                               EACH OF NOBS OBSERVER POSITIONS             EJECT      60
C                    BETA       ELEVATION ANGLE PROJECTION FOR EACH         EJECT      61
C                               OF NOBS OBSERVER POSITIONS.                 EJECT      62
C                                                                           EJECT      63
C                                                                           EJECT      64
C FUNCTION SUBPROGM  COS        ESHLDG     PWRSUM                           EJECT      65
C                                                                           EJECT      66
C SUBROUTINES        ANGLES     MENCZZ         ZERO                        EJECT      67
C                                                                           EJECT      68
C                                                                           EJECT      69
C                                                                           EJECT      70
      COMMON /EJECTD/ IEJECT,NUMTBS,AREA,AR,TS,AMACHJ,AMACHS,CV,            EJECT      71
     *  PS,PAREA,PTS,PMACHJ,PCV,EJANG,                                      EJECT      72
     *ICOR9,LIN9,NTF9,IMA9,LGMS,NWLS,ICF9,ILAYS,                            EJECT      73
     *TF9(10),PCTA9(10),PLAS(10),                                           EJECT      74
     *ELOH9,EDH9,RIW9(10),TL9(10),CFS,FM9                                   EJECT      75
C                                                                           EJECT      76
C                                                                           EJECT      77
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICOF,IPRT(7),ICN(13),NLOPT             EJECT      78
C                                                                           EJECT      79
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                    EJECT      80
C     CONSTANTS USED IN INTERNAL CALCULATIONS                               EJECT      81
C                                                                           EJECT      82
      COMMON /GCONST/ IN,IO,IT1,IT2,FO,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,      EJECT      83
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,PI,P33,P5,P001,     EJECT      84
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI      EJECT      85
C                                                                           EJECT      86
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                     EJECT      87
C                                                                           EJECT      88
      COMMON /GCOMON/ NOF,NK,BOF(24),TSPL(24,10,17),SPLT(24,17),            EJECT      89
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)                         EJECT      90
      COMMON/SUMSPL/SSPL(24,10,17)                                          EJECT      91
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                        EJECT      92
C                                                                           EJECT      93
C     FREQUENCY BANDS USED BY PROGRAM                                       EJECT      94
C                                                                           EJECT      95
      COMMON /GFREQ/ CFREQ(24),LFREQ(25),PFREQ(24)                          EJECT      96
C                                                                           EJECT      97
C     GENERAL INPUT PARAMETERS                                              EJECT      98
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)                       EJECT      99
C                                                                           EJECT     100
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),ITENG,IUNIT       EJECT     101
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)           EJECT     102
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP        EJECT     103
     *     ,CPRES,CRHUMD,IEGA,IGOR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),       EJECT     104
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF             EJECT     105
C                                                                           EJECT     106
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                    EJECT     107
C                                                                           EJECT     108
      COMMON /GEOMD/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),           EJECT     109
     * B1(10,17),B2(10,17),TDS(17,10),TFD(17,10),IRR(10,17)                 EJECT     110
     *,APP,TP,RHP,APC,TC,RHC,CA,CZ,TSP(17,10),CCV                           EJECT     111
C                                                                           EJECT     112
C     CONVERSION CONSTANTS                                                  EJECT     113
C                                                                           EJECT     114
      COMMON/GCONVC/C(2,10),SLDISX(10)                                      EJECT     115
```

```
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                             EJECT
C                                                                       EJECT
C                                                                       EJECT
      DIMENSION PSZ(24,17)                                              EJECT
C                                                                       EJECT
      ICN(9)=ICN(9)+1                                                   EJECT
C                                                                       EJECT
C                                                                       EJECT
      DELTA=EJANG*RPD                                                   EJECT
      ALPHA=DELTA-ATAN(SLOPE)                                           EJECT
      AN=NUMTBS                                                         EJECT
      CALL ANGLES(NOBS,DELTA)                                           EJECT
C                                                                       EJECT
C                                                                       EJECT
C     LOOP FOR THE NUMBER OF OBSERVER POSITIONS                         EJECT
C                                                                       EJECT
   40 DO 1000 M=1,NOBS                                                  EJECT
C                                                                       EJECT
C                                                                       EJECT
C     CALCULATE THE PRE MERGE JET NOISE PREDICTION                      EJECT
C                                                                       EJECT
      CALL MENOZZ(IEJECT,1,AREA,TS,AMACHJ,CV,AN,AMACHS,AR,PS,CZ,        EJECT
     *          APO,PSI(1,M ),CFREQ(1),SPLT(1,1),FBPF)                  EJECT
      CALL LINCOR(SPZ(1,1),IMAS,LGMS,ELCHS,ECHS,NWLS,R1WS,TLS,          EJECT
     *ILAYS,FMS,IDPS,PSI(1,M),NCF,BCF,PLAS,CFS,PCTAS,NTFS,TFS,          EJECT
     *DOPSF,SPL2,ICORS,IB(1,1,ITYPE),LINS,FBPF)                         EJECT
C                                                                       EJECT
C                                                                       EJECT
   45 CONTINUE                                                          EJECT
C                                                                       EJECT
C     CONVERT TO A UNIT OR INDEXED SPECTRA                              EJECT
C                                                                       EJECT
      ENG=NENG                                                          EJECT
      IF(ENG.LE.0.0) ENG=1.0                                            EJECT
      DO 50 J=1,17                                                      EJECT
      ELVANG=BETA(J,M)                                                  EJECT
      DANGLE=PSI0(J,M)                                                  EJECT
      ENS=ESHLOG(DANGLE,ELVANG,ENG)                                     EJECT
      DO 50 K=1,24                                                      EJECT
   50 SPLT(K,J)=SPLT(K,J)-ENS                                           EJECT
      IF(NCF.EQ.24) GO TO 300                                           EJECT
C                                                                       EJECT
C     CONVERT 1/3 OCTAVE TO FULL OCTAVE                                 EJECT
C                                                                       EJECT
      DO 200 J=1,17                                                     EJECT
      DO 200 K=1,8                                                      EJECT
      SPLT(K,J)  =  SPLT(3*K-1,J) + 4.8                                 EJECT
  200 CONTINUE                                                          EJECT
C                                                                       EJECT
C                                                                       EJECT
C     ADD TO CURRENT TOTAL AND WRITE ON TAPE 10                         EJECT
C                                                                       EJECT
C                                                                       EJECT
  300 DO 400 J=1,NCF                                                    EJECT
      DO 350 K=1,17                                                     EJECT
  350 SPLT(J,K)=SPLT(J,K)-SPZ(J,K)                                      EJECT
 400  CONTINUE                                                          EJECT
```

```
C                                                                       EJECT
C     CALCULATE THE POSTMERGE JET NOISE PREDICTION                      EJECT
C                                                                       EJECT
      CALL MENOZZ(IEJECT,2,AREA,PTS,PMACHJ,PCV,ALPHA,AMACH,AR,PAREA,    EJECT
     *            CZ,APO,PSI(1,M),CFREQ(1),PSZ(1,1),FBPF)               EJECT
C                                                                       EJECT
C                                                                       EJECT
C                                                                       EJECT
C     CONVERT TO A UNIT CR INDEXED SPECTRA                              EJECT
C                                                                       EJECT
      ENG=NENG                                                          EJECT
      IF(ENG.LE.0.0) ENG=1.0                                            EJECT
      DO 550 J=1,17                                                     EJECT
      ELVANG=BETA(J,M)                                                  EJECT
      DANGLE=PSIO(J,M)                                                  EJECT
      ENS=ESHLDG(DANGLE,ELVANG,ENG)                                     EJECT
      DO 550 K=1,24                                                     EJECT
  550 PSZ(K,J)=PSZ(K,J)-ENS                                             EJECT
      IF(NCF.EQ.24) GO TO 700                                           EJECT
C                                                                       EJECT
C     CONVERT 1/3 OCTAVE TO FULL OCTAVE                                 EJECT
C                                                                       EJECT
      DO 600 J=1,17                                                     EJECT
      DO 600 K=1,8                                                      EJECT
      PSZ(K,J)  =  PSZ(3*K-1,J) + 4.8                                   EJECT
  600 CONTINUE                                                          EJECT
C                                                                       EJECT
C                                                                       EJECT
C     ADD TO CURRENT TOTAL AND WRITE ON TAPE 10                         EJECT
C                                                                       EJECT
C                                                                       EJECT
  700 DO 800 J=1,NCF                                                    EJECT
      DO 750 K=1,17                                                     EJECT
      SPLT(J,K)=PWRSUM(SPLT(J,K),PSZ(J,K))                              EJECT
  750 SSPL(J,M,K)=PWRSUM(SSPL(J,M,K),SPLT(J,K))                         EJECT
 800  CONTINUE                                                          EJECT
      IF(IPRT(7).NE.7)GO TO 410                                         EJECT
      CALL NOISO(IPRT(7),M,NK,10,CHIN,ILNIT,SLOISX(M),PFREQ,SPLT(1,1),  EJECT
     *  NCF,ITYPE)                                                      EJECT
 410  CONTINUE                                                          EJECT
      DO 360 JC=1,NCF                                                   EJECT
      DO 360 KC=1,17                                                    EJECT
 360  SPLT(JC,KC)=SPLT(JC,KC)-TSPL(JC,M,KC)                             EJECT
      CALL PNLSUB(SPLT(1,1),PSPL(1,M),TPD(1,M),EPNL(1,M),SPL2,          EJECT
     *TEPNL(1,M),NK,BCG,TCG,FLR,M,NOBS,IRR(M,1))                        EJECT
      IF(IPRT(3).NE.3)GO TO 1000                                        EJECT
      CALL NOISO(IPRT(3),M,NK,12,CHIN,ILNIT,SLOISX(M),PFREQ,            EJECT
     *   SPLT(1,1),NCF,ITYPE)                                           EJECT
C                                                                       EJECT
C                                                                       EJECT
C                                                                       EJECT
 1000 CONTINUE                                                          EJECT
      RETURN                                                            EJECT
      END                                                               EJECT
```

```
      SUBROUTINE EDGEOM(X,Y,ZEDN,DELT3,U,V,W,THO,DLT,ALP,                EDGEOM      2
     1                  ETA,TH,PSIO,PN)                                  EDGEOM      3
C                                                                       EDGEOM      4
C  TITLE                                                                EDGEOM      5
C     EDGE/OBSERVER GEOMETRY                                            EDGEOM      6
C                                                                       EDGEOM      7
C  PURPOSE                                                              EDGEOM      8
C     THIS SUBROUTINE DEFINES THE EDGE/OBSERVER GEOMETRY CONSISTING OF  EDGEOM      9
C     THE FOLLOWING BASIC STEPS                                         EDGEOM     10
C         UNIT VECTOR FOR SOUND PROPAGATION                             EDGEOM     11
C         DIRECTION ANGLES RELATIVE TO EDGE                             EDGEOM     12
C         DIRECTIVITY ANGLE GRAZING WING EDGE                           EDGEOM     13
C                                                                       EDGEOM     14
C  INPUT - CALL SEQUENCE                                                EDGEOM     15
C     X,Y,ZEDN AIRCRAFT COORDINATES RELATIVE TO OBSERVER                EDGEOM     16
C     DELT3    ENGINE INCLINATION ANGLE RELATIVE TO HORIZON             EDGEOM     17
C     U,V,W    UNIT VECTORS FOR WING EDGE                               EDGEOM     18
C     THO      ANGLE OF POLAR COORDINATE OF INLET OR NOZZLE RELATIVE TO EDGEOM     19
C              EDGE                                                     EDGEOM     20
C     DLT,ALP  ENGINE CENTER LINE ORIENTATION ANGLES RELATIVE TO EDGE   EDGEOM     21
C                                                                       EDGEOM     22
C  OUTPUT                                                               EDGEOM     23
C     ETA,TH   DIRECTION ANGLES RELATIVE TO EDGE                        EDGEOM     24
C     PSIO     DIRECTIVITY GRAZING ANGLE                                EDGEOM     25
C     PN       UNIT VECTOR FOR SOUND PROPAGATION                        EDGEOM     26
C                                                                       EDGEOM     27
C  NOTE                                                                 EDGEOM     28
C     ALL INPUT AND OUTPUT ANGLES ARE IN DEGREES                        EDGEOM     29
C                                                                       EDGEOM     30
      DIMENSION U(3),V(3),W(3),PN(3)                                    EDGEOM     31
      DATA DEGRAD, RADDEG /1.745329251943E-2, 57.295779513082/          EDGEOM     32
C                                                                       EDGEOM     33
C     COMPUTE UNIT VECTOR FOR SOUND PROPAGATION                         EDGEOM     34
C                                                                       EDGEOM     35
      SIND3 = SIN(DELT3*DEGRAD)                                         EDGEOM     36
      COSD3 = COS(DELT3*DEGRAD)                                         EDGEOM     37
      PN(1) = X                                                         EDGEOM     38
      PN(2) = -Y*COSD3 - ZEDN*SIND3                                     EDGEOM     39
      PN(3) =  Y*SIND3 - ZEDN*COSD3                                     EDGEOM     40
      CALL VECN(PN)                                                     EDGEOM     41
C                                                                       EDGEOM     42
C     COMPUTE DIRECTION ANGLES                                          EDGEOM     43
C                                                                       EDGEOM     44
      ETA = ASIN( DOTP(PN,U) )*RADDEG                                   EDGEOM     45
      TH  = ATAN2(-DOTP(PN,W),DOTP(PN,V) )*RADDEG                       EDGEOM     46
C                                                                       EDGEOM     47
C     COMPUTE GRAZING ANGLE                                             EDGEOM     48
C                                                                       EDGEOM     49
      PSIO = 180. - ACOS( COS(ALP*DEGRAD)*COS(ETA*DEGRAD)*COS((THO-DLT)* EDGEOM     50
     1       DEGRAD) - SIN(ALP*DEGRAD)*SIN(ETA*DEGRAD) )*RADDEG         EDGEOM     51
C                                                                       EDGEOM     52
      RETURN                                                            EDGEOM     53
      END                                                               EDGEOM     54
```

```
      SUBROUTINE EPNLI(PNL,T,N,H,TO,CNF,ANS,IGLPNL)                     EPNLI
C                                                                       EPNLI
      DIMENSION T(2), PNL(2), ANS(5)                                    EPNLI
C                                                                       EPNLI
C  PURPOSE                                                              EPNLI
C     TO COMPUTE EFFECTIVE PERCEIVED NOISE LEVEL. COMPUTATION INVOLVES  EPNLI
C     INTEGRATION OF THE PNL-TIME HISTORY OVER THE LIMITS (PNLN,PNLX)   EPNLI
C     AND (TN, TX), I.E.                                                EPNLI
C                                                                       EPNLI
C     EPNL   =  PNLX + 10 * ALOG10((1 / TO) *                           EPNLI
C               INTEGRAL( ANTILOG(0.1 * (PNL - PNLX)) * DT ))           EPNLI
C                                                                       EPNLI
C  WHERE                                                                EPNLI
C     PNLX   =  MAXIMUM PNL                                             EPNLI
C     PNLN   =  AMAX1(PNLX - H, CNL)                                    EPNLI
C     TN     =  MINIMUM TIME WHEN PNL = PNLN                            EPNLI
C     TX     =  MAXIMUM TIME WHEN PNL = PNLN                            EPNLI
C                                                                       EPNLI
C  INPUTS                                                               EPNLI
C    1) T      ... ARRAY OF (N) TIME VALUES, EACH CORRESPONDING TO THE  EPNLI
C                   TIME WHEN A (PNL) VALUE IS OBSERVED.                EPNLI
C    2) PNL    ... ARRAY OF (N) PNL VALUES FOR THE TIME HISTORY.        EPNLI
C    3) N      ... NUMBER OF POINTS FOR THE TIME HISTORY                EPNLI
C    4) TO     ... NORMALIZING TIME CONSTANT IN THE INTEGRAL FORMULA.   EPNLI
C                   NORMALLY THIS IS TEN SECONDS                        EPNLI
C    5) H      ... PNL INCREMENT DOWN FROM THE MAXIMUM (PNLX) USED TO   EPNLI
C                   DETERMINE THE INTEGRATION LIMITS IF (PNLX .GT.      EPNLI
C                   (CNL + H)). NORMALLY (H) IS TEN PNDB.               EPNLI
C    6) CNF    ... CUTOFF OR NOISE FLOOR USED AS AN ADDITIONAL CONSTRAINT EPNLI
C                   IN DETERMINING THE INTEGRATION LIMITS. FUNCTIONS ONLY EPNLI
C                   IF (PNLX .LE. (CNF+H)).                             EPNLI
C                                                                       EPNLI
C  OUTPUT                                                               EPNLI
C    1) EPNL   ... THE EFFECTIVE PNL IN (EPNDB)                         EPNLI
C    2) PNLN                                                            EPNLI
C       PNLX   ... MIN/MAX PNL USED IN THE INTEGRATION FORMULA          EPNLI
C    3) TN                                                              EPNLI
C       TX     ... MIN/MAX TIME USED IN THE INTEGRATION FORMULA         EPNLI
C    4) IGLPNL... FUNCTION VALUE USED AS AN ERROR CODE.                 EPNLI
C                 =  0  FOR NO ERROR                                    EPNLI
C                 =  1  FOR BAD INPUTS, RESULTS SET TO OMEGA, I.E. 1.E75 EPNLI
C                 =  2  INTEGRATION LIMITS ARE UNDEFINED, RESULTS ARE   EPNLI
C                       SET TO OMEGA.                                   EPNLI
C                                                                       EPNLI
C  REMARKS                                                              EPNLI
C    1) ASSUMES LINEAR VARIATION BETWEEN POINTS (T, PNL) FOR INTERPOLA- EPNLI
C       TION, EXTRAPOLATION, AND COMPUTATION OF THE INTEGRAL.           EPNLI
C    2) INPUTS (TO, H, N) MUST BE GREATER THAN (0., 0., 2).             EPNLI
C                                                                       EPNLI
C.......................................................................EPNLI
      LOGICAL A, B                                                      EPNLI
      DATA I1,I2, F0, F1, F10, C1, OMEGA /1,2,0.,1.,10.,.23025851,1.E75/ EPNLI
      TOX(X1,X2,Y1,Y2) = (X1*(Y2-PNLN) + X2*(PNLN-Y1)) / (Y2-Y1)         EPNLI
      DA(X1)  =  X1 * XPM1DX(C3) * DT                                   EPNLI
      EPNL  =  OMEGA                                                    EPNLI
      TN=OMEGA                                                          EPNLI
      TX=OMEGA                                                          EPNLI
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```
      PNLN=OMEGA                                                        EPNLI      59
      PNLX=OMEGA                                                        EPNLI      60
      IGLPNL  =  I1                                                     EPNLI      61
C                                                                       EPNLI      62
C ERROR CHECKS                                                          EPNLI      63
      IF  ((N .LE. I2) .OR. (TC .LE. FO) .OR. (H .LE. FO))  GO TO 160   EPNLI      64
      IGLPNL  =  I2                                                     EPNLI      65
C                                                                       EPNLI      66
C  SORT POINTS WITH RESPECT TO INCREASING (T) AND FIND (PNLX)           EPNLI      67
      KE  =  N - I1                                                     EPNLI      68
      DO  20  K = 1,KE                                                  EPNLI      69
      JS  =  K + I1                                                     EPNLI      70
      DO  20  J = JS,N                                                  EPNLI      71
      IF  (T(J) - T(K))  10, 20, 20                                     EPNLI      72
   10 DT  =  T(J)                                                       EPNLI      73
      T(J)  =  T(K)                                                     EPNLI      74
      T(K)  =  DT                                                       EPNLI      75
      DT  =  PNL(J)                                                     EPNLI      76
      PNL(J)  =  PNL(K)                                                 EPNLI      77
      PNL(K)  =  DT                                                     EPNLI      78
   20 CONTINUE                                                          EPNLI      79
      MT  =  I1                                                         EPNLI      80
      PNLX  =  PNL(1)                                                   EPNLI      81
      DO  50  K = I2,N                                                  EPNLI      82
      IF  (PNLX - PNL(K))  30, 40, 50                                   EPNLI      83
   30 PNLX  =  PNL(K)                                                   EPNLI      84
   40 MT  =  K                                                          EPNLI      85
   50 CONTINUE                                                          EPNLI      86
      IF  ((MT .LE. I1) .OR. (MT .GE. N) .OR. (PNLX .LE. CNF)) GO TO 160 EPNLI      87
      PNLN  =  AMAX1(PNLX - H, CNF)                                     EPNLI      88
      CO  =  EXP(C1 * (PNLN - PNLX))                                    EPNLI      89
      I  =  -I1                                                         EPNLI      90
      SUM  =  FO                                                        EPNLI      91
C                                                                       EPNLI      92
C  PERFORM INTEGRATION                                                  EPNLI      93
C  CHECK FOR END POINTS BEING ABOVE (PNLN), AND CALC. AREA IF SO BY     EPNLI      94
C  USING LINEAR EXTRAPOLATION.                                          EPNLI      95
      IF  (PNL(1) .LE. PNLN)  GO TO 80                                  EPNLI      96
      IF  (PNL(2) - PNL(1))  160, 160, 60                               EPNLI      97
   60 TN  =  TCX(T(1), T(2), PNL(1), PNL(2))                            EPNLI      98
      DT  =  T(1) - TN                                                  EPNLI      99
      C3  =  C1 * (PNL(1) - PNLN)                                       EPNLI     100
   70 SUM  =  SUM + DA(CO)                                              EPNLI     101
      IF  (I)  80, 100, 100                                             EPNLI     102
   80 TX  =  -TX                                                        EPNLI     103
      IF  (PNL(N) .LE. PNLN)  GO TO 100                                 EPNLI     104
      J  =  N - I1                                                      EPNLI     105
      I  =  I + I1                                                      EPNLI     106
      IF  (PNL(J) - PNL(N))  160, 160, 90                               EPNLI     107
   90 TX  =  TCX(T(J), T(N), PNL(J), PNL(N))                            EPNLI     108
      DT  =  TX - T(N)                                                  EPNLI     109
      C3  =  C1 * (PNL(N) - PNLN)                                       EPNLI     110
      GO TO 70                                                          EPNLI     111
  100 CONTINUE                                                          EPNLI     112
C                                                                       EPNLI     113
C  LOOP OVER ALL POINTS AND SUM AREAS IF ABOVE (PNLN)                   EPNLI     114
      DO  140  J = I2,N                                                 EPNLI     115
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      I   =   J - I1                                                    EPNLI     116
      A   =   PNL(I) .GT. PNLN                                          EPNLI     117
      B   =   PNL(J) .GT. PNLN                                          EPNLI     118
      IF  (A .AND. B)  GO TO 110                                        EPNLI     119
      IF  (B .AND. (.NOT. A))  GO TO 120                                EPNLI     120
      IF  (A .AND. (.NOT. B))  GO TO 130                                EPNLI     121
      GO TO 140                                                         EPNLI     122
  110 DT  =   T(J) - T(I)                                               EPNLI     123
      C2  =   EXP(C1 * (PNL(I) - PNLX))                                 EPNLI     124
      C3  =   C1 * (PNL(J) - PNL(I))                                    EPNLI     125
      SUM  =   SUM + DA(C2)                                             EPNLI     126
      GO TO 140                                                         EPNLI     127
  120 TT  =   TCX(T(I), T(J), PNL(I), PNL(J))                           EPNLI     128
      TN  =   AMIN1(TN, TT)                                             EPNLI     129
      DT  =   T(J) - TT                                                 EPNLI     130
      C3  =   C1 * (PNL(J) - PNLN)                                      EPNLI     131
      GO TO 135                                                         EPNLI     132
  130 TT  =   TCX(T(I), T(J), PNL(I), PNL(J))                           EPNLI     133
      TX  =   AMAX1(TX, TT)                                             EPNLI     134
      DT  =   TT - T(I)                                                 EPNLI     135
      C3  =   C1 * (PNL(I) - PNLN)                                      EPNLI     136
  135 SUM  =   SUM + DA(C0)                                             EPNLI     137
  140 CONTINUE                                                          EPNLI     138
  150 SUM  =   SUM / TO                                                 EPNLI     139
      IF  (SUM .LE. FO)  GO TO 160                                      EPNLI     140
      EPNL  =   F10 * ALOG10(SUM) + PNLX                                EPNLI     141
      IGLPNL  =   0                                                     EPNLI     142
      ANS(1)=EPNL                                                       EPNLI     143
      ANS(2)=PNLN                                                       EPNLI     144
      ANS(3)=PNLX                                                       EPNLI     145
      ANS(4)=TN                                                         EPNLI     146
      ANS(5)=TX                                                         EPNLI     147
  160 RETURN                                                            EPNLI     148
      END                                                               EPNLI     149
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      SUBROUTINE ERROR(ITYPE,INDX1,INDX2)                                ERROR
C                                                                        ERROR
C  AUTHOR    M.A. JAEGER                                                 ERROR
C                                                                        ERROR
C PURPOSE            TO WRITE ERROR MESSAGES                             ERROR
C                                                                        ERROR
C  METHOD     THE CALLING SEQUENCE PARAMETERS ARE AS FOLLOWS             ERROR
C     ITYPE     IDENTIFIES THE NOISE TYPE CURRENTLY BEING PREDICTED      ERROR
C     INDX1     IDENTIFIES THE ROUTINE IN WHICH THE ERROR WAS FOUND      ERROR
C     INDX2     IDENTIFIES THE STATEMENT TO BE PRINTED.                  ERROR
C     ERRORS THAT ARE FATAL CAUSE A PROGRAM STOP,OTHERWISE A RETURN TO   ERROR
C            THE ROUTINE CALLING ERROR AND A RETURN TO ITS CALLING ROUTI ERROR
C            WITHOUT CONTINUEING CALCULATION                             ERROR
C                                                                        ERROR
C                                                                        ERROR
C                                                                        ERROR
C                                                                        ERROR
      DIMENSION TYPNAM(4,13)                                             ERROR
      DIMENSION SUBNAM(2, 7)                                             ERROR
      DATA IOUTAP/ 6/                                                    ERROR
      DATA SUBNAM/4HATMO,4HSP   ,                                        ERROR
     *            4HBLWF,4HLP   ,                                        ERROR
     *            4HCOPT,4HR    ,                                        ERROR
     *            4HLINC,4HOR   ,                                        ERROR
     *            4HPROP,4H     ,                                        ERROR
     *            4HCORS,4HPL     ,                                      ERROR
     *           4HMAIN,4H     /                                        ERROR
      DATA TYPNAM/4HPRIM,4HARY ,4HJET ,4H     ,                          ERROR
     *            4HPRI.,4HAND ,4HSEC.,4HJET ,                           ERROR
     *            4HCORE,4H AND,4HTURB,4HINE ,                           ERROR
     *            4HCOMP,4H.AND,4HINLT,4H.FAN,                           ERROR
     *            4HEXIT,4H FAN,4H     ,4H     ,                         ERROR
     *            4HAUGM,4HENTC,4HR WI,4HNG   ,                          ERROR
     *            4HBLOW,4HN FL,4HAP   ,4H     ,                         ERROR
     *            4HEJEC,4HTOR ,4HSUPP,4HRESR,                           ERROR
     *            4HLIFT,4H FAN,4H     ,4H     ,                         ERROR
     *            4HPROP,4HELLE,4HR    ,4H     ,                         ERROR
     *            4HHELI,4HCOPT,4HER   ,4H     ,                         ERROR
     *            4HMEAS,4HURED,4H DAT,4HA    ,                          ERROR
     *            4HFLIG,4HHT G,4HECME, 4HTRY /                          ERROR
      WRITE(IOUTAP,5)(TYPNAM(I,ITYPE),I=1,4)                             ERROR
    5 FORMAT(4H ERR,4HOR D,4HETEC,4HTED ,4HIN P,4HREDI,4HCTIC,4HN OF,4H  ERROR
     *   ,4A4,4H NOI,4HSE T,4HYPE )                                      ERROR
      WRITE(IOUTAP,2010)(SUBNAM(I,INDX1),I=1,2)                          ERROR
 2010 FORMAT(1X,4HERRO,4HR RO,4HUTIN,4HE CA,4HLLED,4H FRO,4HM SU,4HBROU, ERROR
     *4HTINE,1X,2A4)                                                     ERROR
      GO TO (10,20,30,40,50,60,70,80,90,100,110,120,                     ERROR
     *130,140,150,160),INDX2                                             ERROR
   10 WRITE(IOUTAP,1010)                                                 ERROR
      GO TO 2000                                                         ERROR
   20 WRITE(IOUTAP,1020)                                                 ERROR
      GO TO 2000                                                         ERROR
   30 WRITE(IOUTAP,1030)                                                 ERROR
      GO TO 2000                                                         ERROR
   40 WRITE(IOUTAP,1040)                                                 ERROR
      GO TO 2000                                                         ERROR
   50 WRITE(IOUTAP,1050)                                                 ERROR
```

```
      GO TO 2000                                                        ERROR
   60 WRITE(IOUTAP,1060)                                                ERROR
      GO TO 2000                                                        ERROR
70    CONTINUE                                                          ERROR
      GO TO 2000                                                        ERROR
   80 WRITE(IOUTAP,1080)                                                ERROR
      GO TO 2000                                                        ERROR
   90 WRITE(IOUTAP,1090)                                                ERROR
      GO TO 2000                                                        ERROR
  100 WRITE(IOUTAP,1100)                                                ERROR
      GO TO 2000                                                        ERROR
  110 WRITE(IOUTAP,1110)                                                ERROR
      GO TO 2000                                                        ERROR
  120 WRITE(IOUTAP,1080)                                                ERROR
      GO TO 2000                                                        ERROR
  130 WRITE(IOUTAP,1130)                                                ERROR
      GO TO 2000                                                        ERROR
  140 WRITE(IOUTAP,1140)                                                ERROR
      GO TO 2000                                                        ERROR
150   WRITE(IOUTAP,1150)                                                ERROR
      STOP                                                              ERROR
  160 WRITE(IOUTAP,1160)                                                ERROR
1010 FORMAT(106HOTOO MANY ENTRIES IN ALTITUDE VS TEMPERATURE TABLE.  MA ERROR
     1XIMUM ALLOWED IS FIFTY.  ISA ATMOSPHERE IS ASSUMED.)              ERROR
1020 FORMAT(103HOTOO MANY ENTRIES IN ALTITUDE VS PRESSURE TABLE.  MAXIM ERROR
     1UM ALLOWED IS FIFTY.  ISA ATMOSPHERE IS ASSUMED.)                 ERROR
1030 FORMAT(112HOTOO MANY ENTRIES IN ALTITUDE VS RELATIVE HUMIDITY TABL ERROR
     1E.  MAXIMUM ALLOWED IS FIFTY.  ISA ATMOSPHERE IS ASSUMED.)        ERROR
1040 FORMAT(105HOALTITUDE VS TEMPERATURE TABLE IS UNDEFINED.  MUST HAVE ERROR
     1 AT LEAST TWO ENTRIES.  ISA ATMOSPHERE IS ASSUMED.)               ERROR
1050 FORMAT(102HOALTITUDE VS PRESSURE TABLE IS UNDEFINED.  MUST HAVE AT ERROR
     1 LEAST TWO ENTRIES.  ISA ATMOSPHERE IS ASSUMED.)                  ERROR
1060 FORMAT(108HOALTITUDE VS RELATIVE HUMIDITY TABLE IS UNDEFINED.  MUS ERROR
     1T HAVE AT LEAST TWO ENTRIES.  ISA ATMOSPHERE ASSUMED.)            ERROR
1080 FORMAT(40H EFFECTIVE TIP MACH NUMBER OUT OF RANGE,  /              ERROR
     * 33HGREATER THAN .93 OR LESS THAN 0.          )                   ERROR
1090 FORMAT(50H TOO MANY TARGET FREQUENCIES SPECIFIED FOR LINING.   /   ERROR
     *25H ONLY FIRST TEN ARE USED.       )                              ERROR
1100 FORMAT(69HOTOO MANY WALLS SPECIFIED IN FAN LINING.      ONLY FIRST ERROR
     1 TEN ARE USED)                                                    ERROR
1110 FORMAT(44HONO WALLS HAVE BEEN DEFINED FOR FAN LINING. )            ERROR
1130 FORMAT(1H ,35HERROR WRITING RANDOM FILE JOB ABORT    )             ERROR
1140 FORMAT(1H ,35HERROR READING RANDOM FILE JOB ABORT    )             ERROR
1150 FORMAT(33HO***FATAL ERROR*** BAD GEOMETRY.    )                    ERROR
1160 FORMAT(78H *** WARNING *** PROGRAM CAPABILITIES EXCEEDED,I.E. (ME/ ERROR
     *SF) GREATER THAN ONE      )                                      ERROR
2000 CONTINUE                                                           ERROR
     RETURN                                                             ERROR
     END                                                                ERROR
```

```
      FUNCTION ESHLDG(PSI, BETA, XE)                                    ESHLDG      2
      DATA F1, HPI, RPD /1.0, 1.570796, 1.745329E-2/                    ESHLDG      3
      ESHLDG  =  -10. * ALOG10(XE)                                      ESHLDG      4
      CP  =  COS(RPD * PSI)                                             ESHLDG      5
      SP  =  SQRT(F1 - CP*CP)                                           ESHLDG      6
      IF  (SP .LE. 3.4E-4)  GO TO 10                                    ESHLDG      7
      CTP  =  F1 + CP / SP                                              ESHLDG      8
      ESHLDG  =  ESHLDG * (F1 - 2. * (COS(HPI * (BETA / 90.)**0.8)**8) / ESHLDG     9
     1 (XE * (F1 + CTP*CTP)))                                           ESHLDG     10
   10 RETURN                                                            ESHLDG     11
      END                                                               ESHLDG     12
```

```
      SUBROUTINE EWGIO
C
C     PURPOSE        TO READ ENGINE/WING GEOMETRY I/O FOR
C                    WING SHIELDING PACKAGE
C
C     INPUT
C         SWPTE      TRAILING EDGE SWEEP ANGLE(DEG) DEFAULT=0.
C         SWPLE      LEADING EDGE SWEEP ANGLE(DEG)          =0.
C         DIHED      WING DIHEDRAL ANGLE(DEG)               =0.
C         DDSD       DIMENSIONLESS DISTANCE BETWEEN ENGINE C.L.
C                    AND WING TIP
C         DDX1D      DIMENSIONLESS DISTANCE IN AXIAL DIRECTION
C                    TO T.E. FROM POINT ON TOP OF WING
C         DDX2D      DIMENSIONLESS DISTANCE IN AXIAL DIRECTION
C                    TO L.E. FROM POINT ON TOP OF WING
C         DDXOD      DIMENSIONLESS DISTANCE IN AXIAL DIRECTION
C                    FROM NOZZLE EXIT PLANE TO POINT ON TOP OF WING DEF=0
C         DDY1D      DIMENSIONLESS DISTANCE NORMAL TO ENGINE C.L.
C                    FROM TOP OF WING TO T.E.
C         DDY2D      DIMENSIONLESS DISTANCE NORMAL TO ENGINE C.L.
C                    FROM TOP OF WING TO L.E.
C         DDYOD      DIMENSIONLESS DISTANCE BETWEEN TOP OF WING
C                    AND ENGINE C.L.  DEFAULT=.1
C         DDLD       DIMENSIONLESS ENGINE LENGTH
C         DIANI      DIAMETER OF NOZZLE INLET (  FT)DEFAULT=.3048
C         DIANE      DIAMETER OF NOZZLE (M,FT)
C
      COMMON/GCONST/IN
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT
C
      COMMON/EWGEO/SWPTE,SWPLE,DIHED,DDSD,DDX1D,DDX2D,DDXOD,
     *DDY1D,DDY2D,DDYOD,DDLD,DIANI,IES
      COMMON/ICPATH/NCAS,NCOF
      DIMENSION WKP(13,3)
      EQUIVALENCE (SEI,IES)
C
      NAMELIST/EWDATA/SWPTE,SWPLE,DIHED,DDX1D,DDX2D,DDXOD,DDSD,
     *DDY1D,DDY2D,DDYOD,DDLD,DIANE,IES
C
C
C
C     TEST AND STORE DATA FOR FIRST CASE
C
      IF( NCAS.EQ.1)GO TO 100
C
C     RESTORE DATA
      SWPTE =WKP( 1,NCOF)
      SWPLE =WKP( 2,NCOF)
      DIHED =WKP( 3,NCOF)
      DDSD  =WKP( 4,NCOF)
      DDX1D =WKP( 5,NCOF)
      DDX2D =WKP( 6,NCOF)
      DDXOD =WKP( 7,NCOF)
      DDY1D =WKP( 8,NCOF)
      DDY2D =WKP( 9,NCOF)
      DDYOD =WKP(10,NCOF)
      DDLD  =WKP(11,NCOF)
```

```
      DIANE =WKP(12,NCOF)                                               EWGIO      59
      SEI=WKP(13,NCOF)                                                  EWGIO      60
  100 READ(IN,EWDATA)                                                   EWGIO      61
      WKP( 1,NCOF)=SWPTE                                                EWGIO      62
      WKP( 2,NCOF)=SWPLE                                                EWGIO      63
      WKP( 3,NCOF)=DIHED                                                EWGIO      64
      WKP( 4,NCOF)=DDSD                                                 EWGIO      65
      WKP( 5,NCOF)=DDX1D                                                EWGIO      66
      WKP( 6,NCOF)=DDX2D                                                EWGIO      67
      WKP( 7,NCOF)=DDX0D                                                EWGIO      68
      WKP( 8,NCOF)=DDY1D                                                EWGIO      69
      WKP( 9,NCOF)=DDY2D                                                EWGIO      70
      WKP(10,NCOF)=DDY0D                                                EWGIO      71
      WKP(11,NCOF)=DDLD                                                 EWGIO      72
      WKP(12,NCOF)=DIANE                                                EWGIO      73
      WKP(13,NCOF)=SEI                                                  EWGIO      74
      DIANI=DIANE                                                       EWGIO      75
      IF(IUNIT.EQ.0)DIANI=DIANI*3.280833                                EWGIO      76
      RETURN                                                            EWGIO      77
      END                                                               EWGIO      78
```

```
      SUBROUTINE EWGOUT(IPRT,IUNIT)
C
C  PURPOSE
C     THIS SUBROUTINE PRINTS THE ENGINE / WING GEOMETRY VARIABLES.
C     THESE VARIABLES ARE AVAILABLE IN COMMON EWGEO.
C     THE PRINTOUT IS ON LOGICAL UNIT 10 UNLESS THE ARRAY REPORT
C     INDICATOR IPRT(7) IS NOT 7 IN WHICH CASE THE PRINTOUT IS ON 6.
C
C  INPUT - CALLING SEQUENCE
C     IPRT   - ARRAY OF REPORT INDICATORS, ONLY 7 IS USED
C     IUNIT  - 0 MKS UNITS
C              1 ENGLISH UNITS
C
C  INPUT - COMMON
C     EWGEO  - ALL VARIABLES ARE PRINTED
C
      DIMENSION IPRT(7)
      COMMON/EWGEO/ SWPTE,SWPLE,DIHED,DDSD,DDX1D,DDX2D,DDXOD,DDY1D,
     1              DDY2D,DDYOD,DDLD,DIANI
      DIMENSION IUD(2)
      DATA IUD /3H M.,3H FT/
C
C     DETERMINE OUTPUT UNIT
C
      IOUT=8
      IF(IPRT(7).NE.7)IOUT=6
C
C     SET THE UNIT FOR DIANI
C
      IF(IUNIT.NE.0)GO TO 25
      IU  =  IUD(1)
      DIANE=DIANI*.3048000
      GO TO 50
   25 IU  =  IUD(2)
      DIANE=DIANI
C
C     PRINT TITLING INFORMATION
C
   50 CALL PRINTH(IPRT(7),LOT,IOUT)
C
C     PRINT THE VARIABLES IN COMMON
C
      WRITE(IOUT,100) SWPTE,DIANE,IU,SWPLE,DDLD,DIHED,DDSD,DDXOD,DDX1D,
     1                DDX2D,DDYOD,DDY1D,DDY2D
  100 FORMAT(1H0,39X,38HE N G I N E / W I N G  G E O M E T R Y //
     1 20X,16HT.E. SWEEP ANGLE,5X,1H=,F6.1,4H DEG,16X,
     2 15HNOZZLE DIA. (D),5X,1H=,F7.2,A3/
     3 20X,16HL.E. SWEEP ANGLE,5X,1H=,F6.1,4H DEG,16X,
     4 19HENGINE LENGTH (L/D),5X,1H=,F7.2/
     5 20X,22HWING DIHEDRAL ANGLE  =,F6.1,4H DEG,16X,
     6 25HDIST. TO WING TIP (S/D) =,F7.2///
     7 41X,37HAXIAL DISTANCE (NOZZLE REL. TO WING)///
     8 21X,8HX0 / D =,F7.2,17X,8HX1 / D =,F7.2,17X,8HX2 / D =,F7.2
     9 ///41X,40HVERTICAL DISTANCES (NOZZLE REL. TO WING)//
     * 21X,8HY0 / D =,F7.2,17X,8HY1 / D =,F7.2,17X,8HY2 / D =,F7.2)
C
      RETURN
```

```
      SUBROUTINE FAAISO(F,FREQ,K,FC)                                    FAAISO     2
C     FAAISO   MASTERS,R.M.   APS-104A   APRIL 1969                     FAAISO     3
C      SUBROUTINE FAAISO CALCULATES THE TONE CORRECTION TO A            FAAISO     4
C      SPECTRUM FROM A KNOWLEDGE OF THE TONAL IRREGULARITIES.           FAAISO     5
C      THE METHOD IS THAT DEFINED BY THE ISO/FAA CURVES OF REFERENCE 1. FAAISO     6
C-----    REFERENCE 1.   DEPARTMENT OF TRANSPORTATION, FEDERAL AVIATION FAAISO     7
C-----                   REGULATIONS, TITLE 14, CHAPTER 1, PART 36   ** FAAISO     8
C-----                   NOISE STANDARDS- AIRCRAFT TYPE CERTIFICATION ** FAAISO     9
C-----                   FEDERAL AVIATION ADMINISTRATION, NOV. 3, 1969. FAAISO    10
C      F------ARRAY OF TONAL IRREGULARITIES                              FAAISO    11
C      FREQ---ARRAY OF 1/3 OCTAVE BAND FREQUENCIES                      FAAISO    12
C      K------NUMBER OF BANDS                                            FAAISO    13
C      FC-----ARRAY OF TONE CORRECTIONS                                 FAAISO    14
C      TEST FOR FREQUENCY IN THE RANGE 500 TO 5000 HZ AND F IN          FAAISO    15
C      RANGE OF 3 TO 20DB                                               FAAISO    16
      DIMENSION F(24),FREQ(24),FC(24)                                   FAAISO    17
      DO 1I=1,K                                                         FAAISO    18
      IF(F(I).GE.3.)GO TO 2                                             FAAISO    19
      FC(I)=0.                                                          FAAISO    20
      GO TO 1                                                           FAAISO    21
    2 IF (500..LE.FREQ(I).AND.FREQ(I).LE.5000.)   GO TO  3              FAAISO    22
C      FREQUENCY NOT IN THE RANGE,TEST FOR VALUE OF F AND FIND FC       FAAISO    23
      IF (F(I).LT.20.)   GO TO 4                                        FAAISO    24
      FC(I)=3.3333333333                                                FAAISO    25
      GO TO 1                                                           FAAISO    26
    4 FC(I)=F(I)/6.                                                     FAAISO    27
      GO TO 1                                                           FAAISO    28
    3 IF (F(I).LT.20.)   GO TO 5                                        FAAISO    29
      FC(I)=6.6666666666                                                FAAISO    30
      GO TO 1                                                           FAAISO    31
    5 FC(I)=F(I)/3.                                                     FAAISO    32
    1 CONTINUE                                                          FAAISO    33
      RETURN                                                            FAAISO    34
      END                                                               FAAISO    35
```

```
      SUBROUTINE FANNOS(SF,ANGLES,ARRAY,IDOPP,NUMSTG,NINLET,NAFT,NB,FPR,
     *      DIAM,RSS,AREA,RN1,RTS,CRTFPR,DELTA,BPR,NI)
C AUTHOR              D. F. MELDRUM
C
C PURPOSE             TO PREDICT INLET FAN NOISE, AND/OR
C                     AFT FAN NOISE FOR THE PHASE B NASA-AMES
C                     FOOTPRINT CONTRACT NAS2-6969.  NOISE IS PREDICTED
C                     AT 150 FEET AS A SINGLE NOISE SOURCE WITHOUT
C                     SHIELDING EFFECTS.
C
C METHOD              AS DESCRIBED IN REFERENCE 1)
C
C INPUTS              VIA THE CALL
C
C                     SF          SCALE FACTOR FOR THE DOPPLAR SHIFT
C                     ANGLES      DIRECTIVITY ANGLES FOR NOISE PREDICTION
C
C                     NUMSTG      NUMBER OF FAN STAGES
C                                 1 & NUMSTG & 3
C                     NINLET      SWITCH FOR INLET FAN NOISE
C                                 PREDICTION IF POSITIVE.
C                     NAFT        SWITCH FOR AFT FAN NOISE
C                                 PREDICTION IF POSITIVE.
C                     IDOPP       SWITCH FOR THE DOPPLAR SHIFT
C                                 FLIGHT EFFECTS.
C                                 0  NO FLIGHT EFFECTS OR DOPPLAR SHIFT.
C                                 1  DOPPLAR SHIFT FOR THE FREQUENCY
C                                    CORRECTION ONLY.
C                                 2  DOPPLAR SHIFT FOR THE FREQUENCY
C                                    AND LEVEL CORRECTION.
C                     NB(I)       NUMBER OF FAN BLADES FOR EACH STAGE
C                                 WHERE 1 & I & NUMSTG
C                     FPR(I)      FAN PRESSURE RATIO
C                     DIAM(I)     FAN INLET DIAMETER (INLET ONLY)  FT
C                     RSS(I)      MINIMUM ROTOR/STATOR SPACING
C                     AREA(I)     FAN DISCHARGE AREA (AFT ONLY)      FT*FT
C                     RN1         ROTOR SPEED                        RPM
C                     RTS         RELATIVE TIP MACH NUMBER OF THE
C                                 FIRST STAGE WITHOUT INLET GUIDE
C                                 VANES (IGV).  IF LESS THAN 1
C                                 IGV WILL BE ASSUMED FOR THE FIRST
C                                 STAGE (INLET FAN ONLY).
C                     CRTFPR      FAN PRESSURE RATIO FOR THE
C                                 RELATIVE TIP MACH NUMBER OF
C                                 1.025 (INLET FAN ONLY)
C                     ANGFAN      ENGINE INCLINATION ANGLE
C
C
C OUTPUTS             ARRAY       INLET FAN NOISE PREDICTION FOR 24
C                                 FREQUENCIES AT 17 ANGLES AND OR
C                                 AFT FAN NOISE PREDICTION FOR 24
C                                 FREQUENCIES AT 17 ANGLES
C
C
C REFERENCES          1)  R. J. SAXBY,  NASA-AMES FOOTPRINT CONTRACT
C                         NAS2-6969  FAN NOISE MODULE,   UN-NUMBERED
C                         COORDINATION SHEET,  DATED 19 JANUARY 1973.
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```
C                                                                       FANNOS     59
C SUBROUTINES        BUZSAW     FANPED     RESCAL                       FANNOS     60
C                                                                       FANNOS     61
C                                                                       FANNOS     62
      DIMENSION NB(3),FPR(3),DIAM(3),RSS(3),AREA(3)                     FANNOS     63
      DIMENSION SF(1),ANGLES(1),        FBPF(3)                         FANNOS     64
      DIMENSION ARRAY(24,17)                                            FANNOS     65
      DIMENSION ADTCR1(7),ADTCR3(21),BDTCR1(5),BDTCR3(29),ABBCR1(5),    FANNOS     66
     *          ABBCR3(13),BBBCR1(5),BBBCR3(29),ARSCRV(10),             FANNOS     67
     *          CBSCR1(39),CBSCR3(11)                                   FANNOS     68
      DATA ADTCR1/3.0,0.1,0.425,1.0,73.0,83.5,83.5/                     FANNOS     69
      DATA ADTCR3/10.0,0.0,20.0,30.0,40.0,50.0,60.0,70.0,80.0,90.0,     FANNOS     70
     *            100.0,2.0,2.0,1.8,1.5,1.0,0.0,-2.0,-5.0,-10.0,        FANNOS     71
     *            -16.2/                                                FANNOS     72
      DATA BDTCR1/2.0,0.1,1.0,75.5,96.5/                                FANNOS     73
      DATA BDTCR3/14.0,40.0,50.0,60.0,70.0,80.0,90.0,100.0,110.0,120.0, FANNOS     74
     *            130.0,140.0,150.0,160.0,170.0,-21.0,-15.0,-9.0,-7.0,  FANNOS     75
     *            -5.0,-3.0,-1.0,0.0,0.0,-1.0,-4.0,-7.0,-11.0,-15.0/    FANNOS     76
      DATA ABBCR1/2.0,0.1,1.0,66.0,82.5/                                FANNOS     77
      DATA ABBCR3/6.0,10.0,60.0,70.0,80.0,90.0,100.0,0.0,0.0,-2.0,-5.0, FANNOS     78
     *            -10.0,-16.0/                                          FANNOS     79
      DATA BBBCR1/2.0,0.1,1.0,73.5,93.5/                                FANNOS     80
      DATA BBBCR3/14.0,40.0,50.0,60.0,70.0,80.0,90.0,100.0,110.0,120.0, FANNOS     81
     *            130.0,140.0,150.0,160.0,170.0,-22.0,-16.0,-10.0,-6.0, FANNOS     82
     *            -4.0,-2.0,-1.0,0.0,0.0,-2.0,-4.0,-7.0,-12.0,-17.0/    FANNOS     83
      DATA ARSCRV/2.0,30.0,300.0,10.0,0.0,2.0,30.0,300.0,5.0,0.0/       FANNOS     84
      DATA CBSCR1/6.0,0.0,.9999,1.0,1.085,1.19,1.435,0.0,0.0,55.0,82.0, FANNOS     85
     *            82.0,77.0,6.0,0.0,.9999,1.0,1.135,1.19,1.435,0.0,0.0, FANNOS     86
     *            55.0,88.0,88.0,83.0,6.0,0.0,.9999,1.0,1.24,1.295,     FANNOS     87
     *            1.435,0.0,0.0,55.0,83.0,83.0,80.5/                    FANNOS     88
      DATA CBSCR3/5.0,10.0,50.0,70.0,80.0,100.0,-16.0,0.0,0.0,-2.0,-18./ FANNOS     89
      DATA ISWTH/1/                                                     FANNOS     90
      ILEVEL=0                                                          FANNOS     91
      IDOP=0                                                            FANNOS     92
      IF(IDOPP.GE.1) IDOP=1                                             FANNOS     93
      IF(IDOPP.EQ.1) ILEVEL=1                                           FANNOS     94
      IF(ISWTH.EQ.0) GO TO 122                                          FANNOS     95
      ISWTH=0                                                           FANNOS     96
      NUM=ADTCR1(1)                                                     FANNOS     97
      CALL RESCAL(NUM,ADTCR1(2))                                        FANNOS     98
      NUM=ABBCR1(1)                                                     FANNOS     99
      CALL RESCAL(NUM,ABBCR1(2))                                        FANNOS    100
      IAT=1                                                             FANNOS    101
      NUM=ARSCRV(IAT)                                                   FANNOS    102
      CALL RESCAL(NUM,ARSCRV(IAT+1))                                    FANNOS    103
      IAT=IAT+2*NUM+1                                                   FANNOS    104
      NUM=ARSCRV(IAT)                                                   FANNOS    105
      CALL RESCAL(NUM,ARSCRV(IAT+1))                                    FANNOS    106
      NUM=BDTCR1(1)                                                     FANNOS    107
      CALL RESCAL(NUM,BDTCR1(2))                                        FANNOS    108
      NUM=BBBCR1(1)                                                     FANNOS    109
      CALL RESCAL(NUM,BBBCR1(2))                                        FANNOS    110
  122 IF(CRTFPR.LE.0.0) CRTFPR=0.0                                      FANNOS    111
C                                                                       FANNOS    112
C                                                                       FANNOS    113
      IF(NUMSTG.GT.3) GO TO 600                                         FANNOS    114
      IF(NUMSTG.LT.1) GO TO 600                                         FANNOS    115
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```
      IF((NINLET.LE.0).AND.(NAFT.LE.0)) GO TO 600                       FANNOS    116
C                                                                       FANNOS    117
C                                                                       FANNOS    118
  130 FPRCRT=CRTFPR                                                     FANNOS    119
C                                                                       FANNOS    120
C                                                                       FANNOS    121
C                                                                       FANNOS    122
      NBUZZ=0                                                           FANNOS    123
      IF(RTS.LT.1.0) NBUZZ=1                                            FANNOS    124
      IGV=NBUZZ                                                         FANNOS    125
      IF(RTS.GT.0.)IGV=0                                                FANNOS    126
      DO  200  I = 1,NUMSTG                                             FANNOS    127
C                                                                       FANNOS    128
C     CALCULATE THE FUNDAMENTAL BLADE PASSING FREQUENCY.                FANNOS    129
C                                                                       FANNOS    130
      BLADES=NB(I)                                                      FANNOS    131
      FBPF(I)=RN1*BLADES/60.0                                           FANNOS    132
C                                                                       FANNOS    133
      IF(NINLET.LE.0) GO TO 175                                         FANNOS    134
C                                                                       FANNOS    135
C     CALCULATE THE INLET FAN NOISE COMPONENTS.                         FANNOS    136
C                                                                       FANNOS    137
      CRT=FPRCRT                                                        FANNOS    138
      CALL FANPED(1,CRT,DIAM(I),FPR(I),FBPF(I),RSS(I),SF,ANGLES,        FANNOS    139
     *             IGV,ILEVEL,IDOP,NI,BFR,DELTA,                        FANNOS    140
     *      ADTCR1,ADTCR3,ABBCR1,ABBCR3,ARSCRV,ARRAY)                   FANNOS    141
      IF(I.NE.1) GO TO 175                                              FANNOS    142
      IF(NBUZZ.EQ.0) CALL BUZSAW(RTS,FBPF(I),DIAM(I),SF,                FANNOS    143
     *                           ANGLES,ILEVEL,IDOP,                    FANNOS    144
     *                           CBSCR1,CBSCR3,ARRAY)                   FANNOS    145
  175 IF(NAFT.LE.0) GO TO 195                                           FANNOS    146
      CRT=FPRCRT                                                        FANNOS    147
C                                                                       FANNOS    148
C     CALCULATE THE AFT FAN NOISE COMPONENTS.                           FANNOS    149
C                                                                       FANNOS    150
      CALL FANPED(0,CRT,AREA(I),FPR(I),FBPF(I),RSS(I),SF,ANGLES,        FANNOS    151
     *             IGV,ILEVEL,IDOP,NI,BFR,DELTA,                        FANNOS    152
     *BDTCR1,BDTCR3,BBBCR1,BBBCR3,ARSCRV,ARRAY)                         FANNOS    153
  195 FPRCRT=0.0                                                        FANNOS    154
      IGV=1                                                             FANNOS    155
  200 CONTINUE                                                          FANNOS    156
  600 RETURN                                                            FANNOS    157
      END                                                               FANNOS    158
```

```
      SUBROUTINE FANPED(ICCDE,FPRCRT,DIAM,FPR,FBPF,RSS,XSF,ANGLES,
     *                  NIGV,ILEVEL,IDOP,NI,BPR,DELTA,
     *                  DTCR1,DTCR3,BBCR1,BBCR3,RSCRV,SPLOUT)
C AUTHOR            D. F. MELDRUM
C
C
C PURPOSE           TO PREDICT THE DISCRETE TONES AND BROADBAND NOISE
C                   COMPONENTS FOR EACH STAGE FOR INLET FAN NOISE OR FOR
C                   THE AFT FAN NOISE.
C
C METHOD            THE DISCRETE TONES AND BROADBAND NOISE IS PREDICTED
C                   FOR THE INLET FAN OR THE AFT FAN
C                   BY THE USE OF CURVES AS PER THE REFERENCE GIVEN.
C                   THESE CURVES ARE INTERPOLATED OR EXTRAPOLATED AS
C                   NEEDED INORDER TO PREDICT THE NOISE AT 150 FT RADIUS
C
C INPUTS            ICODE      INDICATOR FOR INLET FAN NOISE OR AFT FAN
C                              NOISE. POSITIVE INDICATES INLET FAN NOISE
C                              OTHERWISE THE AFT FAN IS ASSUMED.
C                   FPRCRT     CRITICAL FAN PRESSURE RATIO  USED TO INDIC
C                              WHETHER OR NOT INLET GUIDE VANES ARE USED
C                              NOT.  IF LESS THAN OR EQUAL TO ONE NO
C                              INLET GUIDE VANES ARE ASSUMED.
C                   DIAM       FAN INLET DIAMETER OR AFT NOZZLE AREA
C                   FPR        FAN PRESSURE RATIO.
C                   FBPF       FUNDAMENTAL BLADE PASSING FREQUENCY
C                   RSS        ROTOR-STATOR SPACING IN PERCENT
C                   XSF        SCALE FACTOR FOR THE DOPPLAR SHIFT
C                   ANGLES     DIRECTIVITY ANGLES FOR NOISE PREDICTION
C                   NIGV       INLET GUIDE VANE SWITCH ON IF
C                              SET NON ZERO
C                   ILEVEL     SWITCH FOR THE DOPPLAR SHIFT LEVEL
C                              CORRECTION IF NON ZERO
C                   IDOP       SWITCH FOR THE DOPPLAR SHIFT FREQUENCY
C                              CORRECTION IF IT SET NON ZERO
C                   DTCR1      CURVE - DISCRETE TONES - BASIC DATA
C                   DTCR3      CURVE - DISCRETE TONES - DIRECTIVITY ANGLE
C                   BBCR1      CURVE - BROADBAND - BASIC DATA
C                   BBCR3      CURVE - BROADBAND - DIRECTIVITY ANGLE
C                   RSCRV      CURVE - ROTOR-STATOR SPACING CORRECTION
C
C                   INPUT VIA LABLED COMMON - GFREQ
C                   BANDLM     1/3 OCTAVE BAND LIMITS
C
C OUTPUTS           SPLOUT     TABLE OF PREDICTED NOISE FOR FAN NOISE
C                              PREDICTION.  THIS ARRAY MUST BE SET TO
C                              ZERO BEFOR PROCESSING EACH CASE.  TO RUN
C                              SEVERAL STAGES CALL ONCE FOR EACH STAGE
C                              AND THE NOISE FOR EACH STAGE WILL BE ADDED
C                              TO THIS ARRAY WHICH SHOULD BE ZERO FOR THE
C                              FIRST STAGE OR WILL HAVE THE SUM OF THE
C                              PREVEIOUS STAGES.
C
C MODIFICATIONS     FROM TEE205 INTO TEE215 - THIS WAS TAKEN FROM
C                   TEE215 AND CHANGES MADE FOR THE NASA-AMES CONTRACT
C
C REFERENCES        COORD SHEET AMEP-M-367  3/17/72  D. MELDRUM  TEE205A
```

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C                    ANS-RES-F-327            5/30/72  D. SCHRANK
C                    R. J. SAXBY,  NASA-AMES FOOTPRINT CONTRACT
C                        NAS2-6969  FAN NOISE MODULE,   UN-NUMBERED
C                        COORDINATION SHEET,  DATED 19 JANUARY 1973.
C
C FUNCTION SUBPRGM  ALOG10    TBLL1     PWRSUM
C
C
      COMMON /GFREQ/ CFREQ(24),BANDLM(25)
C
      DIMENSION DTCR1(1),DTCR3(1),BBCR1(1),
     *          BBCR3(1),RSCRV(1),SPLCLT(24,1)
      DIMENSION SPL(24),ANGLES(1),XSF(1)
      DIMENSION CNI(3)
C
      DATA CNI/1.0,3.0,6.0/
      DATA NANGLE/17/,NFREQ/24/
C
C
C
C
C     TEST FOR INLET FAN NOISE OR FOR AFT FAN NOISE
C
      IGV=0
      DELTLT=0.
      DELTLB=0.
      ACON=0.
      IF(ILEVEL.NE.0) ACON=-40.
C
      IF(ICODE.LE.0) GO TO 50
C
C     INLET FAN NOISE
C
      SF=20.0
      IF(NIGV.NE.0) IGV=1
      GO TO 100
C
C     AFT FAN NOISE
C
   50 SF=10.0
      IF(NIGV.NE.0) IGV=2
C
C
      IF(NI.GT.3) GO TO 100
      IF(NI.LE.0) GO TO 100
      IF(BPR.GE.10.0) GO TO 100
      IF(BPR.LE.0.5) DELTLT=-7.8
      IF(DELTLT.EQ.0.0) DELTLT=6.0*ALOG10(BPR/10.0)
      DELTLT=DELTLT/CNI(NI)
      DELTLB=DELTLT*0.5
C
C     CALCULATE THE ENGINE SIZE CORRECTION.
C
  100 SF=SF*ALOG10(DIAM)
      ALGFPR=ALOG10(FPR-1.0)
C
C     CALCULATE THE BASIC NOISE
```

```
C
      IX=2
      NUM=DTCR1(1)
      IY=NUM+IX
      DT=TBLU1(ALGFPR,DTCR1(IX),DTCR1(IY),1,NUM)
      IF(NIGV.NE.0) GO TO 105
      IF(ICODE.LE.0) GO TO 105
      IF(FPRCRT.GE.FPR) GO TO 105
C
      ALGCRT=ALOG10(FPRCRT-1.0)
      DT=TBLU1(ALGCRT,DTCR1(IX),DTCR1(IY),1,NUM)
      DT=DT-30.56*(ALGFPR-ALGCRT)
C
  105 DT=DT+SF+DELTLT+DELTA
      NUM=BBCR1(1)
      IY=NUM+IX
      BB=SF+DELTLB+TBLU1(ALGFPR,BBCR1(IX),BBCR1(IY),1,NUM)
C
C     CALCULATE THE ROTOR-STATOR SPACING CORRECTION.
C
      ALGRSS=ALOG10(RSS)
      IZ=2
      NUM=RSCRV(IZ-1)
      IY=NUM+IZ
      RSSDT=TBLU1(ALGRSS,RSCRV(IZ),RSCRV(IY),1,NUM)
      IZ=NUM*2+IZ+1
      NUM=RSCRV(IZ-1)
      IY=NUM+IZ
      RSSBB=TBLU1(ALGRSS,RSCRV(IZ),RSCRV(IY),1,NUM)
      DT=DT+RSSDT
      IF(IGV.EQ.1) DT=DT-6.0
      BB=BB+RSSBB
      IF(IGV.EQ.2) BB=BB+3.
      DO 210 J=1,NANGLE
C
C     IDENTIFY BANDS WITH DISCRETE TONES
C
      DO 110 I=1,NFREQ
  110 SPL(I)=0.0
C
      FREQ=FBPF
      IF(IDOP.NE.0) FREQ=FREQ/XSF(J)
      I1=BANDLM(1)/FREQ
      IF(I1.LE.0) I1=1
      I2=BANDLM(25)/FREQ
      IF(I2.LE.0) GO TO 145
C
      DO 140 I=I1,I2
      FREQ=I
      FREQ=FBPF*FREQ
      IF(IDOP.NE.0) FREQ=FREQ/XSF(J)
      IF(FREQ.LT.BANDLM(1)) GO TO 140
      DO 120 K=1,NFREQ
      IBAND=K
      IF(FREQ.LE.BANDLM(K+1)) GO TO 130
  120 CONTINUE
      GO TO 145
```

```
  130 VALUE= -1                                                          FANPED    173
      VALUE= 3.0*VALUE                                                   FANPED    174
      IF((I. Q.1).AND.(IGV.NE.C)) VALLE=VALUE+6.                         FANPED    175
      SPL(IB ND)=PWRSUM(SPL(IBAND),DT+VALUE)                             FANPED    176
  14C CONTIN E                                                           FANPED    177
C                                                                        FANPED    178
C     IDENTI Y THE REFERENCE BAND FCR BRCADBANC NOISE                    FANPED    179
C                                                                        FANPED    180
  145 FREQ=F PF*2.0                                                      FANPED    181
      IF(IDO .NE.0) FREQ=FREQ/XSF(J)                                     FANPED    182
  155 AN=10. *ALOG10(FREQ/10C00.0)+24.C                                  FANPED    183
C                                                                        FANPED    184
C     CALCUL TE THE BASIC SPECTRUM                                       FANPED    185
C                                                                        FANPED    186
  160 DO 200 I=1,NFREQ                                                   FANPED    187
      DTFREQ SPL(I)                                                      FANPED    188
      IF(ILE EL.NE.0) DTFREQ=DTFREQ-40.0*ALOG10(XSF(J))                  FANPED    189
      BAND=I                                                             FANPED    190
      BAND=B ND-AN                                                       FANPED    191
      BBFREQ BAND                                                        FANPED    192
      IF(BAN .GT.0.0) BBFREQ=-2.0*BAND                                   FANPED    193
      BBFREQ BBFREQ+BB                                                   FANPED    194
      BBFREQ BBFREQ+ACON*ALOG1C(XSF(J))                                  FANPED    195
C                                                                        FANPED    196
C     GENERA E TABLE OF NOISE COMPCNENTS                                 FANPED    197
C                                                                        FANPED    198
      NUM=DT R3(1)                                                       FANPED    199
      IY=NUM IX                                                          FANPED    200
      DTDATA DTFREQ+TBLU1(ANGLES(J),DTCR3(IX),CTCR3(IY),1,NUM)           FANPED    201
      NUM=BB R3(1)                                                       FANPED    202
      IY=NUM IX                                                          FANPED    203
      BBDATA BBFREQ+TBLU1(ANGLES(J),BBCR3(IX),BBCR3(IY),1,NUM)           FANPED    204
      SPLTMP PWRSUM(BBDATA,DTDATA)                                       FANPED    205
      SPLOUT I,J)=PWRSUM(SPLTMP,SPLCUT(I,J))                             FANPED    206
  20C CONTIN E                                                           FANPED    207
  21C CONTIN E                                                           FANPED    208
      RETURN                                                             FANPED    209
      END                                                                FANPED    210
```

```
      SUBROUTINE FLTGEO(IEC)                                            FLTGEO
C                                                                       FLTGEO
C  ROUTINE TO SOLVE FLIGHT PATH SEGMENT GEOMETRY POINTS FOR CALCULATING FLTGEO
C  NOISE EXTRAPOLATION CORRECTIONS.                                     FLTGEO
C                                                                       FLTGEO
C                                                                       FLTGEO
C                                                                       FLTGEO
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           FLTGEO
C                                                                       FLTGEO
      COMMON /GCONST/ IN,IO,IT1,IT2,FC,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  FLTGEO
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001, FLTGEO
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI  FLTGEO
C                                                                       FLTGEO
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 FLTGEO
C                                                                       FLTGEO
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),        FLTGEO
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                     FLTGEO
C                                                                       FLTGEO
C     FREQUENCY BANDS USED BY PROGRAM                                   FLTGEO
C                                                                       FLTGEO
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)                      FLTGEO
C                                                                       FLTGEO
C     GENERAL INPUT PARAMETERS                                          FLTGEO
C                                                                       FLTGEO
      COMMON /GPRAM/ ZO,ZR,GRAD,AMACH,L,SLDIST(10),ITENG,IUNIT          FLTGEO
     *     ,ISPTRM,IATMOS,IAIR,LAIRAB(24),NTEMP,TEMP(50),TALT(50)       FLTGEO
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP    FLTGEO
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),   FLTGEO
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         FLTGEO
C                                                                       FLTGEO
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                FLTGEO
C                                                                       FLTGEO
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),       FLTGEO
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             FLTGEO
     *,APP,TP,RHP,APO,TO,RHC,CA,CZ,TSP(17,10),CCV                       FLTGEO
C                                                                       FLTGEO
C     CONVERSION CONSTANTS                                              FLTGEO
C                                                                       FLTGEO
C  INPUTS-                                                              FLTGEO
C    A) L=NSLD      NUMBER OF SIDELINE POINTS ON WHICH CALCULATIONS ARE FLTGEO
C                   TO BE BASED -MAXIMUM OF 10                           FLTGEO
C    SLDIST(1-10)   SIDELINE DISTANCE  BETWEEN FLIGHT TRACK AND OBSERVER FLTGEO
C                   ON THE GROUND.                                       FLTGEO
C    ZO = ALTP ..   AIRCRAFT HEIGHT ABOVE THE GROUND WHEN AT (Y=0).     FLTGEO
C                   *RESTRICTION* 0. .LE. ZR .LE. ZO                     FLTGEO
C    ZR =ALTR ...   OBSERVER HEIGHT ABOVE THE GROUND                     FLTGEO
C                   *RESTRICTION* 0. .LE. ZR                             FLTGEO
C    GRAD=SLOPE..   CLIMB GRADIENT FOR (Z .GE. ZR).                      FLTGEO
C                                                                       FLTGEO
C  OUTPUTS-                                                             FLTGEO
C     EACH OUTPUT ARRAY CONSIST OF A MAXIMUM OF 170 ELEMENTS(10 SIDELINE FLTGEO
C     POINTS TIMES 17 ANGLES)                                           FLTGEO
C    APY(10,17)..   AIRCRAFT COORDINATE IN DIRECTION OF FLIGHT PATH      FLTGEO
C                   PROJECTION ON THE GROUND.                            FLTGEO
C    APZ(10,17)..   AIRCRAFT VERTICAL COORDINATE ABOVE THE GROUND.       FLTGEO
C    PD(10,17)...   DISTANCE FOR SOUND PROPAGATION.                      FLTGEO
C     DPND(10,17)   RELATIVE INCREASE IN PATH LENGTH FOR GROUND REFLECTED FLTGEO
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C                    SIGNAL, I.E. DPN = DP / P                                FLTGEO    59
C     B1(10,17 ...   ANGLE OF INCIDENCE IN RADIANS OF GROUND REFLECTED        FLTGEO    60
C                    SIGNAL RELATIVE TO GRAZING INCIDENCE.                    FLTGEO    61
C     B2(10,17 ...   ELEVATION ANGLE IN RADIANS USED IN EXTRA-GROUND-         FLTGEO    62
C                    ATTENUATION FORMULA.                                     FLTGEO    63
C     IRR(10,17)..   ERROR CODE                                               FLTGEO    64
C                     RR = -1 FOR PD= C AND NOISE LEVELS ARE TO BE SET TO     FLTGEO    65
C                             PLUS INFINITY.                                  FLTGEO    66
C                        =  0 FOR NO ERROR DETECTED                           FLTGEO    67
C                        =  1 FOR NO SOLUTION AND NOISE LEVELS ARE TO BE      FLTGEO    68
C                             SET TO INDEFINITE.                              FLTGEO    69
C                                                                             FLTGEO    70
C  REMARKS                                                                    FLTGEO    71
C     1) OBSERVER COORDINATES ARE (C, C, ZR)                                  FLTGEO    72
C     2) AIRCRAFT COORDINATES ARE (X, Y, Z) EXCEPT WHEN AT THE VISUAL         FLTGEO    73
C        OVERHEAD REFERENCE (X, 0, ZO).                                       FLTGEO    74
C     3) Z .GE. ZR. IF AN INITIAL CALCULATION SHOWS THAT Z .LT. ZR,           FLTGEO    75
C        Z WILL BE SET TO ZR AND THE CLIMB GRADIENT WILL BE TREATED AS        FLTGEO    76
C        IF IT WERE ZERO.                                                     FLTGEO    77
C.......................................................................      FLTGEO    78
      ZRZ=ZR+ALT                                                              FLTGEO    79
      ZOZ=ZO+ALT                                                              FLTGEO    80
      CALL ATMOSP(ZRZ ,APP,TP,RHP)                                            FLTGEO    81
      CALL ATMOSP(ZOZ ,APO,TO,RHO)                                            FLTGEO    82
      CZ=A*SQRT(TO)                                                           FLTGEO    83
      COV=A*SQRT(TP)                                                          FLTGEO    84
      CA=P5*(CZ+COV)                                                          FLTGEO    85
      VO=CZ*MACH                                                              FLTGEO    86
      DO 200 J=I1,I17                                                         FLTGEO    87
      DO 200 I = I1,L                                                         FLTGEO    88
      S2T  =  F1 + GRAD*GRAD                                                  FLTGEO    89
      CT   =  F1 / SQRT(S2T)                                                  FLTGEO    90
      S2T  =  (GRAD*GRAD) / S2T                                               FLTGEO    91
      X=SLDIS(I)                                                              FLTGEO    92
      XS   =  X*X                                                             FLTGEO    93
      ZNO  =  ZO - ZR                                                         FLTGEO    94
      IEC=IC                                                                  FLTGEO    95
      Y  = -P * ZNO * S2T                                                     FLTGEO    96
      A1  =  ETA(J)                                                           FLTGEO    97
      SA1  =  SIN(A1)                                                         FLTGEO    98
      T  =  ABS(SA1)                                                          FLTGEO    99
      IF  (T   EPS)  120, 120, 10                                             FLTGEO   100
   10 IF  (ABS(T -  F1) - EPS)  25, 20, 20                                    FLTGEO   101
   20 TA1  =  TAN(A1)                                                         FLTGEO   102
      Y  =  Y - CT * SQRT(XS + (ZNO*CT)*(ZNO*CT)) / TA1                       FLTGEO   103
   25 ZN  =  NO + Y * GRAD                                                    FLTGEO   104
      IF  (ZN   100, 30, 30                                                   FLTGEO   105
   30 ZNS  =  ZN*ZN                                                           FLTGEO   106
      PS  =  XS + Y*Y + ZNS                                                   FLTGEO   107
      P  =  SQRT(PS)                                                          FLTGEO   108
      Z  =  ZN + ZR                                                           FLTGEO   109
      IF  (P)  40, 160, 40                                                    FLTGEO   110
   40 R  =  -P * Z * ZR / PS                                                  FLTGEO   111
      IF  (ABS(R) - RPD)  60, 60, 50                                          FLTGEO   112
   50 DPN  =  SQRT( F1 - R) -  F1                                             FLTGEO   113
      GO TO 8                                                                 FLTGEO   114
   60 FK  =  0                                                                FLTGEO   115
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```
      BK   =   -PS * R                                                  FLTGEO    116
      DPN  =   BK                                                       FLTGEO    117
   7C FK   =   FK + F1                                                  FLTGEO    118
      FTK  =   FK + FK                                                  FLTGEO    119
      BK   =   R * BK * (FTK -  F1) / FTK                               FLTGEO    120
      DPN  =   DPN + BK                                                 FLTGEO    121
      IF  (ABS(BK) - EPS*ABS(DPN))  80, 80, 70                          FLTGEO    122
   8C ZNP  =   Z + ZR                                                   FLTGEO    123
      B1(I,J)      =   ATAN2(ABS(ZNP), SQRT(PS-ZNS))*DPR                FLTGEO    124
      B2(I,J)      =   ASIN(ABS(ZN / P))*DPR                            FLTGEO    125
   9C IRR(I,J)     =    IEC                                             FLTGEO    126
      APY(I,J)    =   Y                                                 FLTGEO    127
      APZ(I,J)    =   Z                                                 FLTGEO    128
      PD(I,J)     =   P                                                 FLTGEO    129
      DPND(I,J)   =   DPN                                               FLTGEO    130
      GO TO 1000                                                        FLTGEO    131
  100 ZN   =   F0                                                       FLTGEO    132
      Y   =   F0                                                        FLTGEO    133
      IF  (ABS(T- F1) - EPS)  30, 110, 110                              FLTGEO    134
  110 Y   =   -X / TA1                                                  FLTGEO    135
      IF  (ABS(GRAD) .LT. EPS)  GO TO 30                                FLTGEO    136
      T   =   -ZNO / GRAD                                               FLTGEO    137
      IF  (ABS(T) .GT. ABS(Y))  Y = T                                   FLTGEO    138
      GO TO 30                                                          FLTGEO    139
  120 ZN   =   F0                                                       FLTGEO    140
      Y   =   F0                                                        FLTGEO    141
      IF  (ABS(X) - EPS)  130, 130, 150                                 FLTGEO    142
  130 IF  (ABS(GRAD) - EPS)  30, 140, 140                               FLTGEO    143
  140 Y   =   -ZNO / GRAD                                               FLTGEO    144
      GO TO 30                                                          FLTGEO    145
  150 IEC  =   I1                                                       FLTGEO    146
      GO TO 90                                                          FLTGEO    147
  160 IEC  = M1                                                         FLTGEO    148
      GO TO 90                                                          FLTGEO    149
 1000 CONTINUE                                                          FLTGEO    150
      IF(VC)1800,1700,1800                                              FLTGEO    151
 1700 TPD(J,I)=UNDEF                                                    FLTGEO    152
      TSP(J,I)=UNDEF                                                    FLTGEO    153
      TDS(J,I)=UNDEF                                                    FLTGEO    154
      GO TO 2000                                                        FLTGEO    155
 1800 DZ=APZ(I,J)-Z0                                                    FLTGEO    156
      DS=SIGN(SQRT(APY(I,J)*APY(I,J)+DZ*DZ),APY(I,J))                   FLTGEO    157
      TDS(J,I)=DS/VC                                                    FLTGEO    158
      TPD(J,I)=PD(I,J)/CA+TDS(J,I)                                      FLTGEO    159
      TSP(J,I)=PD(I,J)/CA                                               FLTGEO    160
      IF(J.EQ.I1) GO TO 1820                                            FLTGEO    161
      TSP(J,I)=TSP(J,I)+ABS(DSL-DS)/VC                                  FLTGEO    162
      GO TO 1830                                                        FLTGEO    163
 1820 DSL=DS                                                            FLTGEO    164
 1830 CONTINUE                                                          FLTGEO    165
 2000 CONTINUE                                                          FLTGEO    166
      RETURN                                                            FLTGEO    167
      END                                                               FLTGEO    168
```

```
      SUBROUTINE  FOTCNT(X,Y,VNOISE,FPATH,AREA,NP,NL,NDIM,TITLE)
C
C
C AUTHOR              K.D. JOHNSON
C PURPOSE             TO PLOT NOISE FOOTPRINT CONTOURS WITHIN A SPECIFIED
C                     PLOT AREA WITH COORDINATE TRANSFORMATION SUCH THAT
C                     X GRAPH = Y PLOTTER
C                     Y GRAPH = X PLOTTER
C
C METHOD              SCALE X-VERTICAL AND Y-HORIZONTAL TO UNITS/CM
C                     DRAW CONTINUOUS CONTOURS IF POINT TO POINT PROJECTIO
C                     REMAINS IN PLOT AREA. AXIS ARE DRAWN TO INTERSECT
C                     AT POINT (0,0).
C
C INPUTS              X          ARRAY OF VERTICAL PLOT COORDINATES
C                                X(NP,LR,NL) WHERE LR=1(RIGHT),LR=2(LEFT)
C                                OF FLIGHT PATH
C                     Y          ARRAY OF HORIZONTAL PLOT COORDINATES
C                     VNOISE     ARRAY OF NOISE LEVEL VALUES
C                     AREA       ARRAY OF AREAS UNDER CONTOURS
C                     FPATH      ARRAY OF FLIGHT PATH COORDINATES
C                     NP         NUMBER OF DATA POINTS EACH SIDE OF CONTOUR
C                     NL         NUMBER OF NOISE LEVEL CONTOURS
C                     NDIM       TOTAL LENGTH OF X,Y,FPATH FIRST DIMENSION
C
C  DIMENSIONS FOR INPUT ARRAYS
C
      DIMENSION TEMP(200)
      DIMENSION X(NDIM,2,5),Y(NDIM,2,5),AREA(5),VNOISE(5),FPATH(NDIM,2)
C
C 360
C     COMMON /PLT/ SCALV,YLENM,XLENM,CMFIN ,LABELX(10),LABELY(10),
C    1 AXUNIT,NLABEL(2),SCALU,IWRITE
C     DIMENSION XY(4,2),TITLE(18)
C
      COMMON /PLT/ SCALV,YLENM,XLENM,CMFIN ,LABELX( 4),LABELY( 4),
     1 AXUNIT,NLABEL(1),SCALU,IWRITE
      DIMENSION XY(4,2),TITLE( 8)
C  SCALV MAY BE SET BY USER. IF NOT SCALV WILL BE COMPUTED
C  YLENM,XLENM MUST BE SET TO MAXMUM OVERALL PLOT DIMENSIONS(IN DUMITS)
      EQUIVALENCE (X1,XY(1,1)),(X2,XY(2,1)),(XL,XY(3,1)),(XP,XY(4,1)),
     1 (Y1,XY(1,2)),(Y2,XY(2,2)),(YL,XY(3,2)),(YP,XY(4,2))
      INTEGER BLANK,AXUNIT
      INTEGER UP,DOWN
      LOGICAL IWRITE
      DATA ZERO/0.0/
      DATA BLANK/4H    / ,BLNK/4H      /
      DATA RADIAN/57.29577/
C
C  INITIALIZE
      UP=3
      DOWN=2
      DELTV=0.
      XMIN=10.E10
      YMIN=10.E10
      SCALU=SCALV
C SET BORDERS IN CENTIMETERS
```

