RUNNING SINDA '85/FLUNT INTERACTIVE ON THE VAX

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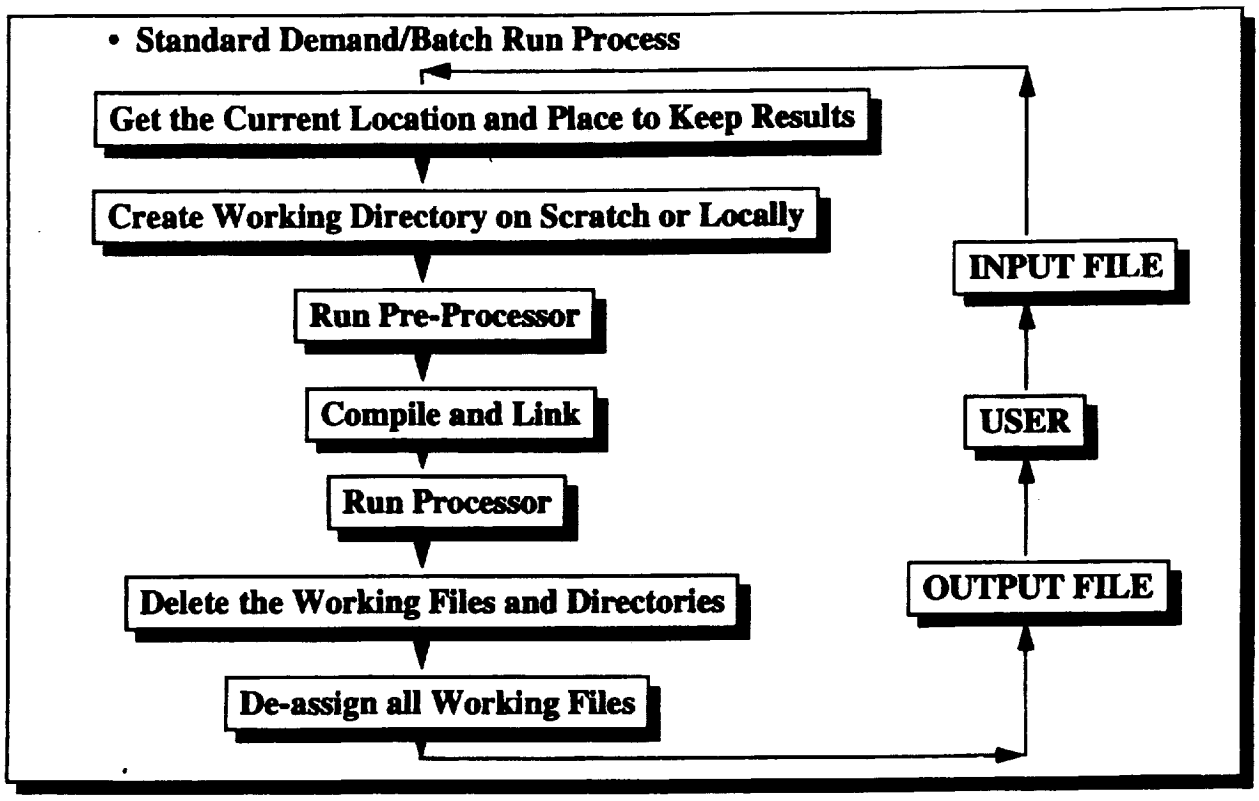
ABSTRACT

Computer software as engineering tools are typically run in three modes: Batch, Demand and Interactive. The first two are the most popular in the SINDA world. The third one is not so popular, due probably to the users inaccessibility to the command procedure files for running SINDA '85, or lack of familiarty with the SINDA '85 execution processes (pre-processor, processor, compilation, linking, execution and all of the file assignment, creation, deletions and de-assignments). Interactive is the mode that makes thermal analysis with SINDA '85 a real-time design tool. This paper explains a command procedure sufficient (the minimum modifications required in an existing demand command procedure) to run SINDA '85 on the VAX in an interactive mode. To exercise the procedure a sample problem is presented exemplifying the mode, plus additional programming capabilities available in SINDA '85. Following the same guidelines the process can be extended to other SINDA '85 residence computer platforms.