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      BOTTM=3.                                                          FOTCNT     59
      TOP=2.                                                            FOTCNT     60
      SIDE=2.                                                           FOTCNT     61
C                                                                       FOTCNT     62
C INITIALIZE IARROW TO PLOT SYMBOL CODE FOR ARROWHEAD                   FOTCNT     63
      IARROW=6                                                          FOTCNT     64
C                                                                       FOTCNT     65
C SET CHARACTER HEIGHT FOR LEGEND                                       FOTCNT     66
      CHRHT=.10                                                         FOTCNT     67
C                                                                       FOTCNT     68
C  SET MAXIMUM LENGTHS OF X AND Y AXIS IN CM UNITS                      FOTCNT     69
C                                                                       FOTCNT     70
C ALLOW FOR BORDERS                                                     FOTCNT     71
      XLEN=FLOAT(INT(XLENM-TOP-BOTTM))                                  FOTCNT     72
      YLEN=FLOAT(INT(YLENM-2.*SIDE))                                    FOTCNT     73
C                                                                       FOTCNT     74
C  COMPUTE SCALE AND FIND MINIMUM AND MAXIMUM PLOT VALUES               FOTCNT     75
      K=1                                                               FOTCNT     76
      XN  =  X(1,1,1)                                                   FOTCNT     77
      DO 20 I=1,2                                                       FOTCNT     78
      DO 20 J=1,NP                                                      FOTCNT     79
      TEMP(K)=X(J,I,1)                                                  FOTCNT     80
      IF  (XN .GT. TEMP(K))  XN = TEMP(K)                               FOTCNT     81
      K=K+1                                                             FOTCNT     82
20    CONTINUE                                                          FOTCNT     83
      K=NP*2                                                            FOTCNT     84
      CALL SCALE(TEMP,XLEN,K,1)                                         FOTCNT     85
      DELTV= TEMP(K+2)                                                  FOTCNT     86
      XMIN= TEMP(K+1)                                                   FOTCNT     87
C  SCALE  Y AXIS                                                        FOTCNT     88
C                                                                       FOTCNT     89
      K=1                                                               FOTCNT     90
      YN  =  Y(1,1,1)                                                   FOTCNT     91
      DO 30 I=1,2                                                       FOTCNT     92
      DO 30 J=1,NP                                                      FOTCNT     93
      TEMP(K)= Y(J,I,1)                                                 FOTCNT     94
      IF  (YN .GT. TEMP(K))  YN = TEMP(K)                               FOTCNT     95
      K=K+1                                                             FOTCNT     96
30    CONTINUE                                                          FOTCNT     97
      K=NP*2                                                            FOTCNT     98
      CALL SCALE(TEMP,YLEN,K,1)                                         FOTCNT     99
      DELTV= AMAX1(DELTV,TEMP(K+2))                                     FOTCNT    100
      YMIN=TEMP(K+1)                                                    FOTCNT    101
      IF  (SCALU)  90, 95, 90                                           FOTCNT    102
   90 XMIN  =  XN                                                       FOTCNT    103
      YMIN  =  YN                                                       FOTCNT    104
      GO TO 99                                                          FOTCNT    105
   95 SCALU  =  DELTV                                                   FOTCNT    106
   99 WRITE (6,1000) TITLE, XLEN, YLEN, SCALU, AXUNIT, DELTV, AXUNIT,   FOTCNT    107
     *                 SCALV, AXUNIT                                    FOTCNT    108
1000  FORMAT(1H1,29X,8A10///50X,28HNOISE FOOTPRINT CONTOUR PLOT //39X,  FOTCNT    109
     *20HPLOT DIMENSIONS (CM),11X,3HX =,F3.0,3H CM/70X,3HY =,F3.0,3H CM FOTCNT    110
     *//39X,7HSCALE =,1PE10.3,1X,A4,3H/CM,6X,15HCOMPUTED      =,E10.3,   FOTCNT    111
     *1X,A4,3H/CM /70X,15HUSER SELECTED =,E10.3,1X,A4,3H/CM)             FOTCNT    112
      XP=SCALU/DELTV                                                    FOTCNT    113
      IF(XP.GT.4..OR.XP.LT..25) WRITE(6,1001)                           FOTCNT    114
1001  FORMAT(1H0,57X,15H*** WARNING ***//55X,19HUSER SELECTED SCALE/    FOTCNT    115
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     *55X,25HTOO SMALL OR TOO LARGE TO/55X,27HPRODUCE COMPREHENSIVE PLOT FOTCNT     116
     *S  )                                                              FOTCNT     117
      DELTV=SCALL                                                       FOTCNT     118
C                                                                       FOTCNT     119
C XMON-YMIN MUST BE IN WHOLE CM INCREMENTS                              FOTCNT     120
      XMIN=FLOAT(IFIX((XMIN-DELTV)/DELTV))*DELTV                        FOTCNT     121
      YMIN=FLOAT(IFIX((YMIN-DELTV)/DELTV))*DELTV                        FOTCNT     122
C                                                                       FOTCNT     123
31    XMAX=DELTV*XLEN+ XMIN                                             FOTCNT     124
      YMAX=DELTV*YLEN+ YMIN                                             FOTCNT     125
      WRITE(6,1005) AXUNIT,XMIN,XMAX,YMIN,YMAX                          FOTCNT     126
1005  FORMAT(1H0,39X,17HPLOT BOUNDARIES (,A4,1H),8X,11HX MINIMUM =      FOTCNT     127
     *1PE10.3/70X,11HX MAXIMUM =,E10.3//70X,11HY MINIMUM =,E10.3/70X,   FOTCNT     128
     *11HY MAXIMUM = ,E10.3 )                                           FOTCNT     129
C                                                                       FOTCNT     130
C IF  WRITE FLAG ON PRINT CONTOURS                                      FOTCNT     131
C                                                                       FOTCNT     132
      IF(IWRITE) GO TO 35                                               FOTCNT     133
      DO 32 I=1,NL                                                      FOTCNT     134
      WRITE(6,1006) TITLE                                               FOTCNT     135
C 360                                                                   FOTCNT     136
C1006 FORMAT(1H1,29X,18A4)                                              FOTCNT     137
1006  FORMAT(1H1,29X,8A10)                                              FOTCNT     138
      WRITE(6,1002) VNOISE(I),NLABEL,AXUNIT                             FOTCNT     139
C 360                                                                   FOTCNT     140
C1002 FORMAT(1H0,48X,11HCONTOUR AT ,F5.0,1X,2A4,1X,2HIN,1X,A4//         FOTCNT     141
 1002 FORMAT(1H0,50X,F5.0,1X,A8,11HCONTOUR IN ,A4//                     FOTCNT     142
     1 41X,4HLEFT,33X,5HRIGHT  )                                        FOTCNT     143
      WRITE(6,1003) (X(J,1,I),Y(J,1,I),X(J,2,I),Y(J,2,I),J=1,NP)        FOTCNT     144
 1003 FORMAT(26X,1PE13.3,3X,E13.3,10X,2E16.3)                           FOTCNT     145
      WRITE(6,1004) AREA(I),AXUNIT                                      FOTCNT     146
 1004 FORMAT(///40X,28HTOTAL AREA WITHIN CONTOUR = ,1PE11.4,5H SQ. ,A4) FOTCNT     147
32    CONTINUE                                                          FOTCNT     148
C                                                                       FOTCNT     149
C POSITION PLOTTER                                                      FOTCNT     150
C                                                                       FOTCNT     151
35    YP=1./CMPIN                                                       FOTCNT     152
      CALL PLOT(0.,-10.,-3)                                             FOTCNT     153
      CALL PLOT(0.,YP,-3)                                               FOTCNT     154
      XP=SIDE/CMPIN                                                     FOTCNT     155
      YP=BOTTM/CMPIN                                                    FOTCNT     156
      CALL PLOT(XP,YP,-3)                                               FOTCNT     157
C  PLOT AND LABEL AXIS WITH CM TIC MARKS                                FOTCNT     158
C Y AXIS TO CROSS X AXIS AT (0,0)                                       FOTCNT     159
      DELCM=DELTV*CMPIN                                                 FOTCNT     160
      XP=ZERO                                                           FOTCNT     161
      YP=ZERO                                                           FOTCNT     162
      IF(XMIN.GE.ZERO)GO TO 40                                          FOTCNT     163
      YP=-XMIN/DELTV                                                    FOTCNT     164
40    YMOVIN=YP/CMPIN                                                   FOTCNT     165
C PLOT Y AXIS                                                           FOTCNT     166
C                                                                       FOTCNT     167
C 360                                                                   FOTCNT     168
C     I=10                                                              FOTCNT     169
      I=4                                                               FOTCNT     170
42    IF(LABELY(I).NE.BLANK)GO TO 44                                    FOTCNT     171
      I=I-1                                                             FOTCNT     172
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      GO TO 42                                                          FOTCNT    173
C  360                                                                  FOTCNT    174
C44   NC=I*4                                                            FOTCNT    175
44    NC=I*10                                                           FOTCNT    176
      CALL CMAXIS(0., YP ,LABELY,-NC ,YLEN,0.0,YMIN,DELTV)              FOTCNT    177
C                                                                       FOTCNT    178
C                                                                       FOTCNT    179
C X AXIS TO CROSS Y AXIS AT (0,0)                                       FOTCNT    180
      YP=ZERO                                                           FOTCNT    181
      IF(YMIN.GE.ZERO)GO TO 45                                          FOTCNT    182
      XP= -YMIN/DELTV                                                   FOTCNT    183
45    XMOVIN=XP/CMPIN                                                   FOTCNT    184
C                                                                       FOTCNT    185
C PLOT X AXIS                                                           FOTCNT    186
C     I=10                                                              FOTCNT    187
      I=4                                                               FOTCNT    188
46    IF(LABELX(I).NE.BLANK)GO TO 48                                    FOTCNT    189
      I=I-1                                                             FOTCNT    190
      GO TO 46                                                          FOTCNT    191
C 360                                                                   FOTCNT    192
C48   NC=I*4                                                            FOTCNT    193
48    NC=I*10                                                           FOTCNT    194
      CALL CMAXIS(XP,0.,LABELX,NC,XLEN,90.,XMIN,DELTV)                  FOTCNT    195
C                                                                       FOTCNT    196
C  START PLOTTING CONTOURS                                              FOTCNT    197
C                                                                       FOTCNT    198
C  INITIALIZE                                                           FOTCNT    199
      L=0                                                               FOTCNT    200
50    L=L+1                                                             FOTCNT    201
      IGO=0                                                             FOTCNT    202
      IF(L.GT.NL)GO TO 100                                              FOTCNT    203
      ISIDE=1                                                           FOTCNT    204
      IBEG=1                                                            FOTCNT    205
      IEND=NP                                                           FOTCNT    206
      IPEN=UP                                                           FOTCNT    207
      INC=1                                                             FOTCNT    208
60    J=IBEG                                                            FOTCNT    209
      IGO=IGO+1                                                         FOTCNT    210
61    XP=X(J,ISIDE,L)                                                   FOTCNT    211
      YP=Y(J,ISIDE,L)                                                   FOTCNT    212
C                                                                       FOTCNT    213
C  DO NOT PLOT POINT IF OUT OF RANGE                                    FOTCNT    214
C                                                                       FOTCNT    215
      IF((XP.LT.XMIN.OR.XP.GT.XMAX).OR.(YP.LT.YMIN.OR.YP.GT.YMAX))      FOTCNT    216
     1 GO TO 75                                                         FOTCNT    217
      IF(IPEN.EQ.DOWN) GO TO 64                                         FOTCNT    218
      IF(J.EQ.IBEG) GO TO 64                                            FOTCNT    219
C  POINT IN RANGE BUT PREVIOUS POINT WAS OUT                            FOTCNT    220
C  IF NOT FIRST POINT MOVE PEN TO BORDER AND PLOT TO POINT WITH PEN DOWN FOTCNT    221
C                                                                       FOTCNT    222
      XA=XL                                                             FOTCNT    223
      YA=YL                                                             FOTCNT    224
610   XLIM=ZERO                                                         FOTCNT    225
      YLIM=ZERO                                                         FOTCNT    226
      IF(XA.LT.XMIN) XLIM=XMIN                                          FOTCNT    227
      IF(XA.GT.XMAX) XLIM=XMAX                                          FOTCNT    228
      IF(YA.LT.YMIN) YLIM=YMIN                                          FOTCNT    229
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      IF(YA.GT.YMAX) YLIM=YMAX                                          FOTCNT    230
C                                                                       FOTCNT    231
C  FIND POINT AT WHICH CONTOUR INTERSECTS PLOT BORDER                   FOTCNT    232
C                                                                       FOTCNT    233
      X1=XLIM                                                           FOTCNT    234
      X2=XLIM                                                           FOTCNT    235
      Y1=YLIM                                                           FOTCNT    236
      Y2=YLIM                                                           FOTCNT    237
      IF(XLIM.NE.ZERO) GO TO 62                                         FOTCNT    238
      X1=XMIN                                                           FOTCNT    239
      X2=XMAX                                                           FOTCNT    240
62    IF(YLIM.NE.ZERO) GO TO 63                                         FOTCNT    241
      Y1=YMIN                                                           FOTCNT    242
      Y2=YMAX                                                           FOTCNT    243
63    CALL INTRCP(XY,XO,YO,IERR)                                        FOTCNT    244
      IF(IERR.GT.0) GO TO 620                                           FOTCNT    245
      XO=(XO-XMIN)/DELCM                                                FOTCNT    246
      YO=(YO-YMIN)/DELCM                                                FOTCNT    247
C                                                                       FOTCNT    248
C  MOVE PEN TO BORDER INTERSECT WITH PEN IN CURRENT POSITION            FOTCNT    249
C                                                                       FOTCNT    250
      CALL PLOT(YO,XO,IPEN)                                             FOTCNT    251
620   IF(IPEN.EQ.UP) GO TO 630                                          FOTCNT    252
C  PEN WAS DOWN - RAISE PEN - SKIP OUT OF RANGE POINT                   FOTCNT    253
C                                                                       FOTCNT    254
640   IPEN=UP                                                           FOTCNT    255
      XL=XP                                                             FOTCNT    256
      YL=YP                                                             FOTCNT    257
      GO TO 65                                                          FOTCNT    258
C                                                                       FOTCNT    259
C  PEN WAS UP - GO PLOT FROM BORDER TO POINT                            FOTCNT    260
C                                                                       FOTCNT    261
630   IPEN=DOWN                                                         FOTCNT    262
C                                                                       FOTCNT    263
C  SCALE TO CM AND CONVERT TO PLOT INCHES                               FOTCNT    264
C                                                                       FOTCNT    265
64    XL=XP                                                             FOTCNT    266
      YL=YP                                                             FOTCNT    267
      XP=(XP-XMIN)/DELCM                                                FOTCNT    268
      YP=(YP-YMIN)/DELCM                                                FOTCNT    269
      CALL PLOT(YP,XP,IPEN)                                             FOTCNT    270
      IPEN=DOWN                                                         FOTCNT    271
65    J=J+INC                                                           FOTCNT    272
      IF(J.GT.0.AND.J.LE.NP)GO TO 61                                    FOTCNT    273
C                                                                       FOTCNT    274
C  PLOT CONTOURS RIGHT TO LEFT,  LEFT TO RIGHT TO MAXIMIZE PLOTTER      FOTCNT    275
C  EFFICIENCY                                                           FOTCNT    276
      GO TO(71,72,73,50),IGO                                            FOTCNT    277
71    IBEG=NP                                                           FOTCNT    278
      IEND=1                                                            FOTCNT    279
      ISIDE=2                                                           FOTCNT    280
      INC=-1                                                            FOTCNT    281
      GO TO 80                                                          FOTCNT    282
72    IBEG=1                                                            FOTCNT    283
      IEND=NP                                                           FOTCNT    284
      ISIDE=2                                                           FOTCNT    285
      INC=1                                                             FOTCNT    286
```

```
      IPEN=UP
      L=L+1
      IF(L.GT.NL)GO TO 100
      GO TO 60
73    IBEG=NP
      IEND=1
      ISIDE=1
      INC=-1
      GO TO 80
75    IF(IPEN.EQ. UP ) GO TO 640
C  CURRENT POINT OUT OF RANGE - LAST POINT IN
C  PLOT TO BORDER WITH PEN DOWN
C
      XA=XP
      YA=YP
      GO TO 610
80    IF(IPEN.EQ.UP) GO TO 60
      IPEN=UP
      IF(XP.EQ.X(IBEG,ISIDE,L)/DELCM.AND.YP.EQ.Y(IBEG,ISIDE,L)/DELCM)
     1 IPEN=DOWN
      GO TO 60
C
C  ALL NOISE LEVELS PLOTTED
C
C PLOT FLIGHT PATH AS SERIES OF ARROW HEADS POINTING IN DIRECTION
C OF FLIGHT
C
100   XL= ZERO
      YL=.0001
      DO 120 I=1,NP
      XP=FPATH(I,1)
      YP=FPATH(I,2)
      IF((XP.LT.XMIN.OR.XP.GT.XMAX).OR.(YP.LT.YMIN.OR.YP.GT.YMAX))
     1GO TO 110
      A=XP-XL
      B=YP-YL
      THETA=ASIN(A/SQRT(A**2+B**2))*RADIAN
      IF(B.GE.ZERO) THETA=THETA-90.
      XPP=(YP-YMIN)/DELCM
      YPP=(XP-XMIN)/DELCM
      CALL SYMBOL(XPP,YPP,.04,IARROW,THETA,-1)
110   XL=XP
      YL=YP
120   CONTINUE
C
C  DRAW TITLE AT TOP OF PAGE
C
      XP=(XLEN+1.)/CMPIN
C 360
C     I=18
      I=8
125   IF(TITLE(I).NE.BLNK) GO TO 130
      I=I-1
      IF(I.LE.0) GO TO 130
      GO TO 125
130   IF(I.EQ.0) GO TO 135
C 360
```

```
C       I=I*4                                                           FOTCNT    344
        I=I*10                                                          FOTCNT    345
        YP  =  .5 * (YLEN / CMPIN - .16 * FLOAT(I))                     FOTCNT    346
        CALL SYMBOL(YP,XP,.16,TITLE,0.0,I)                              FOTCNT    347
135     CONTINUE                                                        FOTCNT    348
C                                                                       FOTCNT    349
C LABEL CONTOURS AT 1/3 TOTAL RANGE ON LEFT SIDE                        FOTCNT    350
C                                                                       FOTCNT    351
        IP= NP/3                                                        FOTCNT    352
        DO 150 I=1,NL                                                   FOTCNT    353
        FPN= VNOISE(I)                                                  FOTCNT    354
        XP=(Y(IP,2,I)-YMIN)/DELCM                                       FOTCNT    355
        YP=(X(IP,2,I)-XMIN)/DELCM                                       FOTCNT    356
        CALL NUMBER(XP,YP,CHRHT,FPN,0.0,-1)                             FOTCNT    357
        XP  =  XP + CHRHT * FLOAT(MCHAR(FPN))                           FOTCNT    358
        CALL SYMBOL(XP,YP,CHRHT,NLABEL,0.0,8)                           FOTCNT    359
150     CONTINUE                                                        FOTCNT    360
C                                                                       FOTCNT    361
C DRAW LEGEND                                                           FOTCNT    362
C ALL PEN MOVEMENTS COMPUTED IN INCHES                                  FOTCNT    363
C                                                                       FOTCNT    364
        XL=YLEN/CMPIN-2.                                                FOTCNT    365
        YP=-CHRHT                                                       FOTCNT    366
        CALL SYMBOL(XL,YP,CHRHT,7HCONTOUR,0.0,7)                        FOTCNT    367
        XP=XL+1.1                                                       FOTCNT    368
        CALL SYMBOL(XP,YP,CHRHT,4HAREA,0.0,4)                           FOTCNT    369
        YP=YP-.15                                                       FOTCNT    370
        CALL SYMBOL(XL,YP,CHRHT,NLABEL,0.0,8)                           FOTCNT    371
        XP=XL+1.0                                                       FOTCNT    372
        CALL SYMBOL(XP,YP,CHRHT,3HSQ.,0.0,3)                            FOTCNT    373
        XP=XL+1.4                                                       FOTCNT    374
        CALL SYMBOL(XP,YP,CHRHT,AXUNIT,0.0,4)                           FOTCNT    375
        DO 175 I=1,NL                                                   FOTCNT    376
        FPN=VNOISE(I)                                                   FOTCNT    377
        XP  =  XL + .4 - CHRHT * FLOAT(MCHAR(FPN))                      FOTCNT    378
        YP=YP-.20                                                       FOTCNT    379
        CALL NUMBER(XP,YP,CHRHT,FPN,0.0,-1)                             FOTCNT    380
        FPN=AREA(I)                                                     FOTCNT    381
        IP=MCHAR(FPN)-1                                                 FOTCNT    382
        FPN=FPN/10.**IP                                                 FOTCNT    383
        XP=XL+ 1.0                                                      FOTCNT    384
        CALL NUMBER(XP,YP,CHRHT,FPN,0.0,3)                              FOTCNT    385
        XP  =  XP + 5. * CHRHT                                          FOTCNT    386
        CALL SYMBOL(XP,YP,CHRHT,1HE,0.0,1)                              FOTCNT    387
        XP=XP+CHRHT                                                     FOTCNT    388
        FPN=IP                                                          FOTCNT    389
        CALL NUMBER(XP,YP,CHRHT,FPN,0.0,-1)                             FOTCNT    390
175     CONTINUE                                                        FOTCNT    391
C                                                                       FOTCNT    392
C DRAW SCALE ANNOTATION IN FAR RIGHT CORNER                             FOTCNT    393
        XP=XL                                                           FOTCNT    394
        YP=YP-.25                                                       FOTCNT    395
        CALL SYMBOL(XP,YP,CHRHT,11HSCALE=1 CM/ ,0.0,11)                 FOTCNT    396
        NC=MCHAR(DELTV)+1                                               FOTCNT    397
        XP=XL+11.*CHRHT                                                 FOTCNT    398
        CALL NUMBER(XP,YP,CHRHT,DELTV,0.0,-1)                           FOTCNT    399
        XP  =  XP + CHRHT * FLOAT(NC)                                   FOTCNT    400
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      CALL SYMBOL(XP,YP,CHRHT,AXUNIT,0.0,4)                              FOTCNT    401
C                                                                        FOTCNT    402
C PAGE UP PAPER                                                          FOTCNT    403
C  ALLOW 2 INCHES BETWEEN PLOTS                                          FOTCNT    404
C                                                                        FOTCNT    405
      XP=(YLEN+SIDE)/CMPIN+2.                                            FOTCNT    406
      YP=        -BOTTM/CMPIN                                            FOTCNT    407
      CALL PLOT(XP,YP,-3)                                                FOTCNT    408
      RETURN                                                             FOTCNT    409
      END                                                                FOTCNT    410
```

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      SUBROUTINE FTPRT(N,DATN,N4,D1,D2,D3,D4,IMCDE,NLN)                 FTPRT      2
C      PURPOSE      TO PREPARE A NOISE CONTOUR SCHEME WITH PARAMETERS   FTPRT      3
C      ENGINE PRESSURE RATIO, OFF AXIS RANGE, NOISE LEVEL AND ELEVATION. FTPRT      4
C                                                                       FTPRT      5
C        NLS     STARTING NOISE CONTOUR                                 FTPRT      6
C        NLF     LAST NOISE CONTOUR TO BE EXAMINED                      FTPRT      7
C     METHOD   THE DATA IS READ IN AND CONVERTED TO A FUNCTION          FTPRT      8
C        LOG(RO)=FUN(EPR,Z,NL) ARRANGED INTO TABLES OF LOG(RO) VALUES   FTPRT      9
C        FOR EACH SPECIFIC NOISE LEVEL TO BE EXAMINED. THEN FOR EACH    FTPRT     10
C        SET OF FLIGHT PARAMETERS, TABLE LOOK UP ROUTINES ARE USEDTO GET FTPRT     11
C        THE VALUEOF LOG(RO) FOR EACH NOISE LEVEL. THE X, Y AND         FTPRT     12
C        DIFFERENTIAL AREA CAN THEN BE CALCULATED FROM ONE POINT TO     FTPRT     13
C        THE SUCCESSIVE POINT AND STORED AS A SUM FOR EACH NOISE LEVEL. FTPRT     14
      COMMON/VALNL/NLST,NLFT                                            FTPRT     15
      COMMON/SIZE/NLRO,NALFA                                            FTPRT     16
      COMMON/COUNT/NEPR,NL                                              FTPRT     17
      COMMON/CONTNT/AEPR(6),ALRO(9),AALFA(6)                            FTPRT     18
      DIMENSION X1(5),X2(5),Y1(5),Y2(5),SUM(5)                          FTPRT     19
      DIMENSION SLNL(3)                                                 FTPRT     20
      DIMENSION DATN(1),D1(1),D2(1),D3(1),D4(1)                         FTPRT     21
      CALL DATAIN(N,DATN,N4,D1,D2,D3,D4,IMCDE)                          FTPRT     22
      IF(IMODE.NE.-1) GO TO  1000                                       FTPRT     23
      NLS=NLST                                                          FTPRT     24
      NLF=NLFT                                                          FTPRT     25
      CALL VOIM(D1,D2,NEPR,NL,NLRO,NALFA,NLS,NLF)                       FTPRT     26
      RETURN                                                            FTPRT     27
 1000 CONTINUE                                                          FTPRT     28
C     DATAIN READS IN THE APPROPRIATE DATA VIA DATA STATEMENTS THEN     FTPRT     29
C     SORTS AND FINDS THE DISTINCT VALUES OF THE INPUTS FROM TEE 187    FTPRT     30
      CALL DRIVES(D1,D2,X1,X2,Y1,Y2,SUM,SLNL,IMCDE)                     FTPRT     31
C     DRIVER IS A TEMPORARY SUBROUTINE TO SIMULATE THE OUTPUT OF THE    FTPRT     32
C     SIMULATOR BY SUPPLYING SAMPLE FLIGHT COORDINATES                  FTPRT     33
      RETURN                                                            FTPRT     34
      END                                                               FTPRT     35
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      COMPLEX FUNCTION FW(W)
C
C  COMPUTES BOUNDARY LOSS FACTOR
C
      COMPLEX W, X, A, S
      DIMENSION XP(2), AP(2), SP(2)
      REAL K
      DOUBLE PRECISION AA(2), SS(2), T1, T2, T
      EQUIVALENCE (XP(1),X), (AP(1),A), (SP(1),S)
      DATA ZERO,ONE,P5,EPS,PI,T1 /0.,1.,-.5,1.2E-7  ,3.1415926535898,1/
      K  =  ZERO
      X  =  W
      XX  =  XP(1)*XP(1) + XP(2)*XP(2)
      IF  (XX - 100.)  100, 200, 200
C
C  SERIES FORM NO.1, ARG MAG .LT. 10.
  100 AA(1)  =  ONE
      AA(2)  =  ZERO
      SS(1)  =  ONE
      SS(2)  =  ZERO
  101 K  =  K + ONE
      T   =  K + K
      T  =  (T - ONE) / ((T + ONE) * K)
      T1  =  AA(1)
      T2  =  AA(2)
      AA(1)  =  T * (T1 * XP(1) - T2 * XP(2))
      AA(2)  =  T * (T1 * XP(2) + T2 * XP(1))
      AP(1)  =  AA(1)
      AP(2)  =  AA(2)
      SS(1)  =  SS(1) + AA(1)
      SS(2)  =  SS(2) + AA(2)
      SP(1)  =  SS(1)
      SP(2)  =  SS(2)
      AX  =  ABS(AP(1)) + ABS(AP(2))
      SX  =  ABS(SP(1)) + ABS(SP(2))
      IF  (AX - EPS * SX)  102, 102, 101
  102 FW  =  ONE - CEXP(-X) * ((X+X) * S - (0.,1.) * CSQRT(PI * X))
      GO TO 300
C
C  CONTINUED FRACTION FORM NO.2, ARG MAG .GE. 10.
  200 A = P5/ (X -2.5 -3./ (X -4.5 -7.5/ (X -6.5 -10.803/ (X -4.269))))
      FW  =  (P5 + A) / (X + P5 + A)
  300 RETURN
      END
```

```
      SUBROUTINE GRDREX(F,NFB,ITONE,R,DRN,BO,CO,KN,ND,LDF,ZNR,ZNI,DSPL)  GRDREX     2
C                                                                        GRDREX     3
C  ROUTINE TO COMPUTE GROUND REFLECTION CORRECTIONS (DSPL) TO BE ADDED   GRDREX     4
C  TO FREE-FIELD ACOUSTIC SPECTRA IN ORDER TO OBTAIN THE EFFECT OF A     GRDREX     5
C  REFLECTING GROUND PLANE. (11 MAY 1972 BY D.G. DUNN)                   GRDREX     6
C                                                                        GRDREX     7
C  REFERENCE                                                             GRDREX     8
C  1) P.B. ONCLEY,/PROPAGATION OF JET ENGINE NOISE NEAR A POROUS         GRDREX     9
C     SURFACE/, JOURNAL OF SOUND AND VIBRATION, VOL13, C1970, PP27-35.   GRDREX    10
C  2) D.G. DUNN, /COMPUTER MODULE FOR GROUND REFLECTION EFFECTS/,        GRDREX    11
C      BOEING COORDINATION SHEET ANS-RES-F-321, MAY 1972                 GRDREX    12
C                                                                        GRDREX    13
C  INPUTS                                                                GRDREX    14
C    1) F      ... ARRAY OF FREQUENCIES (HZ) TO BE USED IN THE CALCULA-  GRDREX    15
C                   TION. *RESTRICTION* F .GT. ZERO AND IF (ITONE .LE. 0) GRDREX    16
C                   THE CORRECTIONS ARE ASSUMED TO APPLY TO BROAD-BAND,  GRDREX    17
C                   CONSTANT-PERCENTAGE-BAND SPECTRA. THE VALUES FOR (F) GRDREX    18
C                   ARE THE GEOMETRIC-MEAN FREQUENCIES FOR THE PASS BANDS, GRDREX  19
C                   POSITIVE (NON-ZERO), AND ORDERED IN MONOTONIC INCREA- GRDREX   20
C                   SING VALUE.                                          GRDREX    21
C    2) NFB    ... NUMBER OF FREQUENCIES OR LEVELS TO BE CORRECTED.      GRDREX    22
C                   *RESTRICTION* IF (ITONE .GT. 0) NFB .GE. 1, OTHERWISE GRDREX   23
C                                                   NFB .GE. 2           GRDREX    24
C    3) ITONE  ... INDICATOR TO SPECIFY THE TYPE OF SPECTRA.              GRDREX    25
C                   ITONE .LT. 0 FOR BROAD-BAND, CONSTANT-PERCENTAGE-BAND GRDREX   26
C                                SPECTRA INTEGRAL EQUATION 8B OF REF.2   GRDREX    27
C                   ITONE .EQ. 0 FOR SAME EXCEPT USE APPROXIMATION EQ.8C GRDREX    28
C                   ITONE .GT. 0 FOR TONES OR POWER SPECTRAL DENSITY     GRDREX    29
C                                TYPE LEVELS. SEE EQ.8A OF REF.2         GRDREX    30
C                                                                        GRDREX    31
C    4) R      ... DISTANCE FOR PROPAGATION (DIRECT PATH) IN FEET.       GRDREX    32
C    5) DRN    ... RELATIVE PATH LENGTH DIFFERENCE FOR REFLECTED SIGNAL, GRDREX    33
C                   IE. DRN = DR/R                                       GRDREX    34
C    6) BO     ... INCIDENT ANGLE FOR REFLECTED SIGNAL IN DEGREES.       GRDREX    35
C                                                                        GRDREX    36
C  INPUTS VIA COMMON BLOCK /BLK98/                                       GRDREX    37
C    7) CO     ... SPEED OF SOUND (FT/SEC) OVER PROPAGATION PATHS.       GRDREX    38
C    8) KN     ... MAGNITUDE OF WAVE NUMBER RATIO, IE. KN = ABS(K1/KO),  GRDREX    39
C                   KO = 2*PI * F / CO, K1 = KO * (A + I*B) FOR GROUND.  GRDREX    40
C                   *RESTRICTION* KN .GT. 0.                             GRDREX    41
C    9) ND     ... NUMBER OF DATA POINTS FOR THE GROUNDS NORMALIZED-     GRDREX    42
C                   COMPLEX IMPEDANCE CURVE.                             GRDREX    43
C                   *RESTRICTION*  3 .LE. ND .LE. 50                     GRDREX    44
C   10) LDF    ... ARRAY OF VALUES, LOG10(F), FOR THE IMPEDANCE DATA     GRDREX    45
C                   CURVE, Z1/Z0 VERSUS LOG10(F).                        GRDREX    46
C   11) ZNR    ... ARRAY OF DIMENSIONLESS  IMPEDANCE VALUES (REAL PART)  GRDREX    47
C                   FOR THE DATA CURVE, IE. ZNR=RE(Z1/Z0)                GRDREX    48
C                   *RESTRICTION* ZNR .GE. ZERO                          GRDREX    49
C   12) ZNI    ... SAME EXCEPT THE IMAGINARY PARTS, IE. ZNI=IM(Z1/Z0)    GRDREX    50
C                                                                        GRDREX    51
C  OUTPUT                                                                GRDREX    52
C   13  DSPL   ... ARRAY OF SPL CORRECTIONS. (DB)                        GRDREX    53
C                                                                        GRDREX    54
C  REMARKS                                                               GRDREX    55
C    1) REQUIRES ROUTINES- DPSD, FW, CPCLAR, TBLU1, TERP1, SEARCH        GRDREX    56
C                                                                        GRDREX    57
C.......................................................................GRDREX    58
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      DOUBLE PRECISION S1, S2                                           GRDREX     59
      REAL KN, LDF                                                      GRDREX     60
      DIMENSION F(1), DSPL(1), AP(2)                                    GRDREX     61
      DIMENSION LDF(1),ZNR(1),ZNI(1)                                    GRDREX     62
      COMPLEX CPOLAR, SB1, A                                            GRDREX     63
      COMPLEX ZN,RP,W,FX                                                GRDREX     64
      COMMON/BLK97/ZN,RP,W,FX                                           GRDREX     65
      EQUIVALENCE (AP(1),A)                                             GRDREX     66
      DATA ONE,ZERO,TEN,EPS,OMEGA,RPD /1.,0.,10.,1.E-3,750.,            GRDREX     67
     * 1.745329251943E-2 /                                              GRDREX     68
C                                                                       GRDREX     69
   10 SBO   =   BO*RPD                                                  GRDREX     70
      CBO   =   COS(SBO)                                                GRDREX     71
      SBO   =   SIN(SBO)                                                GRDREX     72
      CB1   =   CBO / KN                                                GRDREX     73
      SB1S   =   ONE - CB1*CB1                                          GRDREX     74
      IF  (SB1S)  11, 12, 12                                            GRDREX     75
   11 SB1   =   CMPLX(ZERO,-SQRT(-SB1S))                                GRDREX     76
      GO TO 13                                                          GRDREX     77
   12 SB1   =   CMPLX(SQRT(SB1S), ZERO)                                 GRDREX     78
   13 IF  (ITONE)  20, 20, 40                                           GRDREX     79
   20 ETA   =   (F(NFB) / F(1))**(.5 / FLOAT(NFB - 1))                  GRDREX     80
      IF  (ITONE .GE. 0)  GO TO 80                                      GRDREX     81
      SRF   = 7.07 * (R * DRN / CO) * (ETA - ONE / ETA)                 GRDREX     82
      DO  30  K = 1,NFB                                                 GRDREX     83
      FL   =   F(K) / ETA                                               GRDREX     84
      FU   =   F(K) * ETA                                               GRDREX     85
      NSR   =   AMAX1(3.0, SRF * F(K)) + 0.5                            GRDREX     86
      N1   =   NSR+NSR                                                  GRDREX     87
      FN1   =   N1                                                      GRDREX     88
      DX   =   (FU - FL) / FN1                                          GRDREX     89
      S1   =   ZERO                                                     GRDREX     90
      N1   =   N1 - 1                                                   GRDREX     91
      DO  21  J = 1,N1,2                                                GRDREX     92
      FTEM=FL+FLOAT(J)*DX                                               GRDREX     93
      STEM=DPSD(FTEM,SBO,CBO,SB1,A,SB1S,R,DRN,CO,KN,LDF,ZNR,ZNI,ND)     GRDREX     94
      S1=S1+STEM                                                        GRDREX     95
   21 CONTINUE                                                          GRDREX     96
      S2   =   ZERO                                                     GRDREX     97
      N1   =   N1 - 1                                                   GRDREX     98
      DO  22  J = 2,N1,2                                                GRDREX     99
      FTEM=FL+FLOAT(J)*DX                                               GRDREX    100
      STEM=DPSD(FTEM,SBO,CBO,SB1,A,SB1S,R,DRN,CO,KN,LDF,ZNR,ZNI,ND)     GRDREX    101
      S2=S2+STEM                                                        GRDREX    102
   22 CONTINUE                                                          GRDREX    103
      STEM=DPSD(FL   ,SBO,CBO,SB1,A,SB1S,R,DRN,CO,KN,LDF,ZNR,ZNI,ND)    GRDREX    104
      FTEM=DPSD(FU   ,SBO,CBO,SB1,A,SB1S,R,DRN,CO,KN,LDF,ZNR,ZNI,ND)    GRDREX    105
      S = (STEM     +FTEM      + 4.0C*S1 + S2+S2) / (3. * FN1)          GRDREX    106
      DSPL(K)   =   TEN * ALOG10(S)                                     GRDREX    107
   30 CONTINUE                                                          GRDREX    108
      GO TO 100                                                         GRDREX    109
   40 DO  70  K = 1,NFB                                                 GRDREX    110
      S    =DPSD(F(K),SBO,CBO,SB1,A,SB1S,R,DRN,CO,KN,LDF,ZNR,ZNI,ND)    GRDREX    111
      IF  (S)  50, 50, 60                                               GRDREX    112
   50 DSPL(K)   =   -OMEGA                                              GRDREX    113
      GO TO 70                                                          GRDREX    114
   60 DSPL(K)   =   TEN * ALOG10(S)                                     GRDREX    115
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   70 CONTINUE                                                          GRDRFX    116
      GO TO 100                                                         GRDRFX    117
   80 FU  =  3.1415926535898 * R * DRN / CO                             GRDRFX    118
      FL  =  FU * (ETA - ONE / ETA)                                     GRDRFX    119
      FU  =  FU * (ETA + ONE / ETA)                                     GRDRFX    120
      DO  90  K = 1,NFB                                                 GRDRFX    121
      P1  =  FL * F(K)                                                  GRDRFX    122
      P2  =  FU * F(K)                                                  GRDRFX    123
      S   =DPSD(F(K),SBO,CBC,SB1,A,SB1S,R,DRN,CO,KN,LDF,ZNR,ZNI,ND)     GRDRFX    124
      A  =  CPOLAR(A)                                                   GRDRFX    125
      S = ONE+AP(1)*AP(1) + (AP(1)+AP(1)) * COS(P2-AP(2)) * SIN(P1)/P1  GRDRFX    126
      DSPL(K)  =  TEN * ALOG10(S)                                       GRDRFX    127
C     IF(R.NE.150.)GO TO 90                                             GRDRFX    128
C     AP(2)=AP(2)/RPD                                                   GRDRFX    129
C     WRITE(6,120)F(K),DSPL(K),ZN,A,RP,h,FX                             GRDRFX    130
  120 FORMAT(3X2F9.1,1PE11.3,9E11.3)                                    GRDRFX    131
   90 CONTINUE                                                          GRDRFX    132
  100 RETURN                                                            GRDRFX    133
      END                                                               GRDRFX    134
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      SUBROUTINE INITL                                                  INITL      2
C                                                                       INITL      3
C     INPUT DATA BLOCKS FOR NOISE COMPONENTS                            INITL      4
C     ITYPE DEFINES THE TYPE OF NOISE COMPONENT                         INITL      5
C ITYPE=1  PRIMARY JET                                                  INITL      6
C  =2      PRIMARY AND SECONDARY JET                                    INITL      7
      COMMON/JETDAT/NJET1,MODE1,AP1,WP1,VP1,AS2,WS2,VS2,PR1,PA1,        INITL      8
     1      TT1,VA1,DIAMJ1,ANGJT1,ICOR1                                 INITL      9
C  =3      CORE AND TURBINE                                             INITL     10
      COMMON/COREIN/TT3,PP3,CMF3,EK3,DELT3,JB3,                         INITL     11
     *  ICOR3,LIN3,NTF3,IMA3,LGM3,NWL3,ICP3,ILAY3,TF3(10),              INITL     12
     *  PCTA3(10),PLA3(10),ELCH3,ECH3,R1W3(10),TL3(10),CF3,FM3          INITL     13
C  =4      COMPRESSOR AND INLET FAN                                     INITL     14
C  =5      EXIT FAN                                                     INITL     15
C  =6      AUGMENTER-WING JET                                           INITL     16
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICOF,IPRT(7),ICN(13),NLCPT         INITL     17
      COMMON/AUGWNG/GAMA6,TT6,NPR6,DELT6,AD6,DE6,                       INITL     18
     *  ICOR6,LIN6,NTF6,IMA6,LGM6,NWL6,ICP6,ILAY6,TF6(10),              INITL     19
     *  PCTA6(10),PLA6(10),ELCH6,ECH6,R1W6(10),TL6(10),CF6,FM6          INITL     20
C  =7      BLOWN-FLAP JET                                               INITL     21
C  =8      EJECTOR - SUPPRESSOR JET                                     INITL     22
C  =9      LIFT-FAN                                                     INITL     23
C  =10     PROPELLER                                                    INITL     24
      COMMON/PROPIN/T10,W10,RPM10,D10,DSUB10,ASUB10,B10,DELT10,         INITL     25
     *ICOR10                                                            INITL     26
C  =11     HELICOPTER AND TILT ROTOR                                    INITL     27
      COMMON/COPTER/T11,Q11,RPM11,B11,DT11,AB11,DE11,RN11,              INITL     28
     1        S11,CEE11,DELT11,XLMC11,XMM11,NRTR11,LLF11,               INITL     29
     *IRR11,ICOR11                                                      INITL     30
C                                                                       INITL     31
C     THIS ROUTINE&S FUNCTION IS TO INSURE CORRECT INITIALIZATION       INITL     32
C     BEFORE EACH DATA CASE IS STARTED                                  INITL     33
C         INFORMATION DESCRIBING THE DATA CASE  (HEADING INFORMATION)   INITL     34
C                                                                       INITL     35
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           INITL     36
C                                                                       INITL     37
      COMMON /GCONST/ IN,IO,IT1,IT2,FC,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  INITL     38
     *                IC,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001, INITL     39
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI  INITL     40
C                                                                       INITL     41
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 INITL     42
C                                                                       INITL     43
      COMMON /GCOMON/ NCF,NK,BCF(24),TSFL(24,10,17),SPLT(24,17),        INITL     44
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)                     INITL     45
C                                                                       INITL     46
C     FREQUENCY BANDS USED BY PROGRAM                                   INITL     47
C                                                                       INITL     48
      COMMON /GFREQ/ CFREQ(24),OFREQ(25),FFREQ(24)                      INITL     49
C                                                                       INITL     50
C     GENERAL INPUT PARAMETERS                                          INITL     51
C                                                                       INITL     52
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT   INITL     53
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)       INITL     54
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP    INITL     55
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),   INITL     56
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF,ISFE   INITL     57
C                                                                       INITL     58
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C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                INITL    59
C                                                                       INITL    60
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),       INITL    61
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             INITL    62
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),COV                       INITL    63
C                                                                       INITL    64
C     CONVERSION CONSTANTS                                              INITL    65
C                                                                       INITL    66
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  INITL    67
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR                     INITL    68
C                                                                       INITL    69
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)                     INITL    70
      COMMON  /HEAD/ HIN(20),HOUT(20),CHIN(20)                          INITL    71
      COMMON/SUMSPL/SSPL(24,10,17)                                      INITL    72
      REWIND 8                                                          INITL    73
      REWIND 9                                                          INITL    74
      REWIND 10                                                         INITL    75
      REWIND 12                                                         INITL    76
      DO 50 I=1,24                                                      INITL    77
      DO 50 J=1,10                                                      INITL    78
      DO 50 K=1,17                                                      INITL    79
 50   SSPL(I,J,K)=F0                                                    INITL    80
      DO 100 I=1,13                                                     INITL    81
 100  ICN(I)=I0                                                         INITL    82
      ISFE = I0                                                         INITL    83
      IF(NCAS.NE.I0)GO TO 2000                                          INITL    84
      CEE11=24.4                                                        INITL    85
      XMM11=2.0                                                         INITL    86
      XLMC11=30.0                                                       INITL    87
      RN11=0.8                                                          INITL    88
      LLF11=2                                                           INITL    89
      S11=5.0                                                           INITL    90
      REWIND 20                                                         INITL    91
      NC=3                                                              INITL    92
      ZNR(1)=3.7                                                        INITL    93
      ZNR(2)=3.7                                                        INITL    94
      ZNR(3)=3.7                                                        INITL    95
      ZNI(26)=11.7                                                      INITL    96
      ZNI(27)=4.0                                                       INITL    97
      ZNI(28)=-3.7                                                      INITL    98
      FLD(26)=100.                                                      INITL    99
      FLD(27)=1000.                                                     INITL   100
      FLD(28)=10000.                                                    INITL   101
      DO 200 I=1,20                                                     INITL   102
      HIN(I)=BL                                                         INITL   103
      HOUT(I)=BL                                                        INITL   104
 200  CHIN(I)=BL                                                        INITL   105
      DO 300 I=1,17                                                     INITL   106
 300  RETA(I)=ETA(I)*RPD                                                INITL   107
      RETURN                                                            INITL   108
 2000 DO 400 J=1,17                                                     INITL   109
 400  DOPSF(J)=F1                                                       INITL   110
      RETURN                                                            INITL   111
      END                                                               INITL   112
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      SUBROUTINE INLET                                                  INLET
C AUTHOR            D. F. MELDRUM                                       INLET
C                                                                       INLET
C PURPOSE           TO PREDICT INLET FAN NOISE FOR THE PHASE B          INLET
C                   NASA-AMES FOOTPRINT CONTRACT NASA-6969.             INLET
C                                                                       INLET
C METHOD            AS DESCRIBED IN REFERENCE 1).                       INLET
C                                                                       INLET
C INPUTS            VIA LABLED COMMON FANDAT                            INLET
C                                                                       INLET
C                   NUMSTG     NUMBER OF FAN STAGES                     INLET
C                              1 & NUMSTG & 3                           INLET
C                   NINLET     SWITCH FOR INLET FAN NOISE               INLET
C                              PREDICTION IF POSITIVE.                  INLET
C                   NAFT       SWITCH FOR AFT FAN NOISE                 INLET
C                              PREDICTION IF POSITIVE.                  INLET
C                   IDOPP      SWITCH FOR THE DOPPLAR SHIFT             INLET
C                              FLIGHT EFFECTS.                          INLET
C                              0  NO FLIGHT EFFECTS OR DOPPLAR SHIFT.   INLET
C                              1  DOPPLAR SHIFT FOR THE FREQUENCY       INLET
C                                 CORRECTION ONLY.                      INLET
C                              2  DOPPLAR SHIFT FOR THE FREQUENCY       INLET
C                                 AND LEVEL CORRECTION.                 INLET
C                   NB(I)      NUMBER OF FAN BLADES FOR EACH STAGE      INLET
C                              WHERE 1 & I & NUMSTG                     INLET
C                   FPR(I)     FAN PRESSURE RATIO                       INLET
C                   DIAM(I)    FAN INLET DIAMETER (INLET ONLY)  FT      INLET
C                   RSS(I)     MINIMUM ROTOR/STATOR SPACING     PERCENT INLET
C                   AREA(I)    FAN DISCHARGE AREA (AFT ONLY)    FT*FT   INLET
C                   RN1        ROTOR SPEED                      RPM     INLET
C                   RTS        RELATIVE TIP MACH NUMBER OF THE          INLET
C                              FIRST STAGE WITHOUT INLET GUIDE          INLET
C                              VANES (IGV).  IF LESS THAN 1             INLET
C                              IGV WILL BE ASSUMED FOR THE FIRST        INLET
C                              STAGE (INLET FAN ONLY).                  INLET
C                   ORTFPR     FAN PRESSURE RATIO FOR THE               INLET
C                              RELATIVE TIP MACH NUMBER OF              INLET
C                              1.025 (INLET FAN ONLY)                   INLET
C                   ANGFAN     ENGINE INCLINATION ANGLE                 INLET
C                                                                       INLET
C                   VIA LABLED COMMON SWITCH                            INLET
C                                                                       INLET
C                   NUMENG     NUMBER OF NOISE SOURCES OF THE SAME      INLET
C                              NOISE TYPE.                              INLET
C                                                                       INLET
C                   VIA LABLED COMMON OCOMON                            INLET
C                                                                       INLET
C                   NOF        1/3 OCTAVE OF FULL OCTAVE SWITCH         INLET
C                              OR NUMBER OF FREQUENCY BANDS (8 OR 24)   INLET
C                   RETA(24)   DIRECTIVITY ANGLES                       INLET
C                                                                       INLET
C                   VIA LABLED COMMON GPRAM                             INLET
C                                                                       INLET
C                   AMACH      MACH NUMBER OF THE AIRCRAFT              INLET
C                   NOBS       NUMBER OF OBSERVER POSITIONS             INLET
C                                                                       INLET
C                   VIA LABLED COMMON SUMSPL                            INLET
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C                                                                       INLET      59
C                    SSPL       CURRENT TOTAL PREDICTED NOISE FOR NOF   INLET      60
C                               (8 OR 24) FREQUENCIES, AT NOBS OBSERVER INLET      61
C                               POSITIONS FOR 17 DIRECTIVITY ANGLES.    INLET      62
C                                                                       INLET      63
C                    VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES INLET     64
C                                                                       INLET      65
C                    PSI        17 DIRECTIVITY ANGLES FOR EACH OF       INLET      66
C                               NOBS OBSERVER POSITIONS.                INLET      67
C                    PSIO       17 DIRECTIVITY ANGLE PROJECTIONS FOR    INLET      68
C                               EACH OF NOBS OBSERVER POSITIONS         INLET      69
C                    BETA       ELEVATION ANGLE PROJEDTION FOR EACH     INLET      70
C                               OF NOBS OBSERVER POSITIONS.             INLET      71
C                                                                       INLET      72
C                    EACH COMPONENT IS WRITTEN ON TAPE OR FILE 10       INLET      73
C                    FOR EACH OF NOF BANDS FOR EACH OF NOBS OBSERVER    INLET      74
C                    POSITIONS.                                         INLET      75
C                                                                       INLET      76
C OUTPUTS            VIA LABLED COMMON SUMSPL                           INLET      77
C                                                                       INLET      78
C                    SSPL       CURRENT TOTAL PREDICTED NOISE FOR       INLET      79
C                               8 OR 24 FREQUENCIES, AT NOBS OBSERVER   INLET      80
C                               POSITIONS FOR 17 DIRECTIVITY ANGLES.    INLET      81
C                                                                       INLET      82
C                    VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES INLET     83
C                                                                       INLET      84
C                    PSI        17 DIRECTIVITY ANGLES FOR EACH OF       INLET      85
C                               NOBS OBSERVER POSITIONS.                INLET      86
C                    PSIO       17 DIRECTIVITY ANGLE PROJECTIONS FOR    INLET      87
C                               EACH OF NOBS OBSERVER POSITIONS         INLET      88
C                    BETA       ELEVATION ANGLE PROJEDTION FOR EACH     INLET      89
C                               OF NOBS OBSERVER POSITIONS.             INLET      90
C                                                                       INLET      91
C                                                                       INLET      92
C REFERENCES         1)  R. J. SAXBY,  NASA-AMES FOOTPRINT CONTRACT     INLET      93
C                        NAS2-6969  FAN NOISE MODULE,   UN-NUMBERED     INLET      94
C                        COORDINATION SHEET,  DATED 19 JANUARY 1973.    INLET      95
C                                                                       INLET      96
C FUNCTION SUBPRGM   COS        ESHLOO     PWRSUM                       INLET      97
C                                                                       INLET      98
C SUBROUTINES        ANGLES     UNIT       FANNOS     ZERO              INLET      99
C                                                                       INLET     100
C                                                                       INLET     101
C                                                                       INLET     102
C                                                                       INLET     103
C                                                                       INLET     104
C                                                                       INLET     105
      COMMON /FANDAT/ NUMSTG,NINLET,NAFT,IDCPP,NB(3),FPR(3),            INLET     106
     *                DIAM(3),RSS(3),AREA(3),RN1,RTS,CRTFPR,ANGFAN,     INLET     107
     *NI5,BPR5,ICOR4,LIN4,NTF4,IMA4,LGM4,NWL4,ICP4,ILAY4,TF4(10),       INLET     108
     *PCTA4(10),PLA4(10),ELOH4,EDH4,RIW4(10),TL4(10),CF4,FM4,           INLET     109
     *ICOR5,LIN5,NTF5,IMA5,LGM5,NWL5,ICP5,ILAY5,TF5(10),                INLET     110
     *PCTA5(10),PLA5(10),ELOH5,EDH5,RIW5(10),TL5(10),CF5,FM5            INLET     111
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLCPT         INLET     112
     *,INSEOW(3),INSHLD                                                 INLET     113
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           INLET     114
C                                                                       INLET     115
```

```
      COMMON /GCONST/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,
     *                EPS,UNDEF,BL,ICC,DPS,RPD,ETA(17),M1,FM1,I17,A,PI
C
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING
C
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)
      COMMON/SUMSPL/SSPL(24,10,17)
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)
C
C     FREQUENCY BANDS USED BY PROGRAM
C
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)
C
C     GENERAL INPUT PARAMETERS
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)
C
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),ITENG,IUNIT
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,NC,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCC,FLS,AALT,FPF
C
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS
C
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)
     *,APP,TP,RHP,APO,TG,RHO,CA,CZ,TSP(17,10),CCV
C
C     CONVERSION CONSTANTS
C
      COMMON/GCONVC/C(2,10),SLDISX(10)
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)
      COMMON/UNSHLD/USPLA(19),FSI(19),NUSPL,INUSP
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR
      COMMON/HEAD/HIN(20),HOUT(20),LHIN(20)
C
C
C
      ICN(4)=ICN(4)+1
C
C
      DELTA=ANGFAN*RPD
      CALL ANGLES(NOBS,DELTA)
C
C
C     LOOP FOR THE NUMBER OF OBSERVER POSITIONS
C
      FBPF  =  FLOAT(NB(1)) * RN1 / 60.
C
C     TEST FOR SHIELDING AND EXIT TO PRINT OUT WING
C     SHIELDING DATA ONCE FOR ALL SIDELINE POSITIONS
      IF(INSHLD.NE.0)CALL WSHOUT(IPRT(7),10,ITYPE,USPLA,NUSPL,FSI,INUSP)
   40 DO 1000 M=1,NOBS
      CALL LINCOR(SPZ(1,1),IMA4,LGM4,ELCH4,ECH4,NWL4,R1W4,TL4,
     *       ILAY4,FM4,IDP4,PSI(1,M),NCF,BCF,PLA4,
```

```
     *       CF4,PCTA4,NTF4,TF4,DOPSF,SPL2,ICOR4,IB(1,1,ITYPE),LIN4,FBPF)
C
      CALL ZERO(SPLT,408)
C
C
C
C     CALCULATE THE INLET FAN NOISE PREDICTION
C
      CALL FANNOS(DOPSF, PSI(1,M),SPLT(1,1),IDCP,NUMSTG,1,0,NB,FPR,
     *            DIAM,RSS,AREA,RN1,RTS,CRTFPR,0.0,BPR5,NI5)
C
C
   45 CONTINUE
C
C     CONVERT TO A UNIT CR INDEXED SPECTRA
C
      CALL UNIT(150.,17,SPLT(1,1))
      ENG=NENG
      IF(ENG.LE.0.0) ENG=1.C
      ELVANG=90.0
      DANGLE=-45.0
      ENS=ESHLDG(DANGLE,ELVANG,ENG)
      DC 50 J=1,17
      DO 50 K=1,24
   50 SPLT(K,J)=SPLT(K,J)-ENS
      IF(NCF.EQ.24) GC TC 3CC
C
C     CONVERT 1/3 OCTAVE TC FULL CCTAVE
C
      DO 20C J=1,17
      DO 20C K=1,8
      TMP  =  0.
      DC 100 L=1,3
      JC  =  3 * K + L - 3
  100 TMP  =  PWRSUM(TMP, SPLT(JC,J))
  200 SPLT(K,J)  =  TMP
C
C
C     ADD TC CURRENT TOIAL AND WRITE CN TAPE 10
C
C
  3CC DO 4CC J=1,NCF
      DO 4CC K=1,17
  400 SPLT(J,K)=SPLT(J,K)-SPZ(J,K)
C
      IF(INSHLD.NE.0)CALL SHLDSP(AMACH,ALTR,ISPTRM,CZ,SLDIST,M,
     *APY,APZ,DOPSF,SPLT,NCF,BCF,SPZ,PSI,ITYPE,ANGFAN,XX)
C
      DC 4C5 J=1,NCF
      DC 4C5 K=1,17
  405 SSPL(J,M,K)=PWRSUM(SSPL(J,M,K),SPLT(J,K))
      IF(IPRT(7).NE.7)GC TC 41C
      CALL NOISO(IPRT(7),M,NK,10,CHIN,ILNIT,SLDISX(M),PFREC,SPLT(1,1),
     *  NCF,ITYPE)
 41C  CCNTINUE
      DO 36C JC=1,NCF
      DC 36C KC=1,17
```

```
 360  SPLT(JC,KC)=SPLT(JC,M,KC)                                          INLET     230
      CALL PNLSUB(SPLT(1,1),PSPL(1,M),TFD(1,M),EPNL(1,M),SPL2,           INLET     231
     *TEPNL(1,M),NK,BCG,TCG,FLR,M,NLBS,IRR(M,1))                         INLET     232
      IF(IPRT(3).NE.3)GO TO 1000                                         INLET     233
      CALL NOISO(IPRT(3),M,NK,12,CFIN,ICNIT,SLOISX(M),PFREQ,             INLET     234
     *   SPLT(1,1),NOF,ITYPE)                                            INLET     235
C                                                                        INLET     236
C                                                                        INLET     237
C                                                                        INLET     238
 1000 CONTINUE                                                           INLET     239
      RETURN                                                             INLET     240
      END                                                                INLET     241
```

```
      SUBROUTINE INPUTG                                                 INPUTG     2
C                                                                       INPUTG     3
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           INPUTG     4
C                                                                       INPUTG     5
      COMMON /GCONST/ IN,IO,IT1,IT2,FC,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  INPUTG     6
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001, INPUTG     7
     *                EPS,UNDEF,BL,ICD,DFR,RFD,ETA(17),M1,FM1,I17,A,PI  INPUTG     8
C                                                                       INPUTG     9
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 INPUTG    10
C                                                                       INPUTG    11
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),        INPUTG    12
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)                     INPUTG    13
C                                                                       INPUTG    14
C     FREQUENCY BANDS USED BY PROGRAM                                   INPUTG    15
C                                                                       INPUTG    16
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)                      INPUTG    17
      COMMON/SUMSPL/SSPL(24,10,17)                                      INPUTG    18
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    INPUTG    19
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)                   INPUTG    20
C                                                                       INPUTG    21
C     GENERAL INPUT PARAMETERS                                          INPUTG    22
C                                                                       INPUTG    23
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT   INPUTG    24
     *    ,ISPTRM,IATMOS,IAIR,LAIRAB(24),NTEMP,TEMP(50),TALT(50)        INPUTG    25
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP     INPUTG    26
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLL(50),    INPUTG    27
     * ZNR(50),ZNL(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPP,ISFE    INPUTG    28
C                                                                       INPUTG    29
C  WING SHIELDING, JET REFRACTION EMPIRICISMS AND CONDITIONS            INPUTG    30
      COMMON/REFRAC/EMJ,TSTSO,IWED(3),FASS(24),TETA(24),CPSIO(24),NASRO, INPUTG    31
     * ASF,IWSFE                                                        INPUTG    32
      DIMENSION FLD(25),ZNI(25)                                         INPUTG    33
      EQUIVALENCE (FLD(1),FLL(26)),(ZNI(1),ZNL(26))                     INPUTG    34
C                                                                       INPUTG    35
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                INPUTG    36
C                                                                       INPUTG    37
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PO(10,17),DPND(10,17),       INPUTG    38
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             INPUTG    39
     *,APP,TP,RHP,APO,TC,RHC,CA,CZ,TSP(17,10),CCV                       INPUTG    40
C                                                                       INPUTG    41
C     CONVERSION CONSTANTS                                              INPUTG    42
C                                                                       INPUTG    43
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  INPUTG    44
      COMMON/CRSPLS/DOB(17),PSCR(17),DFB(408),NPSCR                     INPUTG    45
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)                     INPUTG    46
      COMMON/SWITCH/NTYPE,ITYPE,NENO,IDOP,IPRT(7),ICN(13),NLOPT         INPUTG    47
     *,INSECW(3),INSHLD                                                 INPUTG    48
C                                                                       INPUTG    49
      COMMON/HEAD/ HIN(20),HOUT(20),CHIN(20)                            INPUTG    50
      DIMENSION IOUT(7)                                                 INPUTG    51
      DATA ALTPG,ALTOG/2*0./                                            INPUTG    52
      NAMELIST/GDATA/ALTPG,ALTOG,SLOPE,AMACH,NOBS,SLDIST,NTENG,IUNIT,   INPUTG    53
     *     ISPTRM,IATMOS,IAIR,LAIRAB,NTEMP,TEMP,TALT,NLOPT,ISFE,        INPUTG    54
     *     NPRES,PRES,PALT,NHUMID,RALT,RHUMID,CTEMP,INSECW,             INPUTG    55
     *     CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD,        INPUTG    56
     *     ZNR,ZNI,LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPP,IDOP,IOUT   INPUTG    57
C     READ IN CASE HEADING CARD UP TO 80 COLS -ONE CARD AS FIRST INPUT  INPUTG    58
```

```
C     EACH CASE - SUCEEDING CASE CARDS MAYBE BLANK IF INITIAL HEADING IS INPUTG
C     THROUGHOUT RUN                                                    INPUTG
C360  READ(IN,1000,END=200)HIN                                          INPUTG
      READ(IN,1000)HIN                                                  INPUTG
      IF  (EOF(IN))  200, 100                                           INPUTG
 100  CONTINUE                                                          INPUTG
      IF(NCAS .EQ. 10)GO TO 25                                          INPUTG
      IF(HIN(I1).EQ.BL.AND.HIN(I2).EQ.BL.AND.HIN(9).                    INPUTG
     1     EQ.BL.AND.HIN(10).EQ.BL.AND.HIN(12).EQ.BL)GO TO 60           INPUTG
 25   CONTINUE                                                          INPUTG
      DO 50 I=I1,20                                                     INPUTG
 50   HOUT(I)=HIN(I)                                                    INPUTG
 60   CONTINUE                                                          INPUTG
C     READ IN DATA FOR GENERAL DESCRIPTION OF CASE                      INPUTG
      READ(IN,GDATA)                                                    INPUTG
      IWSFE = ISFE                                                      INPUTG
      ALTP=ALTPG                                                        INPUTG
      ALTR=ALTOG                                                        INPUTG
C     ADD  PRINT REPORTS INDICATOR VALUES TO NAMELIST GDATA AND COMMON  INPUTG
C     BLOCK SWITCH                                                      INPUTG
C     THERE ARE 7 DIFFERENT REPORTS AVAILABLE AS OPTIONS PLUS A DEFAULT INPUTG
C     OPTION. THESE  REPORTS MAY BE REQUESTED BY INPUTING VALUES 1 THRU INPUTG
C     7 INTO A 7 ELEMENT ARRAY IOUT IN ANY ORDER OR ANY SUBSET DURING   INPUTG
C     THE INITIALIZATION PHASE OF INPUT.  I.E. IOUT(1)=5,7,4,2          INPUTG
C     IN THE ABOVE EXAMPLE 4 TYPES OF REPORTS WOULD BE GENERATED        INPUTG
C     THE FOLLOWING ARE THE 7 TYPES OF REPORTS INDICATED BY A PARTICULAR INPUTG
C     VALUE                                                             INPUTG
C     =1    TOTAL NOISE AT SIDELINE DISTANCES PLUS NOISE TIME HISTORY   INPUTG
C     =2    ASSUMPTIONS ON WHICH THE PREDICTION IS BASED                INPUTG
C     =3    NOISE AT SIDELINE DISTANCES PER COMPONENT                   INPUTG
C     =4    FLIGHT PATH/OBSERVER GEOMETRY                               INPUTG
C     =5    EXTRAPOLATION CORRECTIONS                                   INPUTG
C     =6    TOTAL FREE FIELD NOISE AT (R=1 M)                           INPUTG
C     =7    FREE FIELD NOISE AT(R=1 M) PER COMPONENT                    INPUTG
C           THE DEFAULT OPTION  PRINTS A REPORT GIVING THE TITLE FOLLOWED INPUTG
C           BY THE NOISE-TIME HISTORY FOR THE TOTAL NOISE AT EACH SIDELIN INPUTG
C      PLUS  (=2) THE ASSUMPTIONS                                       INPUTG
C     SET  UP REPORT OPTIONS FOR PRINTOUT                               INPUTG
      DO 125 I=I1,NOBS                                                  INPUTG
 125  SLDISX(I)=SLDIST(I)                                               INPUTG
      DO 130 I=1,7                                                      INPUTG
  130 IPRT(I)=0                                                         INPUTG
      IPK=0                                                             INPUTG
      DO 160 I=1,7                                                      INPUTG
      DO 150 J=1,7                                                      INPUTG
      IF(IOUT(I).NE .J)GO TO 150                                        INPUTG
      IPRT(J)=J                                                         INPUTG
      IPK=J                                                             INPUTG
      GO TO 160                                                         INPUTG
 150  CONTINUE                                                          INPUTG
 160  CONTINUE                                                          INPUTG
      IF(IPK.EQ.0)IPRT(1)=8                                             INPUTG
 170  CONTINUE                                                          INPUTG
C     WRITE(IT1,GDATA)                                                  INPUTG
      RETURN                                                            INPUTG
 200  ICD=I2                                                            INPUTG
      RETURN                                                            INPUTG
```

```
1000 FORMAT(20A4)                                          INPUTG     116
     END                                                   INPUTG     117
```

```
      SUBROUTINE INTRCP(XY,X,Y,IERR)
C
C AUTHOR              K.D. JOHNSON
C
C PURPOSE             TO CALCULATE THE POINT OF INTERSECTION OF 2 LINES
C                     DEFINED BY THE SET OF COORDINATES  XY
C
C METHOD              POINT SLOPE
C
C INPUT               XY          COORDINATE ARRAY WHERE
C                                 XY(1)-XY(2) DEFINE END POINTS OF LINE 1
C                                 XY(3)-XY(4) DEFINE END POINTS OF LINE 2
C
C OUTPUT              X           X INTERCEPT
C                     Y           Y INTERCEPT
C
C ERROR CODE          IERR        0= INTERCEPT RETURNED
C                                 1= NO INTERCEPT POSSIBLE
C
      DIMENSION  XY(4,2)
C
C  INITIALIZE
      IERR=0
      X1=XY(1,1)
      X2=XY(2,1)
      X3=XY(3,1)
      X4=XY(4,1)
      Y1=XY(1,2)
      Y2=XY(2,2)
      Y3=XY(3,2)
      Y4=XY(4,2)
      SAME=.00001
      IGO=1
      T=X2-X1
      IF(ABS(T).LT.SAME) GO TO 10
      S12=(Y2-Y1)/T
      GO TO 12
10    IGO=2
12    T=X3-X4
      IF(ABS(T).LT.SAME) GO TO 60
      S34=(Y3-Y4)/T
      IF  (IGO-1)  25, 25, 50
C
C  COMPUTE INTERCEPT IF SLOPES ARE NOT EQUAL OR INFINITE
C
25    IF(ABS(S12 - S34).LT.SAME) GO TO 90
      X= (Y4 - Y1 + S12*X1 - S34*X4)/(S12 - S34)
30    Y=  S12 * (X - X1) + Y1
      GO TO 99
C
C  COMPUTE INTERCEPT WHERE  X=X1=X2
C
50    X=X1
      IF(ABS(X3-X4).LT.SAME) GO TO 90
      Y= S34 * (X - X4) + Y4
      GO TO 99
C
```

```
C  COMPUTE INTERCEPT WHERE  X=X3=X4                                    INTRCP     59
C                                                                      INTRCP     60
60     X=X3                                                            INTRCP     61
       IF( ABS(X1-X2).LT.SAME) GO TO 90                                INTRCP     62
       GO TO 30                                                        INTRCP     63
C                                                                      INTRCP     64
C NO INTERCEPT POSSIBLE WITHIN REASONABLE RANGE IF EVER                INTRCP     65
C                                                                      INTRCP     66
90     IERR=1                                                          INTRCP     67
C                                                                      INTRCP     68
99     RETURN                                                          INTRCP     69
       END                                                             INTRCP     70
```

```
      SUBROUTINE JBES(ARG, N, EPS, BES)
C
C  ROUTINE TO CALCULATE BESSEL FUNCTIONS OF ORDERS (0 THRU N-1).
C
C *NOTE*
C  ASSUMES POSITIVE ARGUMENT AND ORDER N.
      DIMENSION BES(1)
      DATA I1, I2, F0, F1, E0, E1 /1, 2, 0., 1., .02, 5.E-3/
      X  =  ABS(ARG)
      IF  (X - E0)  10, 40, 40
   10 BES(1)  =  F1
      DO  20  K = 1,N
      BES(K+1)  =  F0
   20 CONTINUE
   30 GO TO 90
   40 M  =  X
      DO  50  K = 1,I2
      MP1  =  M + I1
      CALL BESJ(X, M, BES(MP1), EPS, IER)
   50 M  =  MP1
      M  =  X
      IF  (M)  80, 80, 60
   60 DO  70  I = 1,M
      K  =  M + I1 - I
      BES(K)  =  FLOAT(K) * (BES(K+1)+BES(K+1)) / X - BES(K+2)
   70 CONTINUE
   80 M  =  M + I2
      IF  (M - N)  100, 90, 90
   90 RETURN
  100 I  =  -I1
      NM1  =  N + I
      S  =  E1 * (ABS(BES(M-1)) + ABS(BES(M)))
      DO  140  K = M,NM1
      KP1  =  K + I1
      BES(KP1)  =  FLOAT(K-1) * (BES(K)+BES(K)) / X - BES(K-1)
      IF  (ABS(BES(KP1)) - S)  110, 130, 130
  110 IF  (I)  120, 150, 150
  120 I  =  I + I1
      GO TO 140
  130 I  =  -I1
  140 CONTINUE
      GO TO 90
  150 DO  160  I = KP1,NM1
      BES(I+1)  =  F0
  160 CONTINUE
      GO TO 90
      END
```

```
      SUBROUTINE JEINT                                                  JEINT
C                                                                       JEINT
C     PURPOSE  JET/EDGE INTERACTION NOISE PREDICTION                    JEINT
C              FOR AN ENGINE OVER WING CONFIGURATION                    JEINT
C              THE PROCEDURE IS BASED ON THEORETICAL                    JEINT
C              AND EMPIRICAL ANAYSIS SHOWN IN THE BOEING REFERENCES     JEINT
C     REF.     FILLER, PREDICTION SCHEME FOR ENGINE JET EXHAUST         JEINT
C              FLOW-WING/FLAP INTERACTION NOISE ANS-RES-670 DEC 74      JEINT
C              DUNN, A/C CONFIGURATION NOISE REDUCTION CONTRACT         JEINT
C              DOT-FA74WA-3497,PROGRESS REPORT 7 FEB 75                 JEINT
C                                                                       JEINT
C     INPUT                                                             JEINT
C              AJS13  JET SPREADING ANGLE (DEG).DEFAULT=5.7             JEINT
C              DDA13  DIMENSIONLESS DISCHARE AREA.DEFAULT=.7854         JEINT
C              DDNE13 DIMENSIONLESS DISTANCE BETWEEN NOZZLE EXIT        JEINT
C                     TO THE WING/FLAP SYSTEMS TRAILING EDGE            JEINT
C              DHNL13 DIMENSIONLESS NOZZLE LIP HEIGHT ABOVE WING SURFACE JEINT
C              DJCL13 DIMENSIONLESS JET CORE LENGTH. DEFAULT=5.0        JEINT
C              EMJ13  JET MACH NUMBER                                   JEINT
C              FLAP13 NOMINAL FLAP ANGLE ANGLE OF ATTACK                JEINT
C              HD13   HYDRAULIC DIAMETER OF JET NOZZLE (M OR FT)        JEINT
C              TSR13  JET STATIC TEMPERATURE RATIO                      JEINT
C              ICOR13 =0 INDICATES NO CONFIGURATION CORRECTIONS         JEINT
C                     =1 CORRECTIONS ARE A FUNCTION OF DIRECTIVITY      JEINT
C                     =2 CORRECTIONS ARE A FUNCTION OF DIRECTIVITY      JEINT
C                        AND FREQUENCY                                  JEINT
C                                                                       JEINT
C     INPUT    GENERAL                                                  JEINT
C              ALTR   OBSERVER HEIGHT ABOVE GROUND                      JEINT
C              AMACH  A/C MACH NO                                       JEINT
C              APO    AMBIENT PRESSURE AT A/C ALTITUDE                  JEINT
C              APY    A/C COORDINATE IN DIRECTION OF FLIGHT PATH        JEINT
C                     PROJECTED ON THE GROUND                           JEINT
C              APZ    A/C HEIGHT ABOVE GROUND                           JEINT
C              BOF    GEOMETRIC MEAN FREQUENCIES FOR SPECTRA            JEINT
C              CZ     AMBIENT SPEED OF SOUND AT A/C ALTITUDE            JEINT
C              DOPSF  DOPPLER SHIFT FACTOR                              JEINT
C              ISPTRM FILTER BANDWIDTH INDEX 1=FULL,IF 0=1/3 O/B SPL    JEINT
C              NOF    NUMBER OF CENTER FREQ.                            JEINT
C              NENG   NO OF ENGINES                                     JEINT
C              NOBS   NUMBER OF OBSERVER POSITIONS                      JEINT
C              SLDIST SIDE LINE DISTANCE                                JEINT
C              SLOPE  A/C CLIMB GRADIENT                                JEINT
C                                                                       JEINT
C     OUTPUT   SPLT   FINAL SOUND PRESSURE LEVEL ,1/1 OR 1/3 O/B SPECTRA JEINT
C                     AT EACH DIRECTIVITY ANGLE POSITION,FREE FIELD R=1M JEINT
C              SSPL   THE SUM OF SPLT AT EACH OBSERVER POSITION         JEINT
C                                                                       JEINT
      COMMON/JETEDG/AJS13,DDA13,DDNE13,DHNL13,DJCL13,                   JEINT
     *FLAP13,HD13,EMJ13,TSR13,ICOR13                                    JEINT
C                                                                       JEINT
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 JEINT
C                                                                       JEINT
      COMMON /GCOMON/ NOF,NK,BOF(24),TSPL(24,10,17),SPLT(24,17),        JEINT
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                     JEINT
C                                                                       JEINT
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  JEINT
```

```
C
C     GENERAL INPUT PARAMETERS
C
      COMMON/ANGLE/PSI(17,10)
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NCBS,SLDIST(10),NTENG,IUNIT
     *     ,ISPTRM,IATMOS,IAIR,LAIRAB(24),NTEMP,TEMP(50),TALT(50)
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,NC,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF
C
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS
C
      COMMON /GEOMC/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)
     *,APP,TP,RHP,APO,TC,RHC,CA,CZ,TSP(17,10),CCV
C
      COMMON/GFREQ/CFREQ(24),UFREQ(25),PFREQ(24)
C
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)
C
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)
C
      COMMON/SUMSPL/SSPL(24,10,17)
C
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICCP,IPRT(7),ICN(13),NLOPT
C
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)
C
      DATA CO,PSO,RO2,DTOR/1116.4,14.696,10.76,.01745329/
      ICN(13) = ICN(13) + 1
C
C     JETSPEED OF SOUND
      CJ= CO*SQRT(TSR13)
C
C     JET VELOCITY
      VJ=EMJ13*CJ
C
C     AMBIENT VELOCITY
      VC=AMACH*CZ
C
C     REL JET VELOCITY
      FLAPR=FLAP13*DTOR
      ALPHA=FLAPR-ATAN(SLOPE)
      VJR= SQRT(VJ*VJ-2.*VJ*VC*COS(ALPHA)+VC*VC)
C
C     CHARACTERISTIC FREQUENCY
      D=HD13
      IF(IUNIT.EQ.0) D=3.280833*HD13
      FC= VJ /D *1.8/(3.+DDNE13)
C
C     CHARACTERISTIC REFERENCE SOUND LEVEL
C
      AENG=NENG
      COCZ=CO/CZ
      PZPSO=APO*APO/(PSO*PSO)
      TSOTS=1./(TSR13*TSR13)
      ARO= DDA13*D*D/RO2
```

```
      BW=1.                                                             JEINT     116
      IF(ISPTRM.EQ.0)BW=1./3.                                           JEINT     117
      SLO=10.*ALOG10(VJ*VJR**4*PZPSC*TSCTS*COCZ*ARC*BW*AENG)            JEINT     118
     *-10.* ABS(ALOG10(DJCL13/DDNE13*VJ/VJR))-4.6                       JEINT     119
      SMT=DHNL13/DDNE13                                                 JEINT     120
      IF(AJS13.EQ.0.0)AJS13=5.7                                         JEINT     121
      SMTO=VJR/VJ*TAN(AJS13*DTOR)                                       JEINT     122
      IF(SMT.GT.SMTO)SLO=SLO-24.*ALOG10(SMT/SMTO)                       JEINT     123
C     DETERMINE DIRECTIVITY ANGLES                                      JEINT     124
      CALL ANGLES(NOBS,FLAPR)                                           JEINT     125
C                                                                       JEINT     126
C     ITERATE FOR EACH OBSERVER COORDINATE                              JEINT     127
C     TO DETERMINE SPL DIRECTIVITY CORRECTION(DC)                       JEINT     128
C                                                                       JEINT     129
      CFLAP=COS(FLAPR)                                                  JEINT     130
      SFLAP=SIN(FLAPR)                                                  JEINT     131
C                                                                       JEINT     132
      DO 300 I=1,NOBS                                                   JEINT     133
      CALL LINCOR(SPZ(1,1),0,W,W,W,W,W,W,W,W,W,PSI(1,I),NCF,BCF,        JEINT     134
     *W,W,W,W,W,W,W,ICOR13,IB(1,1,ITYPE),0,W)                           JEINT     135
      X=SLDIST(I)                                                       JEINT     136
      X2=X*X                                                            JEINT     137
C                                                                       JEINT     138
      CALL ZERO(SPLT,408)                                               JEINT     139
C                                                                       JEINT     140
C     LOOP ON THE 17 DIRECTIVITY ANGLES                                 JEINT     141
C                                                                       JEINT     142
      DO 200 J=1,17                                                     JEINT     143
      Y=APY(I,J)                                                        JEINT     144
      ZN=APZ(I,J)-ALTR                                                  JEINT     145
      ZN2=ZN*ZN                                                         JEINT     146
      Y2=Y*Y                                                            JEINT     147
      SF=DOPSF(J)                                                       JEINT     148
      YPZ=SQRT(Y2+ZN2)                                                  JEINT     149
      THETO= ACOS((Y*CFLAP+ZN*SFLAP)/YPZ)                               JEINT     150
      COSETA=YPZ/SQRT(X2+Y2+ZN2)                                        JEINT     151
      Q= ABS(COSETA)*SIN(.5*THETO)**2/(SF*SF*SF)                        JEINT     152
      IF(Q.LT.1.0E-10)Q=1.0E-10                                         JEINT     153
      DIRCOR =10.*ALOG10(Q)                                             JEINT     154
C                                                                       JEINT     155
C     LOOP ON FILTER BAND FREQUENCY FOR EACH DIRECTIVITY ANGLE          JEINT     156
C                                                                       JEINT     157
      DO 100 NF=1,NCF                                                   JEINT     158
      DSFN=BCF(NF)*SF/FC                                                JEINT     159
      SSC=10.*ALOG10(DSFN**4.8/(1.+1.5*(DSFN)**5.7)**1.4)               JEINT     160
      SPLT(NF,J)=SSC+DIRCOR+SLO-SPZ(NF,J)                               JEINT     161
      SSPL(NF,I,J)=PWRSUM(SSPL(NF,I,J),SPLT(NF,J))                      JEINT     162
  100 CONTINUE                                                          JEINT     163
  200 CONTINUE                                                          JEINT     164
C                                                                       JEINT     165
C     OUTPUT OF SPECTRA(INDEX,EXTRAPOLATED),AND CALCULATION OF          JEINT     166
C     PERCEIVED NOISE LEVELS,AND EFFECTIVE PERCEIVED NOISE LEVELS       JEINT     167
C                                                                       JEINT     168
      IF(IPRT(7).NE.7)GO TO 220                                         JEINT     169
      CALL NOISO(IPRT(7),I,NK,10,CHIN,ILNIT,SLDISX(I),PFREQ,            JEINT     170
     *SPLT(1,1),NCF,ITYPE)                                              JEINT     171
  220 CONTINUE                                                          JEINT     172
```

```
      DO 240 NF=1,NCF                                                   JEINT     173
      DO 240 J=1,17                                                     JEINT     174
  240 SPLT(NF,J)= SPLT(NF,J)-TSPL(NF,I,J)                               JEINT     175
      CALL PNLSUB(SPLT(1,1),PSPL(1,I),IPD(1,I),EPNL(1,I),SPL2,          JEINT     176
     *TEPNL(1,I),NK,BCG,TCG,FLR,I,NCBS,IRR(I,1))                        JEINT     177
      IF(IPRT(3).NE.3)GO TO 300                                         JEINT     178
      CALL NOISO(IPRT(3),I,NK,12,CHIN,ILNIT,SLDISX(I),PFREQ,            JEINT     179
     *SPLT(1,1),NCF,ITYPE)                                              JEINT     180
  300 CONTINUE                                                          JEINT     181
      RETURN                                                            JEINT     182
      END                                                               JEINT     183
```

```
      SUBROUTINE JET                                                    JET
C AUTHOR            D. F. MELDRUM                                       JET
C                                                                       JET
C PURPOSE           TO PREDICT JET NOISE FOR THE PHASE B                JET
C                   NASA-AMES FOOTPRINT CONTRACT NAS2-6969.             JET
C                                                                       JET
C METHOD            AS DESCRIBED IN REFERENCES 1) AND 2).               JET
C                                                                       JET
C INPUTS            VIA LABLED COMMON JETDAT                            JET
C                                                                       JET
C                   NJET      CODE FOR METHOD OF JET NOISE PREDICTION   JET
C                             0  NO JET NOISE PREDICTION                JET
C                             1  REQUIRES AP, PR, PA, TT, AND VA        JET
C                             2  REQUIRES WP, PR, PA, TT, AND VA        JET
C                             3  REQUIRES AP, WP, VP, AND VA            JET
C                                OPTIONALY AS, VS, AND WS MAY BE INPUT  JET
C                                FOR A BYPASS ENGINE.  (REQUIRED FOR    JET
C                                PROCESSING SECONDARY JET NOISE.)       JET
C                             NOT 0, 1, 2, OR 3 THE DATA WILL BE        JET
C                                INSPECTED TO DETERMINE THE PROPER      JET
C                                METHOD.  WILL BE ASSUMED TO BE         JET
C                                3  IF PR, PA, AND TT ARE ALL ZERO, OR  JET
C                                2  IF AP IS ZERO, OR                   JET
C                                1  IF WP IS ZERO.                      JET
C                   MCODE     CODE FOR USE OF THE STROUHAL CURVES       JET
C                             1  FOR FLIGHT                             JET
C                             2  FOR GROUND                             JET
C                             3  FOR MIXED                              JET
C                   AP        PRIMARY JET NOZZLE AREA          FT*FT    JET
C                   WP        PRIMARY JET WEIGHT FLOW          LBS/SEC  JET
C                   VP        PRIMARY JET VELOCITY (REL)       FT/SEC   JET
C                   AS        SECONDARY JET NOZZLE AREA        FT*FT    JET
C                   WS        SECONDARY JET WEIGHT FLOW        LBS/SEC  JET
C                   VS        SECONDARY JET VELOCITY (REL)     FT/SEC   JET
C                   PR        NOZZLE PRESSURE RATIO (PT/PA)            JET
C                   PA        AMBIENT PRESSURE                 LB/FT/FT JET
C                   TT        JET TOTAL TEMPERATURE            DEG R    JET
C                   VA        VELOCITY OF THE AIRCRAFT         FT/SEC   JET
C                   DIAMET    EFFECTIVE DIAMETER (OPTIONAL             JET
C                             INPUT FOR ALL METHODS)           FT       JET
C                   ANGJET    ENGINE INCLINATION ANGLE                 JET
C                                                                       JET
C                                                                       JET
C                   VIA LABLED COMMON SWITCH                            JET
C                                                                       JET
C                   NUMENG    NUMBER OF NOISE SOURCES OF THE SAME       JET
C                             NOISE TYPE.                               JET
C                                                                       JET
C                   VIA LABLED COMMON GCOMON                            JET
C                                                                       JET
C                   NOF       1/3 OCTAVE OF FULL OCTAVE SWITCH          JET
C                             OR NUMBER OF FREQUENCY BANDS (8 OR 24)    JET
C                   RETA(24)  DIRECTIVITY ANGLES                        JET
C                                                                       JET
C                   VIA LABLED COMMON GPRAM                             JET
C                                                                       JET
C                   AMACH     MACH NUMBER OF THE AIRCRAFT               JET
```

```
C                    NOBS       NUMBER OF OBSERVER POSITIONS                JET
C                                                                           JET
C                    VIA LABLED COMMON SUMSPL                               JET
C                                                                           JET
C                    SSPL       CURRENT TOTAL PREDICTED NOISE FOR NOF       JET
C                               (8 OR 24) FREQUENCIES, AT NOBS OBSERVER     JET
C                               POSITIONS FOR 17 DIRECTIVITY ANGLES.        JET
C                                                                           JET
C                    VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES JET
C                                                                           JET
C                    PSI        17 DIRECTIVITY ANGLES FOR EACH OF           JET
C                               NOBS OBSERVER POSITIONS.                    JET
C                    PSIC       17 DIRECTIVITY ANGLE PROJECTIONS FOR        JET
C                               EACH OF NOBS OBSERVER POSITIONS             JET
C                    BETA       ELEVATION ANGLE PROJECTION FOR EACH         JET
C                               OF NOBS OBSERVER POSITIONS.                 JET
C                                                                           JET
C                    EACH COMPONENT IS WRITTEN ON TAPE OR FILE 10           JET
C                    FOR EACH OF NOF BANDS FOR EACH OF NOBS OBSERVER        JET
C                    POSITIONS.                                             JET
C                                                                           JET
C OUTPUTS            VIA LABLED COMMON SUMSPL                               JET
C                                                                           JET
C                    SSPL       CURRENT TOTAL PREDICTED NOISE FOR           JET
C                               8 OR 24 FREQUENCIES, AT NOBS OBSERVER       JET
C                               POSITIONS FOR 17 DIRECTIVITY ANGLES.        JET
C                                                                           JET
C                    VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES JET
C                                                                           JET
C                    PSI        17 DIRECTIVITY ANGLES FOR EACH OF           JET
C                               NOBS OBSERVER POSITIONS.                    JET
C                    PSIC       17 DIRECTIVITY ANGLE PROJECTIONS FOR        JET
C                               EACH OF NOBS OBSERVER POSITIONS             JET
C                    BETA       ELEVATION ANGLE PROJECTION FOR EACH         JET
C                               OF NOBS OBSERVER POSITIONS.                 JET
C                                                                           JET
C                                                                           JET
C REFERENCES         1)  R. J. SAXBY,  JET NOISE PREDICTION PROCEDURE       JET
C                        FOR THE NASA-AMES FOOTPRINT CONTRACT NAS2-6969,    JET
C                        UN-NUMBERED COORDINATION SHEET,  DATED             JET
C                        17 JANUARY 1973.                                   JET
C                                                                           JET
C FUNCTION SUBPRGM   COS        ESHLDG     FWRSUM                           JET
C                                                                           JET
C SUBROUTINES        ANGLES     UNIT       JETNOS        ZERO               JET
C                                                                           JET
C                                                                           JET
C                                                                           JET
      COMMON /JETDAT/ NJET,MODDE,AP,WF,VP,AS,WS,VS,                         JET
     *                PR,PA,TT,VA,DIAMET,ANGJET,IOOR1                       JET
C                                                                           JET
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDDP,IPRT(7),ION(13),NLOPT             JET
     *,INSEOW(3),INSHLD                                                     JET
      COMMON/SHLDJT/SPLP(24,17),SPLS(24,17)                                 JET
C                                                                           JET
C     CONSTANTS USED IN INTERNAL CALCULATIONS                               JET
C                                                                           JET
```

```
      COMMON /GCONSI/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI
C
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING
C
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)
      COMMON/SUMSPL/SSPL(24,10,17)
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)
C
C     FREQUENCY BANDS USED BY PROGRAM
C
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)
C
C     GENERAL INPUT PARAMETERS
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)
C
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),ITENG,IUNIT
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF
C
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS
C
      COMMON /GEOMU/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CCV
C
C     CONVERSION CONSTANTS
C
      COMMON/GCONVC/C(2,10),SLDISX(10)
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR
C
      DIMENSION DSPL(24,17)
C
      PA=APO*144.
C
C
      IF(ITYPE.EQ.1) ICN(1)=ICN(1)+1
      IF(ITYPE.EQ.2) ICN(2)=ICN(2)+1
      VA=AMACH*CZ
C
C
      DELTA=ANGJET*RPD
      CALL ANGLES(NOBS,DELTA)
C
C
C     LOOP FOR THE NUMBER OF OBSERVER POSITIONS
C
   40 DO 1000 M=1,NOBS
      CALL LINCOR(SPZ(1,1),0,X,X,X,X,X,X,X,X,X,PSI(1,M),NCF,
     *BCF,X,X,X,X,X,X,X,ICOR1,IB(1,1,ITYPE),0,X)
C
```

```
      CALL ZERO(SPLT,408)                                               JET
      CALL ZERO(SPLP,408)                                               JET
      CALL ZERO(SPLS,408)                                               JET
      CALL ZERO(DSPL,408)                                               JET
C                                                                       JET
C                                                                       JET
C                                                                       JET
C     CALCULATE THE JET NOISE PREDICTION                                JET
C                                                                       JET
      CALL JETNOS(PSI(1,M),SPLT(1,1))                                   JET
C                                                                       JET
C                                                                       JET
   45 CONTINUE                                                          JET
C                                                                       JET
C     CONVERT TO A UNIT OR INDEXED SPECTRA                              JET
C                                                                       JET
      CALL UNIT(150.,17,SPLT(1,1))                                      JET
      CALL UNIT(150.,17,SPLP(1,1))                                      JET
      CALL UNIT(150.,17,SPLS(1,1))                                      JET
      ENG=NENG                                                          JET
      IF(ENG.LE.0.0) ENG=1.0                                            JET
      DO 50 J=1,17                                                      JET
      ELVANG=BETA(J,M)                                                  JET
      DANGLE=PSIO(J,M)                                                  JET
      ENS=ESHLDG(DANGLE,ELVANG,ENG)                                     JET
      DO 50 K=1,24                                                      JET
      SPLP(K,J)=SPLP(K,J)-ENS                                           JET
      SPLS(K,J)=SPLS(K,J)-ENS                                           JET
   50 SPLT(K,J)=SPLT(K,J)-ENS                                           JET
      IF( NOF.EQ.24 ) GO TO 250                                         JET
C                                                                       JET
C     CONVERT 1/3 OCTAVE TO FULL OCTAVE                                 JET
C                                                                       JET
      DO 200 J=1,17                                                     JET
      DO 200 K=1,8                                                      JET
      TMP  =  0.                                                        JET
      DO 100 L=1,3                                                      JET
      JC  =  3 * K + L - 3                                              JET
  100 TMP  =  PWRSUM(TMP, SPLT(JC,J))                                   JET
  200 SPLT(K,J)  =  TMP                                                 JET
C                                                                       JET
      DO  22 J=1,17                                                     JET
      DO 22 K=1,8                                                       JET
      TMP  =  0.                                                        JET
      DO 11 L=1,3                                                       JET
      JC  =  3 * K + L - 3                                              JET
   11 TMP  =  PWRSUM(TMP, SPLP(JC,J))                                   JET
   22 SPLP(K,J)  =  TMP                                                 JET
      IF(ITYPE.NE.2)GO TO 55                                            JET
      DO 44 J=1,17                                                      JET
      DO 44 K=1,8                                                       JET
      TMP  =  0.                                                        JET
      DO 33 L=1,3                                                       JET
      JC  =  3 * K + L - 3                                              JET
   33 TMP  =  PWRSUM(TMP, SPLS(JC,J))                                   JET
   44 SPLS(K,J)  =  TMP                                                 JET
   55 CONTINUE                                                          JET
```

```
C                                                                       JET      230
  250 IF( INSHLD.EQ.0 ) GO TO 300                                       JET      231
      CALL JNSA(APY,APZ,ALTR,BCF,CZ,DELTA,DIAMET,VP,VS,                 JET      232
     *          SLDIST,M,NCF,SPLP,SPLS,SPLT,ITYPE,DSPL,IUNIT)           JET      233
C                                                                       JET      234
C                                                                       JET      235
C     ADD TO CURRENT TOTAL AND WRITE ON TAPE 10                         JET      236
C                                                                       JET      237
C                                                                       JET      238
  300 DO 400 J=1,NCF                                                    JET      239
      DO 350 K=1,17                                                     JET      240
      SPLP(J,K)=SPLP(J,K)-SPZ(J,K)                                      JET      241
      SPLS(J,K)=SPLS(J,K)-SPZ(J,K)                                      JET      242
      SPZ(J,K)=SPZ(J,K)+DSPL(J,K)                                       JET      243
      SPLT(J,K)=SPLT(J,K)-SPZ(J,K)                                      JET      244
  350 SSPL(J,M,K)=PWRSUM(SSPL(J,M,K),SPLT(J,K))                         JET      245
  400 CONTINUE                                                          JET      246
      IF(IPRT(7).NE.7)GO TO 410                                         JET      247
      CALL NOISO(IPRT(7),M,NK,10,CHIN,ILNIT,SLDISX(M),PFREQ,SPLT(1,1),  JET      248
     *  NCF,ITYPE)                                                      JET      249
  410 CONTINUE                                                          JET      250
      DO 360 JC=1,NCF                                                   JET      251
      DO 360 KC=1,17                                                    JET      252
  360 SPLT(JC,KC)=SPLT(JC,KC)-TSPL(JC,M,KC)                             JET      253
      CALL PNLSUB(SPLT(1,1),PSPL(1,M),TPC(1,M),EPNL(1,M),SPL2,          JET      254
     *TEPNL(1,M),NK,BCG,TCG,FLR,M,NCBS,IRR(M,1))                        JET      255
      IF(IPRT(3).NE.3)GO TO 1000                                        JET      256
      CALL NOISO(IPRT(3),M,NK,12,CHIN,ILNIT,SLDISX(M),PFREQ,            JET      257
     *   SPLT(1,1),NCF,ITYPE)                                           JET      258
C                                                                       JET      259
C                                                                       JET      260
C                                                                       JET      261
 1000 CONTINUE                                                          JET      262
      RETURN                                                            JET      263
      END                                                               JET      264
```

```
      SUBROUTINE JETNOS(ANGLES,SPL)                                     JETNOS     2
C AUTHOR              D. F. MELDRUM                                     JETNOS     3
C                                                                       JETNOS     4
C PURPOSE             TO PREDICT JET NOISE FOR THE PHASE B NASA-AMES    JETNOS     5
C                     FOOTPRINT CONTRACT NAS2-6969.  NOISE IS PREDICTED JETNOS     6
C                     AT 150 FEET AS A SINGLE SOURCE WITHOUT            JETNOS     7
C                     SHIELDING EFFECTS.                                JETNOS     8
C                                                                       JETNOS     9
C METHOD              AS DESCRIBED IN REFERENCE 1).                     JETNOS    10
C                                                                       JETNOS    11
C INPUTS              VIA THE CALL                                      JETNOS    12
C                                                                       JETNOS    13
C                     ANGLES    DIRECTIVITY ANGLES                      JETNOS    14
C                                                                       JETNOS    15
C                     VIA LABLED COMMON JETDAT                          JETNOS    16
C                                                                       JETNOS    17
C                     NJET      CODE FOR METHOD OF JET NOISE PREDICTION JETNOS    18
C                               0  NO JET NOISE PREDICTION              JETNOS    19
C                               1  REQUIRES AP, PR, PA, TT, AND VA      JETNOS    20
C                               2  REQUIRES WP, PR, PA, TT, AND VA      JETNOS    21
C                               3  REQUIRES AP, WP, VP, AND VA          JETNOS    22
C                                  OPTIONALY AS, VS, AND WS MAY BE INPUT JETNOS    23
C                                  FOR A BYPASS ENGINE.  (REQUIRED FOR  JETNOS    24
C                                  PROCESSING SECONDARY JET NOISE.)     JETNOS    25
C                                  INSPECTED TO DETERMINE THE PROPER    JETNOS    26
C                                  METHOD.  WILL BE ASSUMED TO BE       JETNOS    27
C                                  3  IF PR, PA, AND TT ARE ALL ZERO, OR JETNOS    28
C                                  2  IF AP IS ZERO, OR                 JETNOS    29
C                                  1  IF WP IS ZERO.                    JETNOS    30
C                     MCODE     CODE FOR USE OF THE STROUHAL CURVES     JETNOS    31
C                               1  FOR FLIGHT                           JETNOS    32
C                               2  FOR GROUND                           JETNOS    33
C                               3  FOR MIXED                            JETNOS    34
C                     AP        PRIMARY JET NOZZLE AREA          FT*FT  JETNOS    35
C                     WP        PRIMARY JET WEIGHT FLOW          LBS/SEC JETNOS   36
C                     VP        PRIMARY JET VELOCITY (REL)       FT/SEC JETNOS    37
C                     AS        SECONDARY JET NOZZLE AREA        FT*FT  JETNOS    38
C                     WS        SECONDARY JET WEIGHT FLOW        LBS/SEC JETNOS   39
C                     VS        SECONDARY JET VELOCITY (REL)     FT/SEC JETNOS    40
C                     PR        NOZZLE PRESSURE RATIO (PT/PA)           JETNOS    41
C                     PA        AMBIENT PRESSURE                 LB/FT/FT JETNOS  42
C                     TT        JET TOTAL TEMPERATURE            DEG R  JETNOS    43
C                     VA        VELOCITY OF THE AIRCRAFT         FT/SEC JETNOS    44
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      DATA D01/-13.90, -5.10,-14.10,-16.50,-16.33,-16.20,-18.67,-19.33,   JETNOS     83
     *         -13.40, -6.33,-13.93,-16.20,-16.33,-16.83,-18.67,-19.33,   JETNOS     84
     *         -13.00, -7.47,-13.60,-15.93,-16.20,-17.37,-18.67,-19.37,   JETNOS     85
     *         -12.40, -7.83,-13.33,-15.60,-16.07,-17.50,-18.67,-19.50,   JETNOS     86
     *         -11.50, -8.00,-13.13,-15.20,-15.87,-17.37,-18.67,-19.67,   JETNOS     87
     *         -10.60, -7.83,-12.60,-14.77,-15.47,-16.77,-18.43,-19.63,   JETNOS     88
     *          -9.40, -7.40,-12.13,-14.27,-14.73,-16.10,-17.67,-18.93,   JETNOS     89
     *          -8.20, -6.47,-11.50,-13.50,-14.03,-15.10,-16.77,-17.93,   JETNOS     90
     *          -6.80, -5.13,-10.50,-12.57,-13.00,-14.03,-15.37,-16.33,   JETNOS     91
     *          -5.10, -3.77, -8.97,-11.33,-11.63,-12.70,-13.77,-14.47,   JETNOS     92
     *          -3.30, -2.33, -7.40, -9.70, -9.97,-11.00,-12.13,-12.47,   JETNOS     93
     *          -2.00,  -.83, -5.77, -7.87, -7.77, -7.90, -9.47, -9.80,   JETNOS     94
     *          -1.20,   .83, -3.27, -4.33, -3.00, -3.80, -4.33, -2.67,   JETNOS     95
     *            .50,  2.43,   .20,  -.23,  2.00,  1.13,  1.13,  3.23,   JETNOS     96
     *           2.30,  4.10,  4.83,  5.07,  6.00,  5.67,  5.67,  6.00,   JETNOS     97
     *           5.50,  5.87,  7.13,  7.33,  7.63,  8.00,  8.17,  6.67,   JETNOS     98
     *           7.00,  5.67,  6.73,  7.20,  8.00,  6.50,  7.00,  5.00,   JETNOS     99
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     *         -12.50,-14.50,-13.70,-13.00,-11.60,-14.90,-14.30,-16.70/  JETNOS    101
      DATA D02/-11.40, -6.20,-14.00,-16.50,-17.20,-17.20,-19.00,-19.00,   JETNOS    102
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     *         -10.60, -7.60,-13.60,-16.10,-16.90,-17.90,-19.00,-19.00,   JETNOS    104
     *         -10.00, -8.10,-13.40,-15.80,-16.70,-18.00,-19.00,-19.00,   JETNOS    105
     *          -9.10, -8.30,-13.20,-15.40,-16.40,-17.80,-19.00,-19.00,   JETNOS    106
     *          -8.20, -8.20,-12.70,-14.90,-15.90,-17.20,-18.80,-18.80,   JETNOS    107
     *          -7.00, -7.80,-12.20,-14.30,-15.10,-16.50,-18.10,-18.10,   JETNOS    108
     *          -5.80, -6.90,-11.50,-13.50,-14.30,-15.50,-17.20,-17.20,   JETNOS    109
     *          -4.40, -5.60,-10.50,-12.50,-13.20,-14.40,-15.80,-15.80,   JETNOS    110
     *          -2.70, -4.20, -9.00,-11.20,-11.80,-12.90,-14.10,-14.10,   JETNOS    111
     *          -2.40, -2.70, -7.40, -9.50,-10.00,-11.00,-12.10,-12.10,   JETNOS    112
     *          -1.90, -1.10, -5.60, -7.50, -7.60, -7.80, -9.10, -9.10,   JETNOS    113
     *          -1.30,   .60, -3.00, -4.00, -3.00, -3.60, -4.00, -2.00,   JETNOS    114
     *           1.00,  2.30,   .50,   .20,  2.00,  1.50,  1.50,  3.80,   JETNOS    115
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*          5.70,  5.90,  7.30,  7.60,  7.80,  8.00,  8.00,  6.00,  JETNOS    117
*          6.00,  6.00,  7.00,  7.20,  7.50,  6.00,  6.00,  4.00,  JETNOS    118
*          6.20,  6.00,  6.70,  6.80,  7.00,  4.00,  4.00,  2.00,  JETNOS    119
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 DATA D03/-13.40, -7.40,-13.80,-16.60,-17.90,-18.00,-19.33,-18.80,  JETNOS    121
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*        -12.00, -8.37,-13.47,-16.00,-17.33,-18.50,-19.33,-18.50,  JETNOS    124
*        -11.10, -8.60,-13.27,-15.60,-16.93,-18.23,-19.33,-18.33,  JETNOS    125
*        -10.20, -8.20,-12.80,-15.03,-16.33,-17.63,-19.17,-17.97,  JETNOS    126
*         -9.00, -8.20,-12.27,-14.33,-15.47,-16.90,-18.53,-17.27,  JETNOS    127
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 DATA D04/-11.20, -8.10,-13.50,-16.80,-18.40,-18.60,-19.67,-18.40,  JETNOS    140
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*        -10.20, -7.87,-13.60,-16.43,-18.30,-18.96,-19.67,-18.27,  JETNOS    142
*         -9.60, -8.63,-13.53,-16.20,-17.97,-19.00,-19.67,-18.00,  JETNOS    143
*         -8.70, -8.90,-13.33,-15.80,-17.47,-18.67,-19.67,-17.67,  JETNOS    144
*         -7.90, -8.93,-12.90,-15.70,-16.77,-18.07,-19.53,-17.13,  JETNOS    145
*         -6.60, -8.60,-12.33,-14.37,-15.83,-17.30,-18.97,-16.43,  JETNOS    146
*         -5.40, -7.77,-11.50,-13.50,-14.83,-16.30,-18.07,-15.73,  JETNOS    147
*         -4.00, -6.53,-10.50,-12.37,-13.60,-15.13,-16.67,-14.73,  JETNOS    148
*         -2.30, -5.07, -9.07,-10.93,-12.13,-13.30,-14.77,-13.37,  JETNOS    149
*         -2.00, -3.43, -7.40, -9.10,-10.07,-11.00,-12.03,-11.37,  JETNOS    150
*         -1.30, -1.63, -5.27, -6.77, -7.27, -7.60, -8.37, -7.70,  JETNOS    151
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 DATA D05/-11.10, -9.30,-13.20,-16.70,-19.00,-19.50,-20.00,-18.00,  JETNOS    159
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*         -8.80, -9.20,-13.40,-16.00,-18.00,-19.10,-20.00,-17.00,  JETNOS    163
*         -7.90, -9.30,-13.00,-15.30,-17.20,-18.50,-19.90,-16.30,  JETNOS    164
*         -6.70, -9.00,-12.40,-14.40,-16.20,-17.70,-19.40,-15.60,  JETNOS    165
*         -5.50, -8.20,-11.50,-13.50,-15.10,-16.70,-18.50,-15.00,  JETNOS    166
*         -4.10, -7.00,-10.50,-12.30,-13.80,-15.50,-17.10,-14.20,  JETNOS    167
*         -2.40, -5.50, -9.10,-10.80,-12.30,-13.50,-15.10,-13.00,  JETNOS    168
*         -1.40, -3.80, -7.40, -8.90,-10.10,-11.00,-12.00,-11.00,  JETNOS    169
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*          4.60,  7.00,  7.80,  7.20,  6.00,  4.50,  3.00,  1.00,  JETNOS    175
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*        -11.10, -8.13,-12.27,-15.17,-18.00,-18.47,-19.17,-17.40,  JETNOS    180
*        -10.50, -8.87,-12.23,-14.93,-17.63,-18.43,-19.17,-17.03,  JETNOS    181
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*          3.20,  5.00,  5.70,  5.10,  3.20,  1.50,   .30, -3.80,  JETNOS    195
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*         -8.40, -8.40, -9.60,-12.30,-16.00,-16.40,-17.50,-16.40,  JETNOS    218
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 DATA D09/ -6.90, -6.10, -8.80,-11.90,-15.80,-15.50,-15.00,-15.20,  JETNOS
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*         -6.90, -7.30, -9.20,-11.70,-15.60,-15.07,-15.00,-14.70,  JETNOS
*         -6.83, -7.67, -9.07,-11.47,-15.30,-14.87,-15.00,-14.40,  JETNOS
*         -6.80, -7.67, -8.80,-11.07,-14.76,-14.67,-15.00,-14.17,  JETNOS
*         -6.27, -7.23, -8.27,-10.43,-14.00,-14.40,-15.00,-13.87,  JETNOS
*         -5.47, -6.57, -7.60, -9.67,-12.97,-13.93,-14.93,-13.47,  JETNOS
*         -4.57, -5.60, -6.60, -8.67,-11.70,-13.13,-14.67,-12.83,  JETNOS
*         -3.53, -4.47, -5.30, -7.50,-10.26,-12.13,-13.93,-11.63,  JETNOS
*         -2.20, -3.06, -3.83, -5.97, -8.53,-10.53,-12.00, -9.93,  JETNOS
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*         -4.33, -5.53, -7.00, -9.03,-12.43,-12.37,-12.47,-11.73,  JETNOS
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*         -3.90, -5.10, -8.40,-10.50,-14.80,-12.40,-10.00,-11.30,  JETNOS
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*        -23.10,-22.30,-23.40,-23.10,-21.80,-23.30,-23.80,-28.00/ JETNOS
 DATA D12/ -3.00, -4.10, -8.10,-10.80,-14.80,-12.90,-10.60,-12.40,  JETNOS
*         -2.93, -4.40, -8.13,-10.53,-14.33,-12.20,-10.33,-11.80,  JETNOS
*         -2.93, -4.73, -8.13,-10.33,-13.80,-11.63,-10.03,-11.30,  JETNOS
*         -2.87, -4.87, -7.87,-10.00,-13.20,-11.07, -9.73,-10.80,  JETNOS
*         -2.87, -4.77, -7.43, -9.40,-12.37,-10.47, -9.40,-10.30,  JETNOS
*         -2.73, -4.47, -6.80, -8.60,-11.27, -9.90, -9.10, -9.80,  JETNOS
*         -2.43, -3.94, -6.00, -7.60,-10.10, -9.30, -8.77, -9.23,  JETNOS
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*        -22.20,-22.30,-21.70,-22.60,-20.90,-21.50,-26.60,-28.10/ JETNOS
 DATA D13/ -2.00, -4.40, -8.20,-11.00,-14.60,-12.40,-11.50,-12.70,  JETNOS
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*         -1.93, -4.33, -7.53, -9.60,-11.90,-10.13, -9.47,-10.60,  JETNOS
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*        -22.00,-22.20,-21.80,-21.80,-20.00,-20.40,-28.80,-28.50/ JETNOS
 DATA D14/ -1.00, -4.40, -8.00,-11.40,-14.20,-12.00,-12.00,-13.30,  JETNOS
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*          -4.00, -2.00, -1.20, -1.40,   .80,   .90,-11.20, -8.90,  JETNOS    347
*         -24.00,-22.00,-21.20,-21.50,-19.20,-19.10,-31.20,-28.90/ JETNOS    348
 DATA D15/ -3.00, -5.30, -7.80,-10.30,-12.80,-11.40,-11.90,-12.50,  JETNOS    349
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*          -2.73, -4.60, -6.87, -8.40, -9.63, -8.90, -9.47, -9.80,  JETNOS    352
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 DATA D16/ -5.00, -6.40, -7.60, -9.10,-11.10,-10.60,-11.70,-12.00,  JETNOS    368
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*          -4.93, -5.93, -7.13, -8.40, -9.60, -9.37,-10.50,-10.03,  JETNOS    370
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 DATA D17/ -7.10, -7.10, -7.10, -8.10, -9.60,-10.20,-11.70,-11.20,  JETNOS    387
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*          -6.90, -6.90, -6.90, -7.60, -8.50, -9.00,-10.70, -9.40,  JETNOS    389
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*          -2.00, -2.00, -3.00, -5.60, -9.10,-10.70,-11.50, -9.60,  JETNOS
*         -22.00,-22.00,-23.00,-25.60,-29.20,-30.70,-31.50,-29.50/  JETNOS
 DATA D18/ -6.30, -6.20, -6.80, -7.90, -9.70, -9.50,-10.00,-10.70,  JETNOS
*          -5.93, -6.33, -6.60, -7.60, -9.00, -8.93, -9.73, -9.80,  JETNOS
*          -5.67, -6.37, -6.50, -7.33, -8.43, -8.50, -9.47, -9.10,  JETNOS
*          -5.00, -5.37, -5.93, -6.60, -7.67, -7.86, -9.00, -8.34,  JETNOS
*          -4.37, -4.70, -5.27, -5.87, -6.87, -7.23, -8.40, -7.40,  JETNOS
*          -3.73, -4.03, -4.57, -5.07, -6.03, -6.60, -7.60, -6.40,  JETNOS
*          -3.17, -3.40, -3.83, -5.67, -5.20, -5.67, -6.60, -5.33,  JETNOS
*          -2.67, -2.73, -2.93, -3.17, -4.17, -4.73, -5.60, -4.13,  JETNOS
*          -2.20, -2.00, -1.80, -2.13, -3.07, -3.60, -4.40, -2.80,  JETNOS
*          -1.97, -1.23,  -.40,  -.60, -1.67, -1.93, -2.67, -1.00,  JETNOS
*          -1.63,  -.07,  1.70,  1.40,  -.07,  -.07,  -.67,  1.00,  JETNOS
*           1.60,  2.03,  3.07,  3.00,  2.33,  1.97,  1.63,  3.50,  JETNOS
*           4.00,  3.33,  2.93,  3.07,  3.33,  3.50,  3.67,  4.67,  JETNOS
*           1.00,   .30,   .60,  1.90,  3.33,  4.10,  5.00,  3.50,  JETNOS
*           -.83, -1.13, -1.33,   .33,  2.03,  3.33,  4.67,  -.93,  JETNOS
*          -1.27, -1.67, -2.43, -1.67,  -.20,  1.03,  2.03, -4.60,  JETNOS
*          -1.27,  -.83, -2.73, -3.80, -4.67, -5.67, -6.33, -7.33,  JETNOS
*          -1.27, -1.70, -3.00, -5.70, -9.40,-11.80,-14.50,-10.00,  JETNOS
*         -21.27,-21.70,-23.00,-25.70,-29.30,-31.90,-34.50,-30.00/  JETNOS
 DATA D19/ -5.50, -5.70, -6.20, -7.80, -9.50, -8.80, -8.60,-10.10,  JETNOS
*          -4.87, -5.67, -6.20, -7.40, -9.00, -8.37, -8.37, -9.40,  JETNOS
*          -4.43, -5.83, -6.10, -7.07, -8.37, -8.00, -8.23, -8.80,  JETNOS
*          -3.80, -4.53, -5.67, -6.40, -7.63, -7.43, -8.00, -8.07,  JETNOS
*          -3.23, -3.90, -5.03, -5.73, -6.83, -6.87, -7.50, -7.20,  JETNOS
*          -2.67, -3.27, -4.33, -4.93, -5.97, -6.30, -6.90, -6.20,  JETNOS
*          -2.23, -2.70, -3.57, -4.00, -5.10, -5.33, -6.10, -5.17,  JETNOS
*          -1.94, -2.17, -2.67, -2.93, -4.03, -4.37, -5.30, -4.07,  JETNOS
*          -1.60, -1.50, -1.40, -1.77, -2.83, -3.30, -4.20, -2.90,  JETNOS
*          -1.33,  -.87,   .20,  -.20, -1.33, -1.47, -2.33, -1.00,  JETNOS
*           -.77,   .37,  2.10,  1.80,   .37,   .47,  -.33,  1.00,  JETNOS
*           2.30,  2.67,  3.43,  3.40,  2.67,  2.23,  2.07,  3.00,  JETNOS
*           5.00,  3.67,  2.87,  2.93,  3.17,  3.50,  3.83,  4.33,  JETNOS
*           2.00,  1.10,   .60,  1.50,  2.67,  3.80,  5.00,  3.00,  JETNOS
*           -.17,  -.77, -1.57,  -.43,  1.07,  2.67,  4.33,  -.97,  JETNOS
*           -.53, -1.33, -2.87, -2.53, -1.40,   .27,  1.77, -4.80,  JETNOS
*           -.53,  -.67, -2.97, -4.30, -5.33, -6.83, -8.17, -7.67,  JETNOS
*           -.70, -1.30, -2.90, -6.00, -9.10,-13.50,-17.80,-10.20,  JETNOS
*         -20.70,-21.30,-22.80,-26.00,-29.20,-33.60,-37.80,-30.20/  JETNOS
 DATA D20/ -4.40, -5.80, -6.00, -7.80, -9.80, -8.20, -7.00, -9.60,  JETNOS
*          -3.80, -5.00, -5.80, -7.20, -9.00, -7.80, -7.00, -9.00,  JETNOS
*          -3.20, -4.30, -5.70, -6.80, -8.30, -7.50, -7.00, -8.50,  JETNOS
*          -2.60, -3.70, -5.40, -6.20, -7.60, -7.00, -7.00, -7.80,  JETNOS
*          -2.10, -3.10, -4.80, -5.60, -6.80, -6.50, -6.60, -7.00,  JETNOS
*          -1.60, -2.50, -4.10, -4.80, -5.90, -6.00, -6.20, -6.00,  JETNOS
*          -1.30, -2.00, -3.30, -3.80, -5.00, -5.00, -5.60, -5.00,  JETNOS
*          -1.20, -1.60, -2.40, -2.70, -3.90, -4.00, -5.00, -4.00,  JETNOS
*          -1.00, -1.00, -1.00, -1.40, -2.60, -3.00, -4.00, -3.00,  JETNOS
*           -.70,  -.50,   .80,   .20, -1.00, -1.00, -2.00, -1.00,  JETNOS
*            .10,   .80,  2.50,  2.20,   .80,  1.00,  0.00,  1.00,  JETNOS
*           3.00,  3.30,  3.80,  3.80,  3.00,  2.50,  2.50,  2.50,  JETNOS
*           6.00,  4.00,  2.80,  2.80,  3.00,  3.50,  4.00,  4.00,  JETNOS
*           3.00,  1.90,   .60,  1.10,  2.00,  3.50,  5.00,  2.50,  JETNOS
```

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*            .50,  -.40, -1.80, -1.20,   .10,  2.00,  4.00, -1.00,  JETNOS    458
*            .20, -1.00, -3.30, -3.40, -2.60,  -.50,  1.50, -5.00,  JETNOS    459
*            .20,  -.50, -3.20, -4.80, -6.00, -8.00,-10.00, -8.00,  JETNOS    460
*            .20, -1.00, -3.30, -6.20, -9.50,-15.30,-21.40,-10.90,  JETNOS    461
*         -19.80,-21.00,-23.30,-26.20,-29.50,-35.40,-41.00,-30.90/  JETNOS    462
 DATA D21/ -5.10, -6.80, -7.10, -8.20, -9.30, -7.70, -7.00, -9.90,  JETNOS    463
*          -4.53, -5.97, -6.80, -7.63, -8.63, -7.53, -7.00, -9.00,  JETNOS    464
*          -4.13, -5.33, -6.57, -7.17, -8.00, -7.30, -6.97, -8.33,  JETNOS    465
*          -3.73, -4.80, -6.13, -6.57, -7.30, -6.93, -6.93, -7.53,  JETNOS    466
*          -3.40, -4.23, -5.50, -5.93, -6.47, -6.40, -6.60, -6.67,  JETNOS    467
*          -3.07, -3.67, -4.73, -5.03, -5.50, -5.80, -6.13, -5.67,  JETNOS    468
*          -2.80, -3.07, -3.80, -3.90, -4.47, -4.80, -5.47, -4.67,  JETNOS    469
*          -2.47, -2.40, -2.70, -2.63, -3.27, -3.73, -4.70, -3.67,  JETNOS    470
*          -1.47, -1.26, -1.10, -1.17, -1.90, -2.60, -3.60, -2.67,  JETNOS    471
*            .20,   .17,   .87,   .60,  -.33,  -.67, -1.67,  -.96,  JETNOS    472
*            .90,  1.53,  2.83,  2.53,  1.47,  1.33,   .33,  1.00,  JETNOS    473
*           2.33,  2.87,  3.70,  3.87,  3.33,  2.83,  2.93,  2.66,  JETNOS    474
*           3.57,  2.67,  2.37,  2.67,  3.10,  3.67,  4.27,  4.00,  JETNOS    475
*           1.17,   .57,  -.27,   .57,  1.93,  3.50,  5.00,  2.66,  JETNOS    476
*           -.63, -1.56, -2.83, -1.90,  -.10,  2.00,  4.17,  1.00,  JETNOS    477
*           -.87, -2.20, -4.30, -4.07, -2.83,  -.50,  1.67, -5.00,  JETNOS    478
*           -.87, -2.00, -4.60, -5.60, -6.00, -7.17, -8.33, -8.00,  JETNOS    479
*          -1.00, -2.10, -4.90, -7.10, -9.40,-13.60,-18.20,-11.00,  JETNOS    480
*         -21.00,-22.10,-24.90,-27.20,-29.40,-33.50,-38.10,-31.00/  JETNOS    481
 DATA D22/ -5.60, -7.30, -8.40, -9.60, -9.10, -7.50, -7.00, -9.90,  JETNOS    482
*          -5.27, -6.93, -7.80, -8.07, -8.27, -7.27, -7.00, -9.00,  JETNOS    483
*          -5.07, -6.37, -7.43, -7.53, -7.70, -7.10, -6.93, -8.17,  JETNOS    484
*          -4.87, -5.90, -6.87, -6.93, -7.00, -6.87, -6.87, -7.27,  JETNOS    485
*          -4.70, -5.37, -6.20, -6.27, -6.13, -6.30, -6.60, -6.33,  JETNOS    486
*          -4.53, -4.83, -5.37, -5.27, -5.10, -5.60, -6.06, -5.33,  JETNOS    487
*          -4.30, -4.13, -4.30, -4.00, -3.93, -4.60, -5.33, -4.33,  JETNOS    488
*          -3.73, -3.20, -3.00, -2.57, -2.63, -3.47, -4.40, -3.33,  JETNOS    489
*          -1.93, -1.53, -1.20,  -.93, -1.20, -2.20, -3.20, -2.33,  JETNOS    490
*           1.10,   .83,   .93,  1.00,   .33,  -.33, -1.33,  -.93,  JETNOS    491
*           1.70,  2.27,  3.17,  2.87,  2.13,  1.67,   .67,  1.00,  JETNOS    492
*           1.67,  2.43,  3.60,  3.93,  3.67,  3.17,  3.37,  2.83,  JETNOS    493
*           1.13,  1.33,  1.93,  2.53,  3.20,  3.83,  4.53,  4.00,  JETNOS    494
*           -.67,  -.77, -1.13,   .03,  1.87,  3.50,  5.00,  2.83,  JETNOS    495
*          -1.77, -2.73, -3.87, -2.60,  -.30,  2.00,  4.33, -1.00,  JETNOS    496
*          -1.93, -3.40, -5.30, -4.73, -3.07,  -.50,  1.83, -5.00,  JETNOS    497
*          -1.93, -3.50, -6.00, -6.40, -6.00, -6.33, -6.66, -8.00,  JETNOS    498
*          -2.00, -3.60, -6.80, -8.20, -8.90,-11.90,-14.70,-10.80,  JETNOS    499
*         -22.00,-23.60,-26.80,-28.30,-28.90,-31.90,-34.60,-30.80/  JETNOS    500
 DATA D23/ -6.00, -8.50, -9.40, -9.30, -8.50, -7.20, -7.20,-10.20,  JETNOS    501
*          -6.00, -7.90, -8.80, -8.50, -7.90, -7.00, -7.00, -9.00,  JETNOS    502
*          -6.00, -7.40, -8.30, -7.90, -7.40, -6.90, -6.90, -8.00,  JETNOS    503
*          -6.00, -7.00, -7.60, -7.30, -6.70, -6.80, -6.80, -7.00,  JETNOS    504
*          -6.00, -6.50, -6.90, -6.60, -5.80, -6.20, -6.60, -6.00,  JETNOS    505
*          -6.00, -6.00, -6.00, -5.50, -4.70, -5.40, -6.00, -5.00,  JETNOS    506
*          -5.80, -5.20, -4.80, -4.10, -3.40, -4.40, -5.20, -4.00,  JETNOS    507
*          -5.00, -4.00, -3.30, -2.50, -2.00, -3.20, -4.10, -3.00,  JETNOS    508
*          -2.40, -1.80, -1.30,  -.70,  -.50, -1.80, -2.80, -2.00,  JETNOS    509
*           2.00,  1.50,  1.00,  1.40,  1.00,  0.00, -1.00,  -.90,  JETNOS    510
*           2.50,  3.00,  3.50,  3.20,  2.80,  2.00,  1.00,  1.00,  JETNOS    511
*           1.00,  2.00,  3.50,  4.00,  4.00,  3.50,  3.80,  3.00,  JETNOS    512
*          -1.30,  0.00,  1.50,  2.40,  3.30,  4.00,  4.80,  4.00,  JETNOS    513
*          -2.50, -2.10, -2.00,  -.50,  1.80,  3.50,  5.00,  3.00,  JETNOS    514
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     *          -2.90, -3.90, -4.90, -3.30,  -.50,  2.00,  4.50, -1.00,  JETNOS
     *          -3.00, -4.60, -6.30, -5.40, -3.30,  -.50,  2.00, -5.00,  JETNOS
     *          -3.00, -5.00, -7.40, -7.20, -6.00, -5.50, -5.00, -8.00,  JETNOS
     *          -3.00, -5.40, -8.40, -8.90, -8.70,-10.60,-12.30,-11.00,  JETNOS
     *         -23.00,-25.40,-28.40,-29.00,-28.70,-30.70,-32.20,-31.00/  JETNOS
      DATA D24/ -7.00, -9.40,-10.40, -9.60, -8.00, -6.80, -7.30,-10.10,  JETNOS
     *          -6.93, -8.87, -9.80, -8.93, -7.53, -6.73, -7.00, -9.00,  JETNOS
     *          -6.93, -8.43, -9.17, -8.27, -7.10, -6.70, -6.87, -8.00,  JETNOS
     *          -7.13, -8.10, -8.33, -7.67, -6.40, -6.73, -6.73, -7.00,  JETNOS
     *          -7.30, -7.63, -7.60, -6.93, -5.46, -6.10, -6.60, -5.83,  JETNOS
     *          -7.47, -7.17, -6.63, -5.73, -4.30, -5.20, -5.93, -4.67,  JETNOS
     *          -7.30, -6.27, -5.30, -4.20, -2.87, -4.20, -5.07, -3.67,  JETNOS
     *          -6.27, -4.80, -3.60, -2.43, -1.37, -2.93, -3.80, -2.67,  JETNOS
     *          -2.87, -2.07, -1.40,  -.47,   .20, -1.40, -2.40, -1.67,  JETNOS
     *           2.90,  2.17,  1.07,  1.80,  1.67,   .33,  -.67,  -.87,  JETNOS
     *           3.30,  3.73,  3.83,  3.53,  3.47,  2.33,  1.33,  1.00,  JETNOS
     *            .33,  1.57,  3.40,  4.07,  4.33,  3.83,  4.23,  3.17,  JETNOS
     *          -3.73, -1.33,  1.07,  2.27,  3.40,  4.17,  5.07,  4.00,  JETNOS
     *          -4.00, -3.43, -2.87, -1.03,  1.73,  3.50,  5.00,  3.17,  JETNOS
     *          -4.03, -5.07, -5.93, -5.07,  -.70,  2.00,  4.67, -1.00,  JETNOS
     *          -4.07, -5.80, -7.30, -6.07, -3.53,  -.50,  2.17, -5.00,  JETNOS
     *          -4.07, -6.50, -8.80, -8.00, -6.00, -4.67, -3.33, -8.00,  JETNOS
     *          -4.10, -7.20,-10.30, -9.80, -8.40, -8.70, -8.80,-11.00,  JETNOS
     *         -24.00,-27.20,-30.30,-29.80,-28.40,-28.70,-28.80,-31.10/  JETNOS
C                                                                        JETNOS
      ALPHA=(ANGJET*1.745329E-2)-ATAN(GRAD)                              JETNOS
      ICODE=NJET                                                         JETNOS
      IF((NJET.GT.0).AND.(NJET.LE.3)) GO TO 250                          JETNOS
      IF(WS.NE.0.) DIAMET=0.                                             JETNOS
      ICODE=3                                                            JETNOS
      IF((PR.LE.0.0).AND.(PA.LE.0.0).AND.(TT.LE.0.0)) GO TO 250          JETNOS
      IF(WP.LE.0.0) ICODE=1                                              JETNOS
      IF(AP.LE.0.0) ICODE=2                                              JETNOS
  250 CALL JETPED(MCODE,ICODE,PR,PA,TT,VA,AP,WP,VP,DIAMET,AS,VS,ALPHA,   JETNOS
     *SPL,TID,ANGLES,SPLP)                                               JETNOS
      IF((ICODE.NE.3).OR.(WS.EQ.0.0)) GO TO 500                          JETNOS
      AE=AP+AS                                                           JETNOS
      RHOE=WS/(AS*VS)                                                    JETNOS
C                                                                        JETNOS
C                                                                        JETNOS
      VE=VP*SQRT((1.+(AS/AP)*((VS/VP)**2))/(1.+AS/AP))                   JETNOS
C                                                                        JETNOS
C                                                                        JETNOS
      WE=RHOE*AE*(VE)                                                    JETNOS
C                                                                        JETNOS
      CALL JETPED(MCODE,ICODE,PR,PA,TT,VA,AE,WE,VE,0.0,0.0,VS,ALPHA,     JETNOS
     *SPL,TID,ANGLES,SPLS)                                               JETNOS
  500 CONTINUE                                                           JETNOS
      RETURN                                                             JETNOS
      END                                                                JETNOS
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      SUBROUTINE JETPED(ISN,IOPT,PR,PA,TT,V,A8,WA,                      JETPED     2
     *VA,DIAMET,A82,V2,ALPHA,SPL,TID,TTHETA,SPLPOS)                     JETPED     3
C AUTHOR              D. F. MELDRUM                                     JETPED     4
C                                                                       JETPED     5
C METHOD              JET NOISE IS PREDICTED BY THE USE OF SEVERAL CURVES JETPED   6
C                     THESE CURVES ARE INTERPOLATED OR EXTRAPOLATED AS  JETPED     7
C                     NEEDED INORDER TO PREDICT THE NOISE AT 150 FT RADIUS JETPED  8
C                                                                       JETPED     9
C PURPOSE             TO PREDICT THE JET NOISE PRODUCED BY 1) PRIMARY JET, JETPED 10
C                     2) SECONDARY JET.                                 JETPED    11
C                                                                       JETPED    12
C INPUTS              ISN        CODE FOR STROUHAL CURVE REQUIRED       JETPED    13
C                                  1    FOR FLIGHT SPECTRUM CURVE      JETPED    14
C                                  2    FOR GROUND SPECTRUM CURVE      JETPED    15
C                                  3    FOR AVERAGE OF 1 AND 3         JETPED    16
C                     IOPT       CODE FOR TYPE OF INPUT DATA           JETPED    17
C                                  1    A8  PR  PA  TT  VELOCY  (DIAMET) JETPED   18
C                                  2    WA  PR  PA  TT  VELOCY  (DIAMET) JETPED   19
C                                  3    A8  WA  VA      VELOCY  (DIAMET  A82 JETPED 20
C                                                          VA2  WA2)    JETPED    21
C                                  4    SECONDARY  (3)                 JETPED    22
C                     PR         NOZZLE PRESSURE RATIO                 JETPED    23
C                     PA         STATIC PRESSURE                       JETPED    24
C                     TT         TOTAL TEMPERATURE OF EXHAUST GAS      JETPED    25
C                     V          AIRCRAFT VELOCITY                     JETPED    26
C                     A8         CROSS-SECTIONAL AREA OF THE NOZZLE EXIT JETPED   27
C                     WA         WEIGHT FLOW OF EXHAUST GAS            JETPED    28
C                     VA         VELOCITY OF JET EXHAUST ABSOLUTE TO NOZZLE JETPED 29
C                     DIAMET     DIAMETER OF NOZZLE - IF ZERO OR NEGATIVE JETPED  30
C                                THE DIAMETER WILL BE CALCULATED FROM THE JETPED  31
C                                NOZZLE AREA                           JETPED    32
C                     A82        SECONDARY AREA (SEE A8)               JETPED    33
C                     V2         SECONDARY ABSOLUTE VELOCITY OF JET EXHAUST JETPED 34
C                     ALPHA      ENGINE ATTITUDE ANGLE TO THE OBSERVER JETPED    35
C                     TID        DIRECTIVITY CORRECTION CURVE          JETPED    36
C                     TTHETA     DIRECTIVITY ANGLES                    JETPED    37
C                                                                       JETPED    38
C                     INPUT VIA LABLED COMMON - GFREQ                   JETPED    39
C                                                                       JETPED    40
C                     TFREQ      1/3 OCTAVE BAND CENTER FREQUENCIES    JETPED    41
C                                                                       JETPED    42
C OUTPUTS             SPL        SOUND PRESSURE LEVEL SPECTRA FOR JET NOISE JETPED 43
C                                                                       JETPED    44
C                     SPLPOS  MATRIX (24,17)OF UNSHIELDED SPECTRA       JETPED    45
C                     EITHER PRIMARY OR SECONDARY JET                   JETPED    46
C                                                                       JETPED    47
C MODIFICATIONS       FROM PROGRAM DESCRIBED IN D6-25490  MADE INTO     JETPED    48
C                     SUBROUTINE BY D. F. MELDRUM 4/15/72  FOR TEE215   JETPED    49
C                     TAKEN FROM TEE215 AND MADE CHANGES FOR THE        JETPED    50
C                     NASA-AMES CONTRACT                                JETPED    51
C                                                                       JETPED    52
C REFERENCES          D6-25490                 1/10/72  P. SCHORR      JETPED    53
C                     R. J. SAXBY,  JET NOISE PREDICTION PROCEDURE      JETPED    54
C                         FOR THE NASA-AMES FOOTPRINT CONTRACT NAS2-6969, JETPED 55
C                         UN-NUMBERED COORDINATION SHEET,  DATED        JETPED    56
C                         17 JANUARY 1973.                              JETPED    57
C                                                                       JETPED    58
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C FUNCTION SUBPRGM  ALOG10    TBLL1     TBLU2     TBLU3     SQRT          JETPED
C                   SIN       COS       PWRSUM                            JETPED
C                                                                         JETPED
C                                                                         JETPED
      COMMON /GFREQ/ TFREQ(24)                                            JETPED
C                                                                         JETPED
      DIMENSION TID(8,19,24),SPL(24,17),TTHETA(17)                        JETPED
      DIMENSION TRV(8),DEFREQ(24),ATHETA(19)                              JETPED
      DIMENSION TTEMP(20),TGMMA(20)                                       JETPED
      DIMENSION TVR(12),TDB(12)                                           JETPED
      DIMENSION TVRN(9),TDBN(9)                                           JETPED
      DIMENSION TCB(13),TSN(13),TSN1(13)                                  JETPED
      DIMENSION TCB2(13),TSN2(13),TSN21(13)                               JETPED
      DIMENSION TCB3(11),TSN3(11),TSN31(11)                               JETPED
      DIMENSION AREAX(6),SNX(36),SNLX(36),TVNRE(36,6)                     JETPED
      DIMENSION SPLPOS(24,17)                                             JETPED
C                                                                         JETPED
C                                                                         JETPED
C                                                                         JETPED
C     AREA RATIO CURVES                                                   JETPED
C                                                                         JETPED
      DATA AREAX/0.,1.,3.,6.,10.,15./                                     JETPED
      DATA SNX/.021,.026,.033,.042,.053,.067,.083,.104,.133,.167,         JETPED
     *        .208,.263,.333,.417,.525,.667,.833,1.042,1.33,1.67,         JETPED
     *          2.08,2.63,3.33,4.17,5.25,6.67,8.33,10.4,13.3,16.7,       JETPED
     *          20.8,26.3,33.3,41.7,52.5,66.7/                           JETPED
      DATA TVNRE/36*0.,                                                   JETPED
     *           3.5,4.5,3.9,3.35,2.75,2.2,1.67,1.2,.7,.45,.5,           JETPED
     *          .63,.85,1.,1.2,1.4,1.6,1.75,1.95,2.15,2.36,2.57,         JETPED
     *          2.77,3.05,3.18,3.38,3.58,3.77,3.98,4.17,4.37,4.57,       JETPED
     *          4.76,4.93,2*5.0,                                         JETPED
     *          .25,1.3,2.,1.9,1.26,.9,.75,.77,.94,1.05,1.2,             JETPED
     *          1.37,1.57,1.74,1.94,2.13,2.3,2.5,2.7,2.95,3.16,3.38,     JETPED
     *          3.61,3.80,4.05,4.26,4.48,4.7,4.9,7*5.,                   JETPED
     *          5*0.,.2,.47,.75,1.03,1.38,1.69,                          JETPED
     *          2.03,2.38,2.74,3.08,3.41,3.58,4.1,4.36,4.63,4.85,5.,     JETPED
     *          14*5.,6*0.0,.4,.78,1.24,1.65,2.07,2.43,                  JETPED
     *          2.81,3.16,3.46,3.78,4.03,4.26,4.48,4.53,4.78,4.85,       JETPED
     *          4.90,4.94,4.98,11*5.0,                                   JETPED
     *          4*0.0,.36,.75,1.13,1.6,2.17,2.64,3.11,3.59,4.,4.31,      JETPED
     *          4.56,4.77,4.89,19*5.0/                                   JETPED
C                                                                         JETPED
C                                                                         JETPED
      DATA TRV/500.,750.,1000.,1250.,1500.,1750.,2000.,3000./             JETPED
C                                                                         JETPED
C     GAMMA VS TOTAL TEMPERATURE                                          JETPED
C                                                                         JETPED
      DATA TTEMP/2.,2.602,2.778,2.903,3.,3.079,3.146,3.204,3.255,3.301,   JETPED
     *      3.342,3.380,3.415,3.447,3.447,3.505,3.531,3.556,3.580,3.602/  JETPED
      DATA TGMMA/1.4,1.4,1.392,1.387,1.369,1.357,1.344,1.333,1.324,1.316  JETPED
     *       ,1.310,1.304,1.3,1.296,1.293,1.290,1.287,1.285,1.283,1.281/  JETPED
C                                                                         JETPED
C     GASPL VS JET RELATIVE VELOCITY                                      JETPED
C                                                                         JETPED
      DATA TVR/2.699,2.949,3.301,3.347,3.362,3.398,                       JETPED
     *          3.431,3.462,3.491,3.544,3.602,3.699/                      JETPED
      DATA TDB/ 64.1, 97.3,146.1,152.5,154.2,158.3,161.0,                 JETPED
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     *          162.3,163.9,166.1,168.5,171.1/                          JETPED    116
C                                                                       JETPED    117
C     DENSITY CORRECTION EXPONENT                                       JETPED    118
C                                                                       JETPED    119
      DATA TVRN/500.,1500.,1600.,1700.,1800.,1900.,2000.,2100.,         JETPED    120
     *           2200./                                                 JETPED    121
      DATA TDBN/-0.40,1.4,1.59,1.77,1.88,1.95,1.99,2.00,2.0/            JETPED    122
C                                                                       JETPED    123
C     STROUHAL SPECTRUM  GROUND  FLIGHT  MIXED                          JETPED    124
C                                                                       JETPED    125
      DATA TCB/-33.5,-16.7,-12.5,-9.8,-8.,-5.5,-4.8,-4.8,-5.,           JETPED    126
     1  -5.8,-8.7,-15.5,-45.3/                                          JETPED    127
      DATA TSN/  .01,.04,.06,.08,.1,.15,.2,.25,.3,.4,.7,2.,100./        JETPED    128
      DATA TCB2/  -34.,-19.,-11.8,-9.5,-6.7,-5.8,-5.,-7.3,-10.9,        JETPED    129
     1  -14.5,-20.6,-26.6,-45.2/                                        JETPED    130
      DATA TSN2/  .01,.025,.04,.05,.08,.1,.2,.5,1.,2.,5.,10.,100./      JETPED    131
      DATA TCB3/  -38.,-14.5,-10.8,-7.7,-5.6,-5.2,-5.8,-7.3,            JETPED    132
     1  -10.7,-15.3,-39.5/                                              JETPED    133
      DATA TSN3/  .01,.07,.1,.15,.25,.4,.6,1.,2.,4.,100./               JETPED    134
      DATA ISWTCH/0/                                                    JETPED    135
C                                                                       JETPED    136
C                                                                       JETPED    137
      IF(ISWTCH.NE.0) GO TO 33                                          JETPED    138
      ISWTCH=1                                                          JETPED    139
C                                                                       JETPED    140
      DO 34 I=1,36                                                      JETPED    141
      SNLX(I)=ALOG10(SNX(I))                                            JETPED    142
      IF(I.GT.24) GO TO 34                                              JETPED    143
      DEFREQ(I)=ALOG10(TFREQ(I)*2.0/1000.)                              JETPED    144
      IF(I.GT.19) GO TO 34                                              JETPED    145
      ATHETA(I)=(I-1)*10                                                JETPED    146
      IF(I.GT.13) GO TO 34                                              JETPED    147
      TSN1(I)=ALOG10(TSN(I))                                            JETPED    148
      TSN21(I)=ALOG10(TSN2(I))                                          JETPED    149
      IF(I.GT.11) GO TO 34                                              JETPED    150
      TSN31(I)=ALOG10(TSN3(I))                                          JETPED    151
   34 CONTINUE                                                          JETPED    152
C                                                                       JETPED    153
C                                                                       JETPED    154
   33 IF(IOPT.EQ.3) GO TO 27                                            JETPED    155
C                                                                       JETPED    156
C                                                                       JETPED    157
      GMMA=TBLU1(ALOG10(TT),TTEMP,TGMMA,1,20)                           JETPED    158
      GAMEX=(GMMA-1.)/GMMA                                              JETPED    159
      GAMX=(1.-GMMA)/GMMA                                               JETPED    160
      RHO=(PA/(53.35*TT))*PR**GAMEX                                     JETPED    161
      VJET=SQRT((64.4/GAMEX)*53.35*TT*(1.-PR**GAMX))                    JETPED    162
      VR=SQRT(VJET*VJET-2.0*VJET*V*COS(ALPHA)+V*V)                      JETPED    163
      VR1=ALOG10(VR)                                                    JETPED    164
      IF (IOPT .EQ. 2) GO TO 25                                         JETPED    165
      XMACH=SQRT((2./(GMMA-1.))*((PR**GAMEX)-1.))                       JETPED    166
 3    IF (XMACH .LE. 1.) GO TO 20                                       JETPED    167
      AREA=(A8*PR**(1./GMMA)*(2./(GMMA+1.))**(1./(GMMA-1.)))/           JETPED    168
     1  SQRT(((GMMA+1.)/(GMMA-1.))*(1.-PR**GAMX))                       JETPED    169
      GO TO 35                                                          JETPED    170
 20   AREA=A8                                                           JETPED    171
      GO TO 35                                                          JETPED    172
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 25   AREA=WA/(RHO*VJET)                                                JETPED   173
      GO TO 35                                                          JETPED   174
C                                                                       JETPED   175
C                                                                       JETPED   176
   27 VR=SQRT(VA*VA-2.0*VA*V*COS(ALPHA)+V*V)                            JETPED   177
 29   AREA =A8                                                          JETPED   178
      RHO=WA/(A8*VA)                                                    JETPED   179
C                                                                       JETPED   180
C     DETERMINE OASPL = DB + B                                          JETPED   181
C                                                                       JETPED   182
   35 VR1=ALOG10(VR)                                                    JETPED   183
      DB=TBLU1(VR1,TVR,TDB,1,12)                                        JETPED   184
      AN=TBLU1(VR,TVRN,TDBN,1,9)                                        JETPED   185
      B=10.*(ALOG10(AREA)+AN*ALOG10(RHO))                               JETPED   186
      DE=SQRT(AREA)*1.13                                                JETPED   187
      IF(DIAMET.GT.0.0) DE=DIAMET                                       JETPED   188
      DO 800 IOT=1,17                                                   JETPED   189
      DO 800 IOB=1,24                                                   JETPED   190
   43 FREQ=TFREQ(IOB)                                                   JETPED   191
      THETA=TTHETA(IOT)                                                 JETPED   192
      SN=FREQ*DE/VR                                                     JETPED   193
      SN1=ALOG10(SN)                                                    JETPED   194
      FREQDE=ALOG10(FREQ*DE/1000.)                                      JETPED   195
C                                                                       JETPED   196
C                                                                       JETPED   197
      DELTA=0.                                                          JETPED   198
      IF(IOPT.NE.3) GO TO 44                                            JETPED   199
      IF(A82.LE.0.) GO TO 44                                            JETPED   200
      IF(V2.LE.0.) GO TO 44                                             JETPED   201
      ABSRAT=ABS((VA-V2)/VA)                                            JETPED   202
      IF(ABSRAT.LT.0.1) RETURN                                          JETPED   203
      AREARO=A82/AREA                                                   JETPED   204
      SNX(1)  =  FREQ * DE / VA                                         JETPED   205
      SNX1  =  ALOG10(SNX(1))                                           JETPED   206
      IF  ((AREARO .LT. 1.) .AND. (SNX(1) .LT. 0.067))  AREARO = 1.     JETPED   207
      AN=TBLU2(SNX1,AREARO,SNLX,AREAX,TVNRE,1,1,36,6,36,6)              JETPED   208
      DELTA=AN*10.*ALOG10(ABSRAT)                                       JETPED   209
C                                                                       JETPED   210
C                                                                       JETPED   211
   44 CONTINUE                                                          JETPED   212
C                                                                       JETPED   213
      IF (ISN .EQ. 1) GO TO 47                                          JETPED   214
      IF (ISN .EQ. 3) GO TO 45                                          JETPED   215
      IF(ISN.NE.2) GO TO 47                                             JETPED   216
      CB=TBLU1(SN1,TSN1,TCB,1,13)                                       JETPED   217
      GO TO 156                                                         JETPED   218
   45 CB=TBLU1(SN1,TSN21,TCB2,1,13)                                     JETPED   219
      GO TO 156                                                         JETPED   220
   47 CB=TBLU1(SN1,TSN31,TCB3,1,11)                                     JETPED   221
  156 IF (VR-3000.) 49,49,28                                            JETPED   222
   28 VR=3000.                                                          JETPED   223
      GO TO 49                                                          JETPED   224
   38 IF (VR-500.) 39,39,49                                             JETPED   225
   39 VR=500.                                                           JETPED   226
CONTINUE                                                                JETPED   227
   49 XID=TBLU3(VR,THETA,FREQDE,TRV,ATHETA,DEFREQ,TID,1,1,1,            JETPED   228
     *            8,19,24,8,19,24)                                      JETPED   229
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 8002 SPLPED=DB+B+CB+XID+DELTA-4.8                                JETPED    230
C                                                                 JETPED    231
      SPLPOS(IOB,IOT)=SPLPED                                      JETPED    232
      SPL(IOB,IOT)=PWRSUM(SPL(IOB,IOT),SPLPED)                    JETPED    233
  800 CONTINUE                                                    JETPED    234
      RETURN                                                      JETPED    235
C                                                                 JETPED    236
C                                                                 JETPED    237
      END                                                         JETPED    238
```