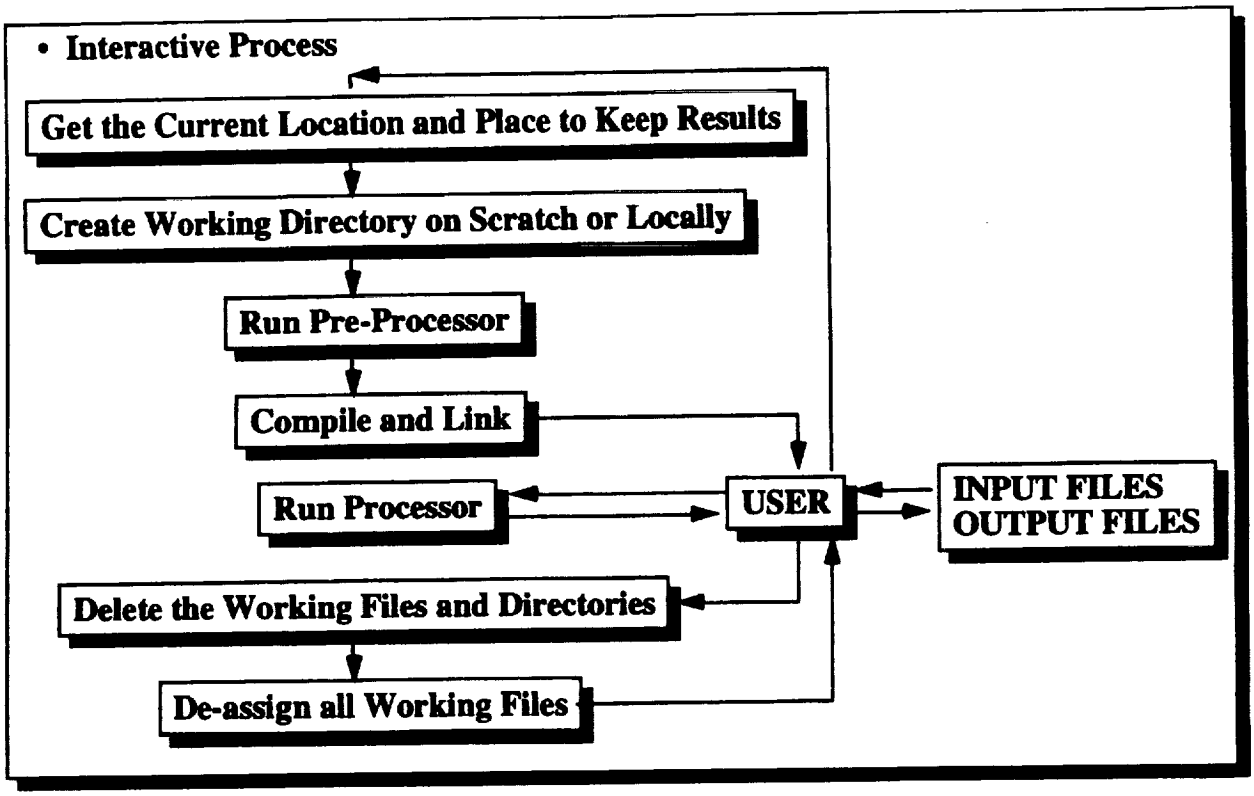
AGENDA

- **SINDA PROCESSES**
  - Standard Demand/Batch Run Process
  - Interactive Process
  - Advantages
- **INTERACTIVE PROCESS**
  - Command Procedure Modifications Required
  - Compilation and Linking process
  - Running Interactive
  - Results Files
- **EXAMPLE PROBLEM**
  - Problem Description
  - SINDA'85/Fluint Model Features
  - Interactive Run
- **SUMMARY**
  - List of Command Procedure Files

SINDA PROCESS



SINDA PROCESS



INTERACTIVE PROCESS

- Minimum Command Procedure Modifications Required

- In the Standard ASTA.COM File Hold the Run-Process and the File-Deletion-Process by Commenting the Following Two Lines:

```
$ RUN 'FNAME
$ @AST:DELWORK
```

- Recommend You Create a New File such as ASTA_SAVE.COM.
- Define a Symbol such as SINDA85_SAVE:= = @ASTA_SAVE in Your THERMAL Set-Up or LOGIN.COM Files.

INTERACTIVE PROCESS

- Compilation and Linking Process

• Run the Preprocessor With Input File XXX.INP:

$>SINDA85_SAVE XXX.INP

• If Errors are found, files XXX.OPP or XXX.LIS located in the Same Directory of XXX.INP Will contain any Pre-Processor (SINDA85/Fluint) or Compilation (Fortran) error messages.

• If No Errors, You will find Yourself within the ZZZZZZ.DIR Scratch Directory. Among All of the XXX.DAT files is the XXX.EXE Executable ready to Run.

• Transparent to the User, the VAX System Has also Assign a Number of Working Files (Just like your ASTA_SAVE.COM File Requested That Will Remain Assign Until they Are De-assigned, or Until You Logout. Should You Logout, These Assignments Need to be Made Before the XXX.EXE can be Run.

INTERACTIVE PROCESS

- Running Interactive:

• To Run Just Enter:

$>RUN XXX

• All of the Lines Programmed in the HEADER OPERATIONS DATA Block of the SINDA"85/Fluint Model Will Begin Execution.

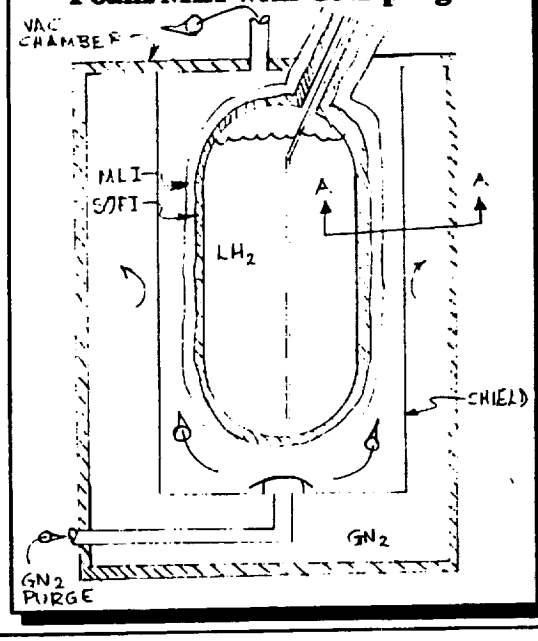
- Result Files:

• Result Files (XXX.OUT, XXX.US1, XXX.RSO, Etc) Will be Created in the Same Location as the XXX.INP Model.