```
      SUBROUTINE JNSA(APY,APZ,ALTR,BCF,CZ,DELTA,DIAMT1,VP,VS,
     *          SLDIST,M,NCF,SPLP,SPLS,SPLT,ITYPE,DSPL,IUNIT)
C
C     PURPOSE  TO PREDICT THE JET NOISE SHIELDING ATTENUATION FOR
C              AN ENGINE-OVER-WING CONFIGURATION
C              THE ATTENUATIONS ARE TO BE SUBTRACTED FROM
C              PREDICTED UNSHIELDED JET NOISE SPECTRA AT INDEXED
C              CONDITIONS
C
C     INPUT
C              APY     ARRAY OF A/C COORDINATE IN DIRECTION OF
C                      FLIGHT PATH PROJECTION ON THE GROUND(FT)
C              APZ     ARRAY OF A/C VERTICAL COORDINATE ABOVE THE GROUND
C              SLDIST  SIDELINE POSITION OF OBSERVER
C              ALTR    OBSERVER HEIGHT ABOVE THE GROUND
C              BCF     GEOMETRIC MEAN FREQUENCIES(HZ)
C              CZ      AMBIENT SPEED OF SOUND(FPS) AT A/C ALTITUDE
C
C                      JET NOISE UNSHIELDED SPECTRUM
C              SPLP    FOR PRIMARY JET(TURBOJET,ITYPE=0) AND
C              SPLS    FOR BULK FLOW JET TURBOFAN COANNULAR NOZZLE,
C              ITYPE   (ITYPE=1)
C
C     INPUT    PRIMARY JET
C              DELTA   ENGINE INCLINATION ANGLE(RAD)
C              DIAMT1  DIAMETER OF NOZZLE (FT)
C              DSL1    DIMENSIONLESS SHIELD LENGTH PARALLEL TO
C                      EXHAUST AXIS FROM NOZZLE EXIT PLANE
C              VP      VELOCITY OF JET EXHAUST RELATIVE TO NOZZLE(FPS)
C     INPUT    SECONDARY JET
C              DIAMT2  DIAMETER OF NOZZLE(FT)
C              DSL2    DIMENSIONLESS SHIELD LENGTH PARALLEL TO
C                      EXHAUST AXIS FROM NOZZLE EXIT PLANE
C              VS      VELOCITY OF JET EXHAUST RELATIVE TO NOZZLE(FPS)
C
C
      DIMENSION APY(10,17),APZ(10,17),BCF(24),SLDIST(10),DSPL(24,17),
     *          SPLP(24,17),SPLS(24,17),SPLT(24,17)
C
      COMMON/JNSHLD/DIAMT2,DSL1,DSL2
C
C     PRIMARY JET CASE(TURBOJET)
C
C     CONSTANT TERM OF REFERENCE CORRELATION TERM
C
      CONST =DSL1*6.0E-7*CZ*CZ/(32.174*VP)+DSL1*2700.*DIAMT1*DIAMT1*
     *32.174/(CZ*CZ*VP)
      SNDE=SIN(DELTA)
      CSDE=COS(DELTA)
C
C     CALCULATE JET NOISE SHIELDING ATTENUATION(PRIMARY JET)
C
      CALL JNSASP(APY,APZ,ALTR,BCF,SLDIST,M,NCF,CONST,SNDE,CSDE,DSPL)
C
C     STORE SHIELDED JET NOISE SPECTRUM  THAT IS
C     UNSHIELDED PRIMARY JET NOISE SPECTRUM MINUS
C     THE JET NOISE SHIELDING(PRIMARY)ATTENUATION
```

```
C                                                                       JNSA
      DO 300 J=1,17                                                     JNSA
      DO 300 I=1,NCF                                                    JNSA
      SPLP(I,J)= SPLP(I,J)-DSPL(I,J)                                    JNSA
  300 CONTINUE                                                          JNSA
C                                                                       JNSA
C     CHECK FOR PRIMARY AND SECONDARY(TURBOFANS                         JNSA
C     WITH COANNULAR NOZZLES)                                           JNSA
C                                                                       JNSA
      IF(ITYPE.EQ.2)GO TO 200                                           JNSA
   66 RETURN                                                            JNSA
  200 CONTINUE                                                          JNSA
C                                                                       JNSA
C     SECONDARY JET CASE(TURBOFAN)                                      JNSA
C     CONSTANT TERM OF CORRELATION TERM                                 JNSA
C                                                                       JNSA
      DIAMTS=DIAMT2                                                     JNSA
      IF(IUNIT.EQ.0)DIAMTS=DIAMT2*3.280833                              JNSA
      CONST=DSL2*6.0E-7*CZ*CZ/(32.174*VS)+DSL2*2700.*DIAMTS*DIAMTS*     JNSA
     *32.174/(CZ*CZ*VS)                                                 JNSA
C                                                                       JNSA
C     CALCULATE JET NOISE SHIELDING ATTENUATION SECONDARY JET           JNSA
C                                                                       JNSA
      CALL JNSASP(APY,APZ,ALTR,BCF,SLDIST,M,NCF,CONST,SNOE,CSOE,DSPL)   JNSA
C                                                                       JNSA
C     FROM THE UNSHIELDED SPECTRUM  SUMMED ON AN ENERGY BASIS(SPLT)     JNSA
C     IS SUBSTRACTED THE SHIELDED SPECTRUMS(PRIMARY AND SECONDARY)      JNSA
C     GIVING THE JET SHIELDING ATTENUATION                              JNSA
C                                                                       JNSA
      DO 400 J=1,17                                                     JNSA
      DO 400 I=1,NCF                                                    JNSA
      SPLS(I,J)=SPLS(I,J)-DSPL(I,J)                                     JNSA
      DSPL(I,J)=SPLT(I,J)-10.*ALOG10(10.**(.1*SPLP(I,J))+               JNSA
     *10.**(.1*SPLS(I,J)))                                              JNSA
  400 CONTINUE                                                          JNSA
      GO TO 66                                                          JNSA
      END                                                               JNSA
```

```
      SUBROUTINE JNSASP(APY,APZ,ALTR,BCF,SLDIST,M,NCF,CONST,
     *                  SNDE,CSDE,DSPL)
C
C     PURPOSE  TO CALCULATE THE JET NOISE SHIELDING ATTENUATION
C              FOR AN EOW CONFIGURATION FOR BOTH TURBOJETS AND
C              TURBOFANS USING CO-ANNULAR NOZZLES
C
C     INPUT    APY    ARRAY OF A/C COORDINATE IN DIRECTION OF
C                     FLIGHT PATHPROJECTION ON THE GROUND(FT)
C              APZ    ARRAY OF A/C VERTICAL COORDINATE ABOVE GROUND
C              ALTR   OBSERVER HEIGHT ABOVE THE GROUND
C              BCF    GEOMETRIC MEAN FREQUENCIES ARRAY
C              SLDIST SIDELINE POSITION OF OBSERVER
C              M      NO. OF SIDELINE OBSERVER POSITIONS
C              NCF    NO. OF GEOMETRIC MEAN FREQUENCIES
C              CONST  CONSTANT PART OF REFERENCE CORRELATION TERM
C              SNDE   SINE OF THE ENGINE INCLINATION ANGLE
C              CSDE   COSINE OF ENGINE INCLINATION ANGLE
C
C     OUTPUT   DSPL   ARRAY OF JET NOISE SHIELDING ATTENUATION
C
      DIMENSION APY(10,17),APZ(10,17),BCF(24),DSPL(24,17),SLDIST(10)
C
C     FOR EACH FREQUENCY A FUNCTION OF EACH REFERENCE CORRELATION
C     TERM ITERATE FOR EACH A/C POSITION RELATIVE TO THE OBSERVER
C
      DO 200 I=1,NCF
      ZDEO=CONST*BCF(I)
C
C     ITERATE FOR EACH A/C POSITION RELATIVE TO THE OBSERVER
C     THAT IS FOR EACH OF 17 DIRECTION ANGLES
C
      DO 100 J=1,17
      ZEN=APZ(M,J)-ALTR
      ARG1=SQRT(APY(M,J)*APY(M,J)+ZEN*ZEN)
      ARG2=-APY(M,J)*CSDE-ZEN*SNDE
C
C     DIRECTION ANGLE CALCULATION
C
      THETA=1.570796327
      IF(ARG1.GT.0.0)THETA=ACOS(ARG2/ARG1)
      DEN=SQRT(SLDIST(M)*SLDIST(M)+APY(M,J)*APY(M,J)+ZEN*ZEN)
      ETA=ASIN(SLDIST(M)/DEN)
C
C     DIRECTIVITY EFFECT
C
      ZEE=0.0
      GRK=3.1415926-THETA
      IF(ABS(GRK).GT.1.0E-3)ZEE=ZDEO*COS(ETA)/(1.+.033*(THETA/GRK)**4)
C
C     JET NOISE SHIELDING ATTENUATION
C
  100 DSPL(I,J)= 10.*ALOG10(1.+ZEE)
  200 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE LGMTRY(NW,RADII,TLENG,EDH,TLOVH)                       LGMTRY     2
C                                                                       LGMTRY     3
C AUTHOR              G. A. WEST                                        LGMTRY     4
C                                                                       LGMTRY     5
C PURPOSE             TO CALCULATE THE EFFECTIVE DUCT HEIGHT AND THE    LGMTRY     6
C                     RATIO OF TREATED AREA TO CROSS SECTIONAL AREA     LGMTRY     7
C                     FOR A DUCT LINING                                 LGMTRY     8
C                                                                       LGMTRY     9
C DESCRIPTION OF VARIABLES                                              LGMTRY    10
C                                                                       LGMTRY    11
C     VARIABLES IN COMMON - SEE MAIN PROGRAM                            LGMTRY    12
C                                                                       LGMTRY    13
C     VARIABLES IN CALLING SEQUENCE                                     LGMTRY    14
C                                                                       LGMTRY    15
C      INPUT                                                            LGMTRY    16
C                                                                       LGMTRY    17
C        NW          - NUMBER OF WALLS IN LINING                        LGMTRY    18
C        RADII       - RADII OF WALLS IN LINING                         LGMTRY    19
C        TLENG       - TREATMENT LENGTH OF WALLS IN LINING              LGMTRY    20
C                                                                       LGMTRY    21
C      OUTPUT                                                           LGMTRY    22
C                                                                       LGMTRY    23
C        EDH         - EFFECTIVE DUCT HEIGHT                            LGMTRY    24
C        TLOVH       - RATIO OF TREATMENT LENGTH TO EFFECTIVE DUCT HEIGHT LGMTRY  25
C                                                                       LGMTRY    26
C     LOCAL VARIABLES                                                   LGMTRY    27
C                                                                       LGMTRY    28
C        AFLOW       - CROSS SECTIONAL FLOW AREA                        LGMTRY    29
C        I           - GENERAL DO LOOP INDEX                            LGMTRY    30
C        LASTW       - INDEX OF INNERMOST WALL THAT IS TREATED ON BOTH  LGMTRY    31
C                      SIDES                                            LGMTRY    32
C        PI          - MATHEMATICAL CONSTANT                            LGMTRY    33
C        SUM         - SUMMATION OF TREATMENT LENGTH OF ALL WALLS       LGMTRY    34
C        TAREA       - TOTAL TREATED AREA                               LGMTRY    35
C        TL          - AVERAGE TREATMENT LENGTH                         LGMTRY    36
C        TLMAX       - MAXIMUM TREATMENT LENGTH OF A WALL               LGMTRY    37
C        TLMIN       - MINIMUM TREATMENT LENGTH OF A WALL               LGMTRY    38
C                                                                       LGMTRY    39
C                                                                       LGMTRY    40
      DIMENSION RADII(1),TLENG(1)                                       LGMTRY    41
C                                                                       LGMTRY    42
      DATA PI/3.14159265/                                               LGMTRY    43
C                                                                       LGMTRY    44
C                                        CALCULATE THE CROSS SECTIONAL  LGMTRY    45
C                                         AREA                          LGMTRY    46
      AFLOW = PI * RADII(1) * RADII(1)                                  LGMTRY    47
      IF (NW .GT. 1) AFLOW = AFLOW - PI * RADII(NW) * RADII(NW)         LGMTRY    48
C                                        CALCULATE THE TREATED AREA     LGMTRY    49
      TAREA = 0.0                                                       LGMTRY    50
      DO 10 I=1,NW                                                      LGMTRY    51
      TAREA = TAREA + 2.0 * PI * RADII(I) * TLENG(I)                    LGMTRY    52
   10 CONTINUE                                                          LGMTRY    53
C                                        THE WALLS ARE TREATED ON BOTH  LGMTRY    54
C                                         SIDES EXCEPT FOR THE OUTTER   LGMTRY    55
C                                         AND INNERMOST WALLS.          LGMTRY    56
      IF (NW .LE. 2) GO TO 25                                           LGMTRY    57
C                                        ADD AREAS OF OTHER SIDES OF THE LGMTRY    58
```

```
C                                          INTERIOR WALLS                    LGMTRY
      LASTW = NW - 1                                                          LGMTRY
      DO 20 I=2,LASTW                                                         LGMTRY
      TAREA = TAREA + 2.0 * PI * RADII(I) * TLENG(I)                          LGMTRY
   20 CONTINUE                                                                LGMTRY
C                                         CALCULATE RATIO OF TREATED AREA    LGMTRY
C                                          TO CROSS SECTIONAL FLOW AREA      LGMTRY
C                                          (L/H)                             LGMTRY
   25 TLOVH = 0.325 * TAREA / AFLOW                                           LGMTRY
C                                         CALCULATE THE APPARENT TREATMENT   LGMTRY
C                                          LENGTH (L)                        LGMTRY
      TLMAX=TLENG(1)                                                          LGMTRY
      IF(NW .EQ. 1) GO TO 40                                                  LGMTRY
      TLMIN = TLMAX                                                           LGMTRY
      SUM = 0.0                                                               LGMTRY
      DO 30 I=1,NW                                                            LGMTRY
      IF(TLENG(I) .GT. TLMAX) TLMAX = TLENG(I)                                LGMTRY
      IF (TLENG(I) .LT. TLMIN) TLMIN = TLENG(I)                               LGMTRY
      SUM = SUM + TLENG(I)                                                    LGMTRY
   30 CONTINUE                                                                LGMTRY
C                                         IF THE RATIO OF THE LONGEST WALL   LGMTRY
C                                          TO THE SHORTEST WALL IS GREATER   LGMTRY
C                                          THAN 1.5 THE APPARENT TREATMENT   LGMTRY
C                                          LENGTH IS EQUAL TO THE LONGEST    LGMTRY
C                                          WALL.  OTHERWISE IT IS EQUAL TO   LGMTRY
C                                          THE AVERAGE LENGTH                LGMTRY
      IF (TLMAX/TLMIN .GE. 1.5) GO TO 40                                      LGMTRY
      TL  =  SUM / FLOAT(NW)                                                  LGMTRY
      GO TO 50                                                                LGMTRY
C                                                                             LGMTRY
   40 TL = TLMAX                                                              LGMTRY
C                                         CALCULATE EFFECTIVE DUCT HEIGHT    LGMTRY
   50 EDH = TL/(TLOVH/0.65)                                                   LGMTRY
C                                                                             LGMTRY
      RETURN                                                                  LGMTRY
      END                                                                     LGMTRY
```

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      SUBROUTINE LIFTFN                                                 LIFTFN     2
C AUTHOR              D. F. MELDRUM                                     LIFTFN     3
C                                                                       LIFTFN     4
C PURPOSE             TO PREDICT LIFT FAN NOISE FOR THE PHASE B         LIFTFN     5
C                     NASA-AMES FOOTPRINT CONTRACT NASA-6969.           LIFTFN     6
C                                                                       LIFTFN     7
C METHOD              AS DESCRIBED IN REFERENCE 1).                     LIFTFN     8
C                                                                       LIFTFN     9
C INPUTS              VIA LABLED COMMON LFTFAN                          LIFTFN    10
C                                                                       LIFTFN    11
C                     NB          NUMBER OF FAN BLADES FOR EACH STAGE   LIFTFN    12
C                                 WHERE 1 & I & NUMSTG                  LIFTFN    13
C                     FPR         FAN PRESSURE RATIO                    LIFTFN    14
C                     DIAM        FAN INLET DIAMETER (INLET ONLY)  FT   LIFTFN    15
C                     RSS         MINIMUN ROTOR/STATOR SPACING     PERCENT LIFTFN 16
C                     AREA        FAN DISCHARGE AREA (AFT ONLY)    FT*FT LIFTFN    17
C                     RN1         ROTOR SPEED                      RPM  LIFTFN    18
C                     RTS         RELATIVE TIP MACH NUMBER OF THE       LIFTFN    19
C                                 FIRST STAGE WITHOUT INLET GUIDE       LIFTFN    20
C                                 VANES (IGV).  IF LESS THAN 1          LIFTFN    21
C                                 IGV WILL BE ASSUMED FOR THE FIRST     LIFTFN    22
C                                 STAGE (INLET FAN ONLY).               LIFTFN    23
C                     ORTFPR      FAN PRESSURE RATIO FOR THE            LIFTFN    24
C                                 RELATIVE TIP MACH NUMBER OF           LIFTFN    25
C                                 1.025 (INLET FAN ONLY)                LIFTFN    26
C                     ANGLFT      ENGINE INCLINATION ANGLE              LIFTFN    27
C                                                                       LIFTFN    28
C                     VIA LABLED COMMON SWITCH                          LIFTFN    29
C                                                                       LIFTFN    30
C                     NUMENG      NUMBER OF NOISE SOURCES OF THE SAME   LIFTFN    31
C                                 NOISE TYPE.                           LIFTFN    32
C                                                                       LIFTFN    33
C                     VIA LABLED COMMON GOOMON                          LIFTFN    34
C                                                                       LIFTFN    35
C                     NOF         1/3 OCTAVE OF FULL OCTAVE SWITCH      LIFTFN    36
C                                 OR NUMBER OF FREQUENCY BANDS (8 OR 24) LIFTFN   37
C                     RETA(24)    DIRECTIVITY ANGLES                    LIFTFN    38
C                                                                       LIFTFN    39
C                     VIA LABLED COMMON GPRAM                           LIFTFN    40
C                                                                       LIFTFN    41
C                     AMACH       MACH NUMBER OF THE AIRCRAFT           LIFTFN    42
C                     NOBS        NUMBER OF OBSERVER POSITIONS          LIFTFN    43
C                                                                       LIFTFN    44
C                     VIA LABLED COMMON SUMSPL                          LIFTFN    45
C                                                                       LIFTFN    46
C                     SSPL        CURRENT TOTAL PREDICTED NOISE FOR NOF LIFTFN    47
C                                 (8 OR 24) FREQUENCIES, AT NOBS OBSERVER LIFTFN 48
C                                 POSITIONS FOR 17 DIRECTIVITY ANGLES.  LIFTFN    49
C                                                                       LIFTFN    50
C                     VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES LIFTFN 51
C                                                                       LIFTFN    52
C                     PSI         17 DIRECTIVITY ANGLES FOR EACH OF     LIFTFN    53
C                                 NOBS OBSERVER POSITIONS.              LIFTFN    54
C                     PSIO        17 DIRECTIVITY ANGLE PROJECTIONS FOR  LIFTFN    55
C                                 EACH OF NOBS OBSERVER POSITIONS       LIFTFN    56
C                     BETA        ELEVATION ANGLE PROJECTION FOR EACH   LIFTFN    57
C                                 OF NOBS OBSERVER POSITIONS.           LIFTFN    58
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C                                                                       LIFTFN     59
C                    EACH COMPONENT IS WRITTEN ON TAPE OR FILE 10       LIFTFN     60
C                    FOR EACH OF NOF BANDS FOR EACH OF NOBS OBSERVER    LIFTFN     61
C                    POSITIONS.                                         LIFTFN     62
C                                                                       LIFTFN     63
C OUTPUTS            VIA LABLED COMMON SUMSPL                           LIFTFN     64
C                                                                       LIFTFN     65
C                    SSPL       CURRENT TOTAL PREDICTED NOISE FOR       LIFTFN     66
C                               8 OR 24 FREQUENCIES, AT NOBS OBSERVER   LIFTFN     67
C                               POSITIONS FOR 17 DIRECTIVITY ANGLES.    LIFTFN     68
C                                                                       LIFTFN     69
C                    VIA LABLED COMMON ANGLE (SET UP BY SUBROUTINE ANGLES LIFTFN    70
C                                                                       LIFTFN     71
C                    PSI        17 DIRECTIVITY ANGLES FOR EACH OF       LIFTFN     72
C                               NOBS OBSERVER POSITIONS.                LIFTFN     73
C                    PSIO       17 DIRECTIVITY ANGLE PROJECTIONS FOR    LIFTFN     74
C                               EACH OF NOBS OBSERVER POSITIONS         LIFTFN     75
C                    BETA       ELEVATION ANGLE PROJECTION FOR EACH     LIFTFN     76
C                               OF NOBS OBSERVER POSITIONS.             LIFTFN     77
C                                                                       LIFTFN     78
C                                                                       LIFTFN     79
C                                                                       LIFTFN     80
C FUNCTION SUBPRGM   COS        ESHLDG     PWRSUM                       LIFTFN     81
C                                                                       LIFTFN     82
C SUBROUTINES        ANGLES     UNIT       FANNOS     ZERO              LIFTFN     83
C                                                                       LIFTFN     84
C                                                                       LIFTFN     85
C                                                                       LIFTFN     86
C                                                                       LIFTFN     87
C                                                                       LIFTFN     88
C                                                                       LIFTFN     89
      COMMON /LFTFAN/ NB,FPR,DIAM,RSS,AREA,RN1,RTS,CRTFPR,ANGLFT,       LIFTFN     90
     *ICOR8,LIN8,NTF8,IMA8,LGM8,NWL8,ICP8,ILAY8,TF8(10),                LIFTFN     91
     *PCTA8(10),PLA8(10),ELGH8,EDH8,R1W8(10),TL8(10),CF8,FM8            LIFTFN     92
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLOPT         LIFTFN     93
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           LIFTFN     94
C                                                                       LIFTFN     95
      COMMON /GCONST/ IN,IO,IT1,IT2,FC,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  LIFTFN     96
     *                IO,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001, LIFTFN     97
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI  LIFTFN     98
C                                                                       LIFTFN     99
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 LIFTFN    100
C                                                                       LIFTFN    101
      COMMON /GCOMON/ NOF,NK,BOF(24),TSPL(24,10,17),SPLT(24,17),        LIFTFN    102
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)                     LIFTFN    103
      COMMON/SUMSPL/SSPL(24,10,17)                                      LIFTFN    104
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    LIFTFN    105
C                                                                       LIFTFN    106
C     FREQUENCY BANDS USED BY PROGRAM                                   LIFTFN    107
C                                                                       LIFTFN    108
      COMMON /GFREQ/ OFREQ(24),UFREQ(25),PFREQ(24)                      LIFTFN    109
C                                                                       LIFTFN    110
C     GENERAL INPUT PARAMETERS                                          LIFTFN    111
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)                   LIFTFN    112
C                                                                       LIFTFN    113
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),ITENG,IUNIT   LIFTFN    114
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)        LIFTFN    115
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     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IFAGE,BCG,TCG,FLR,AALT,EPF
C
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS
C
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CGV
C
C     CONVERSION CONSTANTS
C
      COMMON/GCONVC/C(2,10),SLDISX(10)
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)
      COMMON/CRSPLS/DOB(17),PSCR(17),DFB(408),NPSCR
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)
C
C
      DIMENSION DEPNDB(17),VOVTIP(17)
C
C
      DATA VOVTIP/.0000,.0125,.0250,.0375,.0500,.0625,.0750,.0875,
     *            .1000,.1125,.1250,.1375,.1500,.1625,.1750,.2000,
     *            .2125/
      DATA DEPNDB/ 0.10, 1.50, 2.80, 3.95, 4.85, 5.60, 6.25, 6.75,
     *             7.15, 7.50, 7.80, 8.00, 8.17, 8.28, 8.32, 8.38,
     *             8.38/
C
C
C
      ICN(8)=ICN(8)+1
C
C
      DELTA=ANGLFT*RPD
      CALL ANGLES(NOBS,DELTA)
C
C
      NINLET=0
      NAFT=0
      IF(DIAM.GT.0.0) NINLET=1
      IF(AREA.GT.0.0) NAFT=1
      VO=(AMACH*CZ)*SIN(DELTA-ATAN(SLOPE))
      DX=DIAM
      IF(NINLET.LE.0) DX=SQRT(AREA/PI)
      VTIP=DX*RN1*PI/60.0
      IF  (VTIP .LE. 0.)  GO TO 40
      DELDB=TBLU1(VO/VTIP,VOVTIP,DEPNDB,1,17)
      DELDB=0.0
C
C
C     LOOP FOR THE NUMBER OF OBSERVER POSITIONS
C
   40 CONTINUE
      FBPF  =  FLOAT(NB) * RN1 / 60.
      DO 1000 M=1,NOBS
      CALL LINCOR(SPZ(1,1),IMAE,LGM8,ELCH8,EDH8,NWL8,R1W8,TL8,
     *       ILAY8,FM8,IDP8,PSI(1,M),NCF,BCF,PLA8,
```

```
     *       CF8,PCTA8,NTF8,TF8,DOPSF,SFL2,ICOR8,I8(1,1,ITYPE),LIN8,FBPF) LIFTFN    173
C                                                                         LIFTFN    174
      CALL ZERO(SPLT,408)                                                 LIFTFN    175
C                                                                         LIFTFN    176
C                                                                         LIFTFN    177
C                                                                         LIFTFN    178
C     CALCULATE THE INLET FAN NOISE PREDICTION                            LIFTFN    179
C                                                                         LIFTFN    180
      CALL FANNOS(DOPSF, PSI(1,M),SPLT(1,1),IDCF,1,NINLET,NAFT,NB,FPR,    LIFTFN    181
     *            DIAM,RSS,AREA,RN1,RTS,CRTFPR,DELDB,0.0,0)               LIFTFN    182
C                                                                         LIFTFN    183
C                                                                         LIFTFN    184
   45 CONTINUE                                                            LIFTFN    185
C                                                                         LIFTFN    186
C     CONVERT TO A UNIT OR INDEXED SPECTRA                                LIFTFN    187
C                                                                         LIFTFN    188
      CALL UNIT(150.,17,SPLT(1,1))                                        LIFTFN    189
      ENG=NENG                                                            LIFTFN    190
      IF(ENG.LE.0.0) ENG=1.0                                              LIFTFN    191
      ELVANG=90.0                                                         LIFTFN    192
      DANGLE=-45.0                                                        LIFTFN    193
      ENS=ESHLDG(DANGLE,ELVANG,ENG)                                       LIFTFN    194
      DO 50 J=1,17                                                        LIFTFN    195
      DO 50 K=1,24                                                        LIFTFN    196
   50 SPLT(K,J)=SPLT(K,J)-ENS                                             LIFTFN    197
      IF(NCF.EQ.24) GO TO 300                                             LIFTFN    198
C                                                                         LIFTFN    199
C     CONVERT 1/3 OCTAVE TO FULL OCTAVE                                   LIFTFN    200
C                                                                         LIFTFN    201
      DO 200 J=1,17                                                       LIFTFN    202
      DO 200 K=1,8                                                        LIFTFN    203
      TMP  =  0.                                                          LIFTFN    204
      DO 100 L=1,3                                                        LIFTFN    205
      JC  =  3 * K + L - 3                                                LIFTFN    206
  100 TMP  =  PWRSUM(TMP, SPLT(JC,J))                                     LIFTFN    207
  200 SPLT(K,J)  =  TMP                                                   LIFTFN    208
C                                                                         LIFTFN    209
C                                                                         LIFTFN    210
C     ADD TO CURRENT TOTAL AND WRITE ON TAPE 10                           LIFTFN    211
C                                                                         LIFTFN    212
C                                                                         LIFTFN    213
  300 DO 400 J=1,NCF                                                      LIFTFN    214
      DO 350 K=1,17                                                       LIFTFN    215
      SPLT(J,K)=SPLT(J,K)-SPZ(J,K)                                        LIFTFN    216
  350 SSPL(J,M,K)=PWRSUM(SSPL(J,M,K),SPLT(J,K))                           LIFTFN    217
  400 CONTINUE                                                            LIFTFN    218
      IF(IPRT(7).NE.7)GO TO 410                                           LIFTFN    219
      CALL NOISO(IPRT(7),M,NK,10,CHIN,ILNIT,SLDISX(M),PFREQ,SPLT(1,1),    LIFTFN    220
     *  NCF,ITYPE)                                                        LIFTFN    221
  410 CONTINUE                                                            LIFTFN    222
      DO 360 JC=1,NCF                                                     LIFTFN    223
      DO 360 KC=1,17                                                      LIFTFN    224
  360 SPLT(JC,KC)=SPLT(JC,KC)-TSPL(JC,M,KC)                               LIFTFN    225
      CALL PNLSUB(SPLT(1,1),PSPL(1,M),TPC(1,M),EPNL(1,M),SPL2,            LIFTFN    226
     *TEPNL(1,M),NK,BCG,TCG,FLR,M,NCBS,IRR(M,1))                          LIFTFN    227
      IF(IPRT(3).NE.3)GO TO 1000                                          LIFTFN    228
      CALL NOISO(IPRT(3),M,NK,12,CHIN,ILNIT,SLDISX(M),PFREQ,              LIFTFN    229
```

```
     *    SPLT(1,1),NCF,ITYPE)                                          LIFTFN    230
C                                                                       LIFTFN    231
C                                                                       LIFTFN    232
C                                                                       LIFTFN    233
 1000 CONTINUE                                                          LIFTFN    234
      RETURN                                                            LIFTFN    235
      END                                                               LIFTFN    236
```

```
      SUBROUTINE LINCOR(SP,I1,I2,A1,A2,I3,A3,A4,I4,A5,I5,A6,I6,A7,
     *  A8,A9,A10,I7,A11,A12,A13,I8,I9,I10,A14)
C       SP=SPZ   I1=IMA& (& DENOTES NOISE MODULE NUMBER)
C       I2=LGM&    A1=ELOH&    A2=EDH&    I3=NWL&    A3=R1W&    A4=TL&
C       I4=ILAY&     A5=FM&      I5=IDP&    A6=PSI(1,I)    I6=NCF
C       A7=BCF       A8=PLA&     A9=CF&    A10=PCTA&    I7=NTF&   A11=TF&
C       A12=DOPSF    A13=SPL2    I8=ICOR&    I9=IB(1,1,ITYPE)    I10=LIN&
C       A14=FBPF
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)
      COMMON/SWITCH/NTYPE,ITYPE
      COMMON/ISWK/ISWT(3,13)
      DIMENSION SP(24,17),A3(1),A4(1),A6(17),A7(24),A8(1),
     *  A10(1),A11(1),A12(1),A13(1),I9(2,3)
      DIMENSION SCR(17),SET(17)
      DATA SCR/17*1.0/
      ISWT(NCOF,ITYPE)=C
      DO 2 N=1,24
      DO 2 J=1,17
    2 SP(N,J)=C.
      IF(I1C .EQ. C)GO TO 1CC
      IF(I7 .LE. 10)GO TC 4
      CALL ERROR(ITYPE,4,9)
      I7=1C
    4 CCNTINUE
      IF(I7 .GT. C)GO TO 5
      I7=1
      A11(1)=A14
      A1C(1)=100.0
    5 CONTINUE
      IF(I1 .EQ. 1 .OR. I2 .EQ. 0)GC TC 10
      IF(I3 .LE. 1C) GO TO 6
      CALL ERROR(ITYPE,4,1C)
      GO TO 10C
    6 CONTINUE
      IF(I3 .EQ. 1)GO TC 1C
      IF (I3 .GE. 2) GO TO 7
      CALL ERROR(ITYPE,4,11)
      GC TO 10C
    7 CCNTINUE
      DC 8 I=1,I3
    8 A3(I)=-A3(I)
      CALL SORTX(A3,A4,I3)
      DC 9 I=1,I3
    9 A3(I)=-A3(I)
   1C CCNTINUE
      DC 11 I=1,17
      SET(I)=A12(I)
      IF(ITYPE.EQ.6.OR.ITYPE.EQ.9)SET(I)=SCR(I)
 11   CCNTINUE
      CALL LINING(SP(1,1),I1,I2,A1,A2,I3,A3,A4,I4,A5,I5,A6,I6,A7,
     *  A8,A9,A10,I7,A11,SET,A13)
      GC TO 12
  100 CONTINUE
   12 CCNTINUE
      IF(I8.EQ.0)GO TO 18
   17 CALL CORSPL(I8,I9(1,1),I6,A6,SP(1,1))
   18 CCNTINUE
```

```
      IF(I10.NE.0)ISWT(NCOF,ITYPE)=10                                   LINCOR     59
      IF(I8.NE.0)ISWT(NCOF,ITYPE)=10                                    LINCOR     60
C     WRITE(10,3)ISWT(NCOF,ITYPE)                                       LINCOR     61
    3 FORMAT(1X,12HLINCOR ISWT=,I10)                                    LINCOR     62
   20 RETURN                                                            LINCOR     63
      END                                                               LINCOR     64
```

```
      SUBROUTINE LINING(ATNSPC,IUDMAX,LGEOM,ELOH,H,NW,RADII,TLNG,ILAY,
     *  DMCHNO,IDOPT,DANGLE,NCF,BCF,PEAK,SVEL,PCT,NTF,TF,DOPSFT,SPLC)
C
C AUTHOR              G. A. WEST, REVISED  21 JUN 72 BY D.G. DUNN
C
C PURPOSE             TO CALCULATE LINING ATTENUATION SPECTRA
C
C DESCRIPTION OF VARIABLES
C
C     VARIABLES IN COMMON - SEE MAIN PROGRAM
C
C     VARIABLES IN CALLING SEQUENCE
C
C      INPUT
C
C        IUDMAX     - SPECIFIES WHETHER THE PROGRAM CALCULATES OR USER
C                     DEFINES THE PEAK LINING ATTENUATION.  EQUALS 0 IF
C                     PROGRAM CALCULATES, 1 IF USER DEFINES PEAK
C        LGEOM      - SPECIFIES WHETHER THE LINING ATTENUATION IS
C                     CALCULATED USING THE LINING GEOMETRY OR EFFECTIVE
C                     DUCT HEIGHT AND RATIO OF TREATMENT LENGTH TO DUCT
C                     HEIGHT.  EQUALS 1 FOR LINING GEOMETRY, 0 FOR
C                     EFFECTIVE DUCT HEIGHT AND RATIO OF TREATMENT LENGTH
C                     TO DUCT HEIGHT
C        ELOH       - RATIO OF TREATMENT LENGTH TO EFFECTIVE DUCT HEIGHT
C        H          - EFFECTIVE DUCT HEIGHT
C        NW         - NUMBER OF WALLS IN LINING
C        RADII      - RADII OF WALLS IN LINING
C        TLNG       - TREATMENT LENGTH OF WALLS
C        ILAY       - = FOR SINGLE WALL LINING    =2 FOR DOUBLE WALL
C        DMCHNO     - DUCT MACH NUMBER
C        IDOPT      - INDICATES THE DESIGN POINT OPTION.  EQUALS 1 FOR
C                     SINGLE DESIGN POINT. 2 FOR MULTIPLE DESIGN POINT
C        DANGLE     - DIRECTIVITY ANGLE OF LINING
C        NCF        - NUMBER OF BANDS IN SPECTRUM
C        BCF        - ARRAY OF CENTER FREQUENCIES FOR BANDS IN SPECTRUM
C        PEAK       - PEAK ATTENUATION OF LINING DEFINED BY USER
C        SVEL       - SPEED OF SOUND IN DUCT
C        PCT        - PERCENTAGE OF LINING TREATED FOR THE TARGET
C                     FREQUENCIES DEFINED IN ARRAY TF
C        NTF        - NUMBER OF TARGET FREQUENCIES IN ARRAY TF
C        TF         - ARRAY OF TARGET FREQUENCIES
C        DOPSFT     - DOPPLER SHIFT FACTOR, IE. 1.0 - AMACH * COS(THETA)
C
C      OUTPUT
C        ATNSPC     - LINING ATTENUATION SPECTRUM
C        SPLC       - PEAK ATTENUATION WHICH INCLUDES EFFECT OF DUCT
C                     MACH NUMBER, DESIGN RELEASE DATE, DIRECTIVITY ANGLE
C                     AND PERCENTAGE OF TOTAL LINING THAT IS TREATED
C                     FOR EACH TARGET FREQUENCY.
C
C     LOCAL VARIABLES
C
C        ALFHC      - LOGARITHM (BASE 10) OF RATIO OF
C                     ((FREQUENCY * DUCT HEIGHT)/SPEED OF SOUND IN DUCT)
C        ALLOH      - LOGARITHM BASE 10 OF RATIO OF TREATMENT LENGTH TO
C                     DUCT HEIGHT
```

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C        CONSTC     - COMPOSITE CORRECTION FACTOR WHICH INCLUDES THE      LINING    59
C                     EFFECT OF DUCT MACH NUMBER, DESIGN RELEASE DATE     LINING    60
C                     AND DIRECTIVITY ANGLE                               LINING    61
C        DANGLC     - CORRECTION FACTOR FOR DIRECTIVITY ANGLE             LINING    62
C        DUCTMC     - CORRECTION FACTOR FOR DUCT MACH NUMBER              LINING    63
C        EDH        - EFFECTIVE DUCT HEIGHT                               LINING    64
C        F9X        - ARRAY OF RATIOS OF TREATMENT LENGTH TO DUCT HEIGHT  LINING    65
C                     (LOG BASE 10)                                       LINING    66
C        F9Y        - ARRAY OF RATIOS OF ((TARGET FREQ * EFFECTIVE DUCT   LINING    67
C                     HEIGHT)/ SONIC VELOCITY)   (LOG BASE 10)            LINING    68
C        F9Z        - ARRAY OF PEAK ATTENUATIONS FOR CORRESPONDING        LINING    69
C                     VALUES IN F9X AND F9Y                               LINING    70
C       MD         - MACH NUMBER ARRAY FOR ATTENUATION CORRECTION FOR DUC LINING    71
C       LC         - LOG10(G) VALUES IN  ATTENUATION CORRECTION TABLE     LINING    72
C       LNTF       - FT H/C DIMENSIONLESS TARGET FREQ FOR ATTENUATION COR LINING    73
C       F10X       - MACH ARRAY FOR K     CORRECTION TABLE FOR SINGLE LIN LINING    74
C       F10Y       - K VALUES FOR SINGLE LAYER LININGS                    LINING    75
C       F11X       - SAME AS F10X FOR     DOUBLE LININGS                  LINING    76
C       F11Y       - SAME AS F10Y FOR    DOUBLE LININGS                   LINING    77
C        F13X       - ARRAY OF DIRECTIVITY ANGLES FOR CORRESPONDING       LINING    78
C                     CORRECTION FACTORS IN F13Y                          LINING    79
C        F13Y       - ARRAY OF DIRECTIVITY ANGLE CORRECTION FACTORS       LINING    80
C                     FOR CORRESPONDING DIRECTIVITY ANGLES IN F13X        LINING    81
C        I          - GENERAL DO LOOP INDEX                               LINING    82
C        J          - GENERAL DO LOOP INDEX                               LINING    83
C        SPLMAX     - PEAK LINING ATTENUATION                             LINING    84
C        TLOVH      - RATIO OF TREATMENT LENGTH TO EFFECTIVE DUCT HEIGHT  LINING    85
C                                                                         LINING    86
      REAL MD(13),LNTF(4),LC(13,4)                                        LINING    87
      DIMENSION ATNSPC(24,17),DOPSFT(1)                                   LINING    88
      DIMENSION            BCF(1),PEAK(1),PCT(1),TF(1),SPLC(1)            LINING    89
      DIMENSION DANGLE(1)                                                 LINING    90
      DIMENSION F10X(4),F10Y(4,2)                                         LINING    91
C                                                                         LINING    92
      DIMENSION RADII(1),TLNG(1)                                          LINING    93
      DIMENSION F9X(11),F9Y(6),F9Z(6,11)                                  LINING    94
      DIMENSION F11X(2),F11Y(2)                                           LINING    95
      DIMENSION F13X(11),F13Y(11)                                         LINING    96
C                                                                         LINING    97
      DATA ZERO /0.0/                                                     LINING    98
      DATA F9X/-1.0,-0.8,-0.6,-0.4,-0.2,0.0,0.2,0.4,0.6,0.8,1.0/          LINING    99
      DATA F9Y/-0.4,-0.2,0.0,0.2,0.4,0.6/                                 LINING   100
      DATA F9Z/ 1.3, 2.1, 2.5, 2.5, 2.1, 1.6,                             LINING   101
     1          2.5, 3.1, 3.5, 3.4, 2.8, 2.3,                             LINING   102
     2          4.0, 4.4, 4.7, 4.4, 3.7, 3.1,                             LINING   103
     3          5.6, 6.0, 6.2, 5.7, 4.8, 4.1,                             LINING   104
     4          7.8, 8.2, 8.2, 7.4, 6.2, 5.3,                             LINING   105
     5         10.7,11.2,10.5, 9.6, 8.1, 6.9,                             LINING   106
     6         15.5,15.5,14.4,12.3,10.3, 8.8,                             LINING   107
     7         22.0,22.0,19.3,16.0,13.4,11.2,                             LINING   108
     8         31.0,30.0,26.3,23.0,17.4,14.6,                             LINING   109
     9         46.5,43.0,37.0,29.5,23.5,18.5,                             LINING   110
     A         70.0,63.0,53.0,41.0,31.0,24.5/                             LINING   111
      DATA F10X/-.4,.4,.8,1./                                             LINING   112
      DATA F10Y/4*1.,.85,.95,2*1./                                        LINING   113
      DATA F11X/-.4,.4/                                                   LINING   114
      DATA F11Y/.85,.9/                                                   LINING   115
```

```
      DATA MD/-.8,-.6,-.5,-.4,-.3,-.2,-.1,0.,.1,.2,.3,.4,.6 /
      DATA LNTF/-.60206,-.30103,0.,.30103/
      DATA LC /.4942,.4928,.4814,.4609,.4216,.3522,.2201,0.,
     1        -.1175,-.2006,-.2652,-.3170,-.4001,.2253,.2227,.2175,
     2         .1959,.1644,.1206,.06446,0.,-.05799,-.1096,-.1549,
     3        -.1972,-.2782,.06070,.05690,.05308,.04922,.04139,
     4         .02938,.01703,0.,-.02411,-.04672,-.06651,-.08672,
     5         .1273,13*0.  /
      DATA F13X/30.0,50.0,70.0,90.0,110.0,115.0,120.0,130.0,140.0,150.0,
     1         160.0/
      DATA F13Y/0.45,0.70,0.88,1.00, 1.00, 0.98, 0.90, 0.62, 0.42, 0.29,
     1          0.21/
C
C
C                                        HAS THE USER DEFINED THE
C                                         MAXIMUM ATTENUATION FOR EACH
C                                         TARGET FREQUENCY
      DO 5 N=1,NOF
      DO 5 J=1,17
 5    ATNSPC(N,J)=ZERO
      FK=1.0
      IF (ILDMAX .EQ. 1) GO TO 35
C                                        PROGRAM IS TO CALCULATE MAXIMUM
C                                         ATTENUATION
C
C                                        HAS USER DEFINED THE EFFECTIVE
C                                         DUCT HEIGHT AND RATIO OF
C                                         TREATMENT LENGTH TO DUCT HEIGHT
C                                         OR IS THE PROGRAM TO CALCULATE
C                                         THESE QUANTATIES FROM LINING
C                                         GEOMETRY
      EDH = H
      TLOVH = ELGH
      IF (LGEOM .EQ. 1) CALL LGMTRY(NW,RADII,TLNG,EDH,TLOVH)
      ALLOH = ALOG10(TLOVH)
C                                        CALCULATE THE EFFECT OF DUCT
C                                         MACH NUMBER ON LINING
C     *      OBTAIN K CORRECTION
   10 CONTINUE
      IF(ILAY.EQ.1)GO TO 20
      FK=TBLU1(DMCHNO,F11X,F11Y,1,2)
      GO TO 30
 20   FK=TBLU1(DMCHNO,F10X,F10Y(1,IDCPT),1,4)
 30   CONTINUE
C  CALC (SPLC) ARRAY
C                                        OBTAIN CORRECTION FOR
C                                         DIRECTIVITY ANGLE
      HDC  =  EDH / SVEL
   35 CONTINUE
      DO 100 J=1,17
      DANGLC=TBLU1(DANGLE(J),F13X,F13Y,2,11)
      CONSTC=.01*DANGLC
      DO 60 I=1,NTF
      C=1.0
      SPLMAX = PEAK(I)
      IF (ILDMAX .EQ. 1) GO TO 50
      ALFHC = ALOG10(TF(I) * HDC)
```

```
      SPLMAX = TBLL2(ALFHC,ALLOH,F9Y,F9X,F9Z,2,2,6,11,6,11)
      IF (SPLMAX .LT. ZERO)  SPLMAX = ZERO
      IF(ALFHC.GE.LNTF(4)) GO TO 40
      C=10.**TBLL2(DMCHNO,ALFHC,MD,LNTF,LC,1,1,13,4,13,4)
 40   IF(ILAY.NE.1)GO TO 50
      C=C*FK
 50   C=CONSTC* C
      SPLC(I)=SPLMAX *C* PCT(I)
   60 CONTINUE
C
C                                          CALCULATE SPECTRUM
      CALL LININS(SPLC,TF,NTF,ATNSPC(1,J),BCF,ACF,FK,DOPSFT(J))
 100  CONTINUE
      RETURN
      END
```

```
      SUBROUTINE LININS(SPLC,TF,NTF,ATN,BCF,NCF,FK,DSFC)                LININS     2
C                                                                       LININS     3
C  AUTHOR              D.G. DUNN                  DATE- 13 JUNE 1972    LININS     4
C                                                                       LININS     5
C  PURPOSE             TO CALCULATE THE LINING ATTENUATION SPECTRUM SHAPE LININS  6
C                      FOR MULTIPLE TARGET FREQUENCIES INCLUDING THE    LININS     7
C                      DOPPLER SHIFT.                                   LININS     8
C                                                                       LININS     9
C  DESCRIPTION OF VARIABLES                                             LININS    10
C                                                                       LININS    11
C  INPUTS                                                               LININS    12
C    1) SPLC   ...  ARRAY OF PEAK ATTENUATION AT EACH TARGET FREQUENCY  LININS    13
C                   IN (DB). INCLUDES EFFECTS OF DUCT MACH NUMBER,      LININS    14
C                   DESIGN RELEASE DATE, DIRECTIVITY ANGLE, AND PER-    LININS    15
C                   CENTAGE OF TOTAL LINING THAT IS TREATED FOR EACH    LININS    16
C                   TARGET FREQUENCY.                                   LININS    17
C    2) TF     ...  ARRAY OF TARGET FREQUENCIES. (HZ)                   LININS    18
C    3) NTF    ...  NUMBER OF TARGET FREQUENCIES.                       LININS    19
C    4) BCF    ...  GEOMETRIC-MEAN FREQUENCIES FOR CONSTANT-PERCENTAGE- LININS    20
C                   BAND ATTENUATION SPECTRUM. (HZ)                     LININS    21
C    5) NCF    ...  NUMBER OF BANDS FOR ATTENUATION SPECTRUM.           LININS    22
C    6) W      ...  BANDWIDTH IN OCTAVES                                LININS    23
C    7) DSFC   ...  DOPPLER SHIFT FACTOR, IE.                           LININS    24
C                   DSFC  =  ONE - AMACH * COS(THETA)                   LININS    25
C                                                                       LININS    26
C  OUTPUTS                                                              LININS    27
C    1) ATN    ...  ARRAY OF (DB) VALUES FOR ATTENUATION SPECTRUM.      LININS    28
C                                                                       LININS    29
C.......................................................................LININS    30
      DIMENSION SPLC(1), TF(1), ATN(1), BCF(1)                          LININS    31
      DIMENSION F12X(37), F12Y(37), F12XO(25), F12YO(25)                LININS    32
      DATA F12X /-24.0, -21.0, -18.0, -15.0, -12.0, -11.0, -10.0,  -9.0, LININS   33
     1           -8.0,  -7.0,  -6.0,  -5.0,  -4.0,  -3.0,  -2.0,  -1.0, LININS   34
     2           -0.7, -0.35,   0.0,  0.35,   0.7,   1.0,   2.0,   3.0, LININS   35
     3            4.0,   5.0,   6.0,   7.0,   8.0,   9.0,  10.0,  11.0, LININS   36
     4           12.0,  15.0,  18.0,  21.0,  24.0/                      LININS    37
      DATA F12Y /0.007776,0.01296,0.0216,0.036,0.06,0.07,0.084,0.105,   LININS    38
     1           0.125,   0.16,   0.21,  0.28, 0.38,0.52,0.70, 0.89,    LININS    39
     2           0.935,   0.97,   0.99,  0.97, 0.935,.89,0.70, 0.52,    LININS    40
     3           0.38,    0.28,   0.21,  0.16, 0.125,.105,.084,0.07,    LININS    41
     4           0.06,    0.036,  0.0216,0.01296,   0.007776/           LININS    42
      DATA F12XO/-24.0, -21.0, -18.0, -15.0, -12.0, -10.5, -9.0,        LININS    43
     1           -7.5,  -6.0,  -4.5,  -3.0,  -1.5,   0.0,  1.5,        LININS    44
     2            3.0,   4.5,   6.0,   7.5,   9.0,  10.5, 12.0,        LININS    45
     3           15.0,  18.0,  21.0,  24.0/                             LININS    46
      DATA F12YO/0.007776,0.01296,0.0216,0.036, 0.06, 0.075, 0.105,     LININS    47
     1           0.165,   0.24,   0.37,  0.55,  0.74, 0.92,  0.74,     LININS    48
     2           0.55,    0.37,   0.24,  0.165, 0.105,0.075, 0.06,     LININS    49
     3           0.036,   0.0216, 0.01295,.007776/                     LININS    50
      DATA ZERO/0./                                                     LININS    51
      DATA IW1/0/                                                       LININS    52
C                                                                       LININS    53
C  ZERO-OUT (ATN) ARRAY                                                 LININS    54
      IF(IW1.NE.0)GO TO 5                                               LININS    55
      W=1.0                                                             LININS    56
      IF(NCF.NE.8)W=1./3.                                               LININS    57
      IW1=1                                                             LININS    58
```

```
 5    CONTINUE                                                          LININS     59
C                                                                       LININS     60
C  OUTTER LOOP FOR EACH TARGET FREQUENCY                                LININS     61
      DO  50  I = 1,NTF                                                 LININS     62
C                                                                       LININS     63
C  DEFINE CHARACTERISTIC FREQUENCY FOR DOPPLER FACTOR AND TARGET FREQ.  LININS     64
      FO  =  TF(I) / DSFC                                               LININS     65
C                                                                       LININS     66
C  INNER LOOP FOR EACH BAND OF ATTENUATION SPECTRUM                     LININS     67
      DO  50  J = 1,NCF                                                 LININS     68
C                                                                       LININS     69
C  CALCULATE THE NUMBER OF (1/3) OCTAVES BCF(J) IS FROM FO.             LININS     70
      DBAND  =   4.328085123 * ALOG(BCF(J) / FO)                        LININS     71
      DBAND=DBAND *FK                                                   LININS     72
C                                                                       LININS     73
C  CHECK FOR FULL OR (1/3) OCTAVE BAND ATTENUATION SPECTRUM SHAPING     LININS     74
      IF  (ABS(H - 1.0) - .002)  30, 30, 20                             LININS     75
   20 SHAPE  =  TBLU1(DBAND, F12X, F12Y, 2, 37)                         LININS     76
      GO TO 40                                                          LININS     77
   30 SHAPE  =  TBLU1(DBAND, F12XO, F12YO, 2, 25)                       LININS     78
   40 IF  (SHAPE .LT. ZERO)  SHAPE = ZERO                               LININS     79
C                                                                       LININS     80
C  SUM ATTENUATIONS FOR EACH TARGET FREQUENCY AT EACH PASS BAND.        LININS     81
      ATN(J)  =  ATN(J) + SHAPE * SPLC(I)                               LININS     82
   50 CONTINUE                                                          LININS     83
      RETURN                                                            LININS     84
      END                                                               LININS     85
```

```
      FUNCTION MCHAR(XX)                                                MCHAR
C                                                                       MCHAR
C  AUTHOR            K.D. JOHNSON                                       MCHAR
C                                                                       MCHAR
C PURPOSE            RETURN THE NUMBER OF DIGITS LEFT OF THE DECIMAL    MCHAR
C                    POINT IN A FLOATING POINT NUMBER                   MCHAR
C                                                                       MCHAR
      X=XX+.1                                                           MCHAR
      MCHAR=INT(ALOG10(X))+1                                            MCHAR
      RETURN                                                            MCHAR
      END                                                               MCHAR
```

```
      SUBROUTINE MEASRD
C
      COMMON /GCONST/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),ML,FM1,I17,A,PI
C
C
      COMMON /MEASIN/ NEP,NPSI,NBETA,DELTA,EP(5),PSX(17),BETX(5),ICDR12
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DDPSF(17)
C
C     FREQUENCY BANDS USED BY PROGRAM
C
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)
      COMMON/SUMSPL/SSPL(24,10,17)
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)
      COMMON/ANGLE/PSI(17,10),PSI0(17,10),BETA(17,10)
C
C     GENERAL INPUT PARAMETERS
C
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF
C
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS
C
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)
     *,APP,TSO,RHP,APO,TC,RHO,CA,CZ,TSP(17,10),COV
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLOPT
      COMMON/GCONVC/C(2,10),SLDISX(10)
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)
C     ****
C     ****
C     ****       DIMENSION SPL(425,24)
C     ****       DO 1 I=1,NEP
C     ****       DO 1 J=1,NPSI
C     ****       DO 1 K=1,NBETA
C     ****       INDEX=I+5*(J-1+17*(K-1))
C     ****     1 READ(----) (SPL(INDEX,L),L=1,NCF)
C     ****
C     ****
      DIMENSION SPL(425,24)
      REWIND 11
      IT=IN
      ICN(12)=ICN(12)+1
      IF(NCAS.NE.1)IT=11
      DO 621 K=1,NBETA
      DO 621 I=1,NEP
      DO 621 J=1,NPSI
      INDEX=I+5*(J-1+17*(K-1))
      READ(IT,625)(SPL(INDEX,L),L=1,NCF)
```

```
      IF(IT.EQ.11)GO TO 621                                             MEASRD     59
      WRITE(11,625)(SPL(INDEX,L),L=1,NCF)                               MEASRD     60
 621  CONTINUE                                                          MEASRD     61
  625 FORMAT(8F10.1)                                                    MEASRD     62
 50   CONTINUE                                                          MEASRD     63
      DELTAX=DELTA*0.01745                                              MEASRD     64
      CALL ANGLES(NOBS,DELTAX)                                          MEASRD     65
C                                                                       MEASRD     66
C                                                                       MEASRD     67
      DO 300 I=1,NOBS                                                   MEASRD     68
      CALL LINCOR(SPZ(1,1),0,X,X,X,X,X,X,X,X,X,PSI(1,I),NCF,BCF,        MEASRD     69
     *  X,X,X,X,X,X,X,ICOR12,IB(1,1,ITYPE),0,X)                         MEASRD     70
      DO 200 J=1,NCF                                                    MEASRD     71
      DO 100 K=1,17                                                     MEASRD     72
C                                                                       MEASRD     73
C                                                                       MEASRD     74
      SPLT(J,K)=TBLU3(EPF,PSI(K,I),BETA(K,I),EP,PSX,BETX,               MEASRD     75
     *                SPL(1,J),1,1,1,NEP,NPSI,NBETA,5,17,5) - SPZ(J,K)  MEASRD     76
  100 SSPL(J,I,K)=PWRSUM(SSPL(J,I,K),SPLT(J,K))                         MEASRD     77
C                                                                       MEASRD     78
 200  CONTINUE                                                          MEASRD     79
      IF(IPRT(7).NE.7)GO TO 220                                         MEASRD     80
      CALL NOISO(IPRT(7),I,NK,10,CHIN,IUNIT,SLDISX(I),PFREQ,            MEASRD     81
     *   SPLT(1,1),NCF,ITYPE)                                           MEASRD     82
 220  CONTINUE                                                          MEASRD     83
      DO 240 NF=1,NCF                                                   MEASRD     84
      DO 240 J=1,17                                                     MEASRD     85
 240  SPLT(NF,J)=SPLT(NF,J)-TSPL(NF,I,J)                                MEASRD     86
      IF(IPRT(3).NE.3)GO TO 300                                         MEASRD     87
      CALL PNLSUB(SPLT(1,1),PSPL(1,I),TPD(1,I),EPNL(1,I),SPL2,          MEASRD     88
     *  TEPNL(1,I),NK,BCG,TCG,FLR,I,NCBS,IRR(I,1))                      MEASRD     89
      CALL NOISO(IPRT(3),I,NK,12,CHIN,IUNIT,SLDISX(I),PFREQ,            MEASRD     90
     *  SPLT(1,1),NCF,ITYPE)                                            MEASRD     91
 300  CONTINUE                                                          MEASRD     92
      RETURN                                                            MEASRD     93
      END                                                               MEASRD     94
```

```
      SUBROUTINE MENOZZ(IEJECT,IENTRY,A,TS,AMACHJ,CV,AN,AMACHS,AR,PS,
     *                  CO,PSO,THETA,FREQ,SPL,XFREQ)
C
      DIMENSION FIG2(6,13),FIG2VR(6),FIG2AN(13)
      DIMENSION FIG2AV(2),FIG2A(2)
      DIMENSION FIG3(10,2),FIG3FO(10)
      DIMENSION FIG4(9,10),FIG4FO(9),FIG4AN(10)
      DIMENSION FIG5(6,11),FIG5VR(6),FIG5AN(11)
      DIMENSION FIG6(5),FIG6M(5)
      DIMENSION FIG10(4),FI1CVR(4)
      DIMENSION FIG8(3),FIG8N(3)
      DIMENSION FIG9(5),FIG9AR(5)
      DIMENSION FIG7(8),FIG7AN(8)
      DIMENSION FTEMP(9),FGAMMA(9)
      DIMENSION SPL(24,17),FREQ(24),THETA(17)
C
C
      DATA FIG2VR/2.778,2.903,3.0,3.176,3.301,3.398/
      DATA FIG2AN/20.,40.,60.,80.,90.,100.,110.,120.,130.,140.,
     *            150.,160.,170./
      DATA FIG2  /106.0,108.8,111.8,116.0,123.1,127.7,
     *            106.3,109.3,112.2,115.0,125.0,129.9,
     *            106.4,109.5,112.8,120.5,127.1,132.9,
     *            106.5,110.0,113.8,122.8,130.0,135.6,
     *            106.6,111.0,115.3,125.1,133.2,139.1,
     *            107.5,112.3,117.0,128.0,136.7,143.0,
     *            110.5,115.2,120.0,131.0,140.0,146.3,
     *            113.3,118.2,123.0,134.5,143.9,150.0,
     *            116.7,121.7,126.8,138.5,148.2,154.6,
     *            118.7,124.0,129.4,142.4,153.0,159.5,
     *            120.4,126.0,131.9,145.7,156.2,163.0,
     *            119.5,125.0,130.7,144.1,154.7,161.0,
     *            117.8,123.0,128.3,140.9,151.0,157.7/
C
C
      DATA FIG2AV/ 650.,1950./
      DATA FIG2A /1000.,1200./
C
C
      DATA FIG3FO/-2.000,-1.699,-1.347,-1.097,-.6576,-.3010,0.000,
     *            .4771, .9031, 1.301/
      DATA FIG3  / -37.3, -29.4, -20.3, -14.3,  -9.5, -11.7, -15.9,
     *            -23.6, -31.0, -37.8,
     *            -37.3, -29.4, -20.3, -14.3,  -8.8, -11.7, -18.7,
     *            -30.9, -41.8, -52.3/
C
C
      DATA FIG4FO/-2.0,-1.523,-1.155,-.699,-.222,.301,.845,1.398,2.0/
      DATA FIG4AN/0.,100.,110.,120.,130.,135.,140.,150.,160.,170./
      DATA FIG4  / 8.4, 5.1, 2.1,0.0, 1.2, 3.9,  5.8,  7.0,  8.0,
     *             8.4, 5.1, 2.1,0.0, 1.2, 3.9,  5.8,  7.0,  8.0,
     *             4.4, 3.3, 1.4,0.0, 1.0, 3.4,  5.2,  6.3,  7.0,
     *             3.0, 2.5, 1.0,0.0, 0.7, 3.0,  4.6,  5.7,  6.4,
     *             0.0, 0.0, 0.0,0.0, 0.3, 1.3,  2.2,  2.7,  3.2,
     *             0.0, 0.0, 0.0,0.0, 0.0, 0.0,  0.0,  0.0,  0.0,
     *            -1.3,-1.0,-0.6,0.0,-0.5,-1.3, -1.9, -2.3, -2.7,
     *            -4.0,-2.9,-1.6,0.0,-1.7,-4.0, -5.8, -7.0, -8.2,
```

```
     *            -6.6,-4.2,-2.2,0.0,-2.5,-6.7,-10.3,-13.7,-17.0,        MENOZZ     59
     *            -9.6,-6.0,-2.8,0.0,-3.9,-9.7,-14.6,-18.8,-23.0/        MENOZZ     60
C                                                                        MENOZZ     61
C                                                                        MENOZZ     62
      DATA FIG5VR/500.,800.,1000.,1250.,1500.,2000./                     MENOZZ     63
      DATA FIG5AN/20.,40.,60.,80.,100.,110.,120.,130.,140.,150.,160./    MENOZZ     64
      DATA FIG5  /1.22,1.28,1.36,1.50,1.65,1.86,                         MENOZZ     65
     *            1.24,1.34,1.43,1.57,1.72,1.95,                         MENOZZ     66
     *            1.26,1.42,1.54,1.70,1.86,2.14,                         MENOZZ     67
     *            1.32,1.57,1.76,1.95,2.14,2.40,                         MENOZZ     68
     *            1.37,1.68,1.89,2.12,2.34,2.66,                         MENOZZ     69
     *            1.37,1.57,1.74,1.92,2.11,2.47,                         MENOZZ     70
     *            1.32,1.36,1.41,1.48,1.55,1.64,                         MENOZZ     71
     *            1.08,1.10,1.12,1.14,1.16,1.22,                         MENOZZ     72
     *             .84, .86, .86, .88, .90, .96,                         MENOZZ     73
     *             .68, .70, .70, .72, .74, .78,                         MENOZZ     74
     *             .58, .60, .61, .62, .64, .71/                         MENOZZ     75
C                                                                        MENOZZ     76
C                                                                        MENOZZ     77
      DATA FIG6M/0.,.4,.8,1.2,1.5/                                       MENOZZ     78
      DATA FIG6 /1.31,1.24,1.07, .75, .45/                               MENOZZ     79
C                                                                        MENOZZ     80
C                                                                        MENOZZ     81
      DATA FI10VR /600.,1200.,1600.,2000./                               MENOZZ     82
      DATA FIG10  / 6.4, 25.4, 36.0, 45.0/                               MENOZZ     83
C                                                                        MENOZZ     84
C                                                                        MENOZZ     85
      DATA FIG8N/0.903,1.602,2.301/                                      MENOZZ     86
      DATA FIG8 /  -5., -10., -15./                                      MENOZZ     87
C                                                                        MENOZZ     88
C                                                                        MENOZZ     89
      DATA FIG9AR/.079,.301,.362,.602,1.161/                             MENOZZ     90
      DATA FIG9  /-7.6,-3.9,-3.2,-1.3, 3.0/                              MENOZZ     91
C                                                                        MENOZZ     92
C                                                                        MENOZZ     93
      DATA FIG7AN/  10.,  35.,  55.,  80., 100., 125., 150., 170./       MENOZZ     94
      DATA FIG7  /-15.0,-12.3, -8.4, -1.9,  2.9,  6.0,  2.6, -4.0/       MENOZZ     95
C                                                                        MENOZZ     96
C                                                                        MENOZZ     97
      DATA FTEMP / 800., 900.,1000.,1200.,1400.,1600.,1800.,2000.,2500./ MENOZZ     98
      DATA FGAMMA/1.382,1.376,1.369,1.357,1.344,1.333,1.324,1.316,1.302/ MENOZZ     99
C                                                                        MENOZZ    100
      DATA SPHDIV/33.2/,G/32.174/,R/53.345/                              MENOZZ    101
C                                                                        MENOZZ    102
      IF(IENTRY.EQ.2) GO TO 200                                          MENOZZ    103
      GAMMA=TBLU1(TS,FTEMP,FGAMMA,1,9)                                   MENOZZ    104
      CJ=SQRT(GAMMA*G*R*TS)                                              MENOZZ    105
      XPS=PS*144.                                                        MENOZZ    106
      IF(IEJECT.EQ.0) XPS=PSC*144.0                                      MENOZZ    107
      RHO=XPS/(R*TS)                                                     MENOZZ    108
      VJET=CV*CJ*AMACHJ                                                  MENOZZ    109
      VS=CO*AMACHS                                                       MENOZZ    110
      UE=VJET-VS+0.4*CO                                                  MENOZZ    111
      TSO=TBLU1(VJET,FIG2AV,FIG2A,1,2)                                   MENOZZ    112
      V2=ALOG10(UE)                                                      MENOZZ    113
      FUN1=TBLU1(AMACHJ,FIG6M,FIG6,2,5)                                  MENOZZ    114
      FUN2=10.0*ALOG10(RHO*RHO*A*(TS/TSO)**1.5)                          MENOZZ    115
```

```
      V3  =  VJET + (VS - 0.4 * CC)                                     MENOZZ    116
      FUN5  =  VJET*VJET / (V3 * 1.13 * SQRT(A / AN))                   MENOZZ    117
      FUN7=FUN2+TBLU1(ALOG10(AN),FIG8N,FIG8,1,3)                        MENOZZ    118
     *         +TBLU1(ALOG10(AR),FIG9AR,FIG9,1,5)                       MENOZZ    119
     *         +SPHDIV+TBLU2(V2,120.0,FIG2VR,FIG2AN,FIG2,1,1,6,13,6,13) MENOZZ    120
      XFREQ=FUN5*FUN1*TBLU2(UE,120.0,FIG5VR,FIG5AN,FIG5,1,1,            MENOZZ    121
     *                      6,11,6,11)*0.3                              MENOZZ    122
C                                                                       MENOZZ    123
C                                                                       MENOZZ    124
      DO 100 I=1,17                                                     MENOZZ    125
C                                                                       MENOZZ    126
C                                                                       MENOZZ    127
      FO2=FUN5*FUN1*TBLU2(UE,THETA(I),FIG5VR,FIG5AN,FIG5,1,1,6,         MENOZZ    128
     *                          11,6,11)                                MENOZZ    129
C                                                                       MENOZZ    130
C                                                                       MENOZZ    131
      OASPL2=FUN7+TBLU1(THETA(I),FIG7AN,FIG7,2,8)                       MENOZZ    132
C                                                                       MENOZZ    133
C                                                                       MENOZZ    134
      DO 100 J=1,24                                                     MENOZZ    135
      FREQ2=ALOG10(FREQ(J)/FO2)                                         MENOZZ    136
C                                                                       MENOZZ    137
C                                                                       MENOZZ    138
C                                                                       MENOZZ    139
  100 SPL(J,I)=OASPL2+TBLU1(FREQ2,FIG3FO,FIG3(1,2),2,10)                MENOZZ    140
     *    +TBLU2(FREQ2,THETA(I)+10.0,FIG4FO,FIG4AN,FIG4,2,1,9,10,9,10)  MENOZZ    141
      RETURN                                                            MENOZZ    142
C                                                                       MENOZZ    143
C                                                                       MENOZZ    144
  200 VO=CO*AMACHS                                                      MENOZZ    145
      VE=SQRT(VJET*VJET-2.0*VJET*VC*COS(AN)+VC*VC)                      MENOZZ    146
      FUN3=FUN2                                                         MENOZZ    147
      V3  =  SQRT(VJET*VJET + 2.*VJET*VC*COS(AN) + VC*VC)               MENOZZ    148
      FUN6=-0.34*TBLU1(VE,FI10VR ,FIG10,1,4)*SQRT(AR-1.0)               MENOZZ    149
C                                                                       MENOZZ    150
C                                                                       MENOZZ    151
      IF(IEJECT.EQ.0) GO TO 250                                         MENOZZ    152
      PGAMMA=TBLU1(TS,FTEMP,FGAMMA,1,9)                                 MENOZZ    153
      PCJ=SQRT(PGAMMA*G*R*TS)                                           MENOZZ    154
      PRHO=PSO*144.0/(R*TS)                                             MENOZZ    155
      PVJET=CV*PCJ*AMACHJ                                               MENOZZ    156
      VE=SQRT(PVJET*PVJET-2.0*PVJET*VC*COS(AN)+VC*VC)                   MENOZZ    157
      PTSO=TBLU1(PVJET,FIG2AV,FIG2A,1,2)                                MENOZZ    158
      FUN3=10.0*ALOG10(PRHO*PRHO* PS*(TS/PTSO)**1.5)                    MENOZZ    159
      V3  =  SQRT(PVJET*PVJET + 2.*PVJET*VC*COS(AN) + VC*VC)            MENOZZ    160
      FUN4  =  PVJET*PVJET / (V3 * 1.13 * SQRT(PS))                     MENOZZ    161
      FUN6=0.0                                                          MENOZZ    162
C                                                                       MENOZZ    163
C                                                                       MENOZZ    164
  250 V1=ALOG10(VE)                                                     MENOZZ    165
C                                                                       MENOZZ    166
C                                                                       MENOZZ    167
C                                                                       MENOZZ    168
      DO 300 I=1,17                                                     MENOZZ    169
C                                                                       MENOZZ    170
C                                                                       MENOZZ    171
      FO1=FUN4*TBLU2(VE,THETA(I),FIG5VR,FIG5AN,FIG5,1,1,6,11,6,11)      MENOZZ    172
```

```
C                                                                       MENOZZ    173
C                                                                       MENOZZ    174
      OASPL1=FUN3+FUN6                                                  MENOZZ    175
     *       +SPHDIV+TBLU2(V1,THETA(I),FIG2VR,FIG2AN,FIG2,1,1,6,13,6,13) MENOZZ    176
C                                                                       MENOZZ    177
C                                                                       MENOZZ    178
      DO 300 J=1,24                                                     MENOZZ    179
      FREQ1=ALOG10(FREQ(J)/F01)                                         MENOZZ    180
C                                                                       MENOZZ    181
C                                                                       MENOZZ    182
  300 SPL(J,I)=OASPL1+TBLU1(FREQ1,FIG3F0,FIG3,2,10)                     MENOZZ    183
     *          +TBLU2(FREQ1,THETA(I),FIG4F0,FIG4AN,FIG4,2,1,9,10,9,10) MENOZZ    184
C                                                                       MENOZZ    185
      RETURN                                                            MENOZZ    186
      END                                                               MENOZZ    187
```

```
      SUBROUTINE NEXTCR                                                 NEXTCR
C                                                                       NEXTCR
C     CONSTANTS USED IN INTERNAL CALCULATIONS                           NEXTCR
C                                                                       NEXTCR
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCP,IPRT(7),ICN(13),NLCPT         NEXTCR
      COMMON /GCONST/ IN,IO,IT1,IT2,FC,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  NEXTCR
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001, NEXTCR
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI  NEXTCR
C                                                                       NEXTCR
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                 NEXTCR
C                                                                       NEXTCR
      COMMON /GCOMON/ NCF,NK,BCF(24),TSFL(24,10,17),SPLT(24,17),        NEXTCR
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DOPSF(17)                     NEXTCR
C                                                                       NEXTCR
C     FREQUENCY BANDS USED BY PROGRAM                                   NEXTCR
C                                                                       NEXTCR
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)                      NEXTCR
C                                                                       NEXTCR
C     GENERAL INPUT PARAMETERS                                          NEXTCR
C                                                                       NEXTCR
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),ITENG,IUNIT   NEXTCR
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)        NEXTCR
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP     NEXTCR
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,CHUMID,XKN,NC,FLD(50),    NEXTCR
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         NEXTCR
C                                                                       NEXTCR
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                NEXTCR
C                                                                       NEXTCR
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),       NEXTCR
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             NEXTCR
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CCV                       NEXTCR
C                                                                       NEXTCR
C     CONVERSION CONSTANTS                                              NEXTCR
C                                                                       NEXTCR
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  NEXTCR
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR                     NEXTCR
      DIMENSION XL(2)                                                   NEXTCR
      DATA XL/2HM.,2HFT/                                                NEXTCR
C                                                                       NEXTCR
C     DETERMINE AVERAGE AIR ABSORPTION COEFFICIENTS                     NEXTCR
 40   IF(IAIR.EQ.M1) GO TO 150                                          NEXTCR
      IF(IAIR.EQ.I1)GO TO  150                                          NEXTCR
      ALTZ=ALTR+AALT                                                    NEXTCR
      ALTW=ALTP+AALT                                                    NEXTCR
      CALL AVGALF(ALTZ,ALTW,NK,NCF,BCF,UAIRAB,IATMOS)                   NEXTCR
 150  IF(IPRT(5).NE.5)GO TO 155                                         NEXTCR
      CALL PRINTH(IPRT(5),LCT,5)                                        NEXTCR
      WRITE(9,20)                                                       NEXTCR
 20   FORMAT(50X,31HNOISE EXTRAPOLATION CORRECTIONS// )                 NEXTCR
      WRITE(9,22)                                                       NEXTCR
 22   FORMAT(2X,46HSPHERICAL DIVERGENCE (APPLYS TO ALL PASSBANDS)/)     NEXTCR
      WRITE(9,24)XL(IUNIT+1)                                            NEXTCR
 24   FORMAT(6X,1HX,44X,32HSOUND PRESSURE LEVEL ATTENUATION /5X,1H(,A2, NEXTCR
     *       1H),56X,4H(DB) /)                                          NEXTCR
      LCT=13                                                            NEXTCR
 155  CONTINUE                                                          NEXTCR
C     SPHERICAL DIVERGENCE CALCULATIONS                                 NEXTCR
```

```
      DO 300 I=I1,NOBS                                                  NEXTCR     59
      DO 200 J=I1,I17                                                   NEXTCR     60
      IF(PD(I,J).NE.F0)GO TO 160                                        NEXTCR     61
      SPLT(I,J)=F0                                                      NEXTCR     62
      GO TO 170                                                         NEXTCR     63
 160  CONTINUE                                                          NEXTCR     64
      SPLT(I,J)=20.* ALOG10(ABS(PD(I,J)*C(I2,I1)))                      NEXTCR     65
 170  CONTINUE                                                          NEXTCR     66
      DO 180 K=I1,NCF                                                   NEXTCR     67
 180  TSPL(K,I,J)=SPLT(I,J)                                             NEXTCR     68
 200  CONTINUE                                                          NEXTCR     69
      IF(IPRT(5).NE.5)GO TO 300                                         NEXTCR     70
      WRITE(9,250)SLDIS*(I),(SPLT(I,J),J=I1,I17)                        NEXTCR     71
 250  FORMAT(2X,1PE10.3,0PF7.1,16F7.1)                                  NEXTCR     72
 300  CONTINUE                                                          NEXTCR     73
      IF(IPRT(5).NE.5)GO TO 310                                         NEXTCR     74
      WRITE(9,275)(ETA(J),J=I1,I17)                                     NEXTCR     75
 275  FORMAT(/3X,8HANGLE XI /4X,5H(DEG),2X,17F7.0//)                    NEXTCR     76
      LCT=LCT+NOBS+5                                                    NEXTCR     77
 310  CONTINUE                                                          NEXTCR     78
C     CALCULATION OF ATMOSPHERIC ABSORPTION                             NEXTCR     79
      DO 400 I=I1,NOBS                                                  NEXTCR     80
      DO 400 K=I1,NCF                                                   NEXTCR     81
      DO 350 J=I1,I17                                                   NEXTCR     82
      SPL2(J)=UAIRAB(K)*PD(I,J)*POC1                                    NEXTCR     83
 350  TSPL(K,I,J)=TSPL(K,I,J)+SPL2(J)                                   NEXTCR     84
      IF(IPRT(5).NE.5) GO TO 400                                        NEXTCR     85
      IF(LCT.GE.54) GO TO 360                                           NEXTCR     86
      IF(K.EQ.1)GO TO 370                                               NEXTCR     87
      GO TO 390                                                         NEXTCR     88
 360  CALL PRINTH(IPRT(5),LCT,9)                                        NEXTCR     89
      WRITE(9,20)                                                       NEXTCR     90
      LCT=8                                                             NEXTCR     91
 370  WRITE(9,380)SLDIS*(I),XL(IUNIT+1)                                 NEXTCR     92
      LCT=LCT+1                                                         NEXTCR     93
 380  FORMAT(2X,32HATMOSPHERIC ABSORPTION   FOR X =,1PE10.3,1X,A2)      NEXTCR     94
      WRITE(9,382)                                                      NEXTCR     95
 382  FORMAT(/3X,9HFREQUENCY,39X,32HSOUND PRESSURE LEVEL ATTENUATION/   NEXTCR     96
     *       5X,5H(KHZ),55X,4H(DB)/)                                    NEXTCR     97
      LCT=LCT+ 4                                                        NEXTCR     98
 390  WRITE(9,250)PFREQ(K),(SPL2(J),J=I1,I17)                           NEXTCR     99
      LCT=LCT+1                                                         NEXTCR    100
      IF(K.NE.NCF)GO TO 400                                             NEXTCR    101
      IF(LCT.GT.49)GO TO 395                                            NEXTCR    102
 392  WRITE(9,275)(ETA(J),J=I1,I17)                                     NEXTCR    103
      LCT=LCT+5                                                         NEXTCR    104
      GO TO 400                                                         NEXTCR    105
 395  CALL PRINTH(IPRT(5),LCT,9)                                        NEXTCR    106
      WRITE(9,20)                                                       NEXTCR    107
      LCT=LCT+3                                                         NEXTCR    108
      WRITE(9,380)SLDIS*(I),XL(IUNIT+1)                                 NEXTCR    109
      LCT=LCT+1                                                         NEXTCR    110
      GO TO 392                                                         NEXTCR    111
 400  CONTINUE                                                          NEXTCR    112
      N1=I1                                                             NEXTCR    113
      N2=I2                                                             NEXTCR    114
C     CALCULATION OF EXTRA GROUND ATTENUATION AND GROUND REFLECTION     NEXTCR    115
```