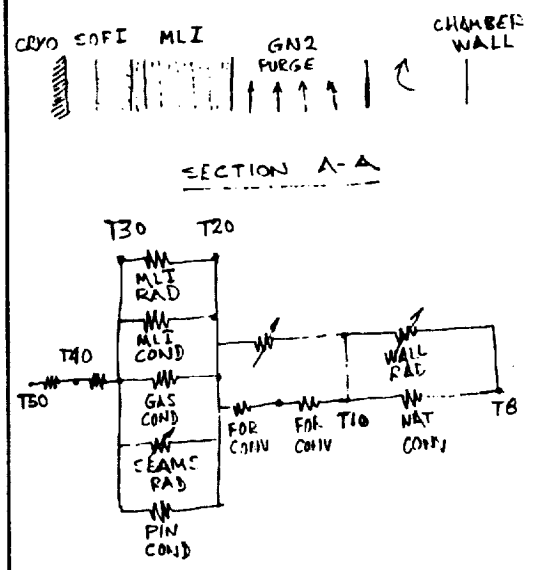
EXAMPLE PROBLEM

- **Problem Description**

- **Foam/MLI with GN2 purge**



- **SINDA'85/Fluint Network**



PROBLEM DESCRIPTION

- **SINDA'85/Fluint Model FMLI.INP**

```
C THIN SUBMODEL: DESIGNED TO MODEL THE THIN INSULATED
C     SECTION OF THE FOAM/MLI TEST ARTICLE IN GROUND PHASE CONDITIONS.
C
C PURGE FLUID SUBMODEL: DESIGNED TO MODEL THE GN2 PURGE BETWEEN THE
C     MLI AND THE SHIELD. THIS SUBMODEL GENERATES THE CONVECTION
C     BETWEEN THE SHIELD AND THE THIN MLI INTERFACE.

HEADER OPTIONS DATA

TITLE FOAM/MLI GROUND PHASE
     MODEL  = TEST
     OUTPUT = FMLI.OUT
     USER1  = FMLI.US1

C FLUID DESCRIPTION FOR LN2 PURGE GAS

HEADER FPROP DATA,8728,SI,0.0

C MOST COMPLETE N2 GAS (NEAR 1 ATM.)
C VALUES BELOW 77.36K ARE FOR VAPOR
C      RGAS  = 8314.34/28.01
AT,V,  65.0,4.40E-6
     77.36,5.44E-6, 80.0,5.59E-6,  85.0,5.9E-6,   90.0,6.22E-6
     95.0,6.54E-6,  100.0,6.87E-6, 105.0,7.19E-6, 110.0,7.52E-6
     115.0,7.83E-6, 120.0,8.15E-6, 125.0,8.0E-6,  126.2,8.65E-6
     130.0,8.76E-6, 140.0,9.4E-6,  160.0,11.8E-6, 200.0,12.9E-6,
     220.0,13.9E-6, 240.0,15.0E-6, 260.0,16.0E-6, 280.0,16.9E-6,
     300.0,17.9E-6, 340.0,19.7E-6, 440.0,23.7E-6, 460.0,24.4E-6,
     480.0,25.2E-6, 500.0,25.9E-6
AT,K,  65.0,6.1E-3,   75.0,7.1E-3,   77.36,7.4E-3,  80.0,7.6E-3,
     85.0,8.0E-3,   90.0,8.5E-3,   95.0,8.9E-3,   100.0,9.4E-3,
     105.0,9.8E-3,  110.0,10.3E-3, 115.0,10.7E-3, 125.0,11.7E-3,
     130.0,12.1E-3, 150.0,13.9E-3, 160.0,14.7E-3, 180.0,16.5E-3,
     200.0,18.3E-3, 220.0,19.9E-3, 240.0,21.5E-3, 300.0,26.0E-3
     320.0,27.4E-3, 340.0,28.7E-3, 380.0,31.3E-3, 400.0,32.5E-3,
     480.0,37.5E-3, 500.0,38.6E-3
AT,CP, 65.0,1.039E3,  320.0,1.039E3, 380.0,1.042E3, 460.0,1.050E3
     500.0,1.056E3

C-----------------
HEADER CONTROL DATA,GLOBAL

     UID    = ENG      PATMOS = -14.7
     ABSZRO = 0.0
     SIGMA  = 1.0
     NLOOPS = 500
```

PROBLEM DESCRIPTION

- SINDA'85/Fluint Model FMLI.INP (cont)

```
HEADER USER DATA, GLOBAL

    PI    = 3.1416
    VALUE  = 0.0
    ICASE  = 1
C*************************************************************************
C TO CHANGE MODEL CONFIGURATION, MODIFY THE FOLLOWING VARIABLES:
C*************************************************************************
C CRYO PHYSICAL PROPERTIES:
    QEVAP  = 191.9      $ HEAT OF VAPORIZATION OF CRYO (BTU/LBM)
    TCRYO  = 37.0       $ CRYO TANK TEMP (DEG R)
C BOUNDARY CONDITIONS:
    TWALL  = 530.0      $ CHAMBER WALL (DEG R)
    TSHIELD = 520.0     $ ALUMINUM SHIELD TEMP (DEG R)
    GN2PT  = 530.0      $ CHAMBER GN2 PURGE GAS TEMP (DEG R)
C MLI PROPERTIES:
    AMLITN = 45.809     $ THIN MLI SURFACE AREA
    DMLITN = 50.0       $ MLI DENSITY (LAYERS/IN)
    XLAYTN = 17.0       $ NUMBER OF MLI LAYERS ON THIN (INC OUTER/INNER)
    EMLIH  = 0.05       $ MLI HEMISPHERICAL EMISIVITY
    EMLIO  = 0.1        $ MLI OUTER LAYER EMISIVITY     PDIA  = 1./32./12.0  $ LEXAN PIN
      DIA (FT)
    DPIN   = 1.0        $ PIN DENSITY (#/SQFT)
    FMSTN  = 1.0        $ THIN  MLI-SHIELD VIEW FACTOR
    SEAMLTN = 36.061    $ THIN  MLI SEAM LENGTH (FT)
    SEAMWTN = 0.125/12. $ THIN  MLI SEAM WIDTH (FT)
C SOFI PROPERTIES:
    ASOFITN = 43.986    $ THIN  SOFI AREA (FT2)
    SOFITN = 0.45/12.   $ THIN  SOFI THICKNESS (FT)
C WALL PROPERTIES:
    EWALL  = 0.8        $ EMISSIVITY OF VAC WALL CHAMBER
C SHIELD PROPERTIES:
    ASHTN  = 62.03      $ THIN  SHIELD AREA (FT2)
    ESHIELD = 0.9       $ EMISSIVITY OF AL SHIELD
    FSW    = 1.0        $ SHIELD-WALL VIEW FACTOR
    CONVSW = 1.0        $ GN2 CONV BET SHIELD AND WALL (BTU/HR-FT2-F)
C GN2 PURGE FLUINT NETWORK
    GN2MLIT = 530.0     $ MLI GN2 PURGE GAS TEMP (DEG R)
    GN2PFR = 10.0       $ MLI GN2 PURGE FLOWRATE (LBS/MIN)
    HTCTN  = 0.0        $ THIN  GN2 PURGE H(BTU/HR-FT2-F) (OUTPUT)
    RENTN  = 0.0        $ THIN  GN2 REYNOLD'S NO. (OUTPUT)
C USED FOR OUTPUT ONLY      XMLITN = 0.0      $ THIN MLI THICKNESS
    VPURTN = 0.0        $ GN2 VEL BET SHIELD AND THIN MLI (FT/SEC)
C OTHER MODIFIABLE INPUTS
    STEF   = 0.1714E-8  $ STEFAN-BOLTZMANN (BTU/HR-FT2-R4)
C*************************************************************************
C END OF MODIFICATIONS
C*************************************************************************
```