```
      IF(IEGA.EQ.I1) N1=I2                                              NEXTCR    116
      SK=F1                                                             NEXTCR    117
      DO 5CC N=N1,N2                                                    NEXTCR    118
      DO 500 I=I1,NOBS                                                  NEXTCR    119
      DO 475 J=I1,I17                                                   NEXTCR    120
      IF  (N-1)  440, 440, 442                                          NEXTCR    121
 440  CALL EGACAL(PD(I,J),B2(I,J),NCF,BCF,TGAGR)                        NEXTCR    122
      GC TO 448                                                         NEXTCR    123
 442  SK=FM1                                                            NEXTCR    124
      IF(IGDR.EQ.IO)GO TO 446                                           NEXTCR    125
      DO 444 K1=1,NCF                                                   NEXTCR    126
 444  TGAGR(K1)=F3                                                      NEXTCR    127
      GO TO 448                                                         NEXTCR    128
 446  CALL GRDRFX(BCF,       NCF,IO,PD(I,J),DPND(I,J),B1(I,J),CA,XKN,ND,  NEXTCR    129
     * FLD,ZNR,ZNI,TGAGR)                                               NEXTCR    130
 448  CONTINUE                                                          NEXTCR    131
      DO 450 K=1,NCF                                                    NEXTCR    132
      SPLT(K,J)=TGAGR(K)                                                NEXTCR    133
 450  TSPL(K,I,J)=TSPL(K,I,J)+TGAGR(K)* SK                              NEXTCR    134
 475  CONTINUE                                                          NEXTCR    135
      IF(IPRT(5).NE.5)GO TO 500                                         NEXTCR    136
      DC 498 K=I1,NCF                                                   NEXTCR    137
      IK=1                                                              NEXTCR    138
      IF(LCT.GE.54) GO TO 460                                           NEXTCR    139
      IF(K.EQ.1.AND.LCT.LE.48) GO TC 493                                NEXTCR    140
      IF(K.EQ.1) GO TO 460                                              NEXTCR    141
      GC TO 490                                                         NEXTCR    142
 460  CALL PRINTH(IPRT(I),LCT,9)                                        NEXTCR    143
      WRITE(9,20)                                                       NEXTCR    144
      LCT=11                                                            NEXTCR    145
      IF  (N-1)  470, 470, 474                                          NEXTCR    146
 470  WRITE(9,480)SLDISX(I),XL(IUNIT+1)                                 NEXTCR    147
 48C  FORMAT(2X,32HEXTRA-GROUND-ATTENUATICN FCR X =,1PE10.3,1X,A2)      NEXTCR    148
      LCT=LCT+1                                                         NEXTCR    149
 482  WRITE(9,382)                                                      NEXTCR    150
      LCT=LCT+4                                                         NEXTCR    151
 490  WRITE(9,250) PFREQ(K),(SPLT(K,J),J=I1,I17)                        NEXTCR    152
      LCT=LCT+1                                                         NEXTCR    153
 491  IF(K.NE.NCF)GO TO 498                                             NEXTCR    154
      IF(LCT.GT.49)GO TO 495                                            NEXTCR    155
      IK=2                                                              NEXTCR    156
 492  WRITE(9,275)(ETA(J),J=I1,I17)                                     NEXTCR    157
      IF  (IK-1)  493, 493, 498                                         NEXTCR    158
 493  CCNTINUE                                                          NEXTCR    159
      IF  (N-1)  470, 470, 474                                          NEXTCR    160
 474  WRITE(9,477)SLDISX(I),XL(IUNIT+1)                                 NEXTCR    161
 477  FORMAT(2X,17HGRCOUND REFLECTICN,8X, 7HFCR X =,1PE10.3,1X,A2 )     NEXTCR    162
      LCT=LCT+1                                                         NEXTCR    163
      IF(IGDR.EQ.IO)GO TO 482                                           NEXTCR    164
      IF(K.NE.1)GO TO 491                                               NEXTCR    165
 476  FORMAT(/2X,47HGROUND REFLECTICN = -3 DB ATTENUATICN OR +3 DB ,    NEXTCR    166
     *     29HCORRECTICN FOR ALL PASSBANDS./ )                          NEXTCR    167
      WRITE(9,476)                                                      NEXTCR    168
      LCT=LCT+3                                                         NEXTCR    169
      GO TO 500                                                         NEXTCR    170
 495  CALL PRINTH(IPRT(5),LCT,9)                                        NEXTCR    171
      LCT=LCT+5                                                         NEXTCR    172
```

```
      WRITE(9,20)                                                       NEXTCR    173
      LCT=LCT+3                                                         NEXTCR    174
      IK=2                                                              NEXTCR    175
      IF  (N-1)  496, 496, 497                                          NEXTCR    176
496   WRITE(9,480)SLDISX(I),XL(IUNIT+1)                                 NEXTCR    177
      LCT=LCT+1                                                         NEXTCR    178
      GO TO 492                                                         NEXTCR    179
497   WRITE(9,477)SLDISX(I),XL(IUNIT+1)                                 NEXTCR    180
      LCT=LCT+1                                                         NEXTCR    181
      GO TO 492                                                         NEXTCR    182
498   CONTINUE                                                          NEXTCR    183
500   CONTINUE                                                          NEXTCR    184
      ENDFILE 9                                                         NEXTCR    185
      REWIND 9                                                          NEXTCR    186
      RETURN                                                            NEXTCR    187
      END                                                               NEXTCR    188
```

```
      SUBROUTINE NINPUT                                                 NINPUT
C                                                                       NINPUT
C     INPUT DATA BLOCKS FOR NOISE COMPONENTS                            NINPUT
C     ITYPE DEFINES THE TYPE OF NOISE COMPONENT                         NINPUT
C ITYPE=1  PRIMARY JET                                                  NINPUT
C  =2      PRIMARY AND SECONDARY JET                                    NINPUT
      COMMON/JETDAT/NJET1,MCODE1,AP1,WP1,VP1,AS2,WS2,VS2,PR1,PA1,       NINPUT
     1      TT1,VA1,DIAMT1,ANGJT1,ICOR1                                 NINPUT
C  =3      CORE AND TURBINE                                             NINPUT
      COMMON/COREIN/TT3,PP3,CMF3,EK3,DELT3,JB3,                         NINPUT
     *  ICOR3,LIN3,NTF3,IMA3,LGM3,NWL3,ICP3,ILAY3,TF3(10),              NINPUT
     *  PCTA3(10),PLA3(10),ELOH3,EDH3,R1W3(10),TL3(10),CF3,FM3          NINPUT
C                                                                       NINPUT
      COMMON/TURBIN/BN3,SS3,VTR3,CLS3,DT3,TU3,FMF3,CS3,IC3,ISW3         NINPUT
C  =4      COMPRESSOR AND INLET FAN                                     NINPUT
C  =5      EXIT FAN                                                     NINPUT
      COMMON/FANDAT/NSTG45,NLET45,NAFT45,ICP45,NB45(3),FPR45(3),        NINPUT
     1  DIAM4(3),RSS45(3),AREA5(3),RN145,RTS45,CFPR4,DELT45,            NINPUT
     *  NI5,BPR5,ICOR4,LIN4,NTF4,IMA4,LGM4,NWL4,ICP4,ILAY4,TF4(10),     NINPUT
     *  PCTA4(10),PLA4(10),ELOH4,EDH4,R1W4(10),TL4(10),CF4,FM4,         NINPUT
     *  ICOR5,LIN5,NTF5,IMA5,LGM5,NWL5,ICP5,ILAY5,TF5(10),              NINPUT
     *  PCTA5(10),PLA5(10),ELOH5,EDH5,R1W5(10),TL5(10),CF5,FM5          NINPUT
C  =6      AUGMENTER-WING JET                                           NINPUT
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICOP,IPRT(7),ICN(13),NLOPT         NINPUT
     *,INSEOW(3),INSHLD                                                 NINPUT
      COMMON/AUGWNG/GAMA6,TT6,XNPR6,DELT6,AD6,CE6,                      NINPUT
     *  ICOR6,LIN6,NTF6,IMA6,LGM6,NWL6,ICP6,ILAY6,TF6(10),              NINPUT
     *  PCTA6(10),PLA6(10),ELOH6,EDH6,R1W6(10),TL6(10),CF6,FM6          NINPUT
C  =7      BLOWN-FLAP JET                                               NINPUT
      COMMON/BLOWIN/PR7,TT7,AN7,DN7,FANG7,DELT7,DL7,HD7,ICOR7           NINPUT
      DIMENSION PR7(1)                                                  NINPUT
C  =8       LIFT-FAN                                                    NINPUT
      COMMON/LFTFAN/NB8,FPR8,DIAM8,RSS8,AREA8,RN18,RTS8,CRFPR8,DELTA8,  NINPUT
     *  ICOR8,LIN8,NTF8,IMA8,LGM8,NWL8,ICP8,ILAY8,TF8(10),PCTA8(10),    NINPUT
     *  PLA8(10),ELOH8,EDH8,R1W8(10),TL8(10),CF8,FM8                    NINPUT
C  =9      EJECTOR - SUPPRESSOR JET                                     NINPUT
      COMMON /EJECTD/ IEJ9,NUM9,AREA9,AR9,ST9,EXNM9,SMACH9,CV9,         NINPUT
     *  PS9,PA9,PTS9,EMACH9,PCV9,DELT9,                                 NINPUT
     *  ICOR9,LIN9,NTF9,IMA9,LGM9,NWL9,ICP9,ILAY9,TF9(10),PCTA9(10),    NINPUT
     *  PLA9(10),ELOH9,EDH9,R1W9(10),TL9(10),CF9,FM9                    NINPUT
C  =10     PROPELLER                                                    NINPUT
      COMMON/PROPIN/T10,W10,RPM10,D10,CSLB10,ASUB10,B10,DELT10,         NINPUT
     *ICOR10                                                            NINPUT
C  =11     HELICOPTER AND TILT ROTOR                                    NINPUT
      COMMON/COPTER/T11,Q11,RPM11,B11,DT11,AB11,DE11,RN11,              NINPUT
     1        SI11,CEE11,DELT11,XLMC11,XMM11,NRTR11,LLF11,IRR11,        NINPUT
     *ICOR11                                                            NINPUT
C                                                                       NINPUT
C  =12     MEASURED DATA INPUTS                                         NINPUT
      COMMON/MEASIN/NEP12,NPSI12,NBTA12,DELT12,EP12(5),PSI12(17),       NINPUT
     *   BETA12(5),                                                     NINPUT
     *ICOR12                                                            NINPUT
C                                                                       NINPUT
C     ITYPE = 13  JET EDGE INTERACTION                                  NINPUT
      COMMON/JETEDG/AJS13,DDA13,DDNE13,DHNL13,DJCL13,                   NINPUT
     *FLAP13,HD13,EMJ13,TSR13,ICOR13                                    NINPUT
C                                                                       NINPUT
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C     THIS ROUTINE HANDLES LINKAGE TO INPUT MODULES  FLIGHT-PATH
C     OBSERVER GEOMETRY MODULE  VARIOUS NOISE ESTIMATION MODULES
C     EXTRAPOLATION MODULE  HUMAN RESPONSE MEASUREMENT MODULE
C
C     CONSTANTS USED IN INTERNAL CALCULATIONS
C
      COMMON /GCONST/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI
C
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING
C
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)
C
C     FREQUENCY BANDS USED BY PROGRAM
C
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)
C
C     GENERAL INPUT PARAMETERS
C
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF
C
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS
C
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CCV
C
C     CONVERSION CONSTANTS
C
      COMMON/GCONVC/C(2,10),SLDISX(10)
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR
      COMMON/ICPATH/NCAS,NCCF,NTYP,IC,NRN,IARRAY(2)
C
C
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)
C
C        THIS SECTION IS FOR STORING DATA LOCALLY
      DIMENSION INI5(3),XBP5(3),INUM(3),AREA9(1),IEJ(3)
      DIMENSION ICOR3(1),IADD3(8,3),ADD3(54,3),ICOR4(1),IADD4(8,3),
     1  ADD4(54,3),ICOR5(1),IADD5(8,3),ADD5(54,3),ICOR6(1),IADD6(8,3),
     2  ADD6(54,3),ICOR7(1),ICOR8(1),IADD8(8,3),
     3  ADD8(54,3),ICOR9(1),IADD9(8,3),ADD9(54,3)
      DIMENSION FPR8(1),INB8(3)
C
      DIMENSION ICON(20),EDGVAR(10)
      DIMENSION S1(9,3),S2(3,3),S3(13,3),S45(16,3),S6(6,3),S7(8,3),
     1          S8(8,3),S9(12,3),S10(8,3),S11(13,3),S12(3)
     2,S13(10,3),IADD13(3)
      DIMENSION NC(4,3),IS45(7,3),JET1(2,3)
      DIMENSION NDIC(4)
      EQUIVALENCE (NTYPE,NDIC(1))
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      DIMENSION T3(5),J3(3,3)                                           NINPUT    116
      EQUIVALENCE (T3(1),TT3)                                           NINPUT    117
      DIMENSION B3(8)                                                   NINPUT    118
      EQUIVALENCE (B3(1),BN3)                                           NINPUT    119
      DIMENSION T113(13),I113(3,3)                                      NINPUT    120
      EQUIVALENCE (T113(1),T11)                                         NINPUT    121
      DIMENSION AUGI(6)                                                 NINPUT    122
      EQUIVALENCE (GAMA6,AUGI(1))                                       NINPUT    123
      DIMENSION PROPI(8)                                                NINPUT    124
      EQUIVALENCE (T10,PROPI(1))                                        NINPUT    125
      DIMENSION IJET(2),AJET(12)                                        NINPUT    126
      EQUIVALENCE (IJET(1),NJET1),(AJET(1),AP1)                         NINPUT    127
      DIMENSION IFAN1(7),FAN2(3),FAN11(3),FAN3(3),FAN41(3),FAN5(20)     NINPUT    128
      EQUIVALENCE (IFAN1(1),NSTG45),(FAN2(1),FPR45(1)),(FAN11(1),       NINPUT    129
     1   DIAM4(1)),(FAN3(1),RSS45(1)),(AREA5(1),FAN41(1)),(FAN4,RN145),  NINPUT    130
     2   (FAN12,RTS45)                                                  NINPUT    131
      EQUIVALENCE (ICOR1,ICOR2)                                         NINPUT    132
      NAMELIST/NOISIN/T10,W10,RPM10,D10,DSUB10,ASUB10,B10,DELT10,NRTR11, NINPUT    133
     *  NENG,NTYPE,ITYPE,GAMA6,TT6,XNPR6,DELT6,AD6,DE6,LLF11,IEJ9,NUM9,  NINPUT    134
     *  NSTG45,NLET45,NAFT45,FPR45,DIAM4,RSS45,AREA5,RN145,AREA9,AR9,    NINPUT    135
     *  RTS45,CFPR4,DELT45,NB45,NI5,BPR5,NJET1,MCODE1,AP1,WP1,VP1,ST9,   NINPUT    136
     *  AS2,WS2,VS2,PR1,PA1,TT1,DIAMT1,ANGJT1,BN3,SS3,VTR3,CLS3,EXNM9,   NINPUT    137
     *  DT3,TU3,PMF3,CS3,IC3,ISW3,TT3,PP3,CMF3,EK3,DELT3,JB3,T11,SMACH9, NINPUT    138
     *  Q11,RPM11,B11,DT11,AB11,DE11,RN11,SI11,CEE11,DELT11,XLMC11,CV9,  NINPUT    139
     *  NEP12,NPSI12,NBTA12,DELT12,EP12,PSI12,BETA12,DCB,PSCR,CPB,NPSCR, NINPUT    140
     *  ICOR3,LIN3,NTF3,IMA3,LGM3,NWL3,ICP3,ILAY3,TF3,PCTA3,PLA3,EMACH9, NINPUT    141
     *  ELOH3,EDH3,R1W3,TL3,CF3,FM3,ICCR4,LIN4,NTF4,IMA4,LGM4,NWL4,PS9,  NINPUT    142
     *  IDP4,ILAY4,TF4,PCTA4,PLA4,ELOH4,EDH4,R1W4,TL4,CF4,FM4,ICCR5,PA9, NINPUT    143
     *  LIN5,NTF5,IMA5,LGM5,NWL5,ICP5,ILAY5,TF5,PCTA5,PLA5,ELOH5,EDH5,   NINPUT    144
     *  R1W5,TL5,CF5,FM5,ICOR6,LIN6,NTF6,IMA6,LGM6,NWL6,ICP6,ILAY6,TF6,  NINPUT    145
     *  PCTA6,PLA6,ELOH6,EDH6,R1W6,TL6,CF6,FM6,ICOR7,NB8,FPR8,DIAM8,     NINPUT    146
     *  RSS8,AREA8,RN18,RTS8,CRFPR8,DELTA8,PR7,TT7,AN7,DN7,FANG7,DELT7,  NINPUT    147
     *  ICOR8,LIN8,NTF8,IMA8,LGM8,NWL8,ICP8,ILAY8,TF8,PCTA8,PLA8,DELT9,  NINPUT    148
     *  ELOH8,EDH8,R1W8,TL8,CF8,FM8,ICCR9,LIN9,NTF9,IMA9,LGM9,NWL9,PTS9, NINPUT    149
     *  IDP9,ILAY9,TF9,PCTA9,PLA9,ELOH9,EDH9,R1W9,TL9,CF9,FM9,PCV9,      NINPUT    150
     *ICOR10,ICOR11,ICOR12,ICCR1,ICCR2,XMM11,DL7,HD7,IRR11,EDGVAR,INSHLD NINPUT    151
     *,ICOR13                                                           NINPUT    152
C                                                                       NINPUT    153
      IF(NTYP.NE.10)GO TO 1015                                          NINPUT    154
 1000 READ(IN,9000)FAN5                                                 NINPUT    155
C                                                                       NINPUT    156
      IF(NCAS.EQ.11)GO TO 1011                                          NINPUT    157
      IF(FAN5(1).EQ.BL.AND.FAN5(2).EQ.BL.AND.FAN5(3).EQ.BL.             NINPUT    158
     1  AND.FAN5(4).EQ.BL.AND.FAN5(5).EQ.BL.AND.FAN5(6).EQ.BL.          NINPUT    159
     2  AND.FAN5(7).EQ.BL.AND.FAN5(8).EQ.BL)GO TO 1015                  NINPUT    160
 1011 DO 1012 I=1,20                                                    NINPUT    161
 1012 CHIN(I)=FAN5(I)                                                   NINPUT    162
C                                                                       NINPUT    163
      IF(NCAS.NE.11.OR.NTYP.NE.10)GO TO 1015                            NINPUT    164
C     STORE DEFAULT VALUES FOR ITYPE=13                                 NINPUT    165
      EDGVAR( 1)=DDNE13                                                 NINPUT    166
      EDGVAR( 2)=EMJ13                                                  NINPUT    167
      EDGVAR( 3)=HD13                                                   NINPUT    168
      EDGVAR( 4)=TSR13                                                  NINPUT    169
      EDGVAR(5)=SHAM                                                    NINPUT    170
      EDGVAR( 6)=AJS13                                                  NINPUT    171
      EDGVAR( 7)=DDA13                                                  NINPUT    172
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      EDGVAR( 8)=DHNL13                                                 NINPUT    173
      EDGVAR( 9)=DJCL13                                                 NINPUT    174
      EDGVAR(10)=FLAP13                                                 NINPUT    175
 1015 NTYP=NTYP+I1                                                      NINPUT    176
      IF(NCAS.EQ.I1) GO TO  1330                                        NINPUT    177
      IGO=ICON(IC)                                                      NINPUT    178
      GO TO( 1017,1060,1080,1100,1120,1200,1220,1230,1240,1250,1270,1290 NINPUT    179
     1,1293),IGO                                                        NINPUT    180
 1017 CONTINUE                                                          NINPUT    181
      DO 1018 I=I1,I3                                                   NINPUT    182
 1018 AJET(I+3)=0.                                                      NINPUT    183
 1020 CONTINUE                                                          NINPUT    184
      DO  1030  I=I1,I3                                                 NINPUT    185
 1030 AJET(I)=S1(I,NCOF)                                                NINPUT    186
      DO  1040  I=I4,I9                                                 NINPUT    187
 1040 AJET(I+3)=S1(I,NCOF)                                              NINPUT    188
      DO  1050  I=I1,I2                                                 NINPUT    189
 1050 IJET(I)=JET1(I,NCOF)                                              NINPUT    190
      GO TO  1300                                                       NINPUT    191
C                                                                       NINPUT    192
 1060 CONTINUE                                                          NINPUT    193
      DO  1070  I=I1,I3                                                 NINPUT    194
 1070 AJET(I+3)=S2(I,NCOF)                                              NINPUT    195
      GO TO  1020                                                       NINPUT    196
 1080 CONTINUE                                                          NINPUT    197
      CALL SN(ICOR3,IADD3(1,NCOF),2,8,1)                                NINPUT    198
      CALL SN(TF3,ADD3(1,NCOF),1,54,1)                                  NINPUT    199
      DO  1090  I=I1,I5                                                 NINPUT    200
 1090 T3(I)=S3(I,NCOF)                                                  NINPUT    201
      JB3=J3(1,NCOF)                                                    NINPUT    202
      DO 1105  I=I6,13                                                  NINPUT    203
 1105 B3(I-5)=S3(I,NCOF)                                                NINPUT    204
      IC3=J3(2,NCOF)                                                    NINPUT    205
      ISW3=J3(3,NCOF)                                                   NINPUT    206
      GO TO  1300                                                       NINPUT    207
 1100 CONTINUE                                                          NINPUT    208
      CALL SN(ICOR4,IADD4(1,NCOF),2,8,1)                                NINPUT    209
      CALL SN(TF4,ADD4(1,NCOF),1,54,1)                                  NINPUT    210
      DO  1110  I=I4,I6                                                 NINPUT    211
 1110 FANI1(I-3)=S45(I,NCOF)                                            NINPUT    212
      CFPR4=S45(15,NCOF)                                                NINPUT    213
      GO TO  1140                                                       NINPUT    214
 1120 DO  1130  I=I10,12                                                NINPUT    215
 1130 FANA1(I-9)=S45(I,NCOF)                                            NINPUT    216
      NI5=INI5(NCOF)                                                    NINPUT    217
      BPR5=XBP5(NCOF)                                                   NINPUT    218
      CALL SN(ICOR5,IADD5(1,NCOF),2,8,1)                                NINPUT    219
      CALL SN(TF5,ADD5(1,NCOF),1,54,1)                                  NINPUT    220
 1140 DO  1150  I=I1,I2                                                 NINPUT    221
 1150 IFAN1(I)=IS45(I,NCOF)                                             NINPUT    222
      DO  1160  I=I5,I7                                                 NINPUT    223
 1160 IFAN1(I)=IS45(I,NCOF)                                             NINPUT    224
      DO  1170  I=I1,I3                                                 NINPUT    225
 1170 FAN2(I)=S45(I,NCOF)                                               NINPUT    226
      DO  1180  I=I7,I9                                                 NINPUT    227
 1180 FAN3(I-6)=S45(I,NCOF)                                             NINPUT    228
      FAN4=S45(13,NCOF)                                                 NINPUT    229
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      FANI2=S45(14,NCOF)                                                NINPUT    230
      DELT45=S45(16,NCOF)                                               NINPUT    231
      GO TO  1300                                                       NINPUT    232
 1200 DO  1210  I=I1,I6                                                 NINPUT    233
 1210 AUGI(I)=S6(I,NCOF)                                                NINPUT    234
      CALL SN(ICOR6,IADD6(1,NCOF),2,8,1)                                NINPUT    235
      CALL SN(TF6,ADD6(1,NCOF),1,54,1)                                  NINPUT    236
      GO TO  1300                                                       NINPUT    237
 1220 CONTINUE                                                          NINPUT    238
      CALL SN(PR7,S7(1,NCOF),1,8,1)                                     NINPUT    239
      GO TO 1300                                                        NINPUT    240
 1230 CONTINUE                                                          NINPUT    241
      NB8=INB8(NCOF)                                                    NINPUT    242
      CALL SN(FPR8, S8(1,NCOF), 1, 8, 1)                                NINPUT    243
      CALL SN(ICOR8,IADD8(1,NCOF),2,8,1)                                NINPUT    244
      CALL SN(TF8,ADD8(1,NCOF),1,54,1)                                  NINPUT    245
      GO TO 1300                                                        NINPUT    246
 1240 CONTINUE                                                          NINPUT    247
      NUM9=INUM(NCOF)                                                   NINPUT    248
      IEJ9=IEJ(NCOF)                                                    NINPUT    249
      CALL SN(AREA9,S9(1,NCOF),1,12,1)                                  NINPUT    250
      CALL SN(ICOR9,IADD9(1,NCOF),2,8,1)                                NINPUT    251
      CALL SN(TF9,ADD9(1,NCOF),1,54,1)                                  NINPUT    252
      GO TO 1300                                                        NINPUT    253
 1250 CONTINUE                                                          NINPUT    254
      DO  1260  I=I1,I8                                                 NINPUT    255
 1260 PROPI(I)=S10(I,NCOF)                                              NINPUT    256
      GO TO  1300                                                       NINPUT    257
 1270 CONTINUE                                                          NINPUT    258
      DO  1280  I=I1,13                                                 NINPUT    259
 1280 T113(I)=S11(I,NCOF)                                               NINPUT    260
      NRTR11=I113(1,NCOF)                                               NINPUT    261
      LLF11=I113(2,NCOF)                                                NINPUT    262
      IRR11=I113(3,NCOF)                                                NINPUT    263
      GO TO  1300                                                       NINPUT    264
 1290 DELT12=S12(NCOF)                                                  NINPUT    265
      GO TO  1300                                                       NINPUT    266
 1293 CONTINUE                                                          NINPUT    267
      DO 1295 I=I1,I10                                                  NINPUT    268
 1295 EDGVAR(I)=S13(I,NCOF)                                             NINPUT    269
      ICOR13=IADD13(NCOF)                                               NINPUT    270
 1300 IF(NTYP.NE.I1)GO TO  1320                                         NINPUT    271
      DO 1310 I=I1,I3                                                   NINPUT    272
 1310 NDIC(I)=NC(I,NCOF)                                                NINPUT    273
      INSHLD=NC(4,NCOF)                                                 NINPUT    274
 1320 ITYPE=IGO                                                         NINPUT    275
 1330 READ(IN,NOISIN)                                                   NINPUT    276
C                                                                       NINPUT    277
      IF(NCAS.EQ.I1) ICON(IC)=ITYPE                                     NINPUT    278
      GO TO( 1335,1380,1400,1420,1440,1520,1540,1550,1560,1570,1590,1610 NINPUT    279
     1,1650),ITYPE                                                      NINPUT    280
 1335 CONTINUE                                                          NINPUT    281
      DO 1336 I=I1,I3                                                   NINPUT    282
 1336 AJET(I+3)=0.                                                      NINPUT    283
 1340 CONTINUE                                                          NINPUT    284
      DO  1350  I=I1,I3                                                 NINPUT    285
 1350 S1(I,NCOF)=AJET(I)                                                NINPUT    286
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      DO  1360  I=I4,I9                                                 NINPUT    287
 1360 S1(I,NCOF)=AJET(I+3)                                              NINPUT    288
      DO  1370  I=I1,I2                                                 NINPUT    289
 1370 JET1(I,NCOF)=IJET(I)                                              NINPUT    290
      GO TO  1620                                                       NINPUT    291
 1380 CONTINUE                                                          NINPUT    292
      DO  1390  I=I1,I3                                                 NINPUT    293
 1390 S2(I,NCOF)=AJET(I+3)                                              NINPUT    294
      GO TO  1340                                                       NINPUT    295
 1400 CONTINUE                                                          NINPUT    296
      CALL SN(ICOR3,IADD3(1,NCOF),2,8,2)                                NINPUT    297
      CALL SN(TF3,ADD3(1,NCOF),1,54,2)                                  NINPUT    298
      DO  1410  I=I1,I5                                                 NINPUT    299
 1410 S3(I,NCOF)=T3(I)                                                  NINPUT    300
      J3(1,NCOF)=JB3                                                    NINPUT    301
      DO 1415 I=I6,13                                                   NINPUT    302
 1415 S3(I,NCOF)=B3(I-5)                                                NINPUT    303
      J3(2,NCOF)=IC3                                                    NINPUT    304
      J3(3,NCOF)=ISW3                                                   NINPUT    305
      GO TO  1620                                                       NINPUT    306
 1420 CONTINUE                                                          NINPUT    307
      DO  1430  I=I4,I6                                                 NINPUT    308
 1430 S45(I,NCOF)=FANI1(I-3)                                            NINPUT    309
      S45(15,NCOF)=CFPR4                                                NINPUT    310
      CALL SN(ICOR4,IADD4(1,NCOF),2,8,2)                                NINPUT    311
      CALL SN(TF4,ADD4(1,NCOF),1,54,2)                                  NINPUT    312
      GO TO  1460                                                       NINPUT    313
 1440 CONTINUE                                                          NINPUT    314
      INI5(NCOF)=NI5                                                    NINPUT    315
      XBP5(NCOF)=BPR5                                                   NINPUT    316
      CALL SN(ICOR5,IADD5(1,NCOF),2,8,2)                                NINPUT    317
      CALL SN(TF5,ADD5(1,NCOF),1,54,2)                                  NINPUT    318
      DO  1450  I=I10,I2                                                NINPUT    319
 1450 S45(I,NCOF)=FANA1(I-9)                                            NINPUT    320
 1460 DO  1470  I=I1,I2                                                 NINPUT    321
 1470 IS45(I,NCOF)=IFAN1(I)                                             NINPUT    322
      DO  1480  I=I5,I7                                                 NINPUT    323
 1480 IS45(I,NCOF)=IFAN1(I)                                             NINPUT    324
      DO  1490  I=I1,I3                                                 NINPUT    325
 1490 S45(I,NCOF)=FAN2(I)                                               NINPUT    326
      DO  1500  I=I7,I9                                                 NINPUT    327
 1500 S45(I,NCOF)=FAN3(I-6)                                             NINPUT    328
      S45(13,NCOF)=FAN4                                                 NINPUT    329
      S45(14,NCOF)=FANI2                                                NINPUT    330
      S45(16,NCOF)=DELT45                                               NINPUT    331
      GO TO  1620                                                       NINPUT    332
 1520 CONTINUE                                                          NINPUT    333
      CALL SN(ICOR6,IADD6(1,NCOF),2,8,2)                                NINPUT    334
      CALL SN(TF6,ADD6(1,NCOF),1,54,2)                                  NINPUT    335
      DO  1530  I=I1,I6                                                 NINPUT    336
 1530 S6(I,NCOF)=ALG1(I)                                                NINPUT    337
      GO TO  1620                                                       NINPUT    338
 1540 CONTINUE                                                          NINPUT    339
      CALL SN(PR7,S7(1,NCOF),1,8,2)                                     NINPUT    340
      GO TO 1620                                                        NINPUT    341
 1550 CONTINUE                                                          NINPUT    342
      INB8(NCOF)=NB8                                                    NINPUT    343
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      CALL SN(FPR8, S8(1,NCOF), 1, 8, 2)                                NINPUT    344
      CALL SN(ICOR8,IADD8(1,NCOF),2,8,2)                                NINPUT    345
      CALL SN(TF8,ADD8(1,NCOF),1,54,2)                                  NINPUT    346
      GO TO 1620                                                        NINPUT    347
 156C CONTINUE                                                          NINPUT    348
      INUM(NCOF)=NUM9                                                   NINPUT    349
      IEJ(NCOF)=IEJ9                                                    NINPUT    350
      CALL SN(AREA9,S9(1,NCOF),1,12,2)                                  NINPUT    351
      CALL SN(ICOR9,IADD9(1,NCOF),2,8,2)                                NINPUT    352
      CALL SN(TF9,ADD9(1,NCOF),1,54,2)                                  NINPUT    353
      GO TO 1620                                                        NINPUT    354
 157C CONTINUE                                                          NINPUT    355
      DO  1580  I=I1,I8                                                 NINPUT    356
 1580 S10(I,NCOF)=PROPI(I)                                              NINPUT    357
      GO TO  1620                                                       NINPUT    358
 159C CONTINUE                                                          NINPUT    359
      DO  1600  I=I1,13                                                 NINPUT    360
 1600 S11(I,NCOF)=T113(I)                                               NINPUT    361
      I113(1,NCOF)=NRTR11                                               NINPUT    362
      I113(2,NCOF)=LLF11                                                NINPUT    363
      I113(3,NCOF)=IRR11                                                NINPUT    364
      GO TO  1620                                                       NINPUT    365
 161C S12(NCOF)=DELT12                                                  NINPUT    366
 162C IF(NTYP.NE.I1)GO TO  164C                                         NINPUT    367
      DO 163C I=I1,I3                                                   NINPUT    368
 163C NC(I,NCOF)=NDIC(I)                                                NINPUT    369
      NC(4,NCOF)=INSHLD                                                 NINPUT    370
 164C CONTINUE                                                          NINPUT    371
C                                                                       NINPUT    372
 900C FORMAT(20A4)                                                      NINPUT    373
      IF(IUNIT.GT.0)GO TO 1700                                          NINPUT    374
      CALL CONVR(ITYPE,I1,I1)                                           NINPUT    375
C                                                                       NINPUT    376
 170C RETURN                                                            NINPUT    377
 165C CONTINUE                                                          NINPUT    378
C     STORE JET EDGE INTERACTION CURRENT DATA                           NINPUT    379
      DO 1660 I=I1,I10                                                  NINPUT    380
 166C S13(I,NCOF)=EDGVAR(I)                                             NINPUT    381
      IADD13(NCOF)=ICOR13                                               NINPUT    382
      DONE13 = EDGVAR( 1)                                               NINPUT    383
      EMJ13  = EDGVAR( 2)                                               NINPUT    384
      HC13   = EDGVAR( 3)                                               NINPUT    385
      TSR13  = EDGVAR( 4)                                               NINPUT    386
      SHAM   = EDGVAR( 5)                                               NINPUT    387
      AJS13  = EDGVAR( 6)                                               NINPUT    388
      DDA13  = EDGVAR( 7)                                               NINPUT    389
      DHNL13 = EDGVAR( 8)                                               NINPUT    390
      DJCL13 = EDGVAR( 9)                                               NINPUT    391
      FLAP13 = EDGVAR(10)                                               NINPUT    392
      GO TO 1620                                                        NINPUT    393
      END                                                               NINPUT    394
```

```
      SUBROUTINE NOISO(IPRT, I   ,NK,ICLT,CHIN,IUNIT,X,CFREQ,SP,NCF        NOISO      2
     * ,ITYPE)                                                             NOISO      3
      COMMON/ISWK/ISWT(3,13)                                               NOISO      4
      COMMON/SWITCH/NTYPE,IDUMT,NENG,ICCF,IDUM(7),ICN(13),NLOPT            NOISO      5
     *,INSECW(3),INSHLD                                                    NOISO      6
      COMMON/TURBIN/XXXXXX(9),ISW3                                         NOISO      7
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)                        NOISO      8
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                   NOISO      9
      COMMON/CLABEL/CH(2,8)                                                NOISO     10
      COMMON/ANGLE/PSI(17,10),PSIC(17,10),BETA(17,10)                      NOISO     11
      COMMON/SDELT/DT                                                      NOISO     12
      COMMON /GCONST/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,     NOISO     13
     *                IO,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,    NOISO     14
     *                EPS,UNDEF,BL,ICD,CPR,RPD,ETA(17),M1,FM1,I17,A,PI     NOISO     15
      DIMENSION TIT(8,14),CHIN(20),CFREQ(24),SP(24,17)                     NOISO     16
      DIMENSION TNU(4,2)                                                   NOISO     17
      DATA TNU/4HCORE,4H NOI,4HSE  ,4H    ,                                NOISO     18
     *4HTURB,4HINE ,4HNOIS,4HE   /                                         NOISO     19
      DATA TIT/4HPRIM,4HARY ,4HJET ,4HNCIS,1HE,3*1H ,                      NOISO     20
     2   4HPRIM,4HARY ,4HAND ,4HSECO,4HNDAR,4HY JE,4HT NO,4HISE ,          NOISO     21
     3   4HCORE,4H AND,4H TUR,4HBINE,4H NOI,2HSE,2*1H ,                    NOISO     22
     4   4HCOMP,4HRESS,4HOR A,4HND I,4HNLET,4H FAN,4H NOI,2HSE,            NOISO     23
     5   4HEXIT,4H FAN,4H NOI,2HSE,4*1H ,                                  NOISO     24
     6   4HAUGM,4HENTE,4HR-WI,4HNG J,4HET N,4HOISE,2*1H ,                  NOISO     25
     7   4HBLOW,4HN-FL,4HAP J,4HET N,4HOISE,3*1H ,                         NOISO     26
     9   4HLIFT,4H-FAN,4H NOI,2HSE,4*1H ,                                  NOISO     27
     8   4HEJEC,4HTOR-,4HSUPP,4HRESS,4HOR J,4HET N,4HOISE,1H ,             NOISO     28
     X   4HPROP,4HELLE,4HR NO,3HISE,4*1H ,                                 NOISO     29
     Y   4HHELI,4HCOPT,4HER N,4HOISE,4*1H ,                                NOISO     30
     Z   4HMEAS,4HURED,4H DAT,4HA NO,3HISE,3*1H ,                          NOISO     31
     U4HJET ,4HEDGE,4H INT,4HERAC,4HTION,3*1H ,                            NOISO     32
     W4HTOTA,4HL NO,4HISE ,4H(ALL,4H COM,4HPONE,4HNTS),2H  /               NOISO     33
      DATA DT/2000./                                                       NOISO     34
      ISW=1                                                                NOISO     35
      IF(IPRT.EQ.0)RETURN                                                  NOISO     36
C     WRITE(IOUT,5)ISWT(NCOF,IDLMT)                                        NOISO     37
    5 FORMAT(1X,5HISWT=,I10)                                               NOISO     38
      ITTT=ISWT(NCOF,IDLMT)                                                NOISO     39
 90   CONTINUE                                                             NOISO     40
      IF(IPRT.NE.8)GO TO 95                                                NOISO     41
 92   CONTINUE                                                             NOISO     42
      IF(LCT.LT.44) GO TO 95                                               NOISO     43
      GO TO 100                                                            NOISO     44
 95   IF(NK.EQ.3.AND.IPRT.NE.8)GO TO 100                                   NOISO     45
      IF(ISW.EQ.2)GO TO 115                                                NOISO     46
      IF(I/2*2 .EQ.I) GO TO 115                                            NOISO     47
 100  CALL PRINTH(IPRT,LCT,IOUT)                                           NOISO     48
 104  IF(ITYPE.NE.3)WRITE(IOUT,105)(TIT(K,ITYPE),K=1,8)                    NOISO     49
      IF(ITYPE.EQ.3.AND.ISW3.EQ.0)WRITE(IOUT,105)(TIT(K,ITYPE),K=1,8)      NOISO     50
      IF(ITYPE.EQ.3.AND.ISW3.EQ.2)WRITE(IOUT,106)(TNU(K,1),K=1,4)          NOISO     51
      IF(ITYPE.EQ.3.AND.ISW3.EQ.3)WRITE(IOUT,106)(TNU(K,2),K=1,4)          NOISO     52
 106  FORMAT(52X,4A4)                                                      NOISO     53
 105  FORMAT(52X,8A4)                                                      NOISO     54
      LCT=LCT+1                                                            NOISO     55
      IF(IPRT.EQ.8)GO TO 140                                               NOISO     56
 115  GO TO(120,120,120,120,120,154,150,104),IPRT                          NOISO     57
 150  CONTINUE                                                             NOISO     58
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      IF  (ISW-1)  152, 152, 189                                        NOISO      59
  152 IF(ITTT.NE.0.OR.INSHLD.NE.0)ISW=2                                 NOISO      60
      IF(ITYPE.EQ.13)ISW=1                                              NOISO      61
C                                                                       NOISO      62
 154  WRITE(IOUT,155)                                                   NOISO      63
      LCT=LCT+3                                                         NOISO      64
 155  FORMAT(49X,35HINDEX, FREE-FIELD SPECTRA (R = 1 M)//)              NOISO      65
      CALL PRTSH1(IUNIT,X,LCT,IOUT,2)                                   NOISO      66
      GO TO 125                                                         NOISO      67
 120  CALL PRTSH1(IUNIT,X,LCT,IOUT,1)                                   NOISO      68
 125  WRITE(IOUT,130)(CFREQ(K1),(SP(K1,K2),K2=1,17),K1=1,NCF)           NOISO      69
 130  FORMAT(1X,1PE10.3,1X,0PF7.1,16F7.1)                               NOISO      70
      LCT=LCT+1                                                         NOISO      71
      GO TO(140,140,140,140,140,160,180),IPRT                           NOISO      72
 160  WRITE(IOUT,170)(ETA(J1),J1=1,17),X,CH(IUNIT+1,1)                  NOISO      73
 170  FORMAT(/2X,8HANGLE XI/3X,5H(DEG),3X,17F7.0//50X,                  NOISO      74
     *    19HSIDELINE DISTANCE =,1PE10.3,A3      /)                    NOISO      75
      LCT=LCT+6                                                         NOISO      76
      RETURN                                                            NOISO      77
 140  CALL WRPNL(NK,I,IOUT,LCT,IPRT)                                    NOISO      78
 135  RETURN                                                            NOISO      79
 180  WRITE(IOUT,185)                                                   NOISO      80
 185  FORMAT(/3X,6HANGLES/3X,5H(DEG)/)                                  NOISO      81
      WRITE(IOUT,186)(PSI(J,I),J=1,17),(BETA(J,I),J=1,17),              NOISO      82
     *   (ETA(J),J=1,17)                                                NOISO      83
 186  FORMAT(4X,3HPSI,5X,17F7.1/4X,4HBETA,4X,17F7.1/                    NOISO      84
     *   4X,2HXI,6X,17F7.1)                                             NOISO      85
 200  CONTINUE                                                          NOISO      86
      DELT=DT*DPR                                                       NOISO      87
      WRITE(IOUT,187)DELT,X,CH(IUNIT+1,1)                               NOISO      88
 187  FORMAT(4X,5HDELTA,3X,F7.1,31X,20HSIDELINE DISTANCE =   ,          NOISO      89
     *    1PE10.3,A3/)                                                  NOISO      90
      LCT=LCT+9                                                         NOISO      91
      IF(ISW.EQ.2)GO TO 92                                              NOISO      92
      RETURN                                                            NOISO      93
  189 ISW=1                                                             NOISO      94
      ISWT(NCOF,IDLMT)=0                                                NOISO      95
      WRITE(IOUT,190)                                                   NOISO      96
 190  FORMAT(49X,35HPREDICTED CONFIGURATION CORRECTIONS  //)            NOISO      97
      LCT=LCT+3                                                         NOISO      98
      CALL PRTSH1(IUNIT,X,LCT,IOUT,3)                                   NOISO      99
      WRITE(IOUT,130)(CFREQ(K1),(SPZ(K1,K2),K2=1,17),K1=1,NCF)          NOISO     100
      LCT=LCT+1                                                         NOISO     101
      WRITE(IOUT,185)                                                   NOISO     102
      WRITE(IOUT,195)(PSI(J,I),J=1,17),(ETA(J),J=1,17)                  NOISO     103
 195  FORMAT(4X,3HPSI,5X,17F7.1/4X,2HXI,6X,17F7.1)                      NOISO     104
      GO TO 200                                                         NOISO     105
      END                                                               NOISO     106
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      SUBROUTINE NSRIO                                                  NSRIO
C                                                                       NSRIO
C     PURPOSE          TO READ NOISE SHIELDING REFRACTION              NSRIO
C                      INPUT DATA AND SET UP CURVES FOR                NSRIO
C                      DISCHARGE TURBOMACHINERY NOISE COMPONENTS       NSRIO
C                      DATA IS STORED FOR ALL COMPONENTS OF ALL THREE  NSRIO
C                      CONFIGURATIONS FOR THE FIRST CASE. THEN ONLY    NSRIO
C                      CHANGES IN DATA FOR A COMPONENT IN A CONFIGURATION NSRIO
C                      REPLACE DATA IN THE FIRST CASE                  NSRIO
C                                                                       NSRIO
C     INPUT                                                             NSRIO
C         EMJ          EXHAUST FLOW MACH NO                            NSRIO
C         IWED         AN ARRAY INDICATING THE TYPE OF WING EDGE       NSRIO
C                      DIFFRACTION SOLUTIONS TO BE INCLUDED FOR        NSRIO
C                      THE NOISE COMPONENT CONSIDERED                  NSRIO
C                      IWED(1)=1 TRAILING EDGE                         NSRIO
C                      IWED(2)=1 LEADING EDGE                          NSRIO
C                      IWED(3)=1 TIP EDGE                              NSRIO
C         TSTSO        EXHAUST FLOW STATIC TEMPERATURE RATIO WITH      NSRIO
C                      TSO=TAMB IN ABSOLUTE UNITS(DEG R OR K)          NSRIO
C         ASF          ANGLE OFFSET, GAMA, FOR ANGULAR SHIFT OF SOURCE. NSRIO
C                      ONE-DIMENSIONAL ARRAYS FOR EMPIRICAL ADJUSTMENT NSRIO
C         CPSIO        CURVES TO THEORETICAL JET REFRACTION MODEL WITH NSRIO
C         FASS         CPSIO  =  COTANGENT(PSIO)  INDEPENDENT VARIABLE NSRIO
C         BETA         FASS   =  ALFA IN FIGURE OF ENGR. DOC.          NSRIO
C                      BETA   =  BETA IN FIGURE OF ENGR. DOC.          NSRIO
C         NASRO        NUMBER OF POINTS IN THE EMPIRICAL CURVES-       NSRIO
C                      FASS VS. CPSIO AND BETA VS. CPSIO               NSRIO
C                      IF NO INPUT CURVES ARE TO BE INPUT, SET NASRO = 0 NSRIO
C                      AND BUILT-IN CURVES WILL BE USED.               NSRIO
C         USPL         EMPIRICAL DIRECTIVITY CURVE OF UNSHIELDED SPL   NSRIO
C         PSI          AT STATIC CONDITIONS USED IN SHIELDING CALCULATIONS NSRIO
C                      IF PREDICTED AND BUILT-IN VALUES ARE NOT DESIRED NSRIO
C         NUSPL        NUMBER OF POINTS IN THE EMPIRICAL CURVE         NSRIO
C                      UPSL .VS. PSI                                   NSRIO
C         INUSP        INDICATOR TO DECIDE WHICH EMPIRICAL CURVE OF    NSRIO
C                      USPL .VS. PSI TO USE                            NSRIO
C                      INUSP=0      USE PREDICTED VALUES               NSRIO
C                      INUSP=1      USE BUILT-IN VALUES                NSRIO
C                      INUSP.GT.1   USE INPUT VALUES DEFINED ABOVE     NSRIO
C         DIAMT2       DIAMETER OF NOZZLE(M OR FT)SECONDARY JET        NSRIO
C         DSL1         DIMENSIONLESS SHIELD LENGTH TO NOZZLE EXIT PLANE NSRIO
C         DSL2         PARALLEL TO EXHAUST AXIS (PRIMARY AND SECONDARY) NSRIO
C                                                                       NSRIO
      COMMON /SWITCH/NTYPE,ITYPE                                        NSRIO
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC                                   NSRIO
      COMMON /TURBIN/HM1,HM2,HM3,HM4,HM5,HM6,HM7,HM8,HM9,ISW3           NSRIO
      COMMON /GCONST/IN                                                 NSRIO
C         JET NOISE SHIELDING DATA                                      NSRIO
      COMMON/JNSHLD/DIAMT2,DSL1,DSL2                                    NSRIO
C     WING SHIELDING DATA                                               NSRIO
      COMMON/REFRAC/EMJ,TSTSO,IWED(3),FASS(24),BETA(24),CPSIO(24),NASRO, NSRIO
     * ASF,IWSFE                                                        NSRIO
      COMMON/UNSHLD/USPL(19),PSI(19),NUSPL,INUSP                        NSRIO
      DIMENSION FPSI(24),FBETA(24),TPSI(24),TBETA(24),CPSI(24),CBETA(24) NSRIO
     *,USPIN( 9),PSIIN( 9),USPAF(17),PSIAF(17),USPTB(17),PSITB(17),     NSRIO
     * USPCR(17),PSICR(17), FALF(24), TALF(24), CALF(24)                NSRIO
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C     STORAGE REQUIRED FOR SAVING DATA FOR NEXT CASE                    NSRIO      59
      DIMENSION ICON(20),STO1(3),ISTC1(3,3),STC2(3,3),ISTO2(3,3),       NSRIO      60
     * IS3C(3,3),IS3CC(3,3),ST3C(3,3),ST3CA(19,3),ST3CB(19,3),          NSRIO      61
     * ST3CC(10,3),ST3CD(10,3),IS3T(3,3),IS3TT(3,3),ST3T(3,3),          NSRIO      62
     *ST3TA(19,3),ST3TB(19,3),ST3TC(10,3),ST3TD(10,3),                  NSRIO      63
     *IS4(3,3),IS44(3,3),ST4A(19,3),ST4B(19,3),IS5(3,3),IS55(3,3),      NSRIO      64
     * ST5(3,3),ST5A(19,3),ST5B(19,3),ST5C(10,3),ST5D(10,3),            NSRIO      65
     * ST3CE(24,3),ST3TE(24,3),ST5E(24,3)                               NSRIO      66
      EQUIVALENCE (PSIAF(1),PSICR(1),PSITB(1)),(FPSI(1),TPSI(1),CPSI(1)) NSRIO     67
      NAMELIST/SHLDAT/EMJ,TSTSO,IWED,FASS,BETA,CPSIO,INASRO,ASF,        NSRIO      68
     *USPL,PSI,NUSPL,INUSP,DIAMT2,DSL1,DSL2                             NSRIO      69
C                                                                       NSRIO      70
C  DATA FOR EMPIRICAL ADJUSTMENT CURVES TO JET REFRACTION MODEL         NSRIO      71
      DATA INASRO /0/                                                   NSRIO      72
      DATA FPSI /-4.,-3.5,-3.,-2.75,-2.5,-2.25,-2.,-1.75,-1.5,-1.25,-1., NSRIO     73
     1 -.75,-.5,-.25, .25,.5,.75,1.,1.25,1.5,1.75,2.,2.5,3./            NSRIO      74
      DATA FALF /2*.45,.53,.64,.75,.87,1.02,1.22,1.42,1.55,1.47,1.3,1.16 NSRIO      75
     *,1.04,.93,.93,1.01,1.14,1.17,1.02,.88,.79,2*.75/                  NSRIO      76
      DATA CALF /2*.45,.51,.57,.67,.77,.86,.96,1.03,1.07,1.01,.9,.82,   NSRIO      77
     * .77,2*.75,.8,.91,.95,.92,.85,.78,2*.75/                          NSRIO      78
      DATA TALF /2*.45,.5,.53,.59,.67,.72,.78,.8,.72,.62,.55,.53,.54,   NSRIO      79
     * .56,.57,.61,.7,.79,.82,.8,.76,.75,.75/                           NSRIO      80
      DATA FBETA /2*.95,.92,.82,.63,.41,.18,-.07,-.28,-.4,-.37,-.19,.07, NSRIO     81
     * .37,.93,1.1,1.13,1.06,1.02,5*1./                                 NSRIO      82
      DATA CBETA /4*.95,.9,.8,.66,.48,.28,.07,-.07,.01,.27,.54,1.08,    NSRIO      83
     * 1.27,1.32,1.3,1.16,1.1,1.07,1.05,2*1./                           NSRIO      84
      DATA TBETA /2*.95,1.,1.07,1.17,1.2,1.17,1.04,.87,.6,.32,.26,.46,  NSRIO      85
     * .73,1.27,1.47,1.55,1.47,1.35,1.24,1.16,1.09,2*1./                 NSRIO      86
C                                                                       NSRIO      87
C     UNSHIELDED DIRECTIVITY FOR HIGH-BYPASS RATIO TURBOFANS            NSRIO      88
      DATA USPIN/0.,0.,-1.,-3.,-6.,-11.,-17.5,-30.,-43./                NSRIO      89
      DATA PSIIN/0.,50.,60.,70.,80.,90.,100.,120.,140./                 NSRIO      90
      DATA USPAF/-27.,-21.5,-17.5,-14.5,-12.5,-11.,-9.,-7.,-4.,-1.5,0., NSRIO      91
     *-1.5,-5.5,-10.,-13.5,-16.,-17./                                   NSRIO      92
      DATA USPTB/-19.,-18.,-17.,-16.,-15.,-14.,-12.,-10.5,-7.,-2.5,0.,  NSRIO      93
     *-5.5,-11.,-13.5,-14.3,-14.5,-14.7/                                NSRIO      94
      DATA USPCR/-20.5,-17.5,-14.7,-13.3,-12.,-10.2,-8.5,-6.5,-4.,      NSRIO      95
     *-1.5,0.,-1.5,-4.,-7.5,-11.,-13.,-13.5/                            NSRIO      96
      DATA PSIAF/0.,20.,40.,50.,60.,70.,80.,90.,100.,110.,120.,130.,    NSRIO      97
     *140.,150.,160.,170.,180./                                         NSRIO      98
C                                                                       NSRIO      99
C     CHECK NOISE COMPONENT TYPE AND EXIT IF NOT INCLUDED               NSRIO     100
C                                                                       NSRIO     101
      IF(ITYPE.GT.5)GO TO 300                                           NSRIO     102
C                                                                       NSRIO     103
C     TEST IF FIRST CASE.IF IT IS READ DATA AND STORE FOR EACH          NSRIO     104
C     COMPONENT,IF NOT FIRST CASE RETRIEVE DATA FOR COMPONENT AND       NSRIO     105
C     CONFIGURATION AND THEN GO AND READ                                NSRIO     106
C                                                                       NSRIO     107
      IF(NCAS.NE.1)GO TO 400                                            NSRIO     108
      INUSP=0                                                           NSRIO     109
      INASRO=0                                                          NSRIO     110
      ASF  =  13.                                                       NSRIO     111
      EMJ=0.0                                                           NSRIO     112
      TSTSO=1.0                                                         NSRIO     113
      GO TO 600                                                         NSRIO     114
  400 IGO=ICON(IC)                                                      NSRIO     115
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      IF(IGO.GT.5)GO TO 300                                             NSRIO     116
      GO TO(410,420,430,440,450),IGO                                    NSRIO     117
C                                                                       NSRIO     118
C     PRIMARY JET                                                       NSRIO     119
  410 DSL1=STO1(NCOF)                                                   NSRIO     120
      DO 415 I=1,3                                                      NSRIO     121
  415 IWED(I)=ISTO1(I,NCOF)                                             NSRIO     122
      GO TO 600                                                         NSRIO     123
C                                                                       NSRIO     124
C     PRIMARY AND SECONDARY                                             NSRIO     125
  420 DSL2=STO2(1,NCOF)                                                 NSRIO     126
      DIAMT2=STO2(2,NCOF)                                               NSRIO     127
      DSL1=STO2(3,NCOF)                                                 NSRIO     128
      DO 425 I=1,3                                                      NSRIO     129
  425 IWED(I)=ISTO2(I,NCOF)                                             NSRIO     130
      GO TO 600                                                         NSRIO     131
C                                                                       NSRIO     132
C     TURBINE OR CORE                                                   NSRIO     133
  430 IF(ISW3.NE.2)GO TO 435                                            NSRIO     134
C     CORE                                                              NSRIO     135
      CALL WSDSTO(IGO  ,INASRC,IS3C(1,NCOF),IS3CC(1,NCOF),ST3CE(1,NCOF), NSRIO     136
     *ST3C(1,NCOF),ST3CA(1,NCOF),ST3CB(1,NCOF),ST3CC(1,NCOF),           NSRIO     137
     * ST3CD(1,NCOF),2)                                                 NSRIO     138
      GO TO 600                                                         NSRIO     139
C                                                                       NSRIO     140
C     TURBINE                                                           NSRIO     141
  435 CALL WSDSTO(IGO  ,INASRC,IS3T(1,NCOF),IS3TT(1,NCOF),ST3TE(1,NCOF), NSRIO     142
     *ST3T(1,NCOF),ST3TA(1,NCOF),ST3TB(1,NCOF),ST3TC(1,NCOF),           NSRIO     143
     * ST3TD(1,NCOF),2)                                                 NSRIO     144
      GO TO 600                                                         NSRIO     145
C                                                                       NSRIO     146
C     INLET FAN                                                         NSRIO     147
  440 CALL WSDSTO(IGO  ,INASRC,IS4(1,NCOF),IS44(1,NCOF),ST5E(1,NCOF),   NSRIO     148
     *ST5(1,NCOF),ST4A(1,NCOF),ST4B(1,NCOF),ST5C(1,NCOF),               NSRIO     149
     * ST5D(1,NCOF),2)                                                  NSRIO     150
      GO TO 600                                                         NSRIO     151
C                                                                       NSRIO     152
C     EXIT OR AFT FAN                                                   NSRIO     153
  450 CALL WSDSTO(IGO  ,INASRC,IS5(1,NCOF),IS55(1,NCOF),ST5E(1,NCOF),   NSRIO     154
     *ST5(1,NCOF),ST5A(1,NCOF),ST5B(1,NCOF),ST5C(1,NCOF),               NSRIO     155
     * ST5D(1,NCOF),2)                                                  NSRIO     156
C     READ NOISE COMPONENT SHIELDING DATA                               NSRIO     157
C                                                                       NSRIO     158
  600 READ(IN,SHLDAT)                                                   NSRIO     159
C     SAVE THE COMPONENT TYPE                                           NSRIO     160
      IF(NCAS.EQ.1)ICON(IC)=ITYPE                                       NSRIO     161
      GO TO(710,720,730,740,750),ITYPE                                  NSRIO     162
C                                                                       NSRIO     163
C     PRIMARY JET                                                       NSRIO     164
  710 STO1(NCOF)=DSL1                                                   NSRIO     165
      DO 715 I=1,3                                                      NSRIO     166
  715 ISTO1(I,NCOF)=IWED(I)                                             NSRIO     167
      GO TO 300                                                         NSRIO     168
C                                                                       NSRIO     169
C     PRIMARY AND SECONDARY JET                                         NSRIO     170
  720 STO2( 1,NCOF)=DSL2                                                NSRIO     171
      STO2(2,NCOF)=DIAMT2                                               NSRIO     172
```

```
      STO2(3,NCOF)=DSL1                                                 NSRIO
      DO 725 I=1,3                                                      NSRIO
  725 ISTO2(I,NCOF)=IWED(I)                                             NSRIO
      GO TO 300                                                         NSRIO
C                                                                       NSRIO
C     TEST FOR CORE OR TURBINE                                          NSRIO
  730 IF(ISW3.NE.2)GO TO 735                                            NSRIO
C     CORE                                                              NSRIO
      CALL WSDSTO(ITYPE,INASRO,IS3C(1,NCOF),IS3CC(1,NCOF),ST3CE(1,NCOF), NSRIO
     *ST3C(1,NCOF),ST3CA(1,NCOF),ST3CB(1,NCOF),ST3CC(1,NCOF),           NSRIO
     * ST3CD(1,NCOF),1)                                                 NSRIO
      GO TO 15                                                          NSRIO
C     TURBINE                                                           NSRIO
  735 CALL WSDSTO(ITYPE,INASRO,IS3T(1,NCOF),IS3TT(1,NCOF),ST3TE(1,NCOF), NSRIO
     *ST3T(1,NCOF),ST3TA(1,NCOF),ST3TB(1,NCOF),ST3TC(1,NCOF),           NSRIO
     * ST3TD(1,NCOF),1)                                                 NSRIO
      GO TO 15                                                          NSRIO
C                                                                       NSRIO
C     INLET FAN                                                         NSRIO
  740 CALL WSDSTO(ITYPE,INASRO,IS4(1,NCOF),IS44(1,NCOF),ST5E(1,NCOF),   NSRIO
     *ST5(1,NCOF),ST4A(1,NCOF),ST4B(1,NCOF),ST5C(1,NCOF),               NSRIO
     * ST5D(1,NCOF),1)                                                  NSRIO
      GO TO 15                                                          NSRIO
C                                                                       NSRIO
C     EXIT OR AFT FAN                                                   NSRIO
  750 CALL WSDSTO(ITYPE,INASRO,IS5(1,NCOF),IS55(1,NCOF),ST5E(1,NCOF),   NSRIO
     *ST5(1,NCOF),ST5A(1,NCOF),ST5B(1,NCOF),ST5C(1,NCOF),               NSRIO
     * ST5D(1,NCOF),1)                                                  NSRIO
C     IF PRIMARY AND SECONDARY RETURN                                   NSRIO
   15 CONTINUE                                                          NSRIO
C                                                                       NSRIO
C     TEST UNSHIELDED EMPIRICAL DIRECTIVITY CURVE USAGE                 NSRIO
C     BRANCH IF PREDICTED OR INPUT CURVE  TO BE USED                    NSRIO
      IF(INUSP.NE.1)GO TO 100                                           NSRIO
C                                                                       NSRIO
C     STORE TEST DATA DIRECTIVITY CURVE FOR COMPONENT ITYPE             NSRIO
C     FROM BUILT-IN CURVES                                              NSRIO
      IF(ITYPE.NE.5)GO TO 30                                            NSRIO
      NUSPL=17                                                          NSRIO
      DO 20 IS=1,NUSPL                                                  NSRIO
      USPL(IS)=USPAF(IS)                                                NSRIO
   20 PSI(IS)=PSIAF(IS)                                                 NSRIO
      GO TO 100                                                         NSRIO
   30 IF(ITYPE.NE.4)GO TO 50                                            NSRIO
      NUSPL=9                                                           NSRIO
      DO 40 IS=1,NUSPL                                                  NSRIO
      USPL(IS)=USPIN(IS)                                                NSRIO
   40 PSI(IS)= PSIIN(IS)                                                NSRIO
      GO TO 100                                                         NSRIO
   50 IF(ISW3.EQ.0)GO TO 280                                            NSRIO
      IF(ISW3.NE.3)GO TO 70                                             NSRIO
   55 NUSPL=17                                                          NSRIO
      DO 60 IS=1,NUSPL                                                  NSRIO
      USPL(IS)=USPTB(IS)                                                NSRIO
   60 PSI(IS)=PSITB(IS)                                                 NSRIO
      GO TO 100                                                         NSRIO
   70 NUSPL=17                                                          NSRIO
```

```
      DO 80 IS=1,NUSPL                                                  NSRIO     230
      USPL(IS)=USPCR(IS)                                                NSRIO     231
   80 PSI(IS) =PSICR(IS)                                                NSRIO     232
C                                                                       NSRIO     233
C  CHECK FOR INPUT OF EMPIRICAL ADJUSTMENT CURVES FOR JET REFRACTION    NSRIO     234
C  MODEL, IF NOT INPUT, USE DEFAULT CURVES PER COMPONENT TYPE           NSRIO     235
  100 NASRO=INASRO                                                      NSRIO     236
      IF  (NASRO .NE. 0)  GO TO 300                                     NSRIO     237
      NASRO  = 24                                                       NSRIO     238
      IF(ITYPE.EQ.4)GO TO 300                                           NSRIO     239
      IF(ITYPE.NE.5)GO TO 130                                           NSRIO     240
      DO 120 IS=1,NASRO                                                 NSRIO     241
      BETA(IS) =FBETA(IS)                                               NSRIO     242
      FASS(IS)  =  FALF(IS)                                             NSRIO     243
  120 CPSIO(IS)=FPSI(IS)                                                NSRIO     244
      GO TO 300                                                         NSRIO     245
  130 IF(ISW3.NE.3) GO TO 150                                           NSRIO     246
      DO 140 IS=1,NASRO                                                 NSRIO     247
      BETA(IS) =TBETA(IS)                                               NSRIO     248
      FASS(IS)  =  TALF(IS)                                             NSRIO     249
  140 CPSIO(IS)=TPSI(IS)                                                NSRIO     250
      GO TO 300                                                         NSRIO     251
  150 DO 160 IS=1,NASRO                                                 NSRIO     252
      BETA(IS) =CBETA(IS)                                               NSRIO     253
      FASS(IS)  =  CALF(IS)                                             NSRIO     254
  160 CPSIO(IS)=CPSI(IS)                                                NSRIO     255
      GO TO 300                                                         NSRIO     256
  280 WRITE(6,290)                                                      NSRIO     257
  290 FORMAT(1H0,10X70HDO CORE SEPARATE FROM TURBINE WHEN SHIELDING INCL NSRIO     258
     $USED  TURBINE ASSUMED)                                            NSRIO     259
      GO TO 55                                                          NSRIO     260
  300 RETURN                                                            NSRIO     261
      END                                                               NSRIO     262
```

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      SUBROUTINE PLOTIT(X,Y,SNDL,FPATH,NDIM,M2,M5)                      PLOTIT     2
C                                                                       PLOTIT     3
C                                                                       PLOTIT     4
C PURPOSE              INITIALIZE PLOTTER AND READ IN DATA              PLOTIT     5
C                                                                       PLOTIT     6
C INPUTS               MAXIMUM DIMENSION OF ARRAYS STORING FLIGHT PATH  PLOTIT     7
C                      DATA POINTS                                      PLOTIT     8
C                                                                       PLOTIT     9
C OUTPUTS              PRINTED CONTOUR DATA POINTS                      PLOTIT    10
C                      PLOT OF NOISE LEVEL CONTOURS                     PLOTIT    11
C                      PLOT OF SIDLINE NOISE LEVEL                      PLOTIT    12
C                                                                       PLOTIT    13
C                                                                       PLOTIT    14
C  X,Y DIMENSIONS (NDIM) MUST BE AT LEAST 2 GREATER THAN THE NUMBER OF  PLOTIT    15
C  FLIGHT PATH POINTS TO BE READ                                        PLOTIT    16
C                                                                       PLOTIT    17
      LOGICAL IWRITE                                                    PLOTIT    18
      DIMENSION X(NDIM,M2,M5),Y(NDIM,M2,M5),FPATH(NDIM,3),VNOISE(5),    PLOTIT    19
     * AREA(5)                                                          PLOTIT    20
     * ,SNDL(NDIM,3),TITLE( 8),NDIST(3)                                 PLOTIT    21
C 360                                                                   PLOTIT    22
C    * ,SNDL(NDIM,3),TITLE(18),NDIST(3)                                 PLOTIT    23
C                                                                       PLOTIT    24
C 360                                                                   PLOTIT    25
C     COMMON /PLT/ SCALV,YLENM,XLENM,CMPIN,LABELX(10),LABELY(10),       PLOTIT    26
C    1 AXUNIT,NLABEL(2),SCALU,IWRITE                                    PLOTIT    27
      COMMON /PLT/ SCALV,YLENM,XLENM,CMPIN,LABELX( 4),LABELY( 4),       PLOTIT    28
     1 AXUNIT,NLABEL(1),SCALU,IWRITE                                    PLOTIT    29
C                                                                       PLOTIT    30
C  PLOTTING BUFFER MAY NOT BE REQUIRED FOR HOUSTON INSTRUMENT PLOTTER   PLOTIT    31
C                                                                       PLOTIT    32
      DIMENSION BUFFER(1024)                                            PLOTIT    33
      DATA IBUF/1024/                                                   PLOTIT    34
C                                                                       PLOTIT    35
      DATA CM,XIN /2HCM,2HIN/                                           PLOTIT    36
      CMPIN=2.54001                                                     PLOTIT    37
      REWIND 2                                                          PLOTIT    38
      IWRITE= .FALSE.                                                   PLOTIT    39
C                                                                       PLOTIT    40
C INITIALIZE PLOTTER TO WRITE ON TAPE99                                 PLOTIT    41
      CALL PLOTS(BUFFER,IBUF,99)                                        PLOTIT    42
C FACTOR REQUIRED ONLY FOR BCS 360 RUNS                                 PLOTIT    43
C     CALL FACTOR(2.0)                                                  PLOTIT    44
C                                                                       PLOTIT    45
C INPUT FROM CARDS GENERAL PLOTTING SPECS                               PLOTIT    46
C 360                                                                   PLOTIT    47
C     READ(5,1000,END=905) SCALV,XLENM,YLENM,DUNITS,AXUNIT,NLABEL       PLOTIT    48
      READ(5,1000)         SCALV,XLENM,YLENM,DUNITS,AXUNIT,NLABEL       PLOTIT    49
      IF  (EOF(5))  905, 1905                                           PLOTIT    50
 1905 CONTINUE                                                          PLOTIT    51
C 360                                                                   PLOTIT    52
C1000 FORMAT(3F10.0,3X,A2,5X,A4,5X,2A4)                                 PLOTIT    53
 1000 FORMAT(3F10.0,3X,A2,5X,A4,5X,A8)                                  PLOTIT    54
C 360                                                                   PLOTIT    55
C     READ(5,1001,END=905) LABELX,LABELY                                PLOTIT    56
      READ(5,1001         ) LABELX,LABELY                               PLOTIT    57
      IF  (EOF(5))  905, 2905                                           PLOTIT    58
```

```
 2905 CONTINUE                                                          PLOTIT     59
C 360                                                                   PLOTIT     60
C1001 FORMAT(10A4)                                                      PLOTIT     61
1001  FORMAT(4A10)                                                      PLOTIT     62
C                                                                       PLOTIT     63
C LENGTH MUST BE IN CM UNITS                                            PLOTIT     64
      IF(DUNITS.NE.XIN.AND.DUNITS.NE.CM)GO TO 901                       PLOTIT     65
      IF(DUNITS.EQ.CM)GO TO 20                                          PLOTIT     66
      XLENM=XLENM*CMPIN                                                 PLOTIT     67
      YLENM=YLENM*CMPIN                                                 PLOTIT     68
C                                                                       PLOTIT     69
 20   CONTINUE                                                          PLOTIT     70
C READ INITIALIZING DATA FROM TAPE2                                     PLOTIT     71
C 360                                                                   PLOTIT     72
C50   READ(2,2003,END=900) TITLE                                        PLOTIT     73
C 360                                                                   PLOTIT     74
C2003  FORMAT(18A4)                                                     PLOTIT     75
2003  FORMAT(8A10)                                                      PLOTIT     76
50    READ(2,2003) TITLE                                                PLOTIT     77
      IF  (EOF(2))  900, 1903                                           PLOTIT     78
1903  CONTINUE                                                          PLOTIT     79
C 360                                                                   PLOTIT     80
C     READ(2,2000,END=902) NP,NL,NSD,NDIST                              PLOTIT     81
      READ(2,2000)         NP,NL,NSD,NDIST                              PLOTIT     82
      IF  (EOF(2))  902, 1902                                           PLOTIT     83
 1902 CONTINUE                                                          PLOTIT     84
 2000 FORMAT(3I5,5X,A4,6X,A4,6X,A4)                                     PLOTIT     85
      READ(2,2002)(VNOISE(I),I=1,NL)                                    PLOTIT     86
2002  FORMAT(5E15.6,I5)                                                 PLOTIT     87
C                                                                       PLOTIT     88
C  READ DATA FOR 1 SET OF PLOTS - CONTOUR + SIDELINE                    PLOTIT     89
C                                                                       PLOTIT     90
      DO 100 I=1,NP                                                     PLOTIT     91
C 360                                                                   PLOTIT     92
C     READ(2,2022,END=902) FPATH(I,1),FPATH(I,2),FPATH(I,3),            PLOTIT     93
      READ(2,2022)         FPATH(I,1),FPATH(I,2),FPATH(I,3),            PLOTIT     94
     X (SNDL(I,K),K=1,NSD)                                              PLOTIT     95
 2022 FORMAT(6E15.6)                                                    PLOTIT     96
      IF  (EOF(2))  902, 1900                                           PLOTIT     97
 1900 CONTINUE                                                          PLOTIT     98
C                                                                       PLOTIT     99
C  READ DATA FOR EACH NOISE LEVEL AT POINT I                            PLOTIT    100
C                                                                       PLOTIT    101
      DO 100 J=1,NL                                                     PLOTIT    102
      READ(2,2002)  X(I,1,J),X(I,2,J), Y(I,1,J),Y(I,2,J),AREA(J),IERR   PLOTIT    103
100   CONTINUE                                                          PLOTIT    104
C                                                                       PLOTIT    105
C  PLOT CONTOURS                                                        PLOTIT    106
C                                                                       PLOTIT    107
      CALL FOTCNT(X,Y,VNOISE,FPATH,AREA,NP,NL,NDIM,TITLE)               PLOTIT    108
C                                                                       PLOTIT    109
C  PLOT SIDELINE                                                        PLOTIT    110
C                                                                       PLOTIT    111
      CALL SIDPLT(SNDL,FPATH(1,3),NP,NDIST,TITLE,NSD,NDIM)              PLOTIT    112
C                                                                       PLOTIT    113
C REPEAT PLOT LOOP UNTIL END OF DATA                                    PLOTIT    114
C                                                                       PLOTIT    115
```

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      GO TO 50                                                          PLOTIT    116
C                                                                       PLOTIT    117
C NORMAL RETURN                                                         PLOTIT    118
C                                                                       PLOTIT    119
C EMPTY PLOT BUFFER                                                     PLOTIT    120
C                                                                       PLOTIT    121
900   CALL PLOT(0.,0.,999)                                              PLOTIT    122
      RETURN                                                            PLOTIT    123
C                                                                       PLOTIT    124
C ABNORMAL TERMINATION                                                  PLOTIT    125
C                                                                       PLOTIT    126
901   WRITE(6,3000)                                                     PLOTIT    127
3000  FORMAT(1H0,20H *** FATAL ERROR *** )                              PLOTIT    128
      WRITE(6,3001)                                                     PLOTIT    129
3001  FORMAT(1H ,5X,                                                    PLOTIT    130
     X45HPLOT SIZE UNITS MUST BE SPECIFIED AS IN OR CM )                PLOTIT    131
      GO TO 999                                                         PLOTIT    132
902   WRITE(6,3000)                                                     PLOTIT    133
      WRITE(6,3002)                                                     PLOTIT    134
3002  FORMAT(1H ,5X,                                                    PLOTIT    135
     128HINSUFFICIENT DATA ON TAPE2    )                                PLOTIT    136
      GO TO 999                                                         PLOTIT    137
905   WRITE(6,3000)                                                     PLOTIT    138
      WRITE(6,3005)                                                     PLOTIT    139
3005  FORMAT(1H ,5X,                                                    PLOTIT    140
     X45HINSUFFICIENT PLOT SPECIFICATION DATA ON CARDS )                PLOTIT    141
999   STOP                                                              PLOTIT    142
      END                                                               PLOTIT    143
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```
      SUBROUTINE PNDB4(SPL,KIND,PNDB)                                   PNDB4
C PURPOSE            TO CALCULATE THE PERCEIVED NOISE LEVEL OF A SOUND  PNDB4
C                    PRESSURE LEVEL SPECTRUM ACCORDING TO REFERENCE 2   PNDB4
C AUTHOR             J. N. THOMAS                                       PNDB4
C MODIFICATIONS      NONE                                               PNDB4
C                                                                       PNDB4
C METHOD             THIS SUBROUTINE USES THE METHODS AND TABLES IN     PNDB4
C                    ARP-865 (REFERENCE 2). THE SPECTRUM CAN BE         PNDB4
C                    PREFERRED 1/3 OCTAVE, PREFERRED OCTAVE, OR COMMON  PNDB4
C                    OCTAVE BANDS.                                      PNDB4
C                                                                       PNDB4
C USAGE              CALL PNDB4(SPL,KIND,PNDB)                          PNDB4
C                    DIMENSION SPL(1)                                   PNDB4
C                                                                       PNDB4
C INPUTS             SPL - ARRAY OF 24 PREFERRED 1/3 OCTAVE, 8 PREFERRED PNDB4
C                          OCTAVE, OR 8 COMMON OCTAVE SPL VALUES IN DB  PNDB4
C                    KIND - = 1 FOR PREFERRED 1/3 OCTAVE                PNDB4
C                           = 2 FOR PREFERRED OCTAVE                    PNDB4
C                           = 3 FOR COMMON OCTAVE                       PNDB4
C                                                                       PNDB4
C OUTPUTS            PNDB - THE PERCEIVED NOISE LEVEL IN PNDB           PNDB4
C                                                                       PNDB4
C ERROR RETURN       IF KIND DOES NOT EQUAL 1,2, OR 3, THE PNL WILL NOT PNDB4
C                    BE CALCULATED, AND THE FOLLOWING MESSAGE WILL BE   PNDB4
C                    PRINTED& KIND EQUAL TO --- IS UNDEFINED.  PNDB IS  PNDB4
C                    SET EQUAL TO ZERO AND CONTROL IS RETURNED TO THE   PNDB4
C                    CALLING PROGRAM.                                   PNDB4
C                                                                       PNDB4
C STORAGE            545 BASE EIGHT                                     PNDB4
C TIMING             0.015 CP SECONDS FOR A 24 VALUE SPL ARRAY          PNDB4
C REFERENCES         1. PEART,N.A., REVISED PNL CALCULATION PROCEDURE,  PNDB4
C                       MEMO 6-8580-9-238,JUNE 19,1969                  PNDB4
C                    2. SOCIETY OF AUTOMOTIVE ENGINEERS, AEROSPACE      PNDB4
C                       RECOMMENDED PRACTICE 865A, SAE, AUGUST 15,1969  PNDB4
C                                                                       PNDB4
C SUBROUTINES CALLED                                                    PNDB4
C                    APPLICATIONS - NONE                                PNDB4
C                    SYSTEMS - ALOG10                                   PNDB4
C                                                                       PNDB4
C DOCUMENTATION      AMEP-S-170                                         PNDB4
C                                                                       PNDB4
C     *** RESTRICTIONS ***                                              PNDB4
C      SPL VALUES SHOULD BE LESS THAN 150 DB . IF THEY ARE NOT,         PNDB4
C          NOY VALUES AND PNDB  VALUES WILL BE INCORRECT.               PNDB4
C                                                                       PNDB4
      REAL LL,MM                                                        PNDB4
      REAL L,M                                                          PNDB4
      DIMENSION L(24,5),M(24,4),SPL(24,17),PNDB(17)                     PNDB4
      DIMENSION LL(120),MM(96)                                          PNDB4
      EQUIVALENCE(LL(1),L(1,1)),(M(1,1),MM(1))                          PNDB4
      DATA  LL                 / 49., 44., 39., 34., 30.,27.,24.,21. ,18.,  PNDB4
     1 5*16.,15.,12.,9.,5. ,4. ,5.,6. ,10. ,17. , 21. ,                 PNDB4
     2                          55., 51., 46., 42., 39.,36.,33.,30. ,27.,  PNDB4
     1 5*25.,23.,21.,18.,15.,14.,14.,15.,17.,23.,29. ,                  PNDB4
     3                          64., 60., 56., 53., 51.,48.,46.,44., 42.,  PNDB4
     1 5*40.,38.,34.,32.,30.,29.,29.,30.,31.,37.,41.  ,                 PNDB4
     4                          91.01 , 85.88,  87.32  , 79.85,  79.76 ,  PNDB4
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     1 75.86  ,73.96   ,74.91    ,94.63 , 13*100.,  44.29  ,50.72      ,  PNDB4
     5                          52., 51., 49., 47., 46.,45.,43.,42. ,41.,  PNDB4
     1 5*40.,38.,34.,32.,30.,29.,29.,3C.,31.,34.,37.       /              PNDB4
      DATA  MM              /   .079520  , 2*.068160     , .059640       , PNDB4
     1  10*.053013       ,     .05964C  , 2*.053013     ,  2*.047712    , PNDB4
     2   2*.053013       ,     .068160  ,   .079520     , .0596401   ,   PNDB4
     X                        2*.058098  ,   .052288     , .047534       , PNDB4
     1   2*.043573       ,     .040221  ,   .037349     ,  7*.034859    , PNDB4
     2     .040221       ,     .037349  , 4*.034859     ,  2*.037349    , PNDB4
     3     .043573 ,                                                     PNDB4
     X                          .043478  ,   .040570     , 2*.036831     , PNDB4
     1     .035336       ,   2*.033333  ,   .032051     , .030675       , PNDB4
     2   6*.030103       ,   7*.029960  , 2*.042285     ,                PNDB4
     X                         15*.030103, 9*.029960 /                   PNDB4
      DO 55 JJ=1,17                                                      PNDB4
      SUM=0.                                                             PNDB4
      XMAX=0.                                                            PNDB4
      PNDB(JJ)=0.                                                        PNDB4
      IF(KIND.LT.1.OR.KIND.GT.3) GC TC 60                                PNDB4
      IF  (KIND-2)  1, 2, 3                                              PNDB4
    1 CONTINUE                                                           PNDB4
      NUM=24                                                             PNDB4
      C=.15                                                              PNDB4
      KK=0                                                               PNDB4
      INC=1                                                              PNDB4
      GC TO 10                                                           PNDB4
    2 CONTINUE                                                           PNDB4
      KK=-1                                                              PNDB4
    4 CONTINUE                                                           PNDB4
      NUM=8                                                              PNDB4
      C=.3                                                               PNDB4
      INC=3                                                              PNDB4
      GC TO 10                                                           PNDB4
    3 CONTINUE                                                           PNDB4
      KK=-2                                                              PNDB4
      GO TO 4                                                            PNDB4
   1C CONTINUE                                                           PNDB4
      DC 50 I=1,NUM                                                      PNDB4
      A=1.                                                               PNDB4
      KK=KK+INC                                                          PNDB4
      DO 20 J=1,4                                                        PNDB4
      IF(SPL(I,JJ).LT.L(KK,J) ) GO TC 21                                 PNDB4
   2C CONTINUE                                                           PNDB4
      J=5                                                                PNDB4
      K=5                                                                PNDB4
      GC TO 22                                                           PNDB4
   21 CONTINUE                                                           PNDB4
C IGNORE SPL(1,JJ) IF IT FALLS OFF THE LCWER  END CF THE TABLE,I.E.,J=1  PNDB4
      IF(J.LT.2) GO TO 5C                                                PNDB4
      IF(J.EQ.2) A=.1                                                    PNDB4
      K=J-1                                                              PNDB4
      IF(K.EQ.2) K=3                                                     PNDB4
   22 CONTINUE                                                           PNDB4
      XNOY= A*1C.** (M(KK,J-1) * (SPL(I,JJ)-L(KK,K) ) )                  PNDB4
      IF(XNOY.GT.XMAX) XMAX=XNCY                                         PNDB4
      SUM=SUM+XNOY                                                       PNDB4
   50 CONTINUE                                                           PNDB4
```

```
      BARN= XMAX + C* (SUM - XMAX)                                      PNDB4     116
C  PNDB CANNOT BE NEGATIVE                                              PNDB4     117
      IF(BARN.GT.0.048) PNDB(JJ)=(ALOG10(BARN))/.030103 + 40.           PNDB4     118
 55   CONTINUE                                                          PNDB4     119
      RETURN                                                            PNDB4     120
   60 CONTINUE                                                          PNDB4     121
      WRITE (6,61) KIND                                                 PNDB4     122
   61 FORMAT(10X,14HKIND EQUAL TO  ,I4,13H IS UNDEFINED )               PNDB4     123
      RETURN                                                            PNDB4     124
      END                                                               PNDB4     125
```

```
      SUBROUTINE PNLSUB(SP,PS,TP,EP,PL,TL,NK,B,T,F,I,NOBS,IR)
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,DUM,SLDIST(10),NTENG,IUNIT
     *     ,ISPTRM,IATMOS,IAIR,LAIRAB(24),NTEMP,TEMP(50),TALT(50)
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,CHUMID,XKN,ND,FLD(50),
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF
      DIMENSION SP(24,17), PS(17,11), TP(17), EP(5), PL(1), TL(5),
     1     IR(10,17)
      DATA UND /177700000000000000000B/
      NL=2
      IF(NK.EQ.3)NL=1
      NOBX=NOBS
      CALL PNDB4(SP(1,1),NL,PS(1,1))
      IF(AMACH.NE.0.)GO TO 100
      GO TO 200
100   CONTINUE
      CALL EPNLI(PS(1,1),TP,17,B,T,F,EP,IER)
      IF(IER.EQ.0)GO TO 300
200   CONTINUE
      EP(1)=UND
      EP(2)=UND
      EP(3)=UND
      EP(4)=UND
      EP(5)=UND
300   CONTINUE
      IF(NK.NE.3) GO TO 380
      CALL TONCOR(SP(1,1),PS(1,11),PL,IRR)
      DO 350 N=1,17
350   PS(N,11)=PS(N,11)+PS(N,1)
      IF(AMACH.NE.0.)GO TO 370
      GO TO 375
370   CONTINUE
      CALL EPNLI(PS(1,11),TP,17,B,T,F,TL,IER)
      IF(IER.EQ.0)GO TO 390
375   CONTINUE
      TL(1)=UND
      TL(2)=UND
      TL(3)=UND
      TL(4)=UND
      TL(5)=UND
390   CONTINUE
380   CONTINUE
      RETURN
      END
```

```
      SUBROUTINE PRINTH(N,LCT,L)                                        PRINTH     2
      COMMON/ICPATH/NCAS,NCOF,NTYP,IC,NRN,IARRAY(2)                     PRINTH     3
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                             PRINTH     4
      DIMENSION HD1(4),HD2(7)                                           PRINTH     5
      DATA HD1 /4HPROG,4HRAM ,4HTEE3,4H30A /, ATE /4HDATE/              PRINTH     6
      DATA HD2/4HAIRC,4HRAFT,4H NOI,4HSE P,4HREDI,4HCTIO,4HN    /       PRINTH     7
      DATA IENTRY/0/                                                    PRINTH     8
      IF(IENTRY.EQ.1)GO TO 10                                           PRINTH     9
      CALL DATE(DAY)                                                    PRINTH    10
      IENTRY=1                                                          PRINTH    11
10    LCT=5                                                             PRINTH    12
      WRITE (L,100) HD1, ATE, HD2, DAY                                  PRINTH    13
 100  FORMAT(1H1,57X,4A4,50X,A4/53X,7A4/120X,A10)                       PRINTH    14
      WRITE(L,110)NCAS,HOUT                                             PRINTH    15
 110  FORMAT(10H CASE NO. ,I3,27X,20A4,1X,8HYR/MO/DA)                   PRINTH    16
      IF(N.EQ.3)GO TO 130                                               PRINTH    17
      IF(N.EQ.7)GO TO 130                                               PRINTH    18
      WRITE(L,120)                                                      PRINTH    19
120   FORMAT(1H )                                                       PRINTH    20
      GO TO 1000                                                        PRINTH    21
130   WRITE(L,140)CHIN                                                  PRINTH    22
 140  FORMAT(40X,20A4)                                                  PRINTH    23
1000  RETURN                                                            PRINTH    24
      END                                                               PRINTH    25
```

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      SUBROUTINE PROP                                                   PROP
C                                                                       PROP
C     PURPOSE              THE FOLLOWING PROPELLER NOISE PREDICTION PROCED PROP
C                          BASED ON THE BELOW LISTED REFERENCES. THE PROCE PROP
C                          CONSIDERS TWO NOISE COMPONENTS. (1)THE VORTEX N PROP
C                          BASED ON THE EQUATIONS IN REFERENCES 1 AND 2.   PROP
C                          (2)DISCRETE TONE NOISE BASED ON REFERENCE 3. TH PROP
C                          RESULTING NOISE ESTIMATES HAVE BEEN CORRECTED T PROP
C                          FREE FIELD  INDEX CONDITIONS  (RADIUS =  1 METE PROP
C                                                                       PROP
C     REFERENCES           1  F.H. SCHMITZ, W.Z.STEPNIEWSKI,J.GIBS,E.HINTE PROP
C                             A COMPARISON OF OPTIMAL AND NOISE ABATEMENT  PROP
C                             TRAJECTORIES OF A TILT ROTOR AIRCRAFT,NASA C PROP
C                             MAY 1972.                                   PROP
C                                                                         PROP
C                          2  F.W.BARRY,B.MAGLIOZZI, NOISE DETECTABILITY P PROP
C                          N METHOD FOR LOW TIP SPEED PROPELLERS (HAMILTON PROP
C                             STANDARD), AFAPL-TR-71-37, JUNE  1971.      PROP
C                                                                         PROP
C                          3  B.MAGLIOZZI, GENERALIZED PROPELLER NOISE EST PROP
C                             PROCEDURE (HAMILTON-STANDARD,REVISION C), 11 PROP
C                                                                         PROP
C     PROGRAMMER           M.A.  JAEGER     NOISE AND PROPULSION GROUP  G- PROP
C     REQUIRED DATA        VARIABLE DEFINITION                       UNITS PROP
C                                                                         PROP
C                          ISPRTM----SWITCH FOR 1/3 OR FULL O.B. (0 OR 1)  PROP
C                          T---------THRUST DEVELOPED BY PROPELLER.   LBF  PROP
C                          W---------POWER GIVEN TO THE PROPELLER          PROP
C                                    SHAFT.                          HP   PROP
C                          RPM-------ROTATIONAL SPEED OF PROPELLER        PROP
C                                    SHAFT.                          RPM  PROP
C                          D---------PROPELLER  DIAMETER              FT   PROP
C                          DSUBE-----CHARACTERISTIC DIMENSION FOR THE     PROP
C                                    BLAD GEOMETRY AT 0.7 SPAN.      FT   PROP
C                                   DSUBE=BT*COS(CL)+CL*ABS(SIN ATTANG)   PROP
C                                    BT= BLADE THICKNESS                  PROP
C                                    CL= CHORD LENGTH                     PROP
C                                    ATTANG= ANGLE OF ATTACK              PROP
C                          ASUBB-----TOTAL BLADE AREA OF PROPELLER   FT**2 PROP
C                                                                         PROP
C                                       ASUBB = B* INTEGRAL(HUB TO TIP)   PROP
C                                                  OF  CL DELTA-R         PROP
C                          B---------NUMBER OF PROPELLER BLADES       NONE PROP
C                          DELTAE----ANGLE BETWEEN PROPELLER AND          PROP
C                                    HORIZON                         DEG. PROP
C                          SLOPE-----CLIMB GRADIENT IE TAN(THETA)     NONE PROP
C                          DOPSF(JJ)-----DOPPLER SHIFT FACTOR (1-AOMN*    PROP
C                                    COS(XI).  IF NO DOPPLER SHIFT        PROP
C                          AMACH-----AIRCRAFT MACH NUMBER             NONE PROP
C                                    THEN DOPSF=1.                      NONE PROP
C                          CAMB------AMBIENT SPEED OF SOUND               PROP
C                                     CAMB= K *SQRT(TSO)                  PROP
C                                      K=20.04647 M/SEC PER DEG. KELVIN   PROP
C                                        49.02142 FT/SEC PER DEG. RANKINE PROP
C                                      TSO= STATIC TEMP    (DEG. R OR K)  PROP
C                                         AT ALTITUDE ZO                  PROP
C                          P---------DISTANCE FOR SOUND PROPAGATION       PROP
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C                                 BETWEEN SOURCE AND OBSERVER        FT  PROP
C                        (X,Y,ZSUBN) AIRCRAFT COORDINATE RELATIVE        PROP
C                                 TO THE OBSERVER.                   FT  PROP
C                        BUF-------ARRAY OF CUTOFF FREQUENCIES (HZ)      PROP
C                                  FOR THE SOUND PRESSURE LEVEL          PROP
C                                  SPECTRUM.   LENGTH=25                 PROP
C                                                                        PROP
C                                    FRCCUT(I)=10**(0.1*(I+15.5))    HZ  PROP
C                        NENG------NUMBER OF PROPELLER ENGINES       NONE PROP
C                                                                        PROP
C      VARIABLES SET DURING                                              PROP
C        INITIALIZATION                                                  PROP
C                                                                        PROP
C                        ALPHA-----ANGLE BETWEEN THE THRUST AXIS AND     PROP
C                                  THE DIRECTION OF THE AIRPLANES        PROP
C                                  MOTION                          DEG.  PROP
C                                     ALPHA=DELTAE-ATAN(GRAD)            PROP
C                        SCI-------THE DIRECTIVITY ANGLE                 PROP
C                                   ACOS(-(YCOS(DELTAE)+ZNSIN(DELTAE)    PROP
C                                          /F))                     DEG. PROP
C                        VSLBT-----TIP SPEED                       FT/SEC PROP
C                                   = PI*RPM*DSUBT / 60                  PROP
C                        XMSLBT----ROTATIONAL TIP MACH NUMBER            PROP
C                        XMSBTR----RELATIVE ROTATIONAL TIP MACH          PROP
C                                   NUMBER                               PROP
C                                   =SQRT XMSLBT**2+(ACMN*COS(ALPHA))**2 PROP
C                                   (DIAGNOSTIC-IF  XMSUBTR GT .9 OR     PROP
C                                    .LE. 0 )                            PROP
C                        VSLBTR----RELATIVE TIP SPEED              FT/SEC PROP
C                                     = CAMB *X MSLBTR                   PROP
C                        FSLBO-----OBSERVED FUNDAMENTAL BLADE PASSAGE    PROP
C                                  FREQUENCY                         HZ  PROP
C                                    = B* RPM/ (60*DOPSF)                PROP
C                        FSUBV-----OBSERVED CHARACTERISTIC FREQUENCY     PROP
C                                  FOR BROADBAND VORTEX NOISE        HZ  PROP
C                                    =0.28*VSUBTR /(DSUBE*DOPSF)         PROP
C                        PSLBI-----ARRAY OF PRESSURE SPECTRA LEVELS      PROP
C                        SPLI -----ARRAY OF SOUND PRESSURE LEVELS I=1,24 PROP
C                        BRING IN INPUT CARD VARIABLES FROM INPUT ROUTIN PROP
C                                                                        PROP
C                                                                        PROP
C                                                                        PROP
C                                                                        PROP
C                                                                        PROP
C                                                                        PROP
C                                                                        PROP
      COMMON/PROPIN/T,W,RPM,D,DSUBE,ASLBB,B,DELTA,                       PROP
     *ICOR10,LIN10,NTF10,IMA10,LGM10,NWL10,IDP10,ILAY10,TF10(10),        PROP
     *PCTA10(10),PLA10(10),ELOH10,EDH10,R1W10(10),TL10(10),CF10,FM10     PROP
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IOOP,IPRT(7),ICN(13),NLOPT          PROP
C     CONSTANTS USED IN INTERNAL CALCULATIONS                            PROP
C                                                                        PROP
      COMMON /GCONST/ IN,IC,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,   PROP
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001,  PROP
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI   PROP
C                                                                        PROP
C     VARIABLE SET CALCULATED IN THE PROGRAM PROCESSING                  PROP
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C                                                                       PROP
      COMMON /GCOMON/ NCF,NK,BCF(24),TSPL(24,10,17),SPLT(24,17),        PROP
     *BUF(25),RETA(17),SPL2(17),TGAGR(24),CCPSF(17)                     PROP
      COMMON/SUMSPL/SSPL(24,10,17)                                      PROP
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    PROP
C                                                                       PROP
C     FREQUENCY BANDS USED BY PROGRAM                                   PROP
C                                                                       PROP
      COMMON /GFREQ/ CFREQ(24),UFREQ(25),PFREQ(24)                      PROP
C                                                                       PROP
C     GENERAL INPUT PARAMETERS                                          PROP
      COMMON/ANGLE/PSI(17,10),PSIC(17,10),BETA(17,10)                   PROP
C                                                                       PROP
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NCBS,SLDIST(10),ITENG,IUNIT   PROP
     *     ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)       PROP
     *     ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP    PROP
     *     ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),   PROP
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         PROP
C                                                                       PROP
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                PROP
C                                                                       PROP
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),       PROP
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             PROP
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CCV                       PROP
C                                                                       PROP
C     CONVERSION CONSTANTS                                              PROP
C                                                                       PROP
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  PROP
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                PROP
      COMMON/CRSPLS/DOB(17),PSCR(17),CPB(408),NPSCR                     PROP
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                             PROP
C                                                                       PROP
C                                                                       PROP
C                                                                       PROP
C                                                                       PROP
C                                                                       PROP
      DIMENSION SCIANG(15),DRINDX(15)                                   PROP
      DIMENSION S(25),DA(10)                                            PROP
      DIMENSION HAR(160)                                                PROP
      DIMENSION HARLEV(16,10),AMTE(16)                                  PROP
      EQUIVALENCE (HAR(1),HARLEV(1,1))                                  PROP
C                                                                       PROP
C                                                                       PROP
C                                                                       PROP
C                                                                       PROP
C                        BUILD TABLE FOR  F OF SCI  CURVES  FOR         PROP
C                        DIRECTIVITY CORRECTION.(ANGLE AND CORRECTION)  PROP
      DATA DRINDX/-7.1,-4.2,-1.6,-1.0,-1.0,-1.0,-0.8,-0.5,-0.0,0.5,-0.2, PROP
     *-1.6,-4.0,-11.5,-20.6/                                            PROP
      DATA SCIANG/0.0,0.349,0.698,0.872,1.047,1.221,1.396,1.571,1.745,  PROP
     *1.919,2.094,2.268,2.44,2.792,3.141/                               PROP
C                        BUILD TABLE OF ATMOSPHERIC ABSORPTION COEFF.   PROP
C                        DELTA K AS A FUNCTION OF K THE BAND NUMBER     PROP
C     DATA BLOCKS DEFINING VARIABLES WITH CONSTANT VALUES               PROP
C                                                                       PROP
C                                                                       PROP
      DATA (HAR(I),I=1,80)/                                             PROP
```

```
     1-0.6,-0.6,-0.6,-0.62,-0.7,-0.75,-0.8,-1.0,-1.2,-1.7,-2.6,-3.2,-3.8 PROP
     *,-4.6,-5.6,-6.7,                                                  PROP
     2-14.,-14.,-14.,-13.7,-13.,-12.1,-10.9,-9.7,-8.4,-7.2,-6.2,-5.8,-5. PROP
     *8,-5.7,-5.8,-5.9,                                                 PROP
     3-18.2,-18.2,-18.,-17.6,-17.2,-16.6,-16.2,-15.6,-14.6,-13.7,-12.3,- PROP
     *11.4,-10.4,-9.2,-7.9,-5.7,                                        PROP
     4-20.,-20.,-19.9,-19.8,-19.5,-19.3,-19.,-18.6,-18.2,-17.6,-16.6,-16 PROP
     *.,-15.,-13.5,-11.,-4.8,                                           PROP
     5-21.9,-21.9,-21.8,-21.6,-21.4,-21.2,-21.,-20.6,-20.2,-19.6,-18.7,- PROP
     *18.,-17.,-15.2,-12.4,-6.3/                                        PROP
      DATA (HAR(I),I=81,160) /                                          PROP
     6-23.,-23.,-23.,-22.9,-22.9,-22.8,-22.6,-22.3,-22.,-21.2,-20.2,-19. PROP
     *4,-18.3,-17.1,-14.4,-8.0,                                         PROP
     7-24.,-24.,-24.,-23.9,-23.9,-23.7,-23.6,-23.4,-22.8,-22.2,-21.4,-20 PROP
     *.8,-20.,-18.6,-16.4,-10.,                                         PROP
     8-25.2,-25.2,-25.2,-25.2,-25.1,-25.,-24.9,-24.8,-24.3,-23.7,-23.,-2 PROP
     *2.2,-21.4,-20.2,-18.,-11.5,                                       PROP
     9-26.8,-26.8,-26.8,-26.8,-26.7,-26.6,-26.5,-26.2,-25.8,-25.2,-24.2, PROP
     *-23.6,-22.9,-21.5,-19.4,-13.,                                     PROP
     0-28.8,-28.8,-28.8,-28.8,-28.7,-28.6,-28.5,-28.2,-27.8,-27.2,-26.2, PROP
     *-25.6,-24.8,-23.6,-21.5,-15.0/                                    PROP
      DATA AMTE/0.3,0.35,0.4,0.45,0.5,0.55,0.6,0.65,0.7,0.75,0.8,0.825,0 PROP
     *.850,0.875,0.9,0.930/                                             PROP
      DATA NMTE/16/, NLAUGK/10/, WSUBO/1000./, DSUBO/1.0/               PROP
C                                                                       PROP
C                                                                       PROP
C                                                                       PROP
C                                                                       PROP
      ICN(10)=ICN(10)+1                                                 PROP
      DELTAE=DELTA*RPD                                                  PROP
      CALL ANGLES(NOBS,DELTAE)                                          PROP
      ALPHA=DELTAE-ATAN(SLOPE)                                          PROP
      VSUBT=PI*RPM*D*0.016667                                           PROP
      XMSUBT=VSUBT/CZ                                                   PROP
      X  =  XMSUBT*XMSUBT + AMACH*AMACH                                 PROP
      Y  =  XMSUBT * AMACH * SIN(ALPHA)                                 PROP
      XMSBTR  =  (X * (X*X + 6.*Y*Y))**.1666667                         PROP
      IF(XMSBTR .LE. 0. .OR. XMSBTR .GT. 0.93)  CALL ERROR(21)          PROP
      VSUBTR=CZ*XMSBTR                                                  PROP
      X  =  X - 0.51*XMSUBT*XMSUBT                                      PROP
      Y  =  0.7 * Y                                                     PROP
      VEEPT7  =  CZ * (X * (X*X + 6.*Y*Y))**.1666667                    PROP
      X11=(VSUBTR*T)**2                                                 PROP
      X33=(1./ASUBB)                                                    PROP
      INCF=NCF+1                                                        PROP
      ONEPLS=1.+XMSBTR                                                  PROP
      ONEMYN=1.-XMSBTR                                                  PROP
      CEE=2.*ALOG(ONEPLS/ONEMYN)                                        PROP
      Z1=W/WSUBO                                                        PROP
      Z2=D/DSUBO                                                        PROP
      DO 25 K=1,10                                                      PROP
   25 DA(K)=TBLL1(XMSBTR,AMTE,HARLEV(1,K),1,16)                         PROP
      DO 9999 II=1,NOBS                                                 PROP
      CALL LINCOR(SPZ(1,1),0,X,X,X,X,X,X,X,X,X,PSI(1,II),NCF,BCF,       PROP
     *  X,X,X,X,X,X,X,ICOR10,IB(1,1,ITYPE),0,X)                         PROP
      DO 8888 JJ=1,17                                                   PROP
C                                                                       PROP
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C                         CALCULATE THE VARIABLES TO BE USED BY BOTH      PROP
C                         ROUTINES                                        PROP
      SCI=PSI(JJ,II)*RPD                                                  PROP
      FSUBO = B*RPM/(60.*DOPSF(JJ))                                       PROP
      FSUBV= 0.28*VEEPT7/(DSUBE*DOPSF(JJ))                                PROP
C                         CALCULATE VORTEX NOISE                          PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
      X22=(0.1+( COS(SCI)**2))/0.21698                                    PROP
      OA=10.*ALOG10(X11*X22*X33/DOPSF(JJ))+5.7                            PROP
      DO 15 I=1,INCF                                                      PROP
   15 S(I)=BUF(I)/FSUBV                                                   PROP
C                         CALCULATE THE SPECTRUM SHAPE  SS(I)             PROP
      DO 20 I=1,NCF                                                       PROP
      GA=1.+(ONEPLS*S(I+1))**2                                            PROP
      GB=1.+(ONEMYN*S(I))**2                                              PROP
      GC=1.+(ONEMYN*S(I+1))**2                                            PROP
      GD=1.+(ONEPLS*S(I))**2                                              PROP
      SS=10.*ALOG10(1./CEE*ALOG((GA*GB)/(GC*GD)))                         PROP
C                         CALCULATE THE RESULTING SOUND PRESSURE LEVEL FO PROP
C                         R VORTEX NOISE AT 500 FT.                       PROP
      SPLT(I,JJ)=OA+SS                                                    PROP
C                         CALCULATE THE RESULTANT PRESSURE SPECTRUM       PROP
      TGAGR(I)=10.**(0.1*SPLT(I,JJ))                                      PROP
   20 CONTINUE                                                            PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
C                                                                         PROP
      FISCI=TBLU1(SCI,SCIANG,DRINDX,1,15)                                 PROP
C                         LO IS THE REFERENCE SOUND PRESSURE LEVEL        PROP
C                         USED TO CALCULATE THE HARMONIC TONES            PROP
      XLO=15.5*ALOG10(Z1)-22.65*ALOG10(Z2)-40.*ALOG10(DOPSF(JJ))+38.00    PROP
     *  *(XMSBTR)-2.2*B+FISCI+137.7                                       PROP
      HO=0.1*XLO                                                          PROP
      H1=0.1*(XLO+DA(10))                                                 PROP
      H2=-2.185434*(DA(9)-DA(10))                                         PROP
C                         FIND THE HARMONICS WITHIN THE BAND,IF ANY       PROP
      N1= 1.+ BUF(1)/FSUBO                                                PROP
      DO 60 I=1,NCF                                                       PROP
      N2=BUF(I+1)/FSUBO                                                   PROP
      IF(N2-N1  .LT. 0) GO TO  50                                         PROP
C                                                                         PROP
C                         SUM THE HARMONIC TONE ENERGY WITHIN EACH BAND   PROP
      DO  45 K=N1,N2                                                      PROP
      IF (K .GT. 10) GO TO  40                                            PROP
      DP=10.**(HO+0.1*DA(K))                                              PROP
      GO TO  45                                                           PROP
 40   XK=K                                                                PROP
      DP=10.**(H1)*(0.1*XK)**H2                                           PROP
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   45 TGAGR(I)=TGAGR(I)+DP                                          PROP      287
   50 SPLT(I,JJ)  =  TGAGR(I) * FLOAT(NENG)                         PROP      288
      IF(SPLT(I,JJ) .LE. 0.)GO TO  61                               PROP      289
      SPLT(I,JJ)=10.*ALOG10(SPLT(I,JJ))-SPZ(I,JJ)                   PROP      290
      GO TO 62                                                      PROP      291
   61 SPLT(I,JJ)=SPZ(I,JJ)                                          PROP      292
   62 CONTINUE                                                      PROP      293
      SSPL(I,II,JJ)=PWRSUM(SSPL(I,II,JJ),SPLT(I,JJ))                PROP      294
   60 N1=N2+1                                                       PROP      295
 8888 CONTINUE                                                      PROP      296
      IF(IPRT(7).NE.7) GO TO 8900                                   PROP      297
      CALL NOISO(IPRT(7),II,NK,10,CHIN,IUNIT,SLDISX(II),PFREQ,      PROP      298
     *     SPLT(1,1),NOF,ITYPE)                                     PROP      299
 8900 CONTINUE                                                      PROP      300
      DO 65 NF=1,NOF                                                PROP      301
      DO 65 J=1,17                                                  PROP      302
 65   SPLT(NF,J)=SPLT(NF,J)-TSPL(NF,II,J)                           PROP      303
      IF(IPRT(3).NE.3)GO TO 9999                                    PROP      304
      CALL PNLSUB(SPLT(1,1),PSPL(1,II),TPD(1,II),EPNL(1,II),SPL2,   PROP      305
     *  TEPNL(1,II),NK,BCG,TCG,FLR,II,NCBS,IRR(II,1))               PROP      306
      CALL NOISO(IPRT(3),II,NK,12,CHIN,IUNIT,SLDISX(II),PFREQ,      PROP      307
     *     SPLT(1,1),NOF,ITYPE)                                     PROP      308
 9999 CONTINUE                                                      PROP      309
      RETURN                                                        PROP      310
      END                                                           PROP      311
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      SUBROUTINE PRTSH1(J,X,LCT,L,K)                                    PRTSH1     2
      COMMON/CLABEL/CH(2,8)                                             PRTSH1     3
      DATA CH/4H M. ,4H FT ,4H MIC,4HC PI,4HRC-N,4HCCBA,4H/SQ.,4HR)  ,  PRTSH1     4
     *        4HM.) ,1H ,1HK,1HR,4HATM.,4HPSIA,3HMPS,3HFPS/             PRTSH1     5
      I=1                                                               PRTSH1     6
      IF(J.EQ.1)I=2                                                     PRTSH1     7
      IF  (K-2)  10, 200, 300                                           PRTSH1     8
10    CONTINUE                                                          PRTSH1     9
      WRITE(L,100)X ,CH(I,1)                                            PRTSH1    10
100   FORMAT(38X,39HOBSERVED SPECTRA AT SIDELINE DISTANCE= ,1PE10.3,    PRTSH1    11
     *   A4//)                                                          PRTSH1    12
      LCT=LCT+3                                                         PRTSH1    13
      GO TO 200                                                         PRTSH1    14
      ENTRY PRTSH2                                                      PRTSH1    15
 200  WRITE(L,210)(CH(I,N),N=2,5)                                       PRTSH1    16
210   FORMAT(2X,9HFREQUENCY,43X,21HSOUND PRESSURE LEVELS/9H    (KHZ),   PRTSH1    17
     *46X,1CH(DB RE. 20,4A4/)                                           PRTSH1    18
      LCT=LCT+3                                                         PRTSH1    19
      RETURN                                                            PRTSH1    20
300   WRITE(L,310)                                                      PRTSH1    21
310   FORMAT(2X,9HFREQUENCY ,34X,                                       PRTSH1    22
     *37HSOUND PRESSURE LEVEL ATTENUATION (DB)   //9H    (KHZ) /)      PRTSH1    23
      LCT=LCT+1                                                         PRTSH1    24
      LCT=LCT+2                                                         PRTSH1    25
      RETURN                                                            PRTSH1    26
      END                                                               PRTSH1    27
```

```
      FUNCTION PWRSUM(SPL1,SPL2)                                        PWRSUM
C AUTHOR              D. F. MELDRUM                                     PWRSUM
C                                                                       PWRSUM
C PURPOSE             TO CALCULATE A POWER SUM                          PWRSUM
C                                                                       PWRSUM
C INPUTS              SPL1, SPL2      TWO SPL VALUES WHICH NEEDS TO BE  PWRSUM
C                                     ADDED TOGETHER - ONE MAY BE A SUM. PWRSUM
C                                                                       PWRSUM
C OUTPUTS             PWRSUM     POWER SUM OF SPL1 AND SPL2 - IF ONE    PWRSUM
C                                     IS ZERO THE OTHER WILL BE RETURNED AS PWRSUM
C                                     THE POWER SUM. IF BOTH ARE ZERO THE PWRSUM
C                                     SUM WILL BE ZERO.                 PWRSUM
C                                                                       PWRSUM
C FUNCTION SUBPRGM  ALOG10                                              PWRSUM
C                                                                       PWRSUM
C                                                                       PWRSUM
C                                                                       PWRSUM
      ANSWER=10.0*ALOG10(10.0**(SPL1*0.1)+10.0**(SPL2*0.1))             PWRSUM
C                                                                       PWRSUM
  300 PWRSUM=ANSWER                                                     PWRSUM
      RETURN                                                            PWRSUM
      END                                                               PWRSUM
```

```
      SUBROUTINE REFRACT(AMACH,PSIC,ETA,DLT,RO,ROV,BV,U,V,W,E1,E2,E3,THO REFRAC      2
     1                   ,ROP,THOP)                                     REFRAC      3
C                                                                       REFRAC      4
C  TITLE                                                                REFRAC      5
C     JET REFRACTION EFFECTS                                            REFRAC      6
C                                                                       REFRAC      7
C  PURPOSE                                                              REFRAC      8
C     THIS SUBROUTINE COMPUTES THE JET FLOW REFRACTION EFFECTS BY       REFRAC      9
C     GIVING THE APPARENT SOURCE POLAR COORDINATE WITH JET FLOW REMOVED REFRAC     10
C                                                                       REFRAC     11
C  INPUT - CALLING SEQUENCE                                             REFRAC     12
C     AMACH     AIRCRAFT MACH NUMBER                                    REFRAC     13
C     PSIO      DIRECTIVITY ANGLE GRAZING WING EDGES                    REFRAC     14
C     ETA       DIRECTION ANGLE RELATIVE TO EDGE                        REFRAC     15
C     DLT       NOT USED, FORMULA     ASIN(W(2))     USED INSTEAD.      REFRAC     16
C     RO        MAGNITUDE OF VECTOR OR INLET OR NOZZLE RELATIVE TO EDGE REFRAC     17
C     ROV       VECTOR OF INLET OR NOZZLE RELATIVE TO EDGE              REFRAC     18
C     BV        VECTOR FOR A POINT ON THE EDGE RELATIVE TO NOZZLE       REFRAC     19
C     U,V,W     UNIT VECTORS OF WING EDGE                               REFRAC     20
C     E1,E2,E3  COORDINATE SYSTEM UNIT VECTORS FIXED TO ENGINE SUCH THAT REFRAC     21
C               E1 IS PARALLEL TO HALF-PLANE                            REFRAC     22
C                                                                       REFRAC     23
C  INPUT - COMMON                                                       REFRAC     24
C     EWGEO     VARIABLE DIANI                                          REFRAC     25
C     REFRAC    ALL VARIABLES EXCEPT IWED ARE USED                      REFRAC     26
C                                                                       REFRAC     27
C  OUTPUT                                                               REFRAC     28
C     ROP       MAGNITUDE OF APPARENT SOURCE COORDINATE WITH JET FLOW   REFRAC     29
C               REMOVED                                                 REFRAC     30
C     THOP      PHASE ANGLE OF APPARENT SOURCE COORDINATE WITH JET FLOW REFRAC     31
C               REMOVED                                                 REFRAC     32
C                                                                       REFRAC     33
C  NOTE                                                                 REFRAC     34
C     ALL INPUT AND OUTPUT ANGLES ARE IN DEGREES                        REFRAC     35
C                                                                       REFRAC     36
C  REFERENCE                                                            REFRAC     37
C     THE WEGSTEIN ITERATION SCHEME IS USED. THE CODE IS EXTRACTED FROM REFRAC     38
C     IBM SYS/360 SCIENTIFIC SUBROUTINE PACKAGE, VER. III, H20-0166-5,  REFRAC     39
C     1968, PP.215-216                                                  REFRAC     40
C                                                                       REFRAC     41
      DIMENSION ROV(3),U(3),V(3),W(3),E1(3),E2(3),E3(3),                REFRAC     42
     *          RV(3),RCAPV(3),X(5),RPV(3),       ROPV(3),BV(3)         REFRAC     43
      COMMON/EWGED/ SWPTE,SWPLE,DIHED,DDSD,DDX1D,DDX2D,DDX0D,DDY1D,     REFRAC     44
     1              DDY2D,DDY0D,DDLD,DIANI                              REFRAC     45
      COMMON/REFRAC/EMJ,TSTSO,IWED(3),FASS(24),BETA(24),CPSIC(24),NASRO, REFRAC     46
     * ASF,IWSFE                                                        REFRAC     47
      DATA IC, I1, F0, F1, RPD, DPR /0,1,0.,1.,1.745329E-2,57.29578/    REFRAC     48
      DATA OMEGA, EPS, MAXIT / 1.E75,1.2E-5,50/                         REFRAC     49
C                                                                       REFRAC     50
C     INITIALIZATION                                                    REFRAC     51
C                                                                       REFRAC     52
      DEL=DLT                                                           REFRAC     53
      DEL  =  DPR * ASIN(W(2))                                          REFRAC     54
      X(1) = AMACH                                                      REFRAC     55
      X(2) = EMJ                                                        REFRAC     56
      X(3) = TSTSO                                                      REFRAC     57
      X(5) = 180. - PSIC                                                REFRAC     58
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      SMJ   = X(2) * X(2)                                               REFRAC     59
      CR    = SQRT( X(3) )                                              REFRAC     60
      RM    = CR * X(2) - X(1)                                          REFRAC     61
      CTO   = COS( RPD * X(5) )                                         REFRAC     62
      STO   = SQRT( F1 - CTO*CTO )                                      REFRAC     63
      IF  (ABS(STO) .LT. EPS)  STO = EPS                                REFRAC     64
      COTPO  =  -CTO / STO                                              REFRAC     65
      ACF  =  TBLU1(COTPO, CPSIO, FASS, 1, NASRC)                       REFRAC     66
      CE=COS(ETA*RPD)                                                   REFRAC     67
      RCP=RC                                                            REFRAC     68
      THOP=THO                                                          REFRAC     69
      IF((EMJ.EQ.AMACH.AND.TSTSO.EQ.1.).OR.(ABS(CE).LT.EPS))RETURN      REFRAC     70
      TEMP=RO*SIN(ETA*RPD)/CE                                           REFRAC     71
      DO 1  J=1,3                                                       REFRAC     72
      RV(J) = ROV(J) + TEMP * L(J)                                      REFRAC     73
    1 CONTINUE                                                          REFRAC     74
      TEMP1=DOTP(E1,U)                                                  REFRAC     75
      TEMP=DOTP(BV,E1)                                                  REFRAC     76
      IF  (ABS(TEMP1) .GT. EPS)  GO TO 320                              REFRAC     77
      DO  310  J = 1,3                                                  REFRAC     78
      RCAPV(J)  =  BV(J) - TEMP * E1(J)                                 REFRAC     79
  310 CONTINUE                                                          REFRAC     80
      GO TO 340                                                         REFRAC     81
  320 TEMP  =  TEMP / TEMP1                                             REFRAC     82
      DO  330  J = 1,3                                                  REFRAC     83
      RCAPV(J)  =  BV(J) - TEMP * L(J)                                  REFRAC     84
  330 CONTINUE                                                          REFRAC     85
  340 RCAPM  =  SQRT(DOTP(RCAPV, RCAPV))                                REFRAC     86
      GAMO = 180. - ACOS( RCAPV(2) / RCAPM) * DPR                       REFRAC     87
      R    = SQRT( DOTP( RV,RV) )                                       REFRAC     88
      X(4) = R / DIANI                                                  REFRAC     89
      CTTP = CTO / (STO - 0.5 / X(4))                                   REFRAC     90
      DU   = 2. * X(4) / STO                                            REFRAC     91
      TM1  = DU * CTTP                                                  REFRAC     92
      TM2  = F1 - DU                                                    REFRAC     93
C                                                                       REFRAC     94
C  CRITICAL ANGLE CALC.                                                 REFRAC     95
      CP2  =  F1 / (RM + CR)                                            REFRAC     96
      IF(ABS(CP2).GT.1.) CP2 = SIGN(1.,CP2)                             REFRAC     97
      SP2  =  SQRT(F1 - CP2*CP2)                                        REFRAC     98
      DX   =  ATAN(SP2 / (X(1) + CP2)) * DPR                            REFRAC     99
      AC   =  X(5) + ACF * (DX - (ASF + X(5)))                          REFRAC    100
      IF  (X(5) - AC)  220, 220, 5                                      REFRAC    101
    5 I  =  -I1                                                         REFRAC    102
      K  =  2                                                           REFRAC    103
      DX  =  FC                                                         REFRAC    104
C                                                                       REFRAC    105
C  FIRST FUNCTION EVALUATION                                            REFRAC    106
   10 COTT1  =  TM1 + TM2 * DX                                          REFRAC    107
      CT1  =  COTT1 / SQRT(F1 + COTT1*COTT1)                            REFRAC    108
      ST1S  =  F1 - CT1*CT1                                             REFRAC    109
      RAD  =  F1 - SMJ * ST1S                                           REFRAC    110
      IF  (RAD)  20, 20, 30                                             REFRAC    111
   20 CP1  =  -F1 / X(2)                                                REFRAC    112
      GO TO 40                                                          REFRAC    113
   30 CP1  =  -X(2) * ST1S + CT1 * SQRT(RAD)                            REFRAC    114
   40 CP2  =  RM * CP1 + CR                                             REFRAC    115
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```
      IF  (CP2)  50, 60, 50                                          REFRAC    116
   50 CP2  =  CP1 / CP2                                              REFRAC    117
      SP2  =  F1 - CP2*CP2                                           REFRAC    118
      IF  (SP2)  60, 60, 70                                          REFRAC    119
   60 CP2  =  -F1 / (RM + CR)                                        REFRAC    120
      CP2  =  .5 * (CP2 + CTC)                                       REFRAC    121
      SP2  =  F1 - CP2*CP2                                           REFRAC    122
      IF  (SP2)  65, 65, 70                                          REFRAC    123
   65 COTT  =  -OMEGA                                                REFRAC    124
      GO TO 180                                                      REFRAC    125
   70 SP2  =  SQRT(SP2)                                              REFRAC    126
      COTT  =  (X(1) + CP2) / SP2                                    REFRAC    127
   80 IF  (I)  90, 110, 160                                          REFRAC    128
C                                                                    REFRAC    129
C  WEGSTEINS ITERATION                                               REFRAC    130
   90 DU  =  COTT - DX                                               REFRAC    131
      IF  (ABS(DU) - EPS * ABS(COTT))  180, 180, 100                 REFRAC    132
  100 DV  =  -DU                                                     REFRAC    133
      DX  =  COTT                                                    REFRAC    134
      I  =  I0                                                       REFRAC    135
C                                                                    REFRAC    136
C  SECOND FUNCTION EVALUATION                                        REFRAC    137
      GO TO 10                                                       REFRAC    138
  110 DY  = DX - COTT                                                REFRAC    139
      I  =  I1                                                       REFRAC    140
      IF  (ABS(DY) - EPS * ABS(COTT))  180, 180, 120                 REFRAC    141
  120 K  =  K + I1                                                   REFRAC    142
      IF  (K - MAXIT)  130, 130, 180                                 REFRAC    143
  130 IF  (DY)  140, 180, 140                                        REFRAC    144
  140 DV  =  DV / DY - F1                                            REFRAC    145
      IF  (DV)  150, 180, 150                                        REFRAC    146
  150 DU  =  DU / DV                                                 REFRAC    147
      DX  =  DX + DU                                                 REFRAC    148
      DV  =  DY                                                      REFRAC    149
C                                                                    REFRAC    150
C  THIRD TO MAXIT FUNCTION EVALUATIONS                               REFRAC    151
      GO TO 10                                                       REFRAC    152
  160 DY  =  DX - COTT                                               REFRAC    153
      RAD  =  ABS(DX) * EPS                                          REFRAC    154
      IF  (ABS(DU) - RAD)  170, 170, 120                             REFRAC    155
  170 IF  (ABS(DY) - 10.*RAD)  180, 180, 120                         REFRAC    156
  180 DX  =  COTT                                                    REFRAC    157
      IF  (DX)  190, 200, 210                                        REFRAC    158
  190 DX  =  180. + DPR * ATAN(F1 / DX)                              REFRAC    159
      GO TO 220                                                      REFRAC    160
  200 DX  =  90.                                                     REFRAC    161
      GO TO 220                                                      REFRAC    162
  210 DX  =  DPR * ATAN(F1 / DX)                                     REFRAC    163
  220 DX  =  X(5) + ACF * (DX - (ASF + X(5)))                        REFRAC    164
  221 CT  =  COS(RPD * DX)                                           REFRAC    165
      ST  =  SQRT(F1 - CT*CT)                                        REFRAC    166
      RAD  =  X(1) * ST                                              REFRAC    167
      RAD  =  F1 - RAD*RAD                                           REFRAC    168
      IF  (RAD)  223, 223, 225                                       REFRAC    169
  223 CP2  =  -F1 / X(1)                                             REFRAC    170
      GO TO 227                                                      REFRAC    171
  225 CP2  =  -X(1) * ST * ST + CT * SQRT(RAD)                       REFRAC    172
```

```
  227 IF(ABS(CP2).GT.1.) CP2 = SIGN(1.,CP2)                          REFRAC    173
      SP2 = SQRT(F1-CP2*CP2)                                         REFRAC    174
      IF(ABS(SP2).LT.EPS)SP2=EPS                                     REFRAC    175
C                                                                    REFRAC    176
C  NEW SOURCE AXIAL LOCATION VECTOR GRAZING WING EDGE.               REFRAC    177
      RPV(1) = RV(1)                                                 REFRAC    178
      RPV(2)  =  -R * STO * CP2 / SP2                                REFRAC    179
      RPV(3) = RV(3)                                                 REFRAC    180
C                                                                    REFRAC    181
C     CALCULATE EFFECTS FOR PRESENCE OF THE WING, RELATIVE FLOW      REFRAC    182
C     TURNING AND DUCTING AND COMPUTE OUTPUT COORDINATES             REFRAC    183
C                                                                    REFRAC    184
      RCAPV(2)  =  RCAPV(2) + (RPV(2) - RV(2))                       REFRAC    185
      COSG1  =  -RCAPV(2) / SQRT(DOTP(RCAPV, RCAPV))                 REFRAC    186
      GAM1  =  ACOS(COSG1) * DPR                                     REFRAC    187
      BETAX=TBLU1(COTPC,CPSIC,BETA,1,NASRO)                          REFRAC    188
      BETAX  =  AMIN1(BETAX, DDYOD*DDYCD - 0.088)                    REFRAC    189
      SING1  =  SQRT(F1 - COSG1*COSG1)                               REFRAC    190
      IF(ABS(SING1).LT.EPS)SING1=EPS                                 REFRAC    191
      COTG1=COSG1/SING1                                              REFRAC    192
      DL=.5*DIANI*BETAX                                              REFRAC    193
      SGPD=SIN((GAM1+DEL)*RPD)                                       REFRAC    194
      IF  (ABS(SGPD) .LT. EPS)  GO TO 820                            REFRAC    195
      SDEL  =  W(2)                                                  REFRAC    196
      CDEL  =  SQRT(F1 - W(2)*W(2))                                  REFRAC    197
      SGMGO=SIN((GAM1-GAMO)*RPD)                                     REFRAC    198
      DL=(DL*SING1*CDEL-RCAPM*SDEL*SGMGO)/SGPD                       REFRAC    199
      CL=DL*COTG1                                                    REFRAC    200
      GO TO 830                                                      REFRAC    201
  820 CL=0.0                                                         REFRAC    202
  830 CONTINUE                                                       REFRAC    203
C                                                                    REFRAC    204
C     MODIFY  COMPONENTS OF RPV IN DIRECTION OF FLOW AND NORMAL TO   REFRAC    205
C     HALF-PLANE FOR EFFECT OF WING PRESENCE, I.E. ADD TERMS (CL, DL) REFRAC   206
C                                                                    REFRAC    207
      P1 = DOTP(RPV,E1)                                              REFRAC    208
      P2 = DOTP(RPV,E2)+CL                                           REFRAC    209
      P3 = DOTP(RPV,E3)+DL                                           REFRAC    210
      DO 850 J=1,3                                                   REFRAC    211
      RPV(J) = P1*E1(J) + P2*E2(J) + P3*E3(J)                        REFRAC    212
  850 CONTINUE                                                       REFRAC    213
      TEMP  =  DOTP(RPV, U)                                          REFRAC    214
      DO 860 J=1,3                                                   REFRAC    215
      ROPV(J) = RPV(J) - TEMP * U(J)                                 REFRAC    216
  860 CONTINUE                                                       REFRAC    217
C                                                                    REFRAC    218
C  COMPUTE APPARENT SOURCE POLAR COORDINATES RE. H.P.                REFRAC    219
      ROP  =  SQRT(DOTP(ROPV, ROPV))                                 REFRAC    220
      THOP  =  DPR * ACOS(DOTP(ROPV,V) / ROP)                        REFRAC    221
C                                                                    REFRAC    222
      RETURN                                                         REFRAC    223
      END                                                            REFRAC    224
```

```
      SUBROUTINE RESCAL(NUMBER,ARRAY)                                   RESCAL     2
C AUTHOR              D. F. MELDRUM                                     RESCAL     3
C                                                                       RESCAL     4
C PURPOSE             TO RESCALE THE INDEPEND VARIABLE FOR THE BASIC DATA RESCAL   5
C                     CURVES FOR DISCRETE TONES AND BROADBAND TO A LOG  RESCAL     6
C                     SCALE.                                            RESCAL     7
C                                                                       RESCAL     8
C INPUTS              NUMBER     NUMBER OF POINTS TO RESCALE.           RESCAL     9
C                     ARRAY      ARRAY OF VARIABLES TO RESCALE.         RESCAL    10
C                                                                       RESCAL    11
C OUTPUTS             ARRAY      LOG OF THE INPUT ARRAY.                RESCAL    12
C                                                                       RESCAL    13
C FUNCTION SUBPRGM    ALOG10                                            RESCAL    14
C                                                                       RESCAL    15
C                                                                       RESCAL    16
      DIMENSION ARRAY(NUMBER)                                           RESCAL    17
      DO 100 I=1,NUMBER                                                 RESCAL    18
  100 ARRAY(I)=ALOG10(ARRAY(I))                                         RESCAL    19
      RETURN                                                            RESCAL    20
      END                                                               RESCAL    21
```

```
      SUBROUTINE SDSPLP(DISTX,NPSIX,PSIX,MAXPSI,NCF,USPL,NPSI,PSI,
     1                  DLTSPL)
C  TITLE
C     SHIELDING ATTENUATION
C
C  PURPOSE
C     THIS SUBROUTINE COMPUTES THE SHIELDING ATTENUATION GIVEN THE
C     SHIELDED MEAN SQUARE PRESSURE PER FLIGHT POSITION AND
C     FREQUENCY SUMMED OVER THE EDGES AND X-COORDINATE
C
C  INPUT
C     DISTX     AIRCRAFT COORDINATE DISTANCE X
C     NPSIX     NUMBER OF PSIX
C     PSIX      ARRAY OF DIRECTIVITY ANGLES AT WHICH USPL ARE GIVEN
C     MAXPSI    COLUMN DIMENSION OF USPL
C     NCF       NUMBER OF FREQUENCIES BCF
C     USPL      UNSHIELDED SPL VERSUS PSIX AND FREQUENCIES IN BCF
C     NPSI      NUMBER OF PSI
C     PSI       ARRAY OF DIRECTIVITY ANGLES AT WHICH DLTSPL ARE GIVEN
C     DLTSPL    UPON INPUT, THIS IS ARRAY OF PS2 VERSUS FREQUENCY AND PSI
C
C OUTPUT
C     DLTSPL    UPON OUTPUT, THIS IS THE SHIELDING ATTENUATION VERSUS
C               FREQUENCY AND PSI
C
C
      COMMON/EWGEO/DMY(12),IES
C
      DIMENSION PSIX(1),USPL(MAXPSI,1),PSI(1),DLTSPL(24,1)
C
      C = 0.
      IF(DISTX.NE.0..AND.IES.EQ.0)C=3.
C
C     LOOP ON FREQUENCY AND DIRECTIVITY ANGLE PSI
C
      DO 100 IF=1,NCF
      DO 100 IPSI=1,NPSI
C
C     COMPUTE UNSHIELD SPL AT THIS FREQUENCY AND PSI BY INTERPOLATION
C
      USPLI=TBLU1(PSI(IPSI),PSIX,USPL(1,IF),2,NPSIX)
C
C     COMPUTE TOTAL SHIELDED SOUND PRESSURE AND SUBTRACT FROM UNSHIELDED
C     TO FORM THE SHIELDED ATTENUATION
C
      SSPL = 0.
      PT2 = DLTSPL(IF,IPSI)
      IF( PT2.GT.0. ) SSPL = 10.*ALOG10( PT2 ) - C
      DLTSPL(IF,IPSI) = USPLI - SSPL
  100 CONTINUE
C
      RETURN
      END
```

```
      SUBROUTINE SHATTN(IMACH,CZ,NCF,BCF,NPSIX,PSIX,MAXPSI,USPL,ISPTRM,  SHATTN     2
     1                  DISTX,APY,APZ,ALTR,NPSI,PSI,DELT3,ITYPE,DLTSPL)  SHATTN     3
C                                                                        SHATTN     4
C  TITLE                                                                 SHATTN     5
C     WING SHIELDING CALCULATION MODULE                                  SHATTN     6
C                                                                        SHATTN     7
C  PURPOSE                                                               SHATTN     8
C     THIS SUBROUTINE CALCULATES WING SHIELDING DELTA-SPL WHICH CONSISTS SHATTN     9
C     OF THE FOLLOWING SUB-TASKS OR MODULES                              SHATTN    10
C         MULTIPLE EDGES                                                 SHATTN    11
C         JET REFRACTION                                                 SHATTN    12
C         UNIFORM FLOW                                                   SHATTN    13
C         EDGE DIFRACTION                                                SHATTN    14
C                                                                        SHATTN    15
C  INPUT - CALLING SEQUENCE                                              SHATTN    16
C     AMACH  - AIRCRAFT MACH NUMBER FROM COMMON GPRAM                    SHATTN    17
C     CZ     - AMBIENT SPEED OF SOUND AT AIRCRAFT ALTITUDE               SHATTN    18
C              FROM COMMON GEOMO                                         SHATTN    19
C     NCF    - NUMBER OF FREQUENCIES, 8 OR 24                            SHATTN    20
C     BCF    - 1/3 O. B. OR FULL O. B. GEOMETRIC MEAN CENTER FREQUENCIES SHATTN    21
C              FROM COMMON GCOMON                                        SHATTN    22
C     NPSIX  - NUMBER OF DIRECTIVITY ANGLES IN PSIX BELOW AT MOST MAXPSI SHATTN    23
C     PSIX   -  DIRECTIVITY ANGLES IN DEGREES AT WHICH USPL ARE DEFINED  SHATTN    24
C              BELOW                                                     SHATTN    25
C     MAXPSI - COLUMN OR VARIABLE DIMENSION OF USPL                      SHATTN    26
C     USPL   - UNSHIELDED SPL VERSUS PSIX AND BCF MATRIX IN THAT ORDER   SHATTN    27
C              AT STATIC CONDITIONS. THESE MAY BE OBTAINED FROM INPUT,   SHATTN    28
C              TABLE OR PREDICTED VALUES                                 SHATTN    29
C     ISPTRM - FILTER BAND WIDTH INDICATOR FROM COMMON GPRAM             SHATTN    30
C              = 0 USE .1 FOR 1/3 OCTAVE BANDS                           SHATTN    31
C                1 USE .3 FOR FULL OCTAVE BANDS                          SHATTN    32
C     DISTX  - AIRCRAFT COORDINATE DISTANCE X FROM COMMON GPRAM  FOR     SHATTN    33
C              THIS OBSERVER POSITION, I.E. A VALUE FROM SLDIST          SHATTN    34
C     APY    - ARRAY OF 17 AIRCRAFT COORDINATES Y FROM COMMON GEOMO FOR  SHATTN    35
C              THIS OBSERVER, A ROW FROM APY                             SHATTN    36
C     APZ    - ARRAY OR 17 AIRCRAFT COORDINATES Z FROM COMMON GEOMO FOR  SHATTN    37
C              THIS OBSERVER, A ROW FROM APZ                             SHATTN    38
C     ALTR   - OBSERVER HEIGHT FROM COMMON GPRAM                         SHATTN    39
C     NPSI   - NUMBER OF DIRECTIVITY ANGLES PSI BELOW (SHOULD BE 17)     SHATTN    40
C     PSI    - DIRECTIVITY ANGLES RELATIVE TO ENGINE INLET PHI FOR SOUND SHATTN    41
C              PROPAGATING TO THE OBSERVER (DEG)                         SHATTN    42
C     DELT3  - ENGINE INCLINATION ANGLE RELATIVE TO HORIZION (DEG)       SHATTN    43
C     ITYPE  - = 4 FOR INLET FAN NOISE                                   SHATTN    44
C              NOT 4 FOR DISCHARGE TURBOMACHINERY NOISE                  SHATTN    45
C                                                                        SHATTN    46
C  INPUT - COMMON                                                        SHATTN    47
C     EWGEO  - ENGINE/WING GEOMETRY VARIABLES                            SHATTN    48
C     REFRAC - NOISE COMPONET REFRACTION VARIABLES                       SHATTN    49
C                                                                        SHATTN    50
C  OUTPUT                                                                SHATTN    51
C     DLTSPL - ARRAY OF SHIELDING DELTA-SPL VERSUS BCF AND PSI, 24 BY 17 SHATTN    52
C                                                                        SHATTN    53
      DIMENSION BCF(1),PSIX(1),USPL(MAXPSI,1),APY(1),APZ(1),PSI(1),      SHATTN    54
     1          DLTSPL(24,1)                                             SHATTN    55
      COMMON/EWGEO/ SWPTE,SWPLE,DIHED,DDSD,DDX1D,DDX2D,DDXOD,DDY1D,      SHATTN    56
     1              DDY2D,DDYOD,DDLD,DIAMI,IES                           SHATTN    57
      COMMON/REFRAC/EMJ,TSTSC,IWED(3),FASS(24),BETA(24),CPSIC(24),NASRO, SHATTN    58
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     * ASF,IWSFE                                                        SHATTN     59
C                                                                       SHATTN     60
      DIMENSION U(3),V(3),E1(3),E2(3),E3(3), ROV(3),ZEDN(17),PN(3),W(3) SHATTN     61
     *          ,AF(3),BV(3)                                            SHATTN     62
C                                                                       SHATTN     63
C  TEST TO SEE IF FLIGHT EFFECTS FOR WING SHIELDING ARE NOT TO BE USED. SHATTN     64
      AMACH  =  TMACH                                                   SHATTN     65
      IF  (IWSFE .NE. 0)  AMACH = 0.                                    SHATTN     66
C                                                                       SHATTN     67
C     INITIALIZE DLTSPL TO ZERO FOR ACCUMULATION OF PS2                 SHATTN     68
C                                                                       SHATTN     69
      DO 90 IP=1,17                                                     SHATTN     70
      DO 90 IF=1,24                                                     SHATTN     71
      DLTSPL(IF,IP) = 0.                                                SHATTN     72
   90 CONTINUE                                                          SHATTN     73
C                                                                       SHATTN     74
C     LOOP ON THE EDGES THAT ARE TURNED ON                              SHATTN     75
C                                                                       SHATTN     76
      DO 1000 IEDGE=1,3                                                 SHATTN     77
      IF( IWED(IEDGE).EQ.0 ) GO TO 1000                                 SHATTN     78
C                                                                       SHATTN     79
C     COMPUTE THE ENGINE/EDGE GEOMETRY                                  SHATTN     80
C                                                                       SHATTN     81
      CALL EEGEOM(IEDGE,ITYPE,                                          SHATTN     82
     1            U,V,W,E1,E2,E3,RO,THO,ROV,BV,DLT,ALP,ALPO,AF)         SHATTN     83
C                                                                       SHATTN     84
C     LOOP ON DISTX, ALWAYS EXECUTE THE LOOP ONCE AND WHEN DISTX IS     SHATTN     85
C     NOT ZERO, SET NEGATIVE AND RE-EXECUTE                             SHATTN     86
C                                                                       SHATTN     87
      X = DISTX                                                         SHATTN     88
      DO 900 IX=1,2                                                     SHATTN     89
      IF( IX.EQ.1) GO TO 210                                            SHATTN     90
      IF(X.EQ.0.)GO TO 900                                              SHATTN     91
      IF(IES.NE.0)GO TO 900                                             SHATTN     92
      X = -X                                                            SHATTN     93
  210 CONTINUE                                                          SHATTN     94
C                                                                       SHATTN     95
C     LOOP ON THE FLIGHT PATH POSITION                                  SHATTN     96
C                                                                       SHATTN     97
      DO 800 IPSI=1,NPSI                                                SHATTN     98
C                                                                       SHATTN     99
C     CORRECT AIRCRAFT HEIGHT FOR OBSERVER HEIGHT                       SHATTN    100
C                                                                       SHATTN    101
      ZEDN(IPSI) = APZ(IPSI) - ALTR                                     SHATTN    102
C                                                                       SHATTN    103
C     COMPUTE EDGE/OBSERVER GEOMETRY                                    SHATTN    104
C                                                                       SHATTN    105
      CALL EOGEOM(  X  ,APY(IPSI),ZEDN(IPSI),DELT3,U,V,W,THO,DLT,ALP,   SHATTN    106
     1            ETA,TH,PSIO,PN)                                       SHATTN    107
C                                                                       SHATTN    108
C     TEST FOR INLET FAN (NO REFRACTION)                                SHATTN    109
C                                                                       SHATTN    110
      IF(ITYPE.NE.4)GO TO 300                                           SHATTN    111
      ROP=RO                                                            SHATTN    112
      THOP=THO                                                          SHATTN    113
      GO TO 400                                                         SHATTN    114
C                                                                       SHATTN    115
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C     COMPUTE JET FLOW REFRACTION EFFECTS                                SHATTN    116
C                                                                        SHATTN    117
  300 CALL REFRACT(AMACH,PSIO,ETA,DLT,RO,RCV,BV,U,V,W,E1,E2,E3,THO,      SHATTN    118
     1             ROP,THOP)                                             SHATTN    119
C                                                                        SHATTN    120
C     COMPUTE UNIFORM FLOW EFFECTS                                       SHATTN    121
C                                                                        SHATTN    122
  400 CALL  UNIFLW(AF,U,V,W,AMACH,RCP,THCP,TH,ETA,PSI(IPSI),ALP,DLT,     SHATTN    123
     1             GAM,ROPP,THOPP,THP,ETAP,TLE,PSIO,PSIOP)               SHATTN    124
C                                                                        SHATTN    125
C     SET FILTER BANDWIDTH AND LOOP ON FREQUENCY                         SHATTN    126
C                                                                        SHATTN    127
      BW = .1                                                            SHATTN    128
      IF(ISPTRM.EQ.1)BW=.3                                               SHATTN    129
      DO 700 IF =1,NCF                                                   SHATTN    130
C                                                                        SHATTN    131
C     COMPUTE EDGE DIFFRACTION                                           SHATTN    132
C                                                                        SHATTN    133
      CALL EDGEDI(NPSIX,PSIX,BCF(IF),        USPL(1,IF),CZ,THP,          SHATTN    134
     1             GAM,ROPP,THOPP,ETAP,PSIO,PSIOP,BW,TLE,                SHATTN    135
     2             PS2)                                                  SHATTN    136
C                                                                        SHATTN    137
C     SUPERPOSITION OF EDGE SOLUTIONS AND X LOOP ALSO                    SHATTN    138
C                                                                        SHATTN    139
      DLTSPL(IF,IPSI) = DLTSPL(IF,IPSI) + PS2                            SHATTN    140
C                                                                        SHATTN    141
C     END ALL FOUR LOOPS                                                 SHATTN    142
C                                                                        SHATTN    143
  700 CONTINUE                                                           SHATTN    144
  800 CONTINUE                                                           SHATTN    145
  900 CONTINUE                                                           SHATTN    146
 1000 CONTINUE                                                           SHATTN    147
C                                                                        SHATTN    148
C     COMPUTE TOTAL SOUND PRESSURE LEVEL AND THE ATTENUATION DUE TO      SHATTN    149
C     WING SHIELDING FOR EACH FREQUENCY AND FLIGHT PATH POSITION         SHATTN    150
C                                                                        SHATTN    151
      CALL SDSPLP(DISTX,NPSIX,PSIX,MAXPSI,NCF,USPL,NPSI,PSI,             SHATTN    152
     1             DLTSPL)                                               SHATTN    153
C                                                                        SHATTN    154
      RETURN                                                             SHATTN    155
      END                                                                SHATTN    156
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      SUBROUTINE SHELL(X,K,N)                                           SHELL
C     S01204   SHELL    PS-481     STD SUB DEV GRP  670511 6600        SHELL
C                                                                       SHELL
C AUTHOR                R.H.HAVIG                                       SHELL
C                                                                       SHELL
C     FORTAN IV SUBROUTINE SHELL ORDERS ARRAY X IN ASCENDING MANNER     SHELL
C          X IS THE ARRAY TO BE ORDERED                                 SHELL
C          N IS THE LENGTH OF X                                         SHELL
C          K WILL BE AN INDEX ARRAY FOR ORDERING DEPENDENT ARRAYS       SHELL
C**** TYPE X AND TEMP AS INTEGER IF X IS INTEGER ARRAY                  SHELL
      DIMENSION X(1),K(1)                                               SHELL
      INTEGER K                                                         SHELL
C  IBM SYS360 + 370                                                     SHELL
C     REAL*8 X, TEMP                                                    SHELL
      IF(N.LE.0)RETURN                                                  SHELL
C     ASSIGN INTEGERS 1 THRU N INTO ARRAY K                             SHELL
      DO  1000  J=1,N                                                   SHELL
 1000 K(J)=J                                                            SHELL
      M=N                                                               SHELL
 1010 M=M/2                                                             SHELL
      IF (M) 1070,1070,1020                                             SHELL
 1020 NM=N-M                                                            SHELL
      DO  1060  J=1,NM                                                  SHELL
 1030 I=J                                                               SHELL
 1040 L=I+M                                                             SHELL
      IF (X(I)-X(L))  1060,1060,1050                                    SHELL
C     EXCHANGE  X(I) WITH X(L)                                          SHELL
 1050 TEMP=X(I)                                                         SHELL
      X(I)=X(L)                                                         SHELL
      X(L)=TEMP                                                         SHELL
C          EXCHANGE K(I)  WITH K(L)                                     SHELL
      NTEMP=K(I)                                                        SHELL
      K(I)=K(L)                                                         SHELL
      K(L)=NTEMP                                                        SHELL
      I=I-M                                                             SHELL
      IF (I-1) 1060,1040,1040                                           SHELL
 1060 CONTINUE                                                          SHELL
      GO TO  1010                                                       SHELL
 1070 CONTINUE                                                          SHELL
C     WRITE (6,100)(K(I),I=1,N)                                         SHELL
 9000 FORMAT(5(3X,I5)  )                                                SHELL
      RETURN                                                            SHELL
      END                                                               SHELL
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      SUBROUTINE SHELXH(Y,K,DUM,N)                                      SHELXH     2
C      AUTHOR   R.H. HAVIG                                              SHELXH     3
C      PURPOSE   TO ORDER ARRAY Y ACCORDING TO THE INDEX OF THE K ARRAY  SHELXH     4
C      THIS SUBROUTINE IS A MODIFIED VERSION OF THE SHELLX VERSION 1    SHELXH     5
C      PS-481  THE WORKING ARRAY DUM IS PASSED THROUGH TEH CALLING      SHELXH     6
C      SEQUENCE                                                         SHELXH     7
C                                                                       SHELXH     8
C      INPUTS     Y = THE ARRAY TO BE ORDERED                           SHELXH     9
C                 K = INDEX ARRAY USED TO ORDER Y ARRAY                 SHELXH    10
C                 DUM = WORKING ARRAY WIT LENGTH EQUAL TO Y ARRAY       SHELXH    11
C                 N = LENGHT OF ARRAY Y,K,DUM                           SHELXH    12
C                 Y = ORDERED ARRAY                                     SHELXH    13
      DIMENSION Y(1),K(1),DUM(1)                                        SHELXH    14
      INTEGER K                                                         SHELXH    15
      DO  1000  J=1,N                                                   SHELXH    16
      L=K(J)                                                            SHELXH    17
 1000 DUM(J)=Y(L)                                                       SHELXH    18
      DO  1010  J=1,N                                                   SHELXH    19
 1010 Y(J)=DUM(J)                                                       SHELXH    20
      RETURN                                                            SHELXH    21
      END                                                               SHELXH    22
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      SUBROUTINE SHLDSP(AMACH,ALTR,ISPTRM,CZ,SLDIST,IOBS,APY,APZ,DOPSF,   SHLDSP
     *                  SPLT,NCF,BCF,SPZ,PSI,ITYPE,DELT3,ISW3)            SHLDSP
C     PURPOSE        TO ADD TO THE SPL EVALUATED FOR EACH OF THE         SHLDSP
C                    NOISE COMPONENTS AFT ,CORE,INLET,AND TURBINE        SHLDSP
C                    THE ATTENUATION DUE TO WING SHIELDING(ECW ONLY)     SHLDSP
C                    THE SHIELDING ATTENUATION SPECTRUM IS DETERMINED    SHLDSP
C                    BY A CALL TO SUBROUTINE SHATTN.                     SHLDSP
C                    THE ATTENUATION IS DOPPLER SHIFTED,AND SUMMED       SHLDSP
C                    WITH THE CONFIGURATION CORRECTION TO GIVE THE       SHLDSP
C                    TOTAL CORRECTION WHICH IS THEN APPLIED TO THE       SHLDSP
C                    BARE ENGINE SPL                                     SHLDSP
C                                                                        SHLDSP
C     INPUT APPLICABLE TO SHLDSP                                         SHLDSP
C                                                                        SHLDSP
C         DOPSF      ARRAY OF DOPPLER SHIFT FACTORS                      SHLDSP
C         ISPTRM     =0 FOR 24 PREFERRED 1/3 OCTAVE BANDS                SHLDSP
C                    =1 FOR 8 PREFERRED 1/1 OCTAVE BANDS                 SHLDSP
C         ITYPE      NOISE COMPONENT INDICATOR                           SHLDSP
C                    =4 INLET FAN                                        SHLDSP
C                    =5 AFT FAN                                          SHLDSP
C                    =3 CORE OR TURBINE                                  SHLDSP
C         ISW3       INDICATES WHEATHER CORE OR TURBINE                  SHLDSP
C                    =2 CORE NOISE ONLY                                  SHLDSP
C                    =3 TURBINE NOISE ONLY                               SHLDSP
C         NCF        NO. OF REQUENCY BANDS 8 OR 24                       SHLDSP
C         IOBS       THE ITH OBSERVER REFERENCE                          SHLDSP
C         SPLT       A MATRIX OF UNSHIELDED SPL SPECTRA AT               SHLDSP
C                    FLIGHT INDEX CONDITION                              SHLDSP
C         SPZ        CONFIGURATION CORRECTIONS AT FLIGHT CONDITIONS      SHLDSP
C                                                                        SHLDSP
C     INPUT APPLICABLE TO WING SHIELDING ATTENUATION                     SHLDSP
C                                                                        SHLDSP
C         AMACH      AIRCRAFT MACH NO                                    SHLDSP
C         CZ         AMBIENT SPEED OF SOUND AT A/C ALTITUDE ZO           SHLDSP
C         DELT3      ENGINE ATTITUDE ANGLE RE TO HORIZON                 SHLDSP
C         SLDIST     SIDE LINE DIST. REL. TO THE OBSERVER                SHLDSP
C         APY        A/C CORDINATES RELATIVE                             SHLDSP
C         APZ        TO EACH OBSERVER POSITION                           SHLDSP
C         ALTR       OBSERVER HEIGHT ABOVE GROUND                        SHLDSP
C         NPSI       NO OF DIRECTIVITY ANGLES                            SHLDSP
C         PSI        DIRECTIVITY ANGLES RE TO ENGINE INLET C.L.          SHLDSP
C         BCF        1/3 OR 1/1 OCTAVE BAND GEOMETRIC MEAN FREQUENCIES   SHLDSP
C                                                                        SHLDSP
C     INPUT FROM LABELED COMMON UNSHLD                                   SHLDSP
C                                                                        SHLDSP
C         USPLA      EMPIRICAL DIRECTIVITY CURVE OF UNSHIELDED SPL       SHLDSP
C         FSI        AT STATIC CONDITIONS(BUILT-IN VALUES)               SHLDSP
C         NUSPL      NUMBER OF POINTS IN THE EMPIRICAL CURVE             SHLDSP
C         INUSP      INDICATOR TO DECIDE THE DIRECTIVITY CURVE TO USE    SHLDSP
C                    THAT IS IF                                          SHLDSP
C                    INUSP=0     USE PREDICTED VALUES                    SHLDSP
C                    INUSP=1     USE BUILT-IN VALUES                     SHLDSP
C                    INUSP.GT.1 USE INPUT VALUES                         SHLDSP
C                                                                        SHLDSP
C     OUTPUT                                                             SHLDSP
C                                                                        SHLDSP
C         SPZ        CONFIGURATION CORRECTIONS AND SHIELDING ATTUENUATION SHLDSP
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C          SPLT       A MATRIX OF SHIELDED SPECTRA                          SHLDSP     59
C      NOTE                                                                 SHLDSP     60
C          USPL       A MATRIX OF UNSHIELDED SPECTRA WITH DOPPLER           SHLDSP     61
C                     EFFECTS REMOVED GENERALLY PREDICTED BUT               SHLDSP     62
C                     COULD BE INPUT OR MADE UP OF BUILT-IN VALUES          SHLDSP     63
C                                                                           SHLDSP     64
C                                                                           SHLDSP     65
C      UNSHIELDED DIRECTIVITY CURVE   DATA                                  SHLDSP     66
C                                                                           SHLDSP     67
       COMMON/UNSHLD/USPLA(19),FSI(19),NUSPL,INUSP                          SHLDSP     68
       DIMENSION DUM(19),YCO(17),ZCO(17),PSIX(19),USPL(19,24),KIN(19),      SHLDSP     69
      *DLTSPL(24,17),APY(10,17),APZ(10,17),SPLT(24,17),SPZ(24,17),FJ(24),   SHLDSP     70
      *SLDIST(10),DOPSF(17),BCF(24),PSI(17,10)                              SHLDSP     71
C                                                                           SHLDSP     72
       DATA NPSI,MAXPSI/17,19/                                              SHLDSP     73
       DATA FJ/1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,13.,                  SHLDSP     74
      *14.,15.,16.,17.,18.,19.,20.,21.,22.,23.,24./                         SHLDSP     75
C                                                                           SHLDSP     76
C      ZERO OUT MATRIX AND SET VARIABLES                                    SHLDSP     77
C                                                                           SHLDSP     78
       CALL ZERO(USPL,408)                                                  SHLDSP     79
       EN=4.                                                                SHLDSP     80
       IF(ITYPE.EQ.3.AND.ISW3.EQ.2)EN=2.                                    SHLDSP     81
C                                                                           SHLDSP     82
C      BANDWIDTH IN 1/3 OCTAVES                                             SHLDSP     83
C                                                                           SHLDSP     84
       BW=1.                                                                SHLDSP     85
       IF(ISPTRM.NE.0)BW=3.                                                 SHLDSP     86
       DISTX=SLDIST(IOBS)                                                   SHLDSP     87
C                                                                           SHLDSP     88
C       STORE COORDINATES FOR EACH OBSERVER TO TRANSFER TO SHATTN           SHLDSP     89
       DO 50 K=1,NPSI                                                       SHLDSP     90
       YCO(K)=APY(IOBS,K)                                                   SHLDSP     91
    50 ZCO(K)=APZ(IOBS,K)                                                   SHLDSP     92
C                                                                           SHLDSP     93
C      TEST FOR WHICH DIRECTIVITY CURVE TO USE                              SHLDSP     94
C                                                                           SHLDSP     95
       IF(INUSP.NE.0)GO TO 450                                              SHLDSP     96
C                                                                           SHLDSP     97
C      USE PREDICTED VALUES REMOVING DOPPLER EFFECT                         SHLDSP     98
C                                                                           SHLDSP     99
       NPSIX=NPSI                                                           SHLDSP    100
       DO 100 K=1,NPSIX                                                     SHLDSP    101
       DELTAL=10.*ALOG10(DOPSF(K))                                          SHLDSP    102
       DELTAB=DELTAL/BW                                                     SHLDSP    103
       PSIX(K)=PSI(K,IOBS)                                                  SHLDSP    104
       DO 100 J=1,NCF                                                       SHLDSP    105
       FJDB= FJ(J)  -DELTAB                                                 SHLDSP    106
       SPLJ=TBLU1(FJDB,FJ,SPLT(1,K),1,NCF)                                  SHLDSP    107
       USPL(K,J)=SPLJ+EN*DELTAL                                             SHLDSP    108
   100 CONTINUE                                                             SHLDSP    109
C                                                                           SHLDSP    110
C      SORT THE DIRECTIVITY ANGLE IN MONOTONICALLY ASCENDING                SHLDSP    111
C      ORDER AND CORRESPONDINGLY ADJUST THE PREDICTED UNSHIELDED SPL        SHLDSP    112
C                                                                           SHLDSP    113
       CALL SHELL(PSIX,KIN,NPSIX)                                           SHLDSP    114
       DO 200 J=1,NCF                                                       SHLDSP    115
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      CALL SHELXH(USPL(1,J), KIN, DLM, NPSIX)                           SHLDSP    116
  200 CONTINUE                                                          SHLDSP    117
C                                                                       SHLDSP    118
C     ADJUST FOR EQUAL DIRECTIVITY ANGLES                               SHLDSP    119
C                                                                       SHLDSP    120
      MPSI=NPSIX-1                                                      SHLDSP    121
      DO 300 ISI=2,MPSI                                                 SHLDSP    122
      IF(PSIX(ISI-1).NE.PSIX(ISI))GO TO 300                             SHLDSP    123
      PSIX(ISI)=PSIX(ISI)+1.E-3*(PSIX(ISI+1)-PSIX(ISI))                 SHLDSP    124
  300 CONTINUE                                                          SHLDSP    125
      IF(PSIX(MPSI).NE.PSIX(NPSI))GO TO 650                             SHLDSP    126
      PSIX(MPSI)=PSIX(MPSI)-1.E-3*(PSIX(MPSI)-PSIX(MPSI-1))             SHLDSP    127
      GO TO 650                                                         SHLDSP    128
C                                                                       SHLDSP    129
C     BUILD MATRIX WITH EITHER BUILT-IN VALUES OR INPUT VALUES          SHLDSP    130
C                                                                       SHLDSP    131
  450 NPSIX=NUSPL                                                       SHLDSP    132
      DO 500 K=1,NPSIX                                                  SHLDSP    133
  500 PSIX(K)=FSI(K)                                                    SHLDSP    134
      DO 600 J=1,NCF                                                    SHLDSP    135
      DO 600 K=1,NPSIX                                                  SHLDSP    136
  600 USPL(K,J)=USPLA(K)                                                SHLDSP    137
C                                                                       SHLDSP    138
C     CALC.BARE ENGINE SPL USING PREDICTED SPL                          SHLDSP    139
C                                                                       SHLDSP    140
  650 DO 700 K=1,NPSI                                                   SHLDSP    141
      DO 700 J=1,NCF                                                    SHLDSP    142
  700 SPLT(J,K)=SPLT(J,K)+SPZ(J,K)                                      SHLDSP    143
C                                                                       SHLDSP    144
C     ENTER PACKAGE TO CALCULATE ATTENUATION                            SHLDSP    145
C     DUE TO WING SHIELDING DLTSPL(MAX 24,17). THIS MATRIX              SHLDSP    146
C     INCLUDES FOR EACH OBSERVER POSITION GREATER THAN 0. THE SUMMED    SHLDSP    147
C     EFFECTS OF BOTH STARBOARD AND PORT NOISE SOURCE COMPONENT OVER    SHLDSP    148
C     THE DESIRED WING EDGES                                            SHLDSP    149
C                                                                       SHLDSP    150
      CALL SHATTN(AMACH,CZ,NCF,BCF,NPSIX,PSIX,MAXPSI,USPL,              SHLDSP    151
     *ISPTRM,DISTX,YCO,ZCO,ALTR,NPSI,PSI,DELT3,ITYPE,DLTSPL)            SHLDSP    152
C                                                                       SHLDSP    153
C     DOPPLER SHIFT THE SHIELDING ATTENUATION,AND ADD TO                SHLDSP    154
C     CONFIGURATION CORRECTION.  THE TOTAL ATTENUATION                  SHLDSP    155
C     IS THEN ADDED TO THE BARE ENGINE SPL TO GIVE THE                  SHLDSP    156
C     THE SHIELDED SPL                                                  SHLDSP    157
C                                                                       SHLDSP    158
      DO 1000 K=1,NPSI                                                  SHLDSP    159
      DELTAL=10.*ALOG10(DOPSF(K))                                       SHLDSP    160
      DELTAB=DELTAL/BW                                                  SHLDSP    161
      DO 1000 J=1,NCF                                                   SHLDSP    162
      FJDB= FJ(J)  +DELTAB                                              SHLDSP    163
      DSPLJ=TBLU1(FJDB,FJ,DLTSPL(1,K),1,NCF)                            SHLDSP    164
      SPZ(J,K)=DSPLJ+SPZ(J,K)                                           SHLDSP    165
      SPLT(J,K)=SPLT(J,K)-SPZ(J,K)                                      SHLDSP    166
 1000 CONTINUE                                                          SHLDSP    167
      RETURN                                                            SHLDSP    168
      END                                                               SHLDSP    169
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      SUBROUTINE SIDPLT(VN,DIST,NP,NDIST,TITLE,NSD,NDIM)                SIDPLT     2
C                                                                       SIDPLT     3
C                                                                       SIDPLT     4
C AUTHOR              K.D. JOHNSON                                      SIDPLT     5
C PURPOSE             TO GENERATE PLOT OF 500 FOOT SIDELINE NOISE LEVEL SIDPLT     6
C                     VS. DISTANCE ALONG RUNWAY                         SIDPLT     7
C                                                                       SIDPLT     8
C METHOD              SCALE TO UNITS/CM, DRAW AXIS AND PLOT CURVE OF    SIDPLT     9
C                     CONNECTING POINTS                                 SIDPLT    10
C                                                                       SIDPLT    11
C INPUTS              VN        ARRAY OF NOISE LEVEL VALUES             SIDPLT    12
C                     DIST      ARRAY OF CORRESPONDING DISTANCE VALUES  SIDPLT    13
C                     NP        NUMBER OF POINTS TO BE PLOTTED          SIDPLT    14
C                                                                       SIDPLT    15
C INPUTS VIA COMMON                                                     SIDPLT    16
C                     SCALV     USER SELECTED SCALE, USED IF NON-ZERO   SIDPLT    17
C                     YLENM     MAXIMUM LENGTH OF Y AXIS (GRAPH) (CM)   SIDPLT    18
C                     XLENM     MAXIMUM LENGTH OF Y AXIS (GRAPH) (CM)   SIDPLT    19
C                     AXUNIT    UNITS FOR DISTANCE                      SIDPLT    20
C                     NLABEL    UNITS FOR NOISE LEVEL                   SIDPLT    21
C                                                                       SIDPLT    22
C DIMENSION FOR INPUT ARRAYS                                            SIDPLT    23
C                                                                       SIDPLT    24
      LOGICAL IWRITE                                                    SIDPLT    25
C 360                                                                   SIDPLT    26
C     DIMENSION VN(NDIM,3),DIST(NDIM),NDIST(3),TITLE(18)                SIDPLT    27
      DIMENSION VN(NDIM,3),DIST(NDIM),NDIST(3),TITLE( 8)                SIDPLT    28
C                                                                       SIDPLT    29
C 360                                                                   SIDPLT    30
C     COMMON /PLT/ SCALV,YLENM,XLENM,CMFIN,SPACE(20),NXUNIT,NLABEL(2)   SIDPLT    31
C                                                                       SIDPLT    32
      COMMON /PLT/ SCALV,YLENM,XLENM,CMFIN,SPACE(8),NXUNIT,NLABEL       SIDPLT    33
     1 ,SCALU,IWRITE                                                    SIDPLT    34
C                                                                       SIDPLT    35
C 360                                                                   SIDPLT    36
C     DIMENSION LABELX(11), LABELY(9)                                   SIDPLT    37
      DIMENSION LABELX(5),LABELY(4)                                     SIDPLT    38
C                                                                       SIDPLT    39
C 360                                                                   SIDPLT    40
C     DATA LABELX/44HNOISE LEVEL AT  XXXXAAAA SIDELINE - AAAAAAAA/      SIDPLT    41
      DATA LABELX/50HNOISE LEVEL AT XXXX AAAA SIDELINE - AAAAAAAA       SIDPLT    42
     * /                                                                SIDPLT    43
C     DATA LABELY /36HDISTANCE ALONG FLIGHT TRACK -        /            SIDPLT    44
      DATA LABELY /40HDISTANCE ALONG FLIGHT TRACK -            /        SIDPLT    45
      DATA BLANK/1H /                                                   SIDPLT    46
C                                                                       SIDPLT    47
C DEFINE BORDERS IN CENTIMETERS                                         SIDPLT    48
      SIDE=2.                                                           SIDPLT    49
      TOP=2.                                                            SIDPLT    50
      BOTTM=3.                                                          SIDPLT    51
C                                                                       SIDPLT    52
C SET POINT SYMBOL                                                      SIDPLT    53
C                                                                       SIDPLT    54
      ISYM=2                                                            SIDPLT    55
C                                                                       SIDPLT    56
C FIND APPROPRIATE NOISE LEVEL SCALE AND LENGTH OF AXIS                 SIDPLT    57
C                                                                       SIDPLT    58
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      IF(IWRITE) GO TO 10                                               SIDPLT
C 360                                                                   SIDPLT
C     WRITE(6,1000) (NLABEL(I),I=1,2),NXUNIT,(NDIST(I),NXUNIT,I=1,NSD)  SIDPLT
      WRITE(6,1000)  NLABEL           ,NXUNIT,(NDIST(I),NXUNIT,I=1,NSD) SIDPLT
 1000 FORMAT(1H1,54X,21HSIDELINE NOISE LEVELS,///31X,21HFLIGHT TRACK DIS SIDPLT
     *TANCE,21X,13HNOISE LEVEL (,A8,1H),/40X,A6,20X,8(A4,1X,A4,6X)//)   SIDPLT
      DO 5 I=1,NP                                                       SIDPLT
      WRITE(6,1001) DIST(I),(VN(I,J),J=1,NSD)                           SIDPLT
 1001 FORMAT(30X,1PE15.3,9X,0PF15.1,2F15.1)                             SIDPLT
5     CONTINUE                                                          SIDPLT
10    XLEN=FLOAT(INT(XLENM-TOP-BOTTM))                                  SIDPLT
C                                                                       SIDPLT
C FIND LENGTH OF YAXIS, Y SCALE SAME AS CONTOUR PLOT                    SIDPLT
C                                                                       SIDPLT
      YLEN=FLOAT(INT(YLENM-2.*SIDE))                                    SIDPLT
      CALL SCALE(DIST,YLEN,NP,1)                                        SIDPLT
      DELTAY=DIST(NP+2)                                                 SIDPLT
      YMIN=DIST(NP+1)                                                   SIDPLT
      DELTAY=SCALU                                                      SIDPLT
      IF  (YMIN .EQ. 0.)  GO TO 15                                      SIDPLT
      YMIN  =  DELTAY * FLOAT(IFIX((YMIN - DEL[illegible] / DELTAY))    SIDPLT
15    CONTINUE                                                          SIDPLT
      DO 200 KK=1,NSD                                                   SIDPLT
      CALL SCALE(VN(1,KK),XLEN,NP,1)                                    SIDPLT
      DELTAX=VN(NP+2,KK)                                                SIDPLT
      XMIN=VN(NP+1,KK)                                                  SIDPLT
      XMIN=FLOAT(IFIX((XMIN-DELTAX)/DELTAX))*DE[illegible]              SIDPLT
C                                                                       SIDPLT
C POSITION PLOTTER  ON PAGE                                             SIDPLT
C                                                                       SIDPLT
      CALL PLOT(0.,-10.,-3)                                             SIDPLT
      YP=1./CMPIN                                                       SIDPLT
      CALL PLOT(0.,YP,-3)                                               SIDPLT
      XP=SIDE/CMPIN                                                     SIDPLT
      YP=BOTTM/CMPIN                                                    SIDPLT
      CALL PLOT(XP,YP,-3)                                               SIDPLT
C                                                                       SIDPLT
C DRAW Y AXIS                                                           SIDPLT
      NC  =  36                                                         SIDPLT
C     LABELY(9)  =  NXUNIT                                              SIDPLT
      CALL STRMOV(NXUNIT,1,4,LABELY,31)                                 SIDPLT
      CALL CMAXIS(0.,0.,LABELY,-NC,YLEN,0.0,YMIN,DELTAY)                SIDPLT
C                                                                       SIDPLT
C DRAW X AXIS                                                           SIDPLT
      NC=44                                                             SIDPLT
C 360                                                                   SIDPLT
C     LABELX(5)=NDIST(KK)                                               SIDPLT
C     LABELX(6)=NXUNIT                                                  SIDPLT
C     DO 25 I=1,2                                                       SIDPLT
C25   LABELX(9+I)=NLABEL(I)                                             SIDPLT
C                                                                       SIDPLT
      CALL STRMOV(NXUNIT,1,4,LABELX,21)                                 SIDPLT
      CALL STRMOV(NDIST(KK),1,4,LABELX,16)                              SIDPLT
      CALL STRMOV(NLABEL,1,8,LABELX,37)                                 SIDPLT
      CALL CMAXIS(0.,0.,LABELX,NC,XLEN,90.,XMIN,DELTAX)                 SIDPLT
C                                                                       SIDPLT
C PLOT POINTS                                                           SIDPLT
```

```
      DELTAX=DELTAX*CMPIN                                               SIDPLT    116
      DELCM=DELTAY*CMPIN                                                SIDPLT    117
      DISTM= YLEN*DELTAY+YMIN                                           SIDPLT    118
C                                                                       SIDPLT    119
C GOTO FIRST POINT WITH PEN UP                                          SIDPLT    120
C                                                                       SIDPLT    121
      XP=(DIST(1)-YMIN)/DELCM                                           SIDPLT    122
      YP=(VN(1,KK)-XMIN)/DELTAX                                         SIDPLT    123
      CALL PLOT(XP,YP,3)                                                SIDPLT    124
C                                                                       SIDPLT    125
C PLOT CURVE AS SERIES OF CONNECTED SYMBOLS                             SIDPLT    126
C                                                                       SIDPLT    127
      DO 100 I=1,NP                                                     SIDPLT    128
      XP= DIST(I)                                                       SIDPLT    129
      IF(XP.GT.DISTM)GO TO 105                                          SIDPLT    130
      XP=(XP-YMIN)/DELCM                                                SIDPLT    131
      YP=(VN(I,KK)-XMIN)/DELTAX                                         SIDPLT    132
      CALL SYMBOL(XP,YP,.08,ISYM,0.0,-2)                                SIDPLT    133
100   CONTINUE                                                          SIDPLT    134
C                                                                       SIDPLT    135
C  DRAW TITLE AT TOP OF PAGE                                            SIDPLT    136
C                                                                       SIDPLT    137
105   XP=(XLEN+1.)/CMPIN                                                SIDPLT    138
C     I=18                                                              SIDPLT    139
      I=8                                                               SIDPLT    140
125   IF(TITLE(I).NE.BLANK) GO TO 130                                   SIDPLT    141
      I=I-1                                                             SIDPLT    142
      IF(I.GT.0) GO TO 125                                              SIDPLT    143
130    IF(I.EQ.0) GO TO 135                                             SIDPLT    144
C     I=I*4                                                             SIDPLT    145
      I=I*10                                                            SIDPLT    146
      YP  =  .5 * (YLEN / CMPIN - .16 * FLOAT(I))                       SIDPLT    147
      CALL SYMBOL(YP,XP,.16,TITLE,0.0,I)                                SIDPLT    148
135   CONTINUE                                                          SIDPLT    149
C                                                                       SIDPLT    150
C MOVE TO NEW PAGE                                                      SIDPLT    151
C                                                                       SIDPLT    152
      XP=(YLEN+SIDE)/CMPIN+ 2.                                          SIDPLT    153
      YP=-BOTTM/CMPIN                                                   SIDPLT    154
      CALL PLOT(XP,YP,-3)                                               SIDPLT    155
200   CONTINUE                                                          SIDPLT    156
C                                                                       SIDPLT    157
      RETURN                                                            SIDPLT    158
      END                                                               SIDPLT    159
```

```
      SUBROUTINE SORRTR(A,B,C,L,DEPNDT,DUM,K,ARG)                       SORRTR     2
      DIMENSION A(1),B(1),C(1),DEPNDT(1),K(1),DUM(1),ARG(1)             SORRTR     3
      INTEGER K                                                         SORRTR     4
C                                                                       SORRTR     5
C   IBM SYS360 + 37C                                                    SORRTR     6
C     REAL*8 ARG, DT1, DT2, DT3                                         SORRTR     7
      EQUIVALENCE (T1,DT1), (T2,DT2), (T3,DT3)                          SORRTR     8
C                                                                       SORRTR     9
C   DETERMINE SCALE FACTORS FOR SINGLE PASS, THREE VARIABLE SORT USING  SORRTR    10
C   FOUR SIGNIFICANT DIGITS                                             SORRTR    11
      DT1  =  0.                                                        SORRTR    12
      DT2  =  0.                                                        SORRTR    13
      DT3  =  0.                                                        SORRTR    14
      FL   =  L                                                         SORRTR    15
      DO  10  I = 1,L                                                   SORRTR    16
      T1   =  T1 + ABS(A(I))                                            SORRTR    17
      T2   =  T2 + ABS(B(I))                                            SORRTR    18
      T3   =  T3 + ABS(C(I))                                            SORRTR    19
   10 CONTINUE                                                          SORRTR    20
      T1   =  10.**(INT(5.0 - ALOG10(T1/FL)))                           SORRTR    21
      T2   =  10.**(INT(-ALOG10(T2/FL)))                                SORRTR    22
      T3   =  10.**(INT(-5.0 - ALOG10(T3/FL)))                          SORRTR    23
C                                                                       SORRTR    24
C   DEFINE NEW INDEPENDENT VARIABLE, ARG, CONTAINING SCALED VALUES OF   SORRTR    25
C   VARIABLES A, B, C.                                                  SORRTR    26
      DO  20  I = 1,L                                                   SORRTR    27
      ARG(I)  =  A(I)*DT1 + B(I)*DT2 + C(I)*DT3                         SORRTR    28
   20 CONTINUE                                                          SORRTR    29
      CALL SHELL(ARG,K,L)                                               SORRTR    30
      CALL SHELXH(DEPNDT,K,DUM,L)                                       SORRTR    31
      CALL SHELXH(A,K,DUM,L)                                            SORRTR    32
      CALL SHELXH(B,K,DUM,L)                                            SORRTR    33
      CALL SHELXH(C,K,DUM,L)                                            SORRTR    34
      RETURN                                                            SORRTR    35
      END                                                               SORRTR    36
```

```
      SUBROUTINE SN(X,Y,I1,I2,N)                                        SN        2
      DIMENSION X(1),Y(1)                                               SN        3
      NM1  =  N - 1                                                     SN        4
      DO 100 I=I1,I2                                                    SN        5
      IF  (NM1)  25, 25, 50                                             SN        6
25    X(I)=Y(I)                                                         SN        7
      GO TO 100                                                         SN        8
50    Y(I)=X(I)                                                         SN        9
100   CONTINUE                                                          SN       10
      RETURN                                                            SN       11
      END                                                               SN       12
```

```
      SUBROUTINE SORTX(X,Y,N)                                           SORTX
C                                                                       SORTX
C       AUTHOR  D.G.DUNN                                                SORTX
C                                                                       SORTX
C       THIS ROUTINE SORTS POINTS (X,Y) WITH RESPECT TO                 SORTX
C       INDEPENDENT VARIABLE (X).  AFTER SORTING THE                    SORTX
C       (X) ARRAY WILL BE MONOTONIC AND ORDERED IN INCREASING           SORTX
C        VALUE.                                                         SORTX
C                                                                       SORTX
      DIMENSION X(1),Y(1)                                               SORTX
      KK=N-1                                                            SORTX
      DO 2 K=1,KK                                                       SORTX
      KL=K+1                                                            SORTX
      DO 2 J=KL,N                                                       SORTX
      IF(X(J)-X(K))1,2,2                                                SORTX
1     T=X(J)                                                            SORTX
      X(J)=X(K)                                                         SORTX
      X(K)=T                                                            SORTX
      T=Y(J)                                                            SORTX
      Y(J)=Y(K)                                                         SORTX
      Y(K)=T                                                            SORTX
2     CONTINUE                                                          SORTX
      RETURN                                                            SORTX
      END                                                               SORTX
```

```
      SUBROUTINE SPECAN                                                 SPECAN     2
C                                                                       SPECAN     3
C     PURPOSE  EMPIRICAL PREDICTION OF THE SOUND PRESSURE LEVEL         SPECAN     4
C              FOR AN AUGMENTOR SLOT NOZZLE WITH JET FLAP               SPECAN     5
C                                                                       SPECAN     6
C     SUBROUTINE SPECAN DETERMINES THE VARIABLES TO CALCULATE           SPECAN     7
C     THE CHARACTERISTIC FREQUENCY AND THEN DEVELOPS ARRAYS OF          SPECAN     8
C     SPL SPECTRA FOR EACH FLIGHT PATH OBSERVER COMBINATION,            SPECAN     9
C     THE INPUT DATA TO THE SUBROUTINE IS PROVIDED THROUGH              SPECAN    10
C     LABELLED COMMON STATEMENTS,AND DATA STATEMENTS                    SPECAN    11
C     INPUT    MO       AIRCRAFT MACH NO                               SPECAN    12
C              TSO      STATIC TEMP. AT ALTITUDE ZO                    SPECAN    13
C              GRAD     CLIMB GRADIENT(TAN(THETA)                      SPECAN    14
C              P        PROPAGATION PATH DISTANCE (SOURCE TO OBSERVER) SPECAN    15
C              X,Y,Z    AIRCRAFT COORDINATES RELATIVE TO OBSERVER      SPECAN    16
C              GAMA     RATIO OF SPECIFIC HEATS FOR EXHAUST            SPECAN    17
C              TT       TOTAL TEMPERATURE AT NOZZLE EXIT               SPECAN    18
C              NPR      NOZZLE PRESSURE RATIO                          SPECAN    19
C              DELT     FLAP ANGLE RELATIVE TO HORIZON                 SPECAN    20
C              AO       NOZZLE DISCHARGE AREA                          SPECAN    21
C              DE       EFFECTIVE DIAMETER - HYDRAULIC DIAMETER        SPECAN    22
C              FRQ      ARRAY OF GEOMETRIC MEAN FREQUENCIES            SPECAN    23
C                       FOR THE SOUND PRESSURE LEVEL SPECTRUM          SPECAN    24
C              NFB      NO. OF FREQUENCY BANDS                         SPECAN    25
C              NOBS      NO. OF SIDELINE OBSERVER POSITIONS            SPECAN    26
C                                                                       SPECAN    27
C     OUTPUT   SPL      COLS.  OF SOUND PRESSURE LEVEL SPECTRA         SPECAN    28
C                       FOR EACH POINT ON THE FLIGHT PATH SEGMENT      SPECAN    29
C                       FORMING AN ARRAY FOR EACH OBSERVER POSITION    SPECAN    30
C                                                                       SPECAN    31
      COMMON/AUGWNG/GAMA,TT,NPR,DELT,AO,DE,                             SPECAN    32
     *  ICORE,LIN6,NTF6,IMA6,LGM6,NWL6,IDP6,ILAY6,TF6(10),              SPECAN    33
     *  PCTA6(10),PLA6(10),ELCH6,ECH6,R1W6(10),TL6(10),CF6,FM6          SPECAN    34
      COMMON/GCOMON/NCF,NK,FRQ(24),TSPL(24,10,17),SPLT(24,17),          SPECAN    35
     1   BUF(25),RETA(17),SPL2(17),TGAGR(24),DCPSF(17)                  SPECAN    36
      COMMON/GEOMO/Y(10,17),Z(10,17),P(10,17),DPND(10,17),              SPECAN    37
     * B1(10,17),B2(10,17),IDS(17,10),TPD(17,10),IRR(10,17)             SPECAN    38
     *,APP,TSO,RHP,APO,TC,RHO,CA,CZ,TSF(17,10),CCV                      SPECAN    39
      COMMON/GPRAM/ALTP,ALTR,GRAD,MC,NOBS,SLDIST(10),NTENG,IUNIT,       SPECAN    40
     *    DUMXX(493),BCG,TCG,FLR,AALT,EPF                               SPECAN    41
      COMMON/SUMSPL/SSPL(24,10,17)                                      SPECAN    42
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    SPECAN    43
      COMMON/ANGLE/PSI(17,10),PSIO(17,10),BETA(17,10)                   SPECAN    44
      COMMON/HEAD/HIN(20),HOUT(20),CHIN(20)                             SPECAN    45
      COMMON/GFREQ/CFREQ(24),OFREQ(25),FFREQ(24)                        SPECAN    46
      COMMON/SWITCH/NTYPE,ITYPE,NENG,IDCF,IPRT(7),ICN(13),NLCPT         SPECAN    47
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  SPECAN    48
      COMMON/TMSPL/SPZ(24,17),IB(2,3,13)                                SPECAN    49
      COMMON/CRSPLS/DOB(17),PSCR(17),DFB(408),NPSCR                     SPECAN    50
C                                                                       SPECAN    51
      DIMENSION XPSI(7),YBETA(4),ZAC(7,4),ZA1(7),ZA2(7,4),              SPECAN    52
     1XFIFO(20),SPLOA(20),OBSS(24)                                      SPECAN    53
      REAL MO,NPR,MJE                                                   SPECAN    54
C                                                                       SPECAN    55
      DATA XPSI/100.,110.,120.,130.,140.,150.,160./                     SPECAN    56
      DATA YBETA/0.,30.,60.,90./                                        SPECAN    57
      DATA ZAC/117.1,117.2,118.6,118.7,122.9,118.8,118.2,               SPECAN    58
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```
     1          121.4,122.0,122.3,120.7,126.1,122.4,121.4,                SPECAN
     2          120.4,122.3,124.1,123.8,127.6,123.4,119.8,                SPECAN
     3          118.9,119.9,121.1,120.9,128.6,122.8,119.5/                SPECAN
      DATA ZA1/15.7,19.3,29.5,34.3,25.3,21.1,20.5/                        SPECAN
      DATA ZA2/51.3,53.1,50.4,53.4,46.0,51.5,53.3,                        SPECAN
     1          52.2,52.5,50.7,52.3,46.2,46.3,45.4,                       SPECAN
     2          61.6,58.0,55.2,56.7,48.8,47.3,51.7,                       SPECAN
     3          63.8,64.8,64.9,61.7,48.3,49.5,51.8/                       SPECAN
      DATA XFIFO/-2.,-1.699,-1.398,-1.222,-1.046,-.757,-.699,-.602,       SPECAN
     *  -.523,-.456,-.398,-.301,-.222,-.097,0.,.114,.176,.301,.519,1.0/   SPECAN
      DATA SPLOA/-31.,-25.,-19.5,-16.5,-13.9,-10.,-9.25,-9.,-9.,          SPECAN
     1 -9.25,-9.5,-10.35,-11.15,-12.85,-14.5,-17.,-18.75,-22.5,           SPECAN
     2-30.,-47.25/                                                        SPECAN
      ICN(6)=ICN(6)+1                                                     SPECAN
C                                                                         SPECAN
C                                                                         SPECAN
      DELTR=DELT*.01745                                                   SPECAN
C     ANGLE BETWEEN FLIGHT PATH AND FLAP ANGLE                            SPECAN
      ALFA =DELTR -ATAN(GRAD)                                             SPECAN
      CSAL=COS(ALFA)                                                      SPECAN
C     TOTAL TEMP.OF FREE STREAM REL. TO EXHAUST                           SPECAN
      TTO= TSO*(1.+.2*(MO*CSAL)**2)                                       SPECAN
      TRAT= TT/TTO                                                        SPECAN
      GAMM1=GAMA-1.                                                       SPECAN
      Q= NPR**(GAMM1/GAMA)                                                SPECAN
C     STATIC TEMP.OF EXHAUST                                              SPECAN
      TS=TT/Q                                                             SPECAN
C     MACH NO OF JET EXHAUST                                              SPECAN
      MJE= SQRT(2./GAMM1*(Q-1.))                                          SPECAN
C     VEL REL TO NOZZLE OF JET EXHAUST                                    SPECAN
      VJE= MJE*SQRT(1716.5*GAMA*TS)                                       SPECAN
C     VEL(AIR)REL. TO NOZZLE                                              SPECAN
      VO=MO*49.02*SQRT(TSO)                                               SPECAN
C     VEL OF JET REL TO AMBIENT AIR                                       SPECAN
      VJR=SQRT(VJE*VJE-2.*VJE*VO*CSAL+VO*VO)                              SPECAN
C     CHARACTERISTIC FREQUENCY                                            SPECAN
      FO= VJR/DE/TRAT                                                     SPECAN
C     EVALUATE CONSTANTS OF FUNCTIONAL VALUES                             SPECAN
      C1=ALOG10(TRAT)                                                     SPECAN
      C2=ALOG10(NPR)                                                      SPECAN
      C3=10.*ALOG10(.188*AD)                                              SPECAN
C     TEST FOR 1/3 OCTAVE BAND FREQUENCY OR PREFERRED                     SPECAN
      TENL3=0.0                                                           SPECAN
      IF(NOF.EQ.8)TENL3=4.77                                              SPECAN
C     FIND OCTAVE BAND SPECTRUM SHAPE                                     SPECAN
   20 DO 50 NF=1,NOF                                                      SPECAN
      FIFO=FRQ(NF)/FO                                                     SPECAN
      AFIFO=ALOG10(FIFO)                                                  SPECAN
      OBSS(NF)=TBLU1(AFIFO,XFIFO,SPLOA,1,20)+TENL3                        SPECAN
   50 CONTINUE                                                            SPECAN
C                                                                         SPECAN
      CALL ANGLES(NOBS,DELTR)                                             SPECAN
      FBPF=0.3*FO                                                         SPECAN
      DO 300 I=1,NOBS                                                     SPECAN
      CALL LINCOR(SPZ(1,1),IMA6,LGM6,ELCH6,EDH6,NWL6,R1W6,TL6,            SPECAN
     *  ILAY6,FM6,IDP6,PSI(1,I),NOF,FRO,PLA6,CF6,PCTA6,NTF6,TF6,DOPSF,    SPECAN
     *  SPL2,ICOR6,IB(1,1,ITYPE),LIN6,FEFF)                               SPECAN
```

```
      DO 200 J=1,17                                                     SPECAN    116
C     TABLE LOOK UP                                                     SPECAN    117
      A0=TBLU2(PSI(J,I),BETA(J,I),XPSI,YBETA,ZA0,1,1,7,4,7,4)           SPECAN    118
      A1=TBLU1(PSI(J,I),XPSI,ZA1,1,7)                                   SPECAN    119
      A2=TBLU2(PSI(J,I),BETA(J,I),XPSI,YBETA,ZA2,1,1,7,4,7,4)           SPECAN    120
C     OVERALL SOUND PRESSURE LEVEL                                      SPECAN    121
      OA=A0+A1*C1+A2*C2+C3                                              SPECAN    122
C     OBTAIN SOUND PRESSURE LEVEL SPECTRUM                              SPECAN    123
C                        SPECTRA FOR AUGMENTOR SLOT NOZZLE WITH JET FLAP SPECAN    124
      DO 100 NF=1,NOF                                                   SPECAN    125
      SPLT(NF,J)=OA+OBSS(NF)-SPZ(NF,J)                                  SPECAN    126
      SSPL(NF,I,J)=PWRSUM(SSPL(NF,I,J),SPLT(NF,J))                      SPECAN    127
C                                                                       SPECAN    128
  100 CONTINUE                                                          SPECAN    129
  200 CONTINUE                                                          SPECAN    130
      IF(IPRT(7).NE.7)GO TO 220                                         SPECAN    131
      CALL NOISO(IPRT(7),I,NK,10,CHIN,ILNIT,SLOISX(I),PFREQ,            SPECAN    132
     *     SPLT(1,1),NOF,ITYPE)                                         SPECAN    133
 220  CONTINUE                                                          SPECAN    134
      DO 240 NF=1,NOF                                                   SPECAN    135
      DO 240 J=1,17                                                     SPECAN    136
 240  SPLT(NF,J)=SPLT(NF,J)-TSPL(NF,I,J)                                SPECAN    137
      IF(IPRT(3).NE.3)GO TO 300                                         SPECAN    138
      CALL PNLSUB(SPLT(1,1),PSPL(1,I),TPC(1,I),EPNL(1,I),SPL2,          SPECAN    139
     *  TEPNL(1,I),NK,BCG,TCG,FLR,I,NOBS,IRR(I,1))                      SPECAN    140
      CALL NOISO(IPRT(3),I,NK,12,CHIN,ILNIT,SLOISX(I),PFREQ,            SPECAN    141
     *     SPLT(1,1),NOF,ITYPE)                                         SPECAN    142
 300  CONTINUE                                                          SPECAN    143
      RETURN                                                            SPECAN    144
      END                                                               SPECAN    145
```

```
      SUBROUTINE SQUASH(A,M,B,L)                                        SQUASH     2
C      VALUES MUST BE MONOTONICALLY INCREASING IN THE A ARRAY           SQUASH     3
C      M MUST BE GREATER THAN ONE                                       SQUASH     4
C      A = INPUT ARRAY                                                  SQUASH     5
C      M = LENGTH OF INPUT ARRAY                                        SQUASH     6
C      B = THE RESULTANT ARRAY OF DISTINCT VALUES WHICH CAN             SQUASH     7
C          BE PLACED IN THE A ARRAY IF CORE SIZE IS OF CONCERN          SQUASH     8
C      L = THE NUMBER OF DISTINCT VALLES IN B                           SQUASH     9
      DIMENSION A(1),B(1)                                               SQUASH    10
      J=1                                                               SQUASH    11
      B(1)=A(1)                                                         SQUASH    12
      DO  1000  I=2,M                                                   SQUASH    13
      IF ( A(I) .EQ. A(I-1)) GO TO  1000                                SQUASH    14
      IF (A(I) .LT. B(J)) GO TO  1010                                   SQUASH    15
      J=J+1                                                             SQUASH    16
      B(J)=A(I)                                                         SQUASH    17
 1000 CONTINUE                                                          SQUASH    18
 1010 CONTINUE                                                          SQUASH    19
      L=J                                                               SQUASH    20
      RETURN                                                            SQUASH    21
      END                                                               SQUASH    22
```

```
      SUBROUTINE SWITCH(NEPR, NL, NLRC, NALFA, AARRAY, BARRAY)
C
C  SWITCH CHANGES NL   =  F(LRO, ALPHA, EPR) INTC A SET OF FUNCTIONS...
C                 LOG10(RO)  =  F(EPR, ALPHA) FOR EACH DESIRED CONTOUR
C  INDICATED BY THE ARRAY ANL(J).
C     NEPR      NUMBER OF EPR VALLES IN AEPR
C     NLRO      NUMBER OF LRO VALUES IN ALRC
C     NALFA     NUMBER OF ALPHA VALLES IN AALFA
C     NL        NUMBER OF VALUES OF NL IN ANL
C     ANL       ARRAY OF VALLES OF SPECIFIC NCISE CCNTOURS
C     AALFA     ARRAY OF VALUES CF ALPHA
C     ALRO      ARRAY OF VALLES OF LCG RC
C     AEPR      ARRAY OF VALUES OF EPR
C    AARRAY  ...  NOISE LEVELS FOR F(LRC, ALPHA, EPR)
C    BARRAY  ...  LOG10(RO)    FOR F(EPR, ALPHA) AT EACH ANL(J)
      DIMENSION AARRAY(NLRO,NALFA,NEPR)
      DIMENSION BARRAY(NEPR,NALFA,NL)
      COMMON/CONTNT/AEPR(6),ALRO(9),AALFA(6)
      COMMON/LEVELS/ANL(5)
C
C
      DO  1010  L=1,NEPR
      DC  101C  M=1,NALFA
      DO  1010  J=1,NL
      BARRAY(L,M,J)  =  TBLU1(ANL(J), AARRAY(1,M,L), ALRC, 1, NLRO)
 101C CONTINUE
C
C  BARRAY REPRESENTS  LOG10(RO) = F(EPR, ALPHA)  FOR EACH ANL(J)
      RETURN
      END
```

```
      FUNCTION TBLU1(XX,X,Y,MD,N)                                       TBLU1      2
C     SC0934   TBLU1    PS-473     LU, PAUL          661013 7094   6600  TBLU1      3
C                        TABLE LOCKUP AND INTERPOLATION                 TBLU1      4
      DIMENSION Y(1),X(1)                                               TBLU1      5
      INTEGER SEARCH                                                    TBLU1      6
C                                                                       TBLU1      7
C     X ALWAYS INCREASING (CR DECREASING)                               TBLU1      8
      NC = MD                                                           TBLU1      9
      IF(SEARCH(XX,X,ND,N,I) .EQ. C)GC TC 43                            TBLU1     10
C     RETURN EXACT VALUE                                                TBLU1     11
      TBLU1 = Y(I)                                                      TBLU1     12
      GO TO 51                                                          TBLU1     13
C      INTERPOLATE                                                      TBLU1     14
   43 TBLU1 = TERP1(XX,X,Y,ND,I)                                        TBLU1     15
   51 RETURN                                                            TBLU1     16
      END                                                               TBLU1     17
```

```
      FUNCTION TBLU2(XX,YY,X,Y,F2,MDX,MDY,NLX,NLY,NFX,NFY)
C     S00936   TBLU2    PS-473     LL, PAUL          661013 7094   6600
C            TABLE LOOKUP AND INTERPOLATE -- 2 INDEPENDENT VARIABLES
      DIMENSION F2(NFX,NFY),S(20),X(1),Y(1)
      INTEGER SEARCH
C     FIND POSITION IN X AND Y
      NDX = MDX
      NDY = MDY
      I1 = SEARCH(XX,X,NDX,NLX,I)
      I1 = I1 + I1 + 1 + SEARCH (YY,Y,NDY,NLY,J)
C     100--NEITHER EXACT, 50--Y EXACT, 60--X EXACT, 10--BOTH EXACT
      GO TO(100,50,60,10),I1
C     X IS EXACT MOVE THAT ROW TO S AND USE TERP1
C     A MAX OF 19 MAY BE USED  IN SOME CASES FOR NDY
   60 IX = MINO(NDY,19)
      I2 = IX + J
      DO 1 I1 = J, I2
      IT = I1 - J
    1 S(IT+1) = F2(I,I1)
      TBLU2 = TERP1(YY,Y(J),S,IX,1)
      GO TO 1000
C     Y IS EXACT USE TERP1
   50 TBLU2 = TERP1(XX,X,F2(1,J),NDX,I)
      GO TO 1000
  100 TBLU2 = TERP2(XX,YY,X,Y,F2,NDX,NDY,NFX,NFY,I,J)
 1000 RETURN
   10 TBLU2 = F2(I,J)
      GO TO 1000
      END
```

```
      FUNCTION TBLU3(X1,Y1,Z1,X,Y,Z,F3,MDX,MDY,MDZ,NLX,NLY,NLZ,
     1           NFX,NFY,NFZ)
C                     TABLE LOOKUP AND INTERPOLATION
C     S00938   TBLU3    PS-473     LL, PAUL          661013 7094   6600
      DIMENSION X(1), Y(1), Z(1), F3(NFX,NFY,NFZ), S(20,20)
      INTEGER SEARCH
      NDX = MDX
      NDY = MDY
      NDZ = MDZ
C     FIND POSITION OF X, Y, AND Z IN TABLES
      IX = SEARCH(X1,X,NDX,NLX,I)
      IY = SEARCH(Y1,Y,NDY,NLY,J)
      IZ = SEARCH(Z1,Z,NDZ,NLZ,K)
C     CONSIDER IX BIT PATTERN
C         BIT 0 SET--X EXACT, BIT 1--Y EXACT, BIT 2--Z EXACT
      IX = IX + IY + IY + IZ*4 +1
      GO TO (11,1,2,21,22,15,20,12),IX
C     NONE EXACT
   11 TBLU3 = TERP3(X1,Y1,Z1,X,Y,Z,F3,NDX,NDY,NDZ,NFX,NFY,NFZ,I,J,K)
 1000 RETURN
C     ALL EXACT--STRAIGHT TABLE LOOKUP
   12 TBLU3 = F3(I,J,K)
      GO TO 1000
C     Y AND Z ARE EXACT
   20 TBLU3 = TERP1(X1,X,F3(1,J,K),NDX,I)
      GO TO 1000
C     X AND Y ARE EXACT -- MOVE F3(I,J,*)
   21 IX = MINO(19,NDZ)
      IY = K + IX
      DO 14 IZ = K, IY
      IXA = IZ - K + 1
   14 S(IXA,1) = F 3(I,J,IZ)
      TBLU3 = TERP1(Z1,Z(K),S,IX,1)
      GO TO 1000
C     X AND Z ARE EXACT -- MOVE F3(I,*,K)
   15 IX = MINO(NDY,19)
      IY = J + IX
      DO 16 IZ = J, IY
      IXA = IZ - J + 1
   16 S(IXA,1) = F3(I,IZ,K)
      TBLU3 = TERP1(Y1,Y(J),S,IX,1)
      GO TO 1000
C     Z IS EXACT
   22 TBLU3 = TERP2(X1,Y1,X,Y,F3(1,1,K),NDX,NDY,NFX,NFY,I,J)
      GO TO 1000
C     X IS EXACT -- MOVE F3(I,*,*)
    1 IX = MINO(NDY,19)
      IY = MINO(NDZ,19)
      IJ = J + IX
      IK = K + IY
      DO 3 IZ = J, IJ
      DO 3 II = K, IK
      IXA = IZ - J + 1
      IXB = II - K + 1
    3 S(IXA,IXB) = F3(I,IZ,II)
      TBLU3 = TERP2(Y1,Z1,Y(J),Z(K),S,IX,IY,20,20,1,1)
      GO TO 1000
```

```
C       Y IS EXACT -- MOVE F3(*,J,*)                                    TBLU3      59
      2 IX = MINO(19,NDX)                                               TBLU3      60
        IZ = MINO(19,NDZ)                                               TBLU3      61
        II = I + IX                                                     TBLU3      62
        IK = K + IZ                                                     TBLU3      63
        DO 4 JI = I, II                                                 TBLU3      64
        DO 4 JK = K, IK                                                 TBLU3      65
        IXA = JI - I + 1                                                TBLU3      66
        IXB = JK - K + 1                                                TBLU3      67
      4 S(IXA,IXB) = F3(JI,J,JK)                                        TBLU3      68
        TBLU3 = TERP2(X1,Z1,X(I),Z(K),S,NDX,NDZ,20,20,1,1)              TBLU3      69
        GO TO 1000                                                      TBLU3      70
        END                                                             TBLU3      71
```

```
      SUBROUTINE TEE227(IMODE,NLN)                                      TEE227
C     PROGRAM TEE227A(INPUT,OUTPUT,TAPE5 INPUT,TAPE6 OUTPUT)            TEE227
C     THIS PROGRAM HAS BEEN GENERATED AS A MEANS OF                     TEE227
C     CIRCUMVENTING THE NEED FOR INPUT TO TEE227 WHICH IS TO            TEE227
C   BE RUN UNDER CONTROL OF A REAL TIME SIMULATOR ON                    TEE227
C     THE SIGMA 7.                                                      TEE227
C     THE 4 NUMBERS REPRESENTED ON EACH LINE OF THE DATA                TEE227
C     STATEMENT ARE THE OUTPUT OF NOISE LEVEL, ENGINE PRESSURE          TEE227
C     RATIO, ELEVATION ANGLE, LOG10 OF RANGE, GENERATED BY              TEE227
C     THE NOISE PREDICTION PROGRAM, TEE187 PER INPUT CASE               TEE227
C     AND PLACED ON FILE TAPE20, WHICH HAVE BEEN PROCESSED              TEE227
C     BY THE TEE187C POST-PROCESSOR.  THE POST-PROCESSOR                TEE227
C     INCORPORATES THIS DATA DURING THE GENERATION OF THE               TEE227
C     MAIN PROGRAM OF TEE227, THE NOISE CONTOUR PROGRAM                 TEE227
C     WHICH THE POST-PROCESSOR HAS OUTPUT IN SOURCE CODING ON           TEE227
C     FILE TAPE22                                                       TEE227
      COMMON/COUNT/NEPR,   NL                                           TEE227
      COMMON/CONTNT/AEPR(6),ALRO(9),AALFA(6)                            TEE227
      DIMENSION A10(72)                                                 TEE227
      EQUIVALENCE (DATN(   1),A10(1))                                   TEE227
      DIMENSION A11(72)                                                 TEE227
      EQUIVALENCE (DATN(  73),A11(1))                                   TEE227
      DIMENSION A12(72)                                                 TEE227
      EQUIVALENCE (DATN( 145),A12(1))                                   TEE227
      DIMENSION A13(72)                                                 TEE227
      EQUIVALENCE (DATN( 217),A13(1))                                   TEE227
      DIMENSION A14(72)                                                 TEE227
      EQUIVALENCE (DATN( 289),A14(1))                                   TEE227
      DIMENSION A15(72)                                                 TEE227
      EQUIVALENCE (DATN( 361),A15(1))                                   TEE227
      DIMENSION A16(72)                                                 TEE227
      EQUIVALENCE (DATN( 433),A16(1))                                   TEE227
      DIMENSION A17(72)                                                 TEE227
      EQUIVALENCE (DATN( 505),A17(1))                                   TEE227
      DIMENSION A18(72)                                                 TEE227
      EQUIVALENCE (DATN( 577),A18(1))                                   TEE227
      DIMENSION A19(72)                                                 TEE227
      EQUIVALENCE (DATN( 649),A19(1))                                   TEE227
      DIMENSION A20(72)                                                 TEE227
      EQUIVALENCE (DATN( 721),A20(1))                                   TEE227
      DIMENSION A21(72)                                                 TEE227
      EQUIVALENCE (DATN( 793),A21(1))                                   TEE227
      DIMENSION A22(72)                                                 TEE227
      EQUIVALENCE (DATN( 865),A22(1))                                   TEE227
      DIMENSION A23(72)                                                 TEE227
      EQUIVALENCE (DATN( 937),A23(1))                                   TEE227
      DIMENSION A24(72)                                                 TEE227
      EQUIVALENCE (DATN(1009),A24(1))                                   TEE227
      DIMENSION A25(72)                                                 TEE227
      EQUIVALENCE (DATN(1081),A25(1))                                   TEE227
      DIMENSION A26(72)                                                 TEE227
      EQUIVALENCE (DATN(1153),A26(1))                                   TEE227
      DIMENSION A27(72)                                                 TEE227
      EQUIVALENCE (DATN(1225),A27(1))                                   TEE227
      DIMENSION DATN(1296)                                              TEE227
      DIMENSION D1(324),D2(324),D3(324),D4(324)                         TEE227
      DATA A10 /                                                        TEE227
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1     1.125E 02,    2.0C0E 00,    7.181E 00,    2.301E 00,          TEE227    59
2     9.530E 01,    1.80CE 00,    1.448E 01,    3.204E 00,          TEE227    60
3     1.1C1E 02,    1.6CCE 00,    7.181E 00,    2.000E 00,          TEE227    61
4     1.116E 02,    1.60CE 00,    1.448E 01,    2.000E 00,          TEE227    62
5     9.341E 01,    1.2CCE 0C,    9.000E 01,    2.301E 0C,          TEE227    63
6     6.268E 01,    1.2CCE 00,    4.500E 01,    3.806E 00,          TEE227    64
7     3.386E 01,    1.0CCE 00,    C.0       ,   4.107E 00,          TEE227    65
8     1.137E 02,    1.60CE 00,    3.C00E 01,    2.000E 00,          TEE227    66
9     7.348E 01,    1.6CCE 00,    C.0       ,   3.806E 00,          TEE227    67
*     1.110E 02,    1.6C0E 00,    4.500E 01,    2.301E 00,          TEE227    68
*     7.934E C1,    1.20CE 00,    3.000E 01,    2.903E 00,          TEE227    69
*     4.695E 01,    1.0CCE CC,    3.000E 01,    3.806E 00,          TEE227    70
*     8.988E 01,    2.0CCE 0C,    9.000E 01,    3.806E 00,          TEE227    71
*     8.140E 01,    1.CCCE 0C,    4.500E 01,    2.000E 00,          TEE227    72
*     1.021E 02,    1.8CCE 0C,    C.0       ,   2.602E 00,          TEE227    73
*     8.449E 01,    1.6CCE 00,    1.448E 01,    3.505E 00,          TEE227    74
*     1.186E 02,    2.CCCE 0C,    7.181E 00,    1.699E 00,          TEE227    75
*     3.988E 01,    1.0CCE 00,    0.0       ,   3.806E 00/          TEE227    76
 DATA A11 /                                                         TEE227    77
1     9.136E 01,    1.8CCE 0C,    3.000E 01,    3.505E 00,          TEE227    78
2     9.270E 01,    1.8CCE 00,    4.500E 01,    3.505E 00,          TEE227    79
3     1.033E 02,    1.8CCE 00,    3.000E 01,    2.903E 00,          TEE227    80
4     9.737E 01,    1.8CCE 0C,    3.000E 01,    3.204E 00,          TEE227    81
5     1.047E 02,    1.8CCE 0C,    4.500E 01,    2.903E 00,          TEE227    82
6     9.943E 01,    1.2CCE 0C,    9.000E 01,    1.699E 00,          TEE227    83
7     9.871E 01,    1.8CCE 0C,    4.500E 01,    3.204E 00,          TEE227    84
8     1.077E 02,    1.4CCE 00,    3.00CE 01,    1.699E 00,          TEE227    85
9     1.0C3E 02,    1.8CCE 00,    9.000E 01,    3.204E 0C,          TEE227    86
*     1.140E 02,    2.CCCE 0C,    1.448E 01,    2.301E 00,          TEE227    87
*     9.859E 01,    1.4CCE 0C,    C.0       ,   2.000E 00,          TEE227    88
*     8.006E 01,    1.0CCE CC,    3.000E 01,    2.000E 00,          TEE227    89
*     9.897E 01,    2.000E 0C,    3.C00E 01,    3.204E 00,          TEE227    90
*     1.003E 02,    2.000E 00,    4.500E 01,    3.204E 00,          TEE227    91
*     1.019E 02,    2.CC0E 0C,    9.C0CE 01,    3.204E 00,          TEE227    92
*     1.056E 02,    1.8C0E 0C,    7.181E 0C,    2.602E 00,          TEE227    93
*     8.003E 01,    1.CC0E 00,    1.448E 01,    1.699E 00,          TEE227    94
*     8.79CE 01,    1.6CCE 00,    4.500E 01,    3.505E 00/          TEE227    95
 CATA A12 /                                                         TEE227    96
1     1.2CCE 02,    2.CC0E 00,    1.448E 01,    1.699E 00,          TEE227    97
2     7.503E 01,    1.0CCE 00,    C.C       ,   1.699E 00,          TEE227    98
3     8.181E 01,    1.8CCE 0C,    7.181E 00,    3.806E 00,          TEE227    99
4     7.857E 01,    1.CCCE 00,    7.181E 00,    1.699E 00,          TEE227   100
5     8.695E 01,    1.2CCE CC,    7.181E 00,    2.301E 0C,          TEE227   101
6     7.990E 01,    1.4CCE 0C,    4.500E 01,    3.505E 00,          TEE227   102
7     9.190E 01,    2.00CE 0C,    C.C       ,   3.204E 00,          TEE227   103
8     8.328E 01,    1.8CCE 00,    1.448E 01,    3.806E 00,          TEE227   104
9     8.C68E 01,    1.2CCE 00,    4.500E 01,    2.903E 00,          TEE227   105
*     9.430E 01,    1.4CCE 0C,    1.448E 01,    2.602E 00,          TEE227   106
*     8.299E 01,    1.0CCE CC,    9.000E 01,    2.000E 00,          TEE227   107
*     8.930E 01,    1.4CCE CC,    C.C       ,   2.602E 00,          TEE227   108
*     9.147E 01,    1.6CCE 0C,    C.0       ,   2.903E 00,          TEE227   109
*     9.501E 01,    1.60CE 00,    7.181E 00,    2.903E 00,          TEE227   110
*     8.81CE 01,    1.2CCE 00,    9.000E 01,    2.602E 00,          TEE227   111
*     1.017E 02,    1.4CCE CC,    3.000E 01,    2.301E 0C,          TEE227   112
*     1.030E 02,    1.4CCE 00,    4.500E 01,    2.301E 00,          TEE227   113
*     5.179E 01,    1.2CCE 0C,    7.181E 0C,    4.107E 00/          TEE227   114
 DATA A13 /                                                         TEE227   115
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1     1.150E 02,     2.000E 00,     0.0        ,     1.699E 00,          TEE227     116
2     1.170E 02,     1.800E 00,     7.181E 00,     1.699E 00,          TEE227     117
3     5.533E 01,     1.200E 00,     3.000E 01,     4.107E 00,          TEE227     118
4     6.529E 01,     1.200E 00,     1.448E 01,     3.505E 00,          TEE227     119
5     9.048E 01,     1.200E 00,     3.000E 01,     2.301E 00,          TEE227     120
6     9.182E 01,     1.200E 00,     4.500E 01,     2.301E 00,          TEE227     121
7     1.063E 02,     1.800E 00,     9.000E 01,     2.903E 00,          TEE227     122
8     9.030E 01,     1.800E 00,     0.0        ,     3.204E 00,          TEE227     123
9     9.384E 01,     1.800E 00,     7.181E 00,     3.204E 00,          TEE227     124
*     1.008E 02,     1.600E 00,     7.181E 00,     2.602E 00,          TEE227     125
*     9.961E 01,     1.400E 00,     1.448E 01,     2.301E 00,          TEE227     126
*     7.746E 01,     1.600E 00,     9.000E 01,     4.107E 00,          TEE227     127
*     8.535E 01,     1.800E 00,     3.000E 01,     3.806E 00,          TEE227     128
*     5.781E 01,     1.200E 00,     7.181E 00,     3.806E 00,          TEE227     129
*     1.046E 02,     1.400E 00,     9.000E 01,     2.301E 00,          TEE227     130
*     7.701E 01,     1.600E 00,     7.181E 00,     3.806E 00,          TEE227     131
*     6.787E 01,     1.000E 00,     9.000E 01,     2.903E 00,          TEE227     132
*     1.149E 02,     1.800E 00,     7.181E 00,     2.000E 00/          TEE227     133
 DATA A14 /                                                             TEE227     134
1     7.848E 01,     1.600E 00,     1.448E 01,     3.806E 00,          TEE227     135
2     5.544E 01,     1.000E 00,     7.181E 00,     3.204E 00,          TEE227     136
3     1.023E 02,     1.600E 00,     1.448E 01,     2.602E 00,          TEE227     137
4     1.044E 02,     1.600E 00,     3.000E 01,     2.602E 00,          TEE227     138
5     6.723E 01,     1.000E 00,     7.181E 00,     2.602E 00,          TEE227     139
6     1.061E 02,     1.600E 00,     7.181E 00,     2.301E 00,          TEE227     140
7     1.134E 02,     1.800E 00,     0.0        ,     1.699E 00,          TEE227     141
8     7.255E 01,     1.400E 00,     3.000E 01,     3.806E 00,          TEE227     142
9     1.042E 02,     1.400E 00,     7.181E 00,     1.699E 00,          TEE227     143
*     9.730E 01,     1.600E 00,     0.0        ,     2.602E 00,          TEE227     144
*     9.429E 01,     1.800E 00,     9.000E 01,     3.505E 00,          TEE227     145
*     7.828E 01,     1.800E 00,     0.0        ,     3.806E 00,          TEE227     146
*     6.287E 01,     1.000E 00,     1.448E 01,     2.903E 00,          TEE227     147
*     6.494E 01,     1.000E 00,     3.000E 01,     2.903E 00,          TEE227     148
*     6.446E 01,     1.400E 00,     1.448E 01,     4.107E 00,          TEE227     149
*     1.106E 02,     1.400E 00,     9.000E 01,     1.699E 00,          TEE227     150
*     9.283E 01,     1.400E 00,     7.181E 00,     2.602E 00,          TEE227     151
*     1.057E 02,     1.600E 00,     4.500E 01,     2.602E 00/          TEE227     152
 DATA A15 /                                                             TEE227     153
1     1.073E 02,     1.600E 00,     9.000E 01,     2.602E 00,          TEE227     154
2     5.666E 01,     1.200E 00,     4.500E 01,     4.107E 00,          TEE227     155
3     5.946E 01,     1.400E 00,     0.0        ,     4.107E 00,          TEE227     156
4     7.726E 01,     1.800E 00,     1.448E 01,     4.107E 00,          TEE227     157
5     8.341E 01,     1.200E 00,     0.0        ,     2.301E 00,          TEE227     158
6     4.488E 01,     1.000E 00,     1.448E 01,     3.806E 00,          TEE227     159
7     9.544E 01,     2.000E 00,     7.181E 00,     3.204E 00,          TEE227     160
8     9.690E 01,     2.000E 00,     1.448E 01,     3.204E 00,          TEE227     161
9     8.841E 01,     1.200E 00,     1.448E 01,     2.301E 00,          TEE227     162
*     1.230E 02,     2.000E 00,     9.000E 01,     2.000E 00,          TEE227     163
*     1.090E 02,     2.000E 00,     0.0        ,     2.301E 00,          TEE227     164
*     1.076E 02,     1.600E 00,     1.448E 01,     2.301E 00,          TEE227     165
*     1.164E 02,     1.800E 00,     1.448E 01,     2.000E 00,          TEE227     166
*     7.933E 01,     1.800E 00,     3.000E 01,     4.107E 00,          TEE227     167
*     6.786E 01,     1.400E 00,     4.500E 01,     4.107E 00,          TEE227     168
*     6.628E 01,     1.000E 00,     4.500E 01,     2.903E 00,          TEE227     169
*     1.126E 02,     1.600E 00,     9.000E 01,     2.301E 00,          TEE227     170
*     8.429E 01,     1.800E 00,     0.0        ,     3.505E 00/          TEE227     171
 DATA A16 /                                                             TEE227     172
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1     1.124E 02,    1.8COE 00,    1.448E 01,    2.301E 00,        TEE227    173
2     7.886E 01,    2.0COE 00,    1.448E 01,    4.107E 00,        TEE227    174
3     8.093E 01,    2.0CCE 00,    3.CO0E 01,    4.107E 00,        TEE227    175
4     1.056E 02,    1.4COE 00,    1.448E 01,    1.699E 00,        TEE227    176
5     9.443E 01,    1.2CCE 00,    1.448E 01,    1.699E 00,        TEE227    177
6     1.097E 02,    1.6CCE 00,    3.000E 01,    2.301E 00,        TEE227    178
7     1.0C6E 02,    1.4CCE 00,    C.0       ,   1.699E 00,        TEE227    179
8     1.185E 02,    1.8CCE 00,    3.000E 01,    2.000E 00,        TEE227    180
9     6.299E 01,    1.4CCE 00,    7.181E 00,    4.107E 00,        TEE227    181
*     8.066E 01,    1.8COE CC,    4.500E 01,    4.107E 00,        TEE227    182
*     9.650E 01,    1.20CE 0C,    3.000E 01,    1.699E 00,        TEE227    183
*     9.784E 01,    1.200E 00,    4.500E 01,    1.699E 00,        TEE227    184
*     8.783E 01,    1.8CCE 00,    7.181E C0,    3.505E 00,        TEE227    185
*     8.929E 01,    1.8CCE 00,    1.448E 01,    3.505E 00,        TEE227    186
*     1.066E 02,    1.6CCE CC,    C.0       ,   2.000E 00,        TEE227    187
*     9.787E 01,    2.0CCE 0C,    C.C       ,   2.903E 00,        TEE227    188
*     8.386E 01,    2.000E 00,    9.000E 01,    4.107E 00,        TEE227    189
*     5.69CE 01,    1.00CE 00,    1.448E 01,    3.204E 00/        TEE227    190
 DATA A17 /                                                        TEE227    191
1     6.946E 01,    1.4CCE CC,    9.000E 01,    4.107E 0C,        TEE227    192
2     6.383E 01,    1.2CCE 00,    7.181E 00,    3.505E 00,        TEE227    193
3     6.901E 01,    1.4CCE 00,    7.181E 00,    3.806E 00,        TEE227    194
4     7.048E 01,    1.400E 00,    1.448E 01,    3.806E 00,        TEE227    195
5     5.897E 01,    1.CCCE 00,    3.000E 01,    3.204E 00,        TEE227    196
6     1.165E 02,    2.CC0E 00,    7.181E 00,    2.000E 00,        TEE227    197
7     4.589E 01,    1.0C0E 00,    0.0       ,   3.505E 00,        TEE227    198
8     7.810E 01,    1.2CCE 00,    C.0       ,   2.602E 00,        TEE227    199
9     8.163E 01,    1.20CE 0C,    7.181E 00,    2.602E 00,        TEE227    200
*     8.695E 01,    2.000E 00,    3.000E 01,    3.806E 00,        TEE227    201
*     7.548E 01,    1.4CCE CC,    9.000E 01,    3.806E 00,        TEE227    202
*     8.828E 01,    2.00CE 00,    4.500E 01,    3.806E 00,        TEE227    203
*     6.901E 01,    1.0CCE CC,    C.0       ,   2.301E 00,        TEE227    204
*     1.221E 02,    2.CC0E 0C,    3.000E 01,    1.699E 00,        TEE227    205
*     8.656E 01,    1.6CCE 00,    3.000E 01,    3.505E 00,        TEE227    206
*     1.150E 02,    1.60CE 00,    4.500E 01,    2.000E 00,        TEE227    207
*     6.029E 01,    1.2CCE 0C,    C.0       ,   3.505E 00,        TEE227    208
*     1.234E 02,    2.CCCE 00,    4.500E 01,    1.699E 00/        TEE227    209
 DATA A18 /                                                        TEE227    210
1     1.250E 02,    2.0CCE 0C,    9.000E 01,    1.699E 00,        TEE227    211
2     1.214E 02,    1.80CE 00,    9.000E 01,    2.000E 00,        TEE227    212
3     1.087E 02,    2.CCCE 00,    1.448E 01,    2.602E 00,        TEE227    213
4     8.226E 01,    1.8C0E 0C,    9.000E 01,    4.107E 00,        TEE227    214
5     1.1C8E 02,    2.CCCE 00,    3.000E 01,    2.602E 00,        TEE227    215
6     6.63CE 01,    1.2CCE CC,    C.C       ,   3.204E 00,        TEE227    216
7     6.984E 01,    1.2CCE 00,    7.181E 00,    3.204E 00,        TEE227    217
8     8.668E 01,    1.8CCE CC,    4.500E 01,    3.806E 00,        TEE227    218
9     8.828E 01,    1.80CE 0C,    9.000E 01,    3.806E 00,        TEE227    219
*     7.226E 01,    1.80CE 0C,    C.0       ,   4.107E 00,        TEE227    220
*     7.579E 01,    1.80CE 00,    7.181E 0C,    4.107E 00,        TEE227    221
*     1.218E 02,    1.8C0E 0C,    4.500E 01,    1.699E 00,        TEE227    222
*     1.234E 02,    1.8C0E 00,    9.000E 01,    1.699E 00,        TEE227    223
*     1.184E 02,    1.8CCE 0C,    1.448E 01,    1.699E 00,        TEE227    224
*     1.121E 02,    2.0C0E 0C,    4.500E 01,    2.602E 00,        TEE227    225
*     1.137E 02,    2.000E 00,    9.C00E 01,    2.602E 00,        TEE227    226
*     5.928E 01,    1.2CCE 00,    1.448E 01,    3.806E 00,        TEE227    227
*     9.770E 01,    1.4CCE CC,    4.500E 01,    2.602E 00/        TEE227    228
 DATA A19 /                                                        TEE227    229
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1     8.701E 01,     1.400E 00,     7.181E 00,     2.903E 00,          TEE227    230
2     9.930E 01,     1.400E 00,     9.000E 01,     2.602E 00,          TEE227    231
3     1.079E 02,     2.000E 00,     9.000E 01,     2.903E 00,          TEE227    232
4     1.180E 02,     2.000E 00,     1.448E 01,     2.000E 00,          TEE227    233
5     1.114E 02,     1.800E 00,     0.0       ,    2.000E 00,          TEE227    234
6     7.581E 01,     1.200E 00,     7.181E 00,     2.903E 00,          TEE227    235
7     1.021E 02,     1.400E 00,     7.181E 00,     2.000E 00,          TEE227    236
8     7.386E 01,     2.000E 00,     0.0       ,    4.107E 00,          TEE227    237
9     7.739E 01,     2.000E 00,     7.181E 00,     4.107E 00,          TEE227    238
*     1.036E 02,     1.400E 00,     1.448E 01,     2.000E 00,          TEE227    239
*     1.166E 02,     1.600E 00,     9.000E 01,     2.000E 00,          TEE227    240
*     5.190E 01,     1.000E 00,     0.0       ,    3.204E 00,          TEE227    241
*     4.341E 01,     1.000E 00,     7.181E 00,     3.806E 00,          TEE227    242
*     1.086E 02,     1.400E 00,     9.000E 01,     2.000E 00,          TEE227    243
*     1.015E 02,     1.600E 00,     9.000E 01,     2.903E 00,          TEE227    244
*     8.550E 01,     1.600E 00,     0.0       ,    3.204E 00,          TEE227    245
*     1.205E 02,     1.800E 00,     3.000E 01,     1.699E 00,          TEE227    246
*     8.210E 01,     1.000E 00,     3.000E 01,     1.699E 00/          TEE227    247
 DATA A20 /                                                             TEE227    248
1     8.188E 01,     1.600E 00,     4.500E 01,     3.806E 00,          TEE227    249
2     8.348E 01,     1.600E 00,     9.000E 01,     3.806E 00,          TEE227    250
3     7.227E 01,     1.200E 00,     0.0       ,    2.903E 00,          TEE227    251
4     1.174E 02,     1.800E 00,     9.000E 01,     2.301E 00,          TEE227    252
5     7.337E 01,     1.200E 00,     3.000E 01,     3.204E 00,          TEE227    253
6     7.471E 01,     1.200E 00,     4.500E 01,     3.204E 00,          TEE227    254
7     7.630E 01,     1.200E 00,     9.000E 01,     3.204E 00,          TEE227    255
8     5.326E 01,     1.200E 00,     1.448E 01,     4.107E 00,          TEE227    256
9     4.826E 01,     1.200E 00,     0.0       ,    4.107E 00,          TEE227    257
*     8.344E 01,     1.000E 00,     4.500E 01,     1.699E 00,          TEE227    258
*     8.503E 01,     1.000E 00,     9.000E 01,     1.699E 00,          TEE227    259
*     8.847E 01,     1.400E 00,     1.448E 01,     2.903E 00,          TEE227    260
*     1.057E 02,     1.400E 00,     3.000E 01,     2.000E 00,          TEE227    261
*     7.255E 01,     1.000E 00,     7.181E 00,     2.301E 00,          TEE227    262
*     1.070E 02,     1.400E 00,     4.500E 01,     2.000E 00,          TEE227    263
*     8.943E 01,     2.000E 00,     7.181E 00,     3.505E 00,          TEE227    264
*     4.226E 01,     1.000E 00,     4.500E 01,     4.107E 00,          TEE227    265
*     4.386E 01,     1.000E 00,     9.000E 01,     4.107E 00/          TEE227    266
 DATA A21 /                                                             TEE227    267
1     7.988E 01,     2.000E 00,     0.0       ,    3.806E 00,          TEE227    268
2     1.145E 02,     1.800E 00,     3.000E 01,     2.301E 00,          TEE227    269
3     7.401E 01,     1.000E 00,     1.448E 01,     2.301E 00,          TEE227    270
4     7.750E 01,     1.400E 00,     0.0       ,    3.204E 00,          TEE227    271
5     9.089E 01,     2.000E 00,     1.448E 01,     3.505E 00,          TEE227    272
6     9.296E 01,     2.000E 00,     3.000E 01,     3.505E 00,          TEE227    273
7     8.341E 01,     2.000E 00,     7.181E 00,     3.806E 00,          TEE227    274
8     1.201E 02,     2.000E 00,     3.000E 01,     2.000E 00,          TEE227    275
9     1.214E 02,     2.000E 00,     4.500E 01,     2.000E 00,          TEE227    276
*     6.746E 01,     1.600E 00,     0.0       ,    4.107E 00,          TEE227    277
*     9.430E 01,     2.000E 00,     4.500E 01,     3.505E 00,          TEE227    278
*     9.589E 01,     2.000E 00,     9.000E 01,     3.505E 00,          TEE227    279
*     1.157E 02,     1.600E 00,     3.000E 01,     1.699E 00,          TEE227    280
*     1.174E 02,     2.000E 00,     4.500E 01,     2.301E 00,          TEE227    281
*     8.055E 01,     1.600E 00,     3.000E 01,     3.806E 00,          TEE227    282
*     6.736E 01,     1.200E 00,     3.000E 01,     3.505E 00,          TEE227    283
*     9.391E 01,     1.600E 00,     4.500E 01,     3.204E 00,          TEE227    284
*     9.550E 01,     1.600E 00,     9.000E 01,     3.204E 00/          TEE227    285
 DATA A22 /                                                             TEE227    286
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1     9.054E 01,     1.400E 00,     3.000E 01,     2.903E 00,          TEE227    287
2     8.750E 01,     1.400E 00,     9.000E 01,     3.204E 00,          TEE227    288
3     9.647E 01,     1.600E 00,     1.448E 01,     2.903E 00,          TEE227    289
4     7.149E 01,     1.400E 00,     0.0       ,    3.505E 00,          TEE227    290
5     8.310E 01,     1.200E 00,     1.448E 01,     2.602E 00,          TEE227    291
6     7.949E 01,     1.600E 00,     0.0       ,    3.505E 00,          TEE227    292
7     7.130E 01,     1.200E 00,     1.448E 01,     3.204E 00,          TEE227    293
8     1.092E 02,     1.800E 00,     3.000E 01,     2.602E 00,          TEE227    294
9     8.104E 01,     1.400E 00,     7.181E 00,     3.204E 00,          TEE227    295
*     6.870E 01,     1.000E 00,     1.448E 01,     2.602E 00,          TEE227    296
*     7.210E 01,     1.000E 00,     4.500E 01,     2.602E 00,          TEE227    297
*     7.370E 01,     1.000E 00,     9.000E 01,     2.602E 00,          TEE227    298
*     5.787E 01,     1.000E 00,     0.0       ,    2.903E 00,          TEE227    299
*     6.141E 01,     1.000E 00,     7.181E 00,     2.903E 00,          TEE227    300
*     1.090E 02,     1.400E 00,     4.500E 01,     1.699E 00,          TEE227    301
*     1.158E 02,     1.800E 00,     4.500E 01,     2.301E 00,          TEE227    302
*     6.135E 01,     1.200E 00,     3.000E 01,     3.806E 00,          TEE227    303
*     8.517E 01,     1.200E 00,     3.000E 01,     2.602E 00/          TEE227    304
 DATA A23 /                                                             TEE227    305
1     1.105E 02,     1.800E 00,     4.500E 01,     2.602E 00,          TEE227    306
2     1.121E 02,     1.800E 00,     9.000E 01,     2.602E 00,          TEE227    307
3     9.854E 01,     1.600E 00,     3.000E 01,     2.903E 00,          TEE227    308
4     7.503E 01,     1.400E 00,     7.181E 00,     3.505E 00,          TEE227    309
5     1.190E 02,     2.000E 00,     9.000E 01,     2.301E 00,          TEE227    310
6     5.296E 01,     1.000E 00,     3.000E 01,     3.505E 00,          TEE227    311
7     3.739E 01,     1.000E 00,     7.181E 00,     4.107E 00,          TEE227    312
8     9.188E 01,     1.400E 00,     4.500E 01,     2.903E 00,          TEE227    313
9     5.430E 01,     1.000E 00,     4.500E 01,     3.505E 00,          TEE227    314
*     7.077E 01,     1.000E 00,     3.000E 01,     2.602E 00,          TEE227    315
*     9.461E 01,     1.400E 00,     0.0       ,    2.301E 00,          TEE227    316
*     9.815E 01,     1.400E 00,     7.181E 00,     2.301E 00,          TEE227    317
*     8.250E 01,     1.400E 00,     1.448E 01,     3.204E 00,          TEE227    318
*     9.347E 01,     1.400E 00,     9.000E 01,     2.903E 00,          TEE227    319
*     8.739E 01,     1.200E 00,     0.0       ,    2.000E 00,          TEE227    320
*     9.093E 01,     1.200E 00,     7.181E 00,     2.000E 00,          TEE227    321
*     7.299E 01,     1.000E 00,     0.0       ,    2.000E 00,          TEE227    322
*     1.074E 02,     1.800E 00,     0.0       ,    2.301E 00/          TEE227    323
 DATA A24 /                                                             TEE227    324
1     8.650E 01,     1.200E 00,     4.500E 01,     2.602E 00,          TEE227    325
2     7.653E 01,     1.000E 00,     7.181E 00,     2.000E 00,          TEE227    326
3     8.904E 01,     1.600E 00,     7.181E 00,     3.204E 00,          TEE227    327
4     6.870E 01,     1.200E 00,     4.500E 01,     3.505E 00,          TEE227    328
5     9.050E 01,     1.600E 00,     1.448E 01,     3.204E 00,          TEE227    329
6     6.548E 01,     1.400E 00,     0.0       ,    3.806E 00,          TEE227    330
7     1.014E 02,     2.000E 00,     7.181E 00,     2.903E 00,          TEE227    331
8     1.086E 02,     1.600E 00,     0.0       ,    1.699E 00,          TEE227    332
9     4.943E 01,     1.000E 00,     7.181E 00,     3.505E 00,          TEE227    333
*     7.586E 01,     1.600E 00,     4.500E 01,     4.107E 00,          TEE227    334
*     6.653E 01,     1.400E 00,     3.000E 01,     4.107E 00,          TEE227    335
*     1.049E 02,     2.000E 00,     3.000E 01,     2.903E 00,          TEE227    336
*     1.122E 02,     1.600E 00,     7.181E 00,     1.699E 00,          TEE227    337
*     8.457E 01,     1.400E 00,     3.000E 01,     3.204E 00,          TEE227    338
*     1.063E 02,     2.000E 00,     4.500E 01,     2.903E 00,          TEE227    339
*     1.130E 02,     2.000E 00,     0.0       ,    2.000E 00,          TEE227    340
*     4.828E 01,     1.000E 00,     4.500E 01,     3.806E 00,          TEE227    341
*     4.988E 01,     1.000E 00,     9.000E 01,     3.806E 00/          TEE227    342
 DATA A25 /                                                             TEE227    343
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1     1.029E 02,    2.000E 00,    1.448E 01,    2.903E 00,          TEE227    344
2     1.170E 02,    1.600E 00,    4.500E 01,    1.699E 00,          TEE227    345
3     9.988E 01,    1.600E 00,    4.500E 01,    2.903E 00,          TEE227    346
4     9.637E 01,    1.400E 00,    3.000E 01,    2.602E 00,          TEE227    347
5     7.029E 01,    1.200E 00,    9.000E 01,    3.505E 00,          TEE227    348
6     8.949E 01,    1.600E 00,    9.000E 01,    3.505E 00,          TEE227    349
7     1.186E 02,    1.600E 00,    9.000E 01,    1.699E 00,          TEE227    350
8     5.428E 01,    1.200E 00,    0.0       ,   3.806E 00,          TEE227    351
9     1.037E 02,    2.000E 00,    0.0       ,   2.602E 00,          TEE227    352
*     1.072E 02,    2.000E 00,    7.181E 00,    2.602E 00,          TEE227    353
*     3.886E 01,    1.000E 00,    1.448E 01,    4.107E 00,          TEE227    354
*     1.136E 02,    1.600E 00,    1.448E 01,    1.699E 00,          TEE227    355
*     7.649E 01,    1.400E 00,    1.448E 01,    3.505E 00,          TEE227    356
*     1.198E 02,    1.800E 00,    4.500E 01,    2.000E 00,          TEE227    357
*     6.428E 01,    1.200E 00,    9.000E 01,    3.806E 00,          TEE227    358
*     5.826E 01,    1.200E 00,    9.000E 01,    4.107E 00,          TEE227    359
*     4.093E 01,    1.000E 00,    3.000E 01,    4.107E 00,          TEE227    360
*     9.257E 01,    1.600E 00,    3.000E 01,    3.204E 00/          TEE227    361
 DATA A26 /                                                         TEE227    362
1     7.856E 01,    1.400E 00,    3.000E 01,    3.505E 00,          TEE227    363
2     8.149E 01,    1.400E 00,    9.000E 01,    3.505E 00,          TEE227    364
3     8.943E 01,    1.200E 00,    0.0       ,   1.699E 00,          TEE227    365
4     9.297E 01,    1.200E 00,    7.181E 00,    1.699E 00,          TEE227    366
5     7.727E 01,    1.200E 00,    1.448E 01,    2.903E 00,          TEE227    367
6     7.608E 01,    1.000E 00,    3.000E 01,    2.301E 00,          TEE227    368
7     7.742E 01,    1.000E 00,    4.500E 01,    2.301E 00,          TEE227    369
8     9.627E 01,    1.800E 00,    0.0       ,   2.903E 00,          TEE227    370
9     9.981E 01,    1.800E 00,    7.181E 00,    2.903E 00,          TEE227    371
*     1.071E 02,    1.800E 00,    1.448E 01,    2.602E 00,          TEE227    372
*     1.013E 02,    1.800E 00,    1.448E 01,    2.903E 00,          TEE227    373
*     5.589E 01,    1.000E 00,    9.000E 01,    3.505E 00,          TEE227    374
*     7.901E 01,    1.000E 00,    9.000E 01,    2.301E 00,          TEE227    375
*     6.370E 01,    1.000E 00,    0.0       ,   2.602E 00,          TEE227    376
*     8.488E 01,    2.000E 00,    1.448E 01,    3.806E 00,          TEE227    377
*     5.089E 01,    1.000E 00,    1.448E 01,    3.505E 00,          TEE227    378
*     1.109E 02,    1.800E 00,    7.181E 00,    2.301E 00,          TEE227    379
*     8.347E 01,    1.400E 00,    0.0       ,   2.903E 00/          TEE227    380
 DATA A27 /                                                         TEE227    381
1     8.591E 01,    1.400E 00,    4.500E 01,    3.204E 00,          TEE227    382
2     8.226E 01,    2.000E 00,    4.500E 01,    4.107E 00,          TEE227    383
3     1.161E 02,    2.000E 00,    3.000E 01,    2.301E 00,          TEE227    384
4     8.227E 01,    1.200E 00,    9.000E 01,    2.903E 00,          TEE227    385
5     7.388E 01,    1.400E 00,    4.500E 01,    3.806E 00,          TEE227    386
6     9.239E 01,    1.200E 00,    1.448E 01,    2.000E 00,          TEE227    387
7     7.099E 01,    1.600E 00,    7.181E 00,    4.107E 00,          TEE227    388
8     9.446E 01,    1.200E 00,    3.000E 01,    2.000E 00,          TEE227    389
9     9.580E 01,    1.200E 00,    4.500E 01,    2.000E 00,          TEE227    390
*     7.246E 01,    1.600E 00,    1.448E 01,    4.107E 00,          TEE227    391
*     8.303E 01,    1.600E 00,    7.181E 00,    3.505E 00,          TEE227    392
*     7.453E 01,    1.600E 00,    3.000E 01,    4.107E 00,          TEE227    393
*     7.799E 01,    1.000E 00,    1.448E 01,    2.000E 00,          TEE227    394
*     6.031E 01,    1.000E 00,    4.500E 01,    3.204E 00,          TEE227    395
*     9.739E 01,    1.200E 00,    9.000E 01,    2.000E 00,          TEE227    396
*     1.026E 02,    1.600E 00,    0.0       ,   2.301E 00,          TEE227    397
*     6.190E 01,    1.000E 00,    9.000E 01,    3.204E 00,          TEE227    398
*     8.589E 01,    2.000E 00,    0.0       ,   3.505E 00/          TEE227    399
 N=1296                                                             TEE227    400
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N4=324                                                          TEE227    401
CALL FTPRT(N,DATN,N4,D1,D2,D3,D4,IMODE,NLN)                     TEE227    402
RETURN                                                          TEE227    403
END                                                             TEE227    404
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      FUNCTION TERP1(Z,X,Y,ND,I)                                        TERP1      2
C     SC0940   TERP1    PS-472     LL, PAUL          661013 7094   6600  TERP1      3
C                              LAGRANGIAN INTERPOLATION                 TERP1      4
      DIMENSION X(1), Y(1)                                              TERP1      5
      N = I + ND                                                        TERP1      6
C     INTERPOLATE FOR Y(Z)                                              TERP1      7
      TERP1 = 0.                                                        TERP1      8
      DO 50 J = I, N                                                    TERP1      9
      PX = 1.                                                           TERP1     10
      DO 42 K = I, N                                                    TERP1     11
      IF(K .EQ. J) GO TO 42                                             TERP1     12
      PX = (PX/(X(J) - X(K)))*(Z - X(K))                                TERP1     13
   42 CONTINUE                                                          TERP1     14
   50 TERP1 = TERP1 + PX*Y(J)                                           TERP1     15
   51 RETURN                                                            TERP1     16
      END                                                               TERP1     17
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      FUNCTION TERP2(ZX,ZY,X,Y,F2,NX,NY,MX,MY,II,JJ)                    TERP2      2
C     S00941   TERP2    PS-472     LL, PAUL          661013 7094   6600  TERP2      3
C             LAGRANGIAN INTERPOLATION -- 2 INDEPENDENT VARIABLES       TERP2      4
      DIMENSION X(1), Y(1), F2(MX,MY)                                   TERP2      5
      N = II + NX                                                       TERP2      6
      M = JJ + NY                                                       TERP2      7
      TERP2 = 0.                                                        TERP2      8
      DO 3 I = II, N                                                    TERP2      9
      PX = 1.                                                           TERP2     10
      DO 1 K = II, N                                                    TERP2     11
      IF(K .EQ. I)GO TO 1                                               TERP2     12
      PX = (PX/(X(I) - X(K)))*(ZX - X(K))                               TERP2     13
    1 CONTINUE                                                          TERP2     14
      DO 3 J = JJ, M                                                    TERP2     15
      PY = 1.                                                           TERP2     16
      DO 2 K = JJ, M                                                    TERP2     17
      IF(K .EQ. J)GO TO 2                                               TERP2     18
      PY = (PY/(Y(J) - Y(K)))*(ZY - Y(K))                               TERP2     19
    2 CONTINUE                                                          TERP2     20
    3 TERP2 = TERP2 + PY*PX*F2(I,J)                                     TERP2     21
      RETURN                                                            TERP2     22
      END                                                               TERP2     23
```

```
      FUNCTION TERP3(X1,Y1,Z1,X,Y,Z,F3,NX,NY,NZ,MX,MY,MZ,I,J,K)
C     S00942   TERP3    PS-472     LL, PAUL          661013 7094   6600
C                LAGRANGIAN INTERPOLATION -- 3 INDEPENDENT VARIABLES
      DIMENSION X(1), Y(1), Z(1), F3(MX,MY,MZ)
C     CALCULATE LOOP ENDS
      NI = I + NX
      NJ = J + NY
      NK = K + NZ
C     TRIPLE SUMMATION
      TERP3 = 0.
      DO 4 LI = I, NI
      PX = 1.
C     X PRODUCT
      DO 1 L = I, NI
      IF(L .EQ. LI)GO TO 1
      PX = (PX/(X(LI) - X(L)))*(X1 - X(L))
    1 CONTINUE
      DO 4 LJ = J, NJ
      PY = 1.
C     Y PRODUCT
      DO 2 L = J, NJ
      IF(L .EQ. LJ)GO TO 2
      PY = (PY/(Y(LJ) - Y(L)))*(Y1 - Y(L))
    2 CONTINUE
      DO 4 LK = K, NK
      PZ = 1.
C     Z PRODUCT
      DO 3 L = K, NK
      IF(L .EQ. LK)GO TO 3
      PZ = (PZ/(Z(LK) - Z(L)))*(Z1 - Z(L))
    3 CONTINUE
C     SUM
    4 TERP3 = TERP3 + PX*PY*PZ*F3(LI,LJ,LK)
      RETURN
      END
```

```
      SUBROUTINE TONCOR(SPL,CORR,FREQ,IRR)                              TONCOR
C-----                                                                  TONCOR
C-----TONCOR   GRABLE,E.L.                OCTOBER 1969                  TONCOR
C-----  ABSTRACT    T O N C O R  IS A DRIVER FOR ACOUSTICS SUBROUTINES  TONCOR
C-----             THAT CALCULATE A TONE CORRECTION FROM A SOUND LEVEL  TONCOR
C-----             SPECTRUM.  THE SLOPE METHOD (DEFINED IN REF. 1) IS USED TONCOR
C-----             TO FIND TONAL IRREGULARITIES, THEN THESE ARE APPLIED TO TONCOR
C-----             THE ISO/FAA CURVES (ALSO IN REF. 1) TO FIND TONE COR-  TONCOR
C-----             RECTIONS.  THE MAXIMUM OF THESE IS RETURNED AS THE TONE TONCOR
C-----             CORRECTION SOUGHT.                                   TONCOR
C-----     REFERENCE 1.   DEPARTMENT OF TRANSPORTATION, FEDERAL AVIATION TONCOR
C-----                    REGULATIONS, TITLE 14, CHAPTER 1, PART 36   ** TONCOR
C-----                    NOISE STANDARDS- AIRCRAFT TYPE CERTIFICATION ** TONCOR
C-----                    FEDERAL AVIATION ADMINISTRATION, NOV. 3, 1969. TONCOR
C-----                                                                  TONCOR
C-----     INPUT     SPL = AN ARRAY OF SOUND PRESSURE LEVELS CORRESPONDING TONCOR
C-----                    TO 24 1/3-OCTAVE BANDS WITH CENTER FREQUENCY OF TONCOR
C-----                    FIRST BAND AT 50 CPS.                         TONCOR
C-----                                                                  TONCOR
C-----     OUTPUT   CORR= THE TONE CORRECTION FOR THE SPECTRUM.         TONCOR
C-----              FREQ= CENTER FREQUENCY OF THE BAND CORRESPONDING TO TONCOR
C-----                    THE TONE CORRECTION.                          TONCOR
C-----              IRR = THE BAND NUMBER CORRESPONDING TO THE TONE     TONCOR
C-----                    CORRECTION.                                   TONCOR
C-----                                                                  TONCOR
C-----     LOCAL VARIABLES                                              TONCOR
C-----      F = AN ARRAY OF TONAL IRREGULARITIES                        TONCOR
C-----     FA = AN ARRAY OF CENTER FREQUENCIES                          TONCOR
C-----     FC = AN ARRAY OF TONAL CORRECTIONS                           TONCOR
C-----     N  = NUMBER OF FREQUENCY BANDS  (24)                         TONCOR
C-----                                                                  TONCOR
      DIMENSION SPL(24,17),FA(24),F(24),FC(24),CORR(17)                 TONCOR
      DATA  FA            / 50.,63.,80.,100.,125.,160.,200.,250.,315.,  TONCOR
     1400.,500.,630.,800.,1000.,1250.,1600.,2000.,2500.,3150.,4000.,    TONCOR
     25000.,6300.,8000.,10000./,N/24/                                   TONCOR
      DO 30 JJ=1,17                                                     TONCOR
      CALL TONES3(SPL(1,JJ),F)                                          TONCOR
      CALL FAAISO(F,FA,N,FC)                                            TONCOR
      IRR = 1                                                           TONCOR
      CORR(JJ)=0.                                                       TONCOR
      DO 20 I=2,24                                                      TONCOR
      IF (FC(I).LE.CORR(JJ)) GO TO 20                                   TONCOR
      IRR = I                                                           TONCOR
      CORR(JJ) = FC(I)                                                  TONCOR
   20 CONTINUE                                                          TONCOR
      FREQ = FA(IRR)                                                    TONCOR
 30   CONTINUE                                                          TONCOR
      RETURN                                                            TONCOR
      END                                                               TONCOR
```

```
      SUBROUTINE TONES3(SPL,F)                                          TONES3     2
C-----    GRABLE, E. L.     TONES3     700108                           TONES3     3
C-----    ABSTRACT  THE SLOPE METHOD OF TONE IDENTIFICATION AS PRESENTED TONES3     4
C-----              IN REFERENCE 1 IS USED TO FIND TONAL IRREGULARITIES TONES3     5
C-----              IN 24 ONE-THIRD OCTAVE BANDS.                       TONES3     6
C-----    REFERENCE 1.   DEPARTMENT OF TRANSPORTATION, FEDERAL AVIATION TONES3     7
C-----                   REGULATIONS, TITLE 14, CHAPTER 1, PART 36   ** TONES3     8
C-----                   NOISE STANDARDS- AIRCRAFT TYPE CERTIFICATION ** TONES3     9
C-----                   FEDERAL AVIATION ADMINISTRATION, NOV. 3, 1969. TONES3    10
C-----                                                                  TONES3    11
C-----    INPUT* SPL ARRAY IS 24 ELEMENT ARRAY OF SOUND PRESSURE LEVELS TONES3    12
C-----               IN 24 ONE-THIRD OCTAVE BANDS (PREFERRED OCTAVES)   TONES3    13
C-----    OUTPUT* F  ARRAY IS 24 ELEMENT ARRAY OF TONAL IRREGULARITIES. TONES3    14
C-----                                                                  TONES3    15
C-----LOCAL VARIABLES                MEANING                            TONES3    16
C-----                 S       FIRST ORDER SLOPES                       TONES3    17
C-----                 SPLP    AVERAGED  SOUND PRESSURE LEVELS          TONES3    18
C-----                                                                  TONES3    19
C                                                                       TONES3    20
C                                                                       TONES3    21
C     REVISIED ON MARCH 10, 1971 BY J. D. CRAIG                         TONES3    22
C                                                                       TONES3    23
C        THE STEP 4 CALCULATIONS HAVE BEEN MODIFIED TO ALTER CALCULATION TONES3    24
C        OF SPLPRIME(23).  HERE-TO-FORE IF SPL(23) HAD BEEN CIRCLED AS  TONES3    25
C        PER CONDITION B OF STEP 3, SPLPRIME(23) WAS NOT CALCULATED AS  TONES3    26
C        THE AVERAGE OF SPL(22) AND SPL(24) AS PER PARAGRAPH B OF STEP  TONES3    27
C        4.  THIS PARAGRAPH IS NOW SATISFIED.                           TONES3    28
C                                                                       TONES3    29
      DIMENSION SPL(24),S(24),SPLP(24),F(24)                            TONES3    30
C-----    STEP ONE                                                      TONES3    31
      DO 20 I=4,24                                                      TONES3    32
      S(I) = SPL(I) - SPL(I-1)                                          TONES3    33
   20 CONTINUE                                                          TONES3    34
C-----    STEPS TWO AND FOUR                                            TONES3    35
      SPLP(3) = SPL(3)                                                  TONES3    36
      SPLP(4) = SPL(4)                                                  TONES3    37
      DO 50 I=5,24                                                      TONES3    38
      SPLP(I) = SPL(I)                                                  TONES3    39
      IF (ABS(S(I)-S(I-1)).LE.5.)  GO TO 50                             TONES3    40
C-----    STEPS THREE AND FOUR                                          TONES3    41
      IF (S(I).LE.0.)    GO TO 40                                       TONES3    42
      IF(I.LT.23.AND.                                                   TONES3    43
     *   (S(I).GT.S(I-1)))     SPLP(I) = (SPL(I-1)+SPL(I+1))*.5         TONES3    44
      GO TO 50                                                          TONES3    45
   40 IF (S(I-1).GT.0.)        SPLP(I-1) = (SPL(I-2)+SPL(I))*.5         TONES3    46
   50 CONTINUE                                                          TONES3    47
      SPLP(24) = SPL(24)                                                TONES3    48
      IF(ABS(S(24)-S(23)).GT.5..AND.S(24).GT.AMAX1(0.,S(23)))           TONES3    49
     *                         SPLP(24) = SPL(23) + S(23)               TONES3    50
C-----    STEPS FIVE, SIX, SEVEN, AND EIGHT.                            TONES3    51
      F(1) = 0.                                                         TONES3    52
      F(2) = 0.                                                         TONES3    53
      F(3) = 0.                                                         TONES3    54
      DO 60 I=4,23                                                      TONES3    55
      F(I)  = SPL(I) - (SPLP(I-1) + SPLP(I) + SPLP(I+1) )/3.            TONES3    56
   60 CONTINUE                                                          TONES3    57
      F(24) = SPL(24) - SPLP(24)                                        TONES3    58
```

```
      DO 80 I=4,24                                                      TONES3     59
      IF (F(I).LT.0.)     F(I) = 0.                                     TONES3     60
   80 CONTINUE                                                          TONES3     61
      RETURN                                                            TONES3     62
      END                                                               TONES3     63
```

```
      SUBROUTINE UNIFLW(AF,U,V,W,AMACH,ROP,THOP,TH,ETA,PSI,ALP,DLT,
     1                  GAM,ROPP,THOPP,THP,ETAP,TLE,PSIO,PSIOP)
C
C  TITLE
C     UNIFORM FLOW EFFECTS
C
C  PURPOSE
C     THIS SUBROUTINE COMPUTES UNIFORM FLOW EFFECTS BY THE FOLLOWING
C         COORDINATE TRANSFORM FOR SOURCE POSITION
C         COORDINATE TRANSFORM FOR OBSERVER DIRECTION ANGLES
C         SPECIAL LEADING EDGE TERM
C         WAVE NUMBER TRANSFORM
C         DIRECTIVITY ANGLE FOR REFERENCE PRESSURE OF DIFFRACTED
C              INCIDENT AND IMAGE FIELDS
C
C  INPUT - CALL SEQUENCE
C     AF        UNIT VECTOR IN DIRECTION OF AMBIENT FLOW
C     U,V,W     UNIT VECTORS FOR COORDINATE SYSTEM FIXED TO EDGE
C     AMACH     AIRCRAFT MACH NUMBER
C     ROP,THOP  POLAR COORDINATES OF APPARENT SOURCE WITH JET FLOW
C               REMOVED
C     TH,ETA    DIRECTION ANGLES RELATIVE TO EDGE
C     PSI       OBSERVER DIRECTIVITY ANGLE
C     ALP,DLT   ENGINE CENTERLINE ANGLES RELATIVE TO HALF PLANE
C
C  OUTPUT
C     GAM       TRANSFORMED WAVE NUMBER
C     ROPP      MAGNITUDE OF TRANSFORMED SOURCE POSITION
C     THOPP     PHASE OF TRANSFORMED SOURCE POSITION
C     THP,ETAP  TRANSFORMED OBSER POSITION ANGLES
C     TLE       LEADING EDGE TERM
C     PSIO      DIRECTIVITY ANGLES FOR DIFFRACTED INCIDENT FIELD
C     PSIOP     DIRECTIVITY ANGLES FOR DIFFRACTED IMAGE FIELD
C
C  NOTE
C     ALL INPUT AND OUTPUT ANGLES ARE IN DEGREES
C
      DIMENSION AF(3),U(3),V(3),W(3),R(3),EL(3)
C
      DATA DEGRAD,RADDEG,EPS /1.745329251943E-2,57.295779513082,1.2E-4/
C
C     INITIALIZATION COMPUTATIONS
C
      TLE    = 0.
      THOPP  = THOP
      THP    = TH
      ETAP   = ETA
      ALP    =  ALP
      ROPP   =  ROP
      GAM    =  1.
      SINETA  =  SIN(ETA * DEGRAD)
      COSETA  =  SQRT(1. - SINETA*SINETA)
      IF  (ABS(AMACH) .LE. EPS)  GO TO 90
C     WAVE NUMBER TRANSFORM
C
      EMV=AMACH*DOTP(AF,V)
      GMA2=1./(1.-EMV*EMV)
```

```
      GAM=SQRT(GMA2)                                                    UNIFLW     59
      GAM1=GAM-1.                                                       UNIFLW     60
C                                                                       UNIFLW     61
C     SOURCE COORDINATE TRANSFORM(ORIGINAL SOURCE VECTOR)               UNIFLW     62
C                                                                       UNIFLW     63
      CTHOP=COS(THOP*DEGRAD)                                            UNIFLW     64
      STHOP=SIN(THOP*DEGRAD)                                            UNIFLW     65
      R(1)= ROP*(STHOP*W(1)-CTHOP*V(1))                                 UNIFLW     66
      R(2)= ROP*(STHOP*W(2)-CTHOP*V(2))                                 UNIFLW     67
      R(3)= ROP*(STHOP*W(3)-CTHOP*V(3))                                 UNIFLW     68
      DOT=DOTP(R,AF)                                                    UNIFLW     69
      EL(1)= R(1)-DOT*AF(1)                                             UNIFLW     70
      EL(2)= R(2)-DOT*AF(2)                                             UNIFLW     71
      EL(3)= R(3)-DOT*AF(3)                                             UNIFLW     72
      ELMAG= SQRT(EL(1)*EL(1)+EL(2)*EL(2)+EL(3)*EL(3))                  UNIFLW     73
      IF(ELMAG.GT.0.)GO TO 20                                           UNIFLW     74
      EL(1)= W(1)                                                       UNIFLW     75
      EL(2)= W(2)                                                       UNIFLW     76
      EL(3)= W(3)                                                       UNIFLW     77
      GO TO 40                                                          UNIFLW     78
   20 CALL VECN(EL)                                                     UNIFLW     79
   40 R(1) = R(1)+GAM1*DOT*AF(1)                                        UNIFLW     80
      R(2)= R(2)+GAM1*DOT*AF(2)                                         UNIFLW     81
      R(3)= R(3)+GAM1*DOT*AF(3)                                         UNIFLW     82
      TMAG=SQRT(R(1)*R(1)+R(2)*R(2)+R(3)*R(3))                          UNIFLW     83
      COSXI = -DOT / ROP                                                UNIFLW     84
      COSXIP=(COSXI+AMACH)/(1.+AMACH*COSXI)                             UNIFLW     85
      SINXIP=SQRT(1.-COSXIP*COSXIP)                                     UNIFLW     86
C                                                                       UNIFLW     87
C     NEW SOURCE VECTOR                                                 UNIFLW     88
C                                                                       UNIFLW     89
      R(1) =TMAG*(SINXIP*EL(1)-COSXIP*AF(1))                            UNIFLW     90
      R(2) = TMAG*(SINXIP*EL(2)-COSXIP*AF(2))                           UNIFLW     91
      R(3) =TMAG*(SINXIP*EL(3)-COSXIP*AF(3))                            UNIFLW     92
      DOT= DOTP(R,U)                                                    UNIFLW     93
      R(1) = R(1)-DOT*U(1)                                              UNIFLW     94
      R(2) = R(2)-DOT*U(2)                                              UNIFLW     95
      R(3) = R(3)-DOT*U(3)                                              UNIFLW     96
      ROPP=SQRT(R(1)*R(1)+R(2)*R(2)+R(3)*R(3))                          UNIFLW     97
      DOT=-DOTP(R,V)                                                    UNIFLW     98
      THOPP=ACOS(DOT/ROPP)*RADDEG                                       UNIFLW     99
C                                                                       UNIFLW    100
C     OBSERVER TRANSFORM (ORIGINAL OBSERVER VECTOR)                     UNIFLW    101
C                                                                       UNIFLW    102
      COSTH  = COS(TH*DEGRAD)                                           UNIFLW    103
      SINTH  = SIN(TH*DEGRAD)                                           UNIFLW    104
      R(1)= SINETA*U(1)+COSETA*COSTH*V(1)-COSETA*SINTH*W(1)             UNIFLW    105
      R(2)= SINETA*U(2)+COSETA*COSTH*V(2)-COSETA*SINTH*W(2)             UNIFLW    106
      R(3)= SINETA*U(3)+COSETA*COSTH*V(3)-COSETA*SINTH*W(3)             UNIFLW    107
      DOT=DOTP(R,AF)                                                    UNIFLW    108
      EL(1)= R(1)-DOT*AF(1)                                             UNIFLW    109
      EL(2)= R(2)-DOT*AF(2)                                             UNIFLW    110
      EL(3)= R(3)-DOT*AF(3)                                             UNIFLW    111
      ELMAG=SQRT(EL(1)*EL(1)+EL(2)*EL(2)+EL(3)*EL(3))                   UNIFLW    112
      IF(ELMAG.GT.0.)GO TO 60                                           UNIFLW    113
      EL(1)=-W(1)                                                       UNIFLW    114
      EL(2)=-W(2)                                                       UNIFLW    115
```

```
      EL(3)=-W(3)                                                       UNIFLW    116
      GO TO 80                                                          UNIFLW    117
   60 CALL VECN(EL)                                                     UNIFLW    118
   80 COSXI=DOT                                                         UNIFLW    119
      COSXIP=(COSXI-AMACH)/(1.-COSXI*AMACH)                             UNIFLW    120
      SINXIP=SQRT(1.-COSXIP*COSXIP)                                     UNIFLW    121
C                                                                       UNIFLW    122
C     NEW VECTOR TO OBSERVER                                            UNIFLW    123
C                                                                       UNIFLW    124
      R(1) =SINXIP*EL(1)+COSXIP*AF(1)                                   UNIFLW    125
      R(2) =SINXIP*EL(2)+COSXIP*AF(2)                                   UNIFLW    126
      R(3) =SINXIP*EL(3)+COSXIP*AF(3)                                   UNIFLW    127
      DOT= DOTP(R,U)                                                    UNIFLW    128
      ETAP=ASIN(DOT)*RADDEG                                             UNIFLW    129
      THP=0.0                                                           UNIFLW    130
      ARG1= -DOTP(R,W)                                                  UNIFLW    131
      ARG2=  DOTP(R,V)                                                  UNIFLW    132
      IF((ARG1.NE.0.).OR.(ARG2.NE.0.))THP=ATAN2(ARG1,ARG2)*RADDEG       UNIFLW    133
C                                                                       UNIFLW    134
C  CALC. SPECIAL LEADING EDGE TERM FACTOR AND REFERENCE DIRECTIVITY     UNIFLW    135
C  ANGLES GRAZING BARRIER EDGE FOR INCIDENT AND IMAGE SIGNALS           UNIFLW    136
C                                                                       UNIFLW    137
      IF(EMV.LT.0.)TLE=EMV/(1.+AMACH*COSXIP)                            UNIFLW    138
   90 SINALP  =  U(2)                                                   UNIFLW    139
      COSALP  =  SQRT(1. - SINALP*SINALP)                               UNIFLW    140
      ARG1  =  COSALP*COSETA*COS((THOP-DLT)*DEGRAD) - SINALP*SINETA     UNIFLW    141
      IF(ABS(ARG1).GT.1.)ARG1=SIGN(1.,ARG1)                             UNIFLW    142
      PSIO=180.-ACOS(ARG1)*RADDEG                                       UNIFLW    143
      IF  (TH .LE.-THOP)  GO TO 100                                     UNIFLW    144
      PSIOP=PSIO                                                        UNIFLW    145
      GO TO 200                                                         UNIFLW    146
  100 ARG1  =  COSALP*COSETA*COS((TH+DLT)*DEGRAD) - SINALP*SINETA       UNIFLW    147
      IF(ABS(ARG1).GT.1.)ARG1=SIGN(1.,ARG1)                             UNIFLW    148
      PSIOP=180.-ACOS(ARG1)*RADDEG                                      UNIFLW    149
  200 IF  (TH .LT. THOP)  PSIO = PSI                                    UNIFLW    150
C                                                                       UNIFLW    151
      RETURN                                                            UNIFLW    152
      END                                                               UNIFLW    153
```

```
      SUBROUTINE UNIT(DISTAT,NUMBER,SPL)
C AUTHOR              D. F. MELDRUM
C
C PURPOSE             TO CONVERT DATA AT ANY GIVEN REFERENCD DISTANCE
C                     TO AN INDEXED SPECTRA AT 3.281 FEET (1 METER)
C
C METHOD              ACCOUNT FOR SPHERICAL DIVERGENCE AND ATMOSHERIC
C                     ABSORPTIONS A STANDARD DAY CONDITIONS OF
C                     70 PERCENT RELATIVE HUMIDITY AND 59 DEGREES F.
C
C INPUTS              DISTAT     DISTANCE GIVEN FOR THE REFERENCED
C                                DATA (DISTANCD PREDICTED AT).
C                     NUMBER     NUMBER OF ANGLES OR SET OF SPECTRA
C                                TO BE CONVERTED.
C                     SPL        SPECTRA TO BE CONVERTED
C
C                     VIA LABLED COMMON GFREQ
C
C                     FREQ       1/3 OCTAVE CENTER BAND FREQUENCIES
C
C OUTPUTS             SPL        CONVERTED TO INDEXED SPECTRA
C
C FUNCTION SUBPRGM    ALOG10
C
C
      DIMENSION COEF(24),SPL(24,NUMBER)
C
C
      COMMON /GFREQ/ FREQ(24)
C
C
      DATA DISTGO/3.281/,ISWTCH/0/
C
      IF(ISWTCH.NE.0) GO TO 100
      ISWTCH=1
      CALL ABSORP(70.0,59.0,3,24,FREQ,COEF)
C
C
  100 SPHER=20.0*ALOG10(DISTAT/DISTGO)
C
      DO 200 I=1,24
      ATMOS=COEF(I)*(DISTAT-DISTGO)/1000.0
C
      DO 200 J=1,NUMBER
C
      IF(SPL(I,J).NE.0.0) SPL(I,J)=SPL(I,J)
     *                              +SPHER+ATMOS
  200 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE VALUES(IMODE,NLS,NLF,XF,YF,Z,SCI,DE,EPR,DS,
     *        X1,X2,Y1,Y2,SUM,SLNL    ,IEC )
      COMMON/VALNL/NLST,NLFT
      COMMON/ASD/SD(3),NSL
      DIMENSION SUM(1),IEC(1),X1(1),X2(1),Y1(1),Y2(1)
      DIMENSION DS(1),SLNL(3)
      DIMENSION X1Q(5),X2Q(5),Y1Q(5),Y2Q(5),SUMQ(5),SLNLQ(3),IECQ(5)
      COMMON/FLIGHT/IMODEQ,XFQ,YFQ,ZQ,SCIQ,DEQ,EPRQ
      COMMON/RESULT/X1Q,X2Q,Y1Q,Y2Q,SUMQ,SLNLQ,IECQ
C
C
C       IF    IMODE= -1    INITIALIZATION OF CONTOUR PROGRAM
C             IMODE=  0    HOLD  NO ACTION   RETURN
C             IMODE=  1    REAL TIME OR 360/67 SIMULATION
      IF(IMODE) 1000,1030,1030
 1000 CONTINUE
      JJK=0
      DO 1001 I=1,3
      IF(DS(I).LT. 1.0)GO TO 1001
      SD(I)=DS(I)
      JJK=JJK+1
 1001 CONTINUE
      NSL=JJK
 1030 CONTINUE
      NLST=NLS
      NLFT=NLF
      CALL TEE227(IMODE,NLN)
      RETURN
 1030 CONTINUE
      IMODEQ=IMODE
      XFQ=XF
      YFQ=YF
      ZQ=Z
      SCIQ=SCI
      DEQ=DE
      EPRQ=EPR
      CALL VALUE2
      DO 1028 I=NLS,NLF
      X1(I)=X1Q(I)
      X2(I)=X2Q(I)
      Y1(I)=Y1Q(I)
      Y2(I)=Y2Q(I)
      SUM(I)=SUMQ(I)
      IEC(I)=IECQ(I)
 1028 CONTINUE
      DO 1029 I=1,NSL
 1029 SLNL(I)=SLNLQ(I)
      RETURN
      END
```

```
      SUBROUTINE VDIM(AARRAY,BARRAY,NEPR,NL,NLRC,NALFA,NLS,NLF)
C
C         THIS ROUTINE ASSUMES THAT THE AIRCRAFT IS FLYING IN THE (X,Y,Z
C         COORDINATE SYSTEM. THE POSITIONS (ONE TO THE RIGHT AND ONE TO
C         THE LEFT OF THE AIRCRAFT IN THE U,V SYSTEM) OF THE INTERSECTIO
C         OF THE CONTOUR ARE CALCULATED. THE COORDINATES OF THESE TWO PO
C         RELATIVE TO THE AIRCRAFT ARE TRANSFORMED INTO THE (X,Y,Z) SYST
C
C
C  REVISED BY D.G. DUNN  (17 JUN 1974)
C
C     IEC   ERROR CODE FOR EACH PARTICULAR CONTOUR
C             IEC LT 0    INDICATES NO ERROR
C             IEC EQ 0    INDICATES CONTOUR HAS CLOSED
C             IEC GT 0    INDICATES SINGULARITY CONDITION EXISTS
C
C     ASSUMPTIONS
C            -90 LT DE LT 90  I.E. COS(DE) GT ZERO
C              0  LT SCI LT 180 AND COS(DE) DOES NOT EQUAL SCI
C     RPD  ... RADIANS PER DEGREE (1.745329252E-2)
C     DPR  ... DEGREES PER RADIAN (57.2957795     )
      DIMENSION SUM(5),IEC(5),U(5),V(5),X1(5),X2(5),Y1(5),Y2(5)
      DIMENSION U2(5), V2(5), SAX(5)
      COMMON/ASD/SD(3),NSL
      COMMON/CONTNT/AEPR(6),ALRO(9),AALFA(6)
      COMMON/FLIGHT/IMODE,XF,YF,Z,SCI,DE,EPR
      COMMON/RESULT/X1,X2,Y1,Y2,SLM,SLML,IEC
      DIMENSION AARRAY(NLRO,NALFA,NEPR),BARRAY(NEPR,NALFA,NL)
      DIMENSION SLML(3),SUMX(5)
      DOUBLE PRECISION SUMX
C
C            DATA CONSTANTS
      DATA IO, I1, I2 /0,1,2/
      DATA INDX, MAXIT, EPS2, U, V, SAX /1,10,1.2E-5,10*0.,5*45.0/
      DATA DPR,RPD,ONE,ZERO,P5,EPS,H1,H2,H3/57.2957795,0.01745329252,
     11.0,0.0,0.5,1.E-4,90.0,180.0,360.0/
      GO TO 1360
      ENTRY RESTRT
 1010 INDX  =  I1
      DO  1020  I=1,NL
      SUM(I)  =  ZERO
      SUMX(I)  =  ZERO
      IEC(I)  = -I1
 1020 CONTINUE
      GO TO 1360
      ENTRY VALUE2
 1030 CONTINUE
      DO  1040  I=NLS,NLF
 1040 IEC(I)  = -I1
      IF  (INDX .GT. I1)  GO TO 1060
      DO  1050   I=NLS,NLF
      SUM(I)  =  ZERO
      SUMX(I)  =  ZERO
      U2(I)  =  ZERO
      V2(I)  =  ZERO
 1050 CONTINUE
      XS=XF
```

```
      YS=YF                                                             VDIM
      ZO=Z                                                              VDIM
      ST  =  ZERO                                                       VDIM
      CT  =  ONE                                                        VDIM
C     REDUCE ANGLES (DE,SCI) TO APPROPRIATE QUADRANTS                   VDIM
 1060 SCI=AMOD(SCI,H3)                                                  VDIM
C                                                                       VDIM
      SCI=ABS(SCI-H3*FLOAT(IFIX(SCI/H2)))                               VDIM
      DE=AMOD(DE,H3)                                                    VDIM
      DE=DE-H3*FLOAT(IFIX(DE/H2))                                       VDIM
      IF (ABS(DE)-H1)  1080,1080,1070                                   VDIM
C     RESTRICTION OF RANGE TEST ON DE                                   VDIM
 1070 DE=DE-SIGN(H2,DE)                                                 VDIM
      SCI=H2-SCI                                                        VDIM
C                                                                       VDIM
 1080 A1=SCI*RPD                                                        VDIM
      A2=DE*RPD                                                         VDIM
      A3 =A1-A2                                                         VDIM
C     A3 REPRESENTS                                                     VDIM
      A3T=ABS(ABS(A3)-1.570796)-EPS                                     VDIM
C     1.5707963267949  A REPRESENTATION OF PI/2                         VDIM
      IF (A3T)  1100,1100,1090                                          VDIM
C     RESTRICTION OF RANGE                                              VDIM
 1090 TA3=TAN(A3)                                                       VDIM
C          TANGENT OF SCI-DE                                            VDIM
 1100 SA2=SIN(A2)                                                       VDIM
C          SINE OF DE                                                   VDIM
      SA2S=SA2*SA2                                                      VDIM
C          SINE SQUARED DE                                              VDIM
      CA2S=ONE-SA2S                                                     VDIM
C          COSINE SQUARED DE                                            VDIM
      CA2=SQRT(CA2S)                                                    VDIM
      CA1=COS(A1)                                                       VDIM
      CA1S=CA1*CA1                                                      VDIM
C                                                                       VDIM
C                                                                       VDIM
      ZS=Z*Z                                                            VDIM
      DX  =  XF - XS                                                    VDIM
      DY  =  YF - YS                                                    VDIM
      DZ  =  Z - ZO                                                     VDIM
      DU  =  DX*DX + DY*DY                                              VDIM
      DV  =  DU + DZ*DZ                                                 VDIM
      IF  (DV .LE. ZERO)  GO TO 1101                                    VDIM
      CA4  =  SQRT(DU / DV)                                             VDIM
      GO TO 1102                                                        VDIM
 1101 CA4  =  ONE                                                       VDIM
 1102 ZE  =  Z * CA4                                                    VDIM
      ZES=ZE*ZE                                                         VDIM
C                                                                       VDIM
C    OBTAIN THE NOISE LEVEL AT DISTANCE SD AND AT ALTITUDE Z            VDIM
      DO 1120 I=1,NSL                                                   VDIM
      ALPHA1=ATAN(ZE/SD(I))*DPR                                         VDIM
      SLLRO  =  P5 * ALOG10(ZES + SD(I)*SD(I))                          VDIM
      SLNL(I)  =  TBLU3(SLLRO, ALPHA1, EPR, ALRO, AALFA, AEPR, AARRAY,  VDIM
     * I1, I1, I1, NLRO, NALFA, NEPR, NLRO, NALFA, NEPR)                VDIM
 1120 CONTINUE                                                          VDIM
C                                                                       VDIM
```

```
C                                                                       VDIM
C                                                                       VDIM
C     OBTAIN QUADRATIC EQUATION COEFICIENTS (A,B) WHICH DO              VDIM
C     NOT VARY FOR EACH NOISE CONTOUR(J)                                VDIM
      A=CA2S-CA1S                                                       VDIM
      B=2.*(Z*SA2*CA2)                                                  VDIM
      CC=ZS*(SA2S-CA1S)                                                 VDIM
      IF (A)  1140,1130,1140                                            VDIM
 1130 IF (B)  1150,1160,1150                                            VDIM
 1140 P1=B/(A+A)                                                        VDIM
      P1S=P1*P1                                                         VDIM
      IP  = -I1                                                         VDIM
      GO TO 1170                                                        VDIM
 1150 IP  =  I0                                                         VDIM
      GO TO 1170                                                        VDIM
 1160 IP  =  I1                                                         VDIM
C                                                                       VDIM
C     OBTAIN SINE AND COSINE OF FLIGHT VECTOR FOR TRANSFORMATION        VDIM
C     OF COORDINATE (U,V) TO (X,Y,Z)                                    VDIM
 1170 DS  =  SQRT(DU)                                                   VDIM
      IF (DS)  1190,1190,1180                                           VDIM
 1180 ST=-(DX/DS)                                                       VDIM
      CT=DY/DS                                                          VDIM
C                                                                       VDIM
C     ITERATION FOR EACH CONTOUR(J)                                     VDIM
C                                                                       VDIM
 1190 DO  1340  J = NLS,NLF                                             VDIM
C                                                                       VDIM
C  ITERATION INVOLVING THE ELEVATION ANGLE (SA  =  ALPHA) WHICH IS A    VDIM
C  FUNCTION OF THE AIRPLANE ALTITUDE AND RANGE FOR A SPECIFIED NOISE    VDIM
C  CONTOUR.                                                             VDIM
C  CODE USES WEGSTEINS SECANT ITERATION SCHEME EXTRACTED FROM SUBR. RTWI VDIM
C  REF... IBM SYS/360 SCIENTIFIC SUBROUTINE PACKAGE, VER.III,           VDIM
C         H20-0166-5, 1968, PP. 215-216                                 VDIM
      DX  =  SAX(J)                                                     VDIM
      I  = -I1                                                          VDIM
      K  =  I2                                                          VDIM
C                                                                       VDIM
C  FIRST FUNCTION EVALUATION                                            VDIM
   10 RO  =  10.**TBLU2(EPR, DX, AEPR, AALFA, BARRAY(1,1,J),I1,I1, NEPR, VDIM
     * NALFA, NEPR, NALFA)                                              VDIM
      IF  (RO - ZE)  20, 20, 30                                         VDIM
   20 SA  =  (DX + H1) * P5                                             VDIM
      GO TO 40                                                          VDIM
   30 SA  =  DPR * ASIN(ZE / RO)                                        VDIM
   40 IF  (I)  50, 60, 120                                              VDIM
   50 DU  =  SA - DX                                                    VDIM
      IF  (ABS(DU) - EPS2 * ABS(SA))  140, 140, 55                      VDIM
   55 DV  =  -DU                                                        VDIM
      DX  =  SA                                                         VDIM
      I  =  I0                                                          VDIM
C                                                                       VDIM
C  SECOND FUNCTION EVALUATION                                           VDIM
      GO TO 10                                                          VDIM
   60 DY  =  DX - SA                                                    VDIM
      I  =  I1                                                          VDIM
      IF  (ABS(DY) - EPS2 * ABS(SA))  140, 140, 80                      VDIM
```

```
   80 K   =   K + I1                                                    VDIM      173
      IF  (K - MAXIT)  90, 90, 140                                      VDIM      174
   90 IF  (DY)  100, 140, 100                                           VDIM      175
  100 DV   =   DV / DY - ONE                                            VDIM      176
      IF  (DV)  110, 140, 110                                           VDIM      177
  110 DU   =   DU / DV                                                  VDIM      178
      DX   =   DX + DU                                                  VDIM      179
      DV   =   DY                                                       VDIM      180
C                                                                       VDIM      181
C  THIRD TO MAXIT FUNCTION EVALUATIONS                                  VDIM      182
      GO TO 10                                                          VDIM      183
  120 DY   =   DX - SA                                                  VDIM      184
      DA   =   EPS2 * ABS(DX)                                           VDIM      185
      IF  (ABS(DU) - DA)  130, 130, 80                                  VDIM      186
  130 IF  (ABS(DY) - 10.*DA)  140, 140, 80                              VDIM      187
  140 SAX(J)   =   SA                                                   VDIM      188
 1220 ROS   =   RO * RO                                                 VDIM      189
      US   =   ROS - ZES                                                VDIM      190
C     TEST  FOR PROPER RANGE OF U SQUARED. (IF CONTOUR HAS CLOSED)      VDIM      191
      IF  (US)  1230, 1230, 1260                                        VDIM      192
 1230 U(J)=ZERO                                                         VDIM      193
      V(J)=ZERO                                                         VDIM      194
      IEC(J)   =   IC                                                   VDIM      195
      IF  (ABS(CA4*DZ) .LE. EPS*RO)  GO TO 1320                         VDIM      196
      DV   =   -DS * (Z - (RO/CA4)) / DZ                                VDIM      197
      IF  (ABS(DV) .LT. DS)  V(J) = DV                                  VDIM      198
      IF(A3T) 1320,1320,1240                                            VDIM      199
C     TEST TO SEE IF RADIATION DIRECTION IS STRAIGHT DOWN               VDIM      200
 1240 V(J)   =   V(J) + RO / (CA4 * TA3)                                VDIM      201
      GO TO  1320                                                       VDIM      202
 1260 U(J)=SQRT(US)                                                     VDIM      203
      C=-US*CA1S+CC                                                     VDIM      204
      IF  (IP)  1270, 1300, 1310                                        VDIM      205
 1270 P2S=P1S-C/A                                                       VDIM      206
      IF (P2S)  1280,1290,1290                                          VDIM      207
C     TEST FOR NOISE CONE FORMING AN ELLIPSE NOT                        VDIM      208
C     INTERSECTING THE SIDELINE                                         VDIM      209
 1280 P2S=-P2S                                                          VDIM      210
      IF(P2S-EPS*P1S)1290,1290,1285                                     VDIM      211
 1285 IEC(J)   =   I1                                                   VDIM      212
      GO TO  1330                                                       VDIM      213
 1290 P2=SIGN(SQRT(P2S),CA1)                                            VDIM      214
      V(J)=P1+P2                                                        VDIM      215
      GO TO  1320                                                       VDIM      216
 1300 V(J)=C/B                                                          VDIM      217
      GO TO  1320                                                       VDIM      218
 1310 V(J)=ZERO                                                         VDIM      219
 1320 UST=U(J)*ST                                                       VDIM      220
      UCT=U(J)*CT                                                       VDIM      221
      DU=XF-V(J)*ST                                                     VDIM      222
      DV=YF+V(J)*CT                                                     VDIM      223
C                                                                       VDIM      224
C     TRANSFORMATION OF COORDINATES(U,V) TO (X,Y)                       VDIM      225
      X1(J)=DU+UCT                                                      VDIM      226
      X2(J)=DU-UCT                                                      VDIM      227
      Y1(J)=DV+UST                                                      VDIM      228
      Y2(J)=DV-UST                                                      VDIM      229
```

```
      DA   =   (U(J) + U2(J)) * (V(J) - V2(J) + DS)                    VDIM      230
      SUMX(J)=SUMX(J)+DA                                               VDIM      231
      IF  (INDX .LE. I1)   SUMX(J) = ZERC                              VDIM      232
      SUM(J)=SUMX(J)                                                   VDIM      233
 1330 U2(J)   =   U(J)                                                 VDIM      234
      V2(J)   =   V(J)                                                 VDIM      235
 1340 CONTINUE                                                         VDIM      236
      INDX   =   INDX + I1                                             VDIM      237
      XS=XF                                                            VDIM      238
      YS=YF                                                            VDIM      239
      ZO=Z                                                             VDIM      240
 1360 RETURN                                                           VDIM      241
      END                                                              VDIM      242
```

```
      SUBROUTINE VECN(A)                                                VECTOR      2
C                                                                       VECTOR      3
C  ROUTINE TO NORMALIZE A VECTOR                                        VECTOR      4
C                                                                       VECTOR      5
      DIMENSION A(3)                                                    VECTOR      6
      AX = SQRT(A(1)*A(1) + A(2)*A(2) + A(3)*A(3))                      VECTOR      7
      IF(AX.EQ.0.)RETURN                                                VECTOR      8
      A(1) = A(1)/AX                                                    VECTOR      9
      A(2) = A(2)/AX                                                    VECTOR     10
      A(3) = A(3)/AX                                                    VECTOR     11
      RETURN                                                            VECTOR     12
      END                                                               VECTOR     13
```

```
      FUNCTION  DOTP(A,B)                                               VECTOR    14
C                                                                       VECTOR    15
C  COMPUTES DOT PRODUCT OF TWO VECTORS, (A.B)                           VECTOR    16
C                                                                       VECTOR    17
      DIMENSION A(3), B(3)                                              VECTOR    18
      DOTP = A(1)*B(1) + A(2)*B(2) + A(3)*B(3)                          VECTOR    19
      RETURN                                                            VECTOR    20
      END                                                               VECTOR    21
```

```
      SUBROUTINE  CROSP(A,B,C)                                          VECTOR     22
C                                                                       VECTOR     23
C  ROUTINE TO COMPUTE THE CROSS PRODUCT, A=B * C                        VECTOR     24
C                                                                       VECTOR     25
      DIMENSION A(3), B(3), C(3)                                        VECTOR     26
      A(1) = B(2)*C(3) - C(2)*B(3)                                      VECTOR     27
      A(2) =C(1)*B(3) - B(1)*C(3)                                       VECTOR     28
      A(3) = B(1)*C(2) - C(1)*B(2)                                      VECTOR     29
      RETURN                                                            VECTOR     30
      END                                                               VECTOR     31
```

```
      SUBROUTINE WRPNL(NK,I,L,LCT,IPT)                                  WRPNL
      COMMON /GCONST/ IN,IO,IT1,IT2,F0,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,  WRPNL
     *                I0,I1,I2,I3,I4,I5,I6,I7,I8,I9,I10,P1,P33,P5,P001, WRPNL
     *                EPS,UNDEF,BL,ICD,DPR,RPD,ETA(17),M1,FM1,I17,A,PI  WRPNL
C     AIRCRAFT-OBSERVER GEOMETRY OUTPUTS                                WRPNL
C                                                                       WRPNL
      COMMON/SWITCH/NTYPE,ITYPE,NENG,ICCP,IPRT(7),ICN(13),NLOPT         WRPNL
      COMMON /GEOMO/ APY(10,17),APZ(10,17),PD(10,17),DPND(10,17),       WRPNL
     * B1(10,17),B2(10,17),TDS(17,10),TPD(17,10),IRR(10,17)             WRPNL
     *,APP,TP,RHP,APO,TO,RHO,CA,CZ,TSP(17,10),CDV                       WRPNL
C                                                                       WRPNL
      COMMON/CLABEL/CH(2,8)                                             WRPNL
      COMMON /GPRAM/ALTP,ALTR,SLOPE,AMACH,NOBS,SLDIST(10),NTENG,IUNIT   WRPNL
     *    ,ISPTRM,IATMOS,IAIR,UAIRAB(24),NTEMP,TEMP(50),TALT(50)        WRPNL
     *    ,NPRES,PRES(50),PALT(50),NHUMID,RALT(50),RHUMID(50),CTEMP     WRPNL
     *    ,CPRES,CRHUMD,IEGA,IGDR,DTEMP,DPRES,DHUMID,XKN,ND,FLD(50),    WRPNL
     * ZNR(50),ZNI(50),LINECT,MAXLIN,IPAGE,BCG,TCG,FLR,AALT,EPF         WRPNL
      COMMON/PNLD/PSPL(17,20),EPNL(5,10),TEPNL(5,10)                    WRPNL
      COMMON/GCONVC/C(2,10),SLDISX(10)                                  WRPNL
      COMMON/CRSPLS/DOB(17),PSCR(17),DPB(408),NPSCR                     WRPNL
      DIMENSION PNL(3),TCPNL(3),T(3)                                    WRPNL
      DATA PNL/4H PNL,4H  (P,4HNDB)/,TCPNL/4H TCP,4HNL(P,4HNDB)/,       WRPNL
     *       T/4H T  ,4H  (S,4HEC) /                                    WRPNL
      WRITE(L,100)                                                      WRPNL
      LCT=LCT+1                                                         WRPNL
 100  FORMAT(1H )                                                       WRPNL
      WRITE(L,90)(ETA(J),J=1,17)                                        WRPNL
 90   FORMAT(2X,10HXI   (DEG),17F7.1)                                   WRPNL
      DO 95 J=1,17                                                      WRPNL
      IF(PSPL(J,I).EQ.0.)PSPL(J,I+10)=0.                                WRPNL
 95   CONTINUE                                                          WRPNL
      WRITE(L,110)PNL,(PSPL(J,I),J=1,17)                                WRPNL
      LCT=LCT+2                                                         WRPNL
      IF(NK.NE.3) GO TO 105                                             WRPNL
      WRITE(L,110)TCPNL,(PSPL(J,I+10),J=1,17)                           WRPNL
      LCT=LCT+1                                                         WRPNL
 105  WRITE(L,110)T,(TPD(J,I),J=1,17)                                   WRPNL
      LCT=LCT+1                                                         WRPNL
      WRITE(L,100)                                                      WRPNL
      LCT=LCT+1                                                         WRPNL
 110  FORMAT(1H ,3A4,F6.1,16F7.1)                                       WRPNL
      WRITE(L,120)(EPNL(J,I),J=1,5)                                     WRPNL
      LCT=LCT+1                                                         WRPNL
 120  FORMAT(20H  EPNL*(EPNDB) =     ,F6.1,1X,28HBASED ON MIN/MAX PNL   WRPNL
     *=    ,F6.1,1H,,F6.1,24H PNDB AND TIME LIMITS  =,5X,F6.1,1H,,F6.1, WRPNL
     *1X,3HSEC)                                                         WRPNL
      IF(IPT.EQ.1)GO TO 121                                             WRPNL
      IF(IPRT(1).NE.8)GO TO 128                                         WRPNL
 121  CONTINUE                                                          WRPNL
      IF(NLOPT .EQ. 0)GO TO 128                                         WRPNL
      IF  (NLOPT-1)  122, 122, 124                                      WRPNL
 122  XNL=EPNL(1,I)                                                     WRPNL
      GO TO 125                                                         WRPNL
 124  XNL=EPNL(3,I)                                                     WRPNL
 125  ELANG=B2(I,9)                                                     WRPNL
      CPAR9=PD(I,9)                                                     WRPNL
      IF (IUNIT .EQ. 0)CPAR9=PD(I,9)*0.3048                             WRPNL
```

```
      CPAR9=ALOG10(CPAR9)                                               WRPNL      59
      WRITE(20,170)XNL,EPF,ELANG,CPAR9                                  WRPNL      60
  170 FORMAT(1PE12.3,3E12.3)                                            WRPNL      61
  128 CONTINUE                                                          WRPNL      62
      IF(NK.NE.3)GO TO 140                                              WRPNL      63
      WRITE(L,130)(TEPNL(J,I),J=1,5)                                    WRPNL      64
      LCT=LCT+1                                                         WRPNL      65
  130 FORMAT(20H  EPNL (EPNDB) =     ,F6.1,1X,                          WRPNL      66
     *  28HBASED ON MIN/MAX TCPNL  =       ,F6.1,1H,                    WRPNL      67
     *,F6.1,1X,23HPNDB AND TIME LIMITS  =,5X,F6.1,1H,,F6.1,1X,3HSEC  )  WRPNL      68
  140 WRITE(L,100)                                                      WRPNL      69
      LCT=LCT+1                                                         WRPNL      70
      PX=PD(I,9)                                                        WRPNL      71
      BX=B2(I,9)                                                        WRPNL      72
      IF(IUNIT .NE. 0)GO TO 145                                         WRPNL      73
      IF(IPT.EQ.1)GO TO 145                                             WRPNL      74
      IF(IPT.EQ.8)GO TO 145                                             WRPNL      75
      PX=PX*C(2,1)                                                      WRPNL      76
  145 CONTINUE                                                          WRPNL      77
      WRITE(L,150)EPF,PX,CH(ILNIT+1,1),BX                               WRPNL      78
      LCT=LCT+1                                                         WRPNL      79
  150 FORMAT(20H  ENG.PERF.PARM.=    ,1PE10.3,18H, RANGE AT CPA  = ,    WRPNL      80
     * E10.3,A3,15H, ELEV.ANGLE = ,E10.3,5H DEG./ )                     WRPNL      81
      RETURN                                                            WRPNL      82
      END                                                               WRPNL      83
```

```
      SUBROUTINE WSHOUT(IPRNT,IOUT,ITYPE,USPL,NUSPL,PSI,INUSP)
C
C  PURPOSE
C     PRINTOUT THE WING SHIELDING VARIABLES
C
C  INPUT - CALLING SEQUENCE
C     IPRNT  - REPORT INDICATOR FOR SUBROUTINE PRINTH
C     IOUT   - OUTPUT UNIT
C     ITYPE  - COMPONENT NOISE TYPE
C     USPL   - ARRAY OF INPUT OR BUILT IN UNSHIELDED SPL TO BE USED
C     NUSPL  - NUMBER OF USPL
C     PSI    - DIRECTIVITY ANGLES AT WHICH PSI ARE INPUT
C     INUSP  - NON-ZERO WHEN USPL ARE TO BE PRINTED, I.E. NOT PREDICTED
C
C  INPUT - COMMON
C     REFRAC - ALL VARIABLES ARE PRINTED
C
C
      DIMENSION USPL(1),PSI(1),COMTI(8,4)
      COMMON/TURBIN/ROT(9),ISW3
C
      COMMON/REFRAC/EMJ,TSTSC,IWED(3),FASS(24),BETA(24),CPSIC(24),NASRO,
     * ASF,IWSFE
C
      DATA COMTI/4HCORE,4H NOI,4HSE  ,5*1H ,
     *           4HTURB,4HINE ,4HNOIS,4HE   ,4*1H ,
     *           4HCOMP,4HRESS,4HOR A,4HND I,4HNLET,4H FAN,4H NOI,4HSE
     2          ,4HEXIT,4H FAN,4H NOI,4HSE  ,4H    ,4H    ,4H    ,4H    /
C
C     PRINT STANDARD TITLE
C
      CALL PRINTH(IPRNT,LOT,IOUT)
C
C     PRINT COMPONENT NOISE TYPE TITLE
C
      IF(ITYPE.NE.3)ITIT=ITYPE-1
      IF(ITYPE.EQ.3)ITIT=ISW3-1
      WRITE(IOUT,100) (COMTI(I,ITIT),I=1,8)
  100 FORMAT(1H0,43X,8A4)
C
C     PRINT INPUT TYPE
C
      WRITE(IOUT,200)
  200 FORMAT(1H0,38X,39HW I N G  S H I E L D I N G  I N P U T S)
C
C     PRINT INPUT FOR FAN, TURBINE AND CORE NOISE CASES
C
      WRITE(IOUT,300) (IWED(I),I=1,3)
  300 FORMAT(////17X,46H1) EDGE SCATTERING CONSIDERED (1 = YES, 0 = NO)/
     1 22X,13HTRAILING E. =,I3,1H,,10X,12HLEADING E. =,I3,1H,,
     2 15X,8HTIP E. =,I3)
      IF( INUSP.EQ.0 ) GO TO 600
      WRITE(IOUT,400) ( USPL(I),I=1,NUSPL)
  400 FORMAT(1H0,16X,31H2) UNSHIELDED DIRECTIVITY CURVE/1H0,19X,
     1 11HSPL (DB)  =,10F7.1/(31X,10F7.1))
      WRITE(IOUT,500) ( PSI(I),I=1,NUSPL)
  500 FORMAT(1H0,19X,11HPSI (DEG) =,10F7.1/(31X,10F7.1))
```

```
C                                                                       WSHOUT     59
C     PRINT FOR DISCHARGE FAN, CORE AND TURBINE CASES BUT NOT INLET FAN WSHOUT     60
C                                                                       WSHOUT     61
  600 IF( ITYPE.EQ.4 ) GO TO 1000                                       WSHOUT     62
      WRITE (IOUT,700) EMJ, TSTSO, (FASS(I), I = 1,NASRO)               WSHOUT     63
  700 FORMAT(///17X,27H3) EXHAUST FLOW MACH NO. = ,F7.3,1H,,            WSHOUT     64
     1 27HSTATIC TEMPERATURE RATIO = ,F7.3//                            WSHOUT     65
     2 17X,48H4) CORRECTION FACTOR FOR ANGULAR SHIFT OF SOURCE /        WSHOUT     66
     3 1HO,19X,11HALFA       =,8F8.3/(31X,8F8.3))                       WSHOUT     67
      WRITE (IOUT,900) (CPSIO(I), I = 1,NASRO)                          WSHOUT     68
      WRITE (IOUT,750) ASF                                              WSHOUT     69
  750 FORMAT(1HO,16X,36H5) ANGLE OFFSET FOR ANGULAR SHIFT OF,           WSHOUT     70
     1 16H SOURCE, GAMA = ,F8.3)                                        WSHOUT     71
      WRITE(IOUT,800) (BETA(I),I=1,NASRO)                               WSHOUT     72
  800 FORMAT(1HO,16X,35H6) RADIAL OFFSET OF APPARENT SOURCE /           WSHOUT     73
     1 1HO,19X,11HBETA       =,8F8.3/(31X,8F8.3))                       WSHOUT     74
      WRITE(IOUT,900) (CPSIO(I),I=1,NASRO)                              WSHOUT     75
  900 FORMAT(1HO,19X,11HCOT(PSIO) =,8F8.3/(31X,8F8.3))                  WSHOUT     76
C                                                                       WSHOUT     77
 1000 RETURN                                                            WSHOUT     78
      END                                                               WSHOUT     79
```

```
      SUBROUTINE WSDSTO(ITYPE,INASRC,IS1,IS2,ST6,                       WSDSTO
     *                  ST1,ST2,ST3,ST4,ST5,ISCR)                       WSDSTO
C     PURPOSE        TO STORE WING SHIELDING DATA FOR COMPONENT         WSDSTO
      DIMENSION IS1(3),IS2(3),ST1(3),ST2(1),ST3(1),ST4(1),ST5(1),ST6(1) WSDSTO
      COMMON/REFRAC/EMJ,TSTSO,IWED(3),FASS(24),BETA(24),CPSIO(24),NASRO, WSDSTO
     * ASF,IWSFE                                                        WSDSTO
      COMMON/UNSHLD/USPL(19),PSI(19),NUSPL,INUSP                        WSDSTO
      IF(ISCR.GT.1)GO TO 100                                            WSDSTO
C     STORE                                                             WSDSTO
      IS1(1)=NUSPL                                                      WSDSTO
      IS1(2)=INUSP                                                      WSDSTO
      DO 20 I=1,3                                                       WSDSTO
   20 IS2(I)=IWED(I)                                                    WSDSTO
C                                                                       WSDSTO
C     TEST WHETHER DIRECTIVITY CURVES TO BE READ IN.                    WSDSTO
C     IF NOT ASSUME DEFAULT OR PREDICTED VALUES                         WSDSTO
C                                                                       WSDSTO
      IF(INUSP.LT.2)GO TO 40                                            WSDSTO
C                                                                       WSDSTO
C     STORE DIRECTIVITY CURVES INPUT AS DATA                            WSDSTO
C                                                                       WSDSTO
      CALL SN(USPL,ST2,1,NUSPL,2)                                       WSDSTO
      CALL SN(PSI,ST3,1,NUSPL,2)                                        WSDSTO
C                                                                       WSDSTO
C     IF INLET FAN EXIT                                                 WSDSTO
C                                                                       WSDSTO
   40 IF(ITYPE.EQ.4)GO TO 80                                            WSDSTO
C                                                                       WSDSTO
C     STORE SHIELDING DATA FOR AFT FAN,TURBINE AND CORE                 WSDSTO
C                                                                       WSDSTO
      ST1(1)=EMJ                                                        WSDSTO
      ST1(2)=TSTSO                                                      WSDSTO
      ST1(3)  =  ASF                                                    WSDSTO
      IS1(3)=INASRO                                                     WSDSTO
      IF(INASRO.EQ.0)GO TO 80                                           WSDSTO
C                                                                       WSDSTO
C  STORE EMPIRICAL CURVES FOR JET REFRACTION MODEL                      WSDSTO
C                                                                       WSDSTO
      CALL SN(BETA,ST4,1,INASRC,2)                                      WSDSTO
      CALL SN(CPSIO,ST5,1,INASRC,2)                                     WSDSTO
      CALL SN(FASS,ST6,1,INASRC,2)                                      WSDSTO
   80 RETURN                                                            WSDSTO
C                                                                       WSDSTO
C     RESTORE WING SHIELDING DATA                                       WSDSTO
C                                                                       WSDSTO
  100 NUSPL=IS1(1)                                                      WSDSTO
      INUSP=IS1(2)                                                      WSDSTO
      DO 120 I=1,3                                                      WSDSTO
  120 IWED(I)=IS2(I)                                                    WSDSTO
C                                                                       WSDSTO
C     TEST IF DIRECTIVITY CURVE INPUT AS DATA                           WSDSTO
C     IF NOT ASSUME DEFAULT OR PREDICTED VALUES                         WSDSTO
C                                                                       WSDSTO
      IF(INUSP.LT.2)GO TO 140                                           WSDSTO
C                                                                       WSDSTO
C     RESTORE DIRECTIVITY CURVES                                        WSDSTO
C                                                                       WSDSTO
```

```
      CALL SN(USPL,ST2,1,NUSPL,1)                                       WSDSTO     59
      CALL SN(PSI,ST3,1,NUSPL,1)                                        WSDSTO     60
C                                                                       WSDSTO     61
C     EXIT IF INLET FAN                                                 WSDSTO     62
C                                                                       WSDSTO     63
  140 IF  (ITYPE .EQ. 4)  GO TO 80                                      WSDSTO     64
C                                                                       WSDSTO     65
C     RESTORE SHIELDING DATA FOR AFT FAN,TURBINE AND CORE               WSDSTO     66
C                                                                       WSDSTO     67
      EMJ=ST1(1)                                                        WSDSTO     68
      TSTSO=ST1(2)                                                      WSDSTO     69
      ASF  =  ST1(3)                                                    WSDSTO     70
      INASRO=IS1(3)                                                     WSDSTO     71
      IF(INASRO.EQ.0)GO TO 80                                           WSDSTO     72
C                                                                       WSDSTO     73
C  RESTORE EMPIRICAL CURVES FOR JET REFRACTION MODEL                    WSDSTO     74
C                                                                       WSDSTO     75
      CALL SN(BETA,ST4,1,INASRC,1)                                      WSDSTO     76
      CALL SN(CPSIO,ST5,1,INASRC,1)                                     WSDSTO     77
      CALL SN(FASS,ST6,1,INASRC,1)                                      WSDSTO     78
      GO TO 80                                                          WSDSTO     79
      END                                                               WSDSTO     80
```

```
      FUNCTION XINTEG(X,Y,NPTS)                                         XINTEG
C PURPOSE              TO INTEGRATE A TABULATED FUNCTION OF ONE INDEPENDENT XINTEG
C                      VARIABLE BY TRAPEZOIDAL RULE                      XINTEG
C AUTHOR               R. M. MASTERS                                     XINTEG
C MODIFICATIONS        NONE                                              XINTEG
C                                                                        XINTEG
C METHOD               THIS SUBROUTINE USES THE TRAPEZOIDAL RULE TO      XINTEG
C                      INTEGRATE A TABULATED FUNCTION WHICH HAS EQUAL OR XINTEG
C                      UNEQUAL STEP SIZES.                               XINTEG
C                                                                        XINTEG
C USAGE                A = XINTEG(X,Y,NPTS)                              XINTEG
C                      DIMENSION X(1),Y(1)                               XINTEG
C                                                                        XINTEG
C INPUTS               X - ARRAY OF NPTS INDEPENDENT VARIABLE VALUES FOR XINTEG
C                          UNEQUAL SPACING OR DELTA X VALUE FOR EQUAL    XINTEG
C                          SPACING                                       XINTEG
C                      Y - ARRAY OF NPTS TABULATED FUNCTION VALUES       XINTEG
C                      NPTS - NUMBER OF POINTS TO BE INTEGRATED (POSITIVE XINTEG
C                             FOR UNEQUAL SPACING, NEGATIVE FOR EQUAL    XINTEG
C                             SPACING)                                   XINTEG
C                                                                        XINTEG
C OUTPUTS              A - THE INTEGRAL OF THE TABULATED FUNCTION        XINTEG
C                                                                        XINTEG
C ERROR RETURN         NONE                                              XINTEG
C STORAGE              112 BASE EIGHT                                    XINTEG
C TIMING               NO TIMING RUNS WERE MADE                          XINTEG
C REFERENCES           NONE                                              XINTEG
C SUBROUTINES CALLED                                                     XINTEG
C                      NONE                                              XINTEG
C                                                                        XINTEG
C DOCUMENTATION        AMEP-S-162                                        XINTEG
C              NPTS .GE. 2  = POINTS UNEQUALLY SPACED,                   XINTEG
C              NPTS .LE.-2  = POINTS EQUALLY SPACED,                     XINTEG
C              OTHERWISE THE INTEGRAL IS SET TO ZERO.                    XINTEG
C                    1)   FOR UNEQUAL SPACING THE X ARRAY CONTAINS THE   XINTEG
C                         INDEPENDENT VARIABLE VALUES CORRESPONDING TO   XINTEG
C                         THE Y ARRAY (DEPENDENT VALUES).                XINTEG
C                    2)   FOR EQUAL SPACING X(1) CONTAINS THE INCREMENT  XINTEG
C                         BETWEEN INDEPENDENT VARIABLE VALUES.           XINTEG
C                    3)   NPTS IS THE NUMBER OF DEPENDENT VARIABLE POINTS XINTEG
C                         TO BE INTEGRATED (+ FOR UNEQUAL SPACING, - FOR XINTEG
C                         EQUAL SPACING).                                XINTEG
C                    4)   ANYTIME THERE ARE LESS THAN 2 DATA POINTS      XINTEG
C                         THE INTEGRAL IS SET TO ZERO.                   XINTEG
      DIMENSION X(2), Y(2)                                               XINTEG
      IF(NPTS.LE.-2) GO TO 200                                           XINTEG
      IF(NPTS.LE.2) GO TO 400                                            XINTEG
C         *****UNEQUAL SPACING*****                                      XINTEG
      NPTS1=NPTS-1                                                       XINTEG
      SUM=Y(1)*(X(2)-X(1))+Y(NPTS)*(X(NPTS)-X(NPTS1))                    XINTEG
      IF(NPTS.EQ.2) GO TO 150                                            XINTEG
      DO 100 I=2,NPTS1                                                   XINTEG
      SUM=SUM+Y(I)*(X(I+1)-X(I-1))                                       XINTEG
  100 CONTINUE                                                           XINTEG
  150 XINTEG=.5*SUM                                                      XINTEG
      RETURN                                                             XINTEG
  200 CONTINUE                                                           XINTEG
```

```
C          *****EQUAL SPACING*****                                    XINTEG     59
      NPTSA=IABS(NPTS)                                                XINTEG     60
      NPTS1=NPTSA-1                                                   XINTEG     61
      SUM=.5*(Y(1)+Y(NPTSA))                                          XINTEG     62
      IF(NPTSA.EQ.2) GO TO 350                                        XINTEG     63
      DO 300 I=2,NPTS1                                                XINTEG     64
      SUM=SUM+Y(I)                                                    XINTEG     65
  300 CONTINUE                                                        XINTEG     66
  350 XINTEG=X(1)*SUM                                                 XINTEG     67
      RETURN                                                          XINTEG     68
  400 CONTINUE                                                        XINTEG     69
C          *****LESS THAN 2 DATA POINTS*****                          XINTEG     70
      XINTEG=0.                                                       XINTEG     71
      RETURN                                                          XINTEG     72
      END                                                             XINTEG     73
```

```
      FUNCTION XPM1DX(Y)                                                XPM1DX     2
C  FUNCTION XPM1DX(Y) SUB-SECTION FOR COMPUTING (EXP(Y) - 1) / Y  TO    XPM1DX     3
C  MAXIMUM MACHINE ACCURACY AND TO AVOID OVERFLOWS.                    XPM1DX     4
      DOUBLE PRECISION S, P                                             XPM1DX     5
      EQUIVALENCE (S,SK), (P,PK)                                        XPM1DX     6
      DATA YL, ONE, EP /.3465736, 1.0, 1.2E-7/                          XPM1DX     7
   12 IF  (ABS(Y) - YL)  14, 13, 13                                     XPM1DX     8
   13 XPM1DX  =  (EXP(Y) - ONE) / Y                                     XPM1DX     9
      GO TO 18                                                          XPM1DX    10
   14 S  =  ONE                                                         XPM1DX    11
      P  =  ONE                                                         XPM1DX    12
      F  =  ONE                                                         XPM1DX    13
   15 F  =  F + ONE                                                     XPM1DX    14
      P  =  P * Y / F                                                   XPM1DX    15
   16 S  =  S + P                                                       XPM1DX    16
      IF  (ABS(PK) - EP * ABS(SK))  17, 17, 15                          XPM1DX    17
   17 XPM1DX  =  S                                                      XPM1DX    18
   18 RETURN                                                            XPM1DX    19
      END                                                               XPM1DX    20
```

```
      SUBROUTINE ZERO(DATA,NUMBER)                                      ZERO
C AUTHOR              D. F. MELDRUM                                     ZERO
C                                                                       ZERO
C PURPOSE             TO ZERO OUT AN ARRAY                              ZERO
C                                                                       ZERO
C INPUTS              DATA       ARRAY TO BE ZEROED OUT                 ZERO
C                     NUMBER     NUMBER OF ELEMENTS TO BE ZEROED OUT    ZERO
C                                                                       ZERO
C OUTPUTS             DATA       ARRAY WHICH IS ZEROED OUT FOR          ZERO
C                                (NUMBER) OF ELEMENTS.                  ZERO
C                                                                       ZERO
C                                                                       ZERO
      DIMENSION DATA(NUMBER)                                            ZERO
      DO 100 I=1,NUMBER                                                 ZERO
  100 DATA(I)=0.                                                        ZERO
C                                                                       ZERO
      RETURN                                                            ZERO
      END                                                               ZERO
```


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