PROBLEM DESCRIPTION

- SINDA'85/Fluint Model FMLI.INP (cont)

```
C THIN SUBMODEL:
C
C MAJOR ASSUMPTIONS
C 1. TANK OUTER SURFACE IS CONSTANT (DEG RANKINE)
C 2. CHAMBER WALL TEMPERATURE IS CONSTANT (DEG RANKINE)
C 3. AVERAGE SOFI THICKNESS IS 0.45 IN. (BASED ON THICKNESS MAP)
C 4. MLI DENSITY - 50 LAYERS/IN., 15 LAYERS MLI PLUS TWO MYLAR COVERS
C    MLI THICKNESS = 17/50 = 0.34 IN.
C 5. MLI HEMISPHERICAL EMISSIVITY = .05
C 6. EMISSIVITY OF MLI OUTER SURFACE = .1, EMISSIVITY OF SHIELD = .9
C    EMISSIVITY OF VACUUM CHAMBER = 0.8.
C 7. LEXAN PINS, DIAMETER = 1/8 IN., DENSITY = 1 PER FT^2 MLI

HEADER USER DATA, THIN

     101=0.
     102=0.
     103=0.
     201=0.
     301=0.
     401=0.
     501=0.
     502=0.
     503=0.
     504=0.
C
     888=0.
     999=0.

HEADER NODE DATA, THIN

     10,    520.0, -1.0   $ ALUMINUM SHIELD
     20,    450.0, -1.0   $ MLI SURFACE
     30,    360.0, -1.0   $ SOFI SURFACE
     40,    200.0, -1.0   $ SOFI MIDPOINT
     -8,    530.0, 0.0    $ CHAMBER WALL
     -9,    530.0, 0.0    $ GN2 PURGE GAS
     -50,   37.0,  -1.0   $ CRYO

HEADER CONDUCTOR DATA, THIN

C CALCULATION FOR HEAT LEAK COMPONENTSC
C G(mli-shield) (100) = A*Fv*Fe*STEF
C G(mli cond) (101) = (CALCULATED IN VARIABLES 1 USING EMPIRICAL FORMULA)
C G(mli rad) (102) = (CALCULATED IN VARIABLES 1 USING EMPIRICAL FORMULA)
C G(mli gas) (103) = KN2 * A/Tmli
C G(mli seam) (-104) = Lseam*Wseam*Fseam*STEF
C G(mli pin) (105) = Kpin*Npin(ratio)*A*Apin/TmliC G(mli pin) (105) = Kpin*Npin(ratio)*A*Apin/Tmli
```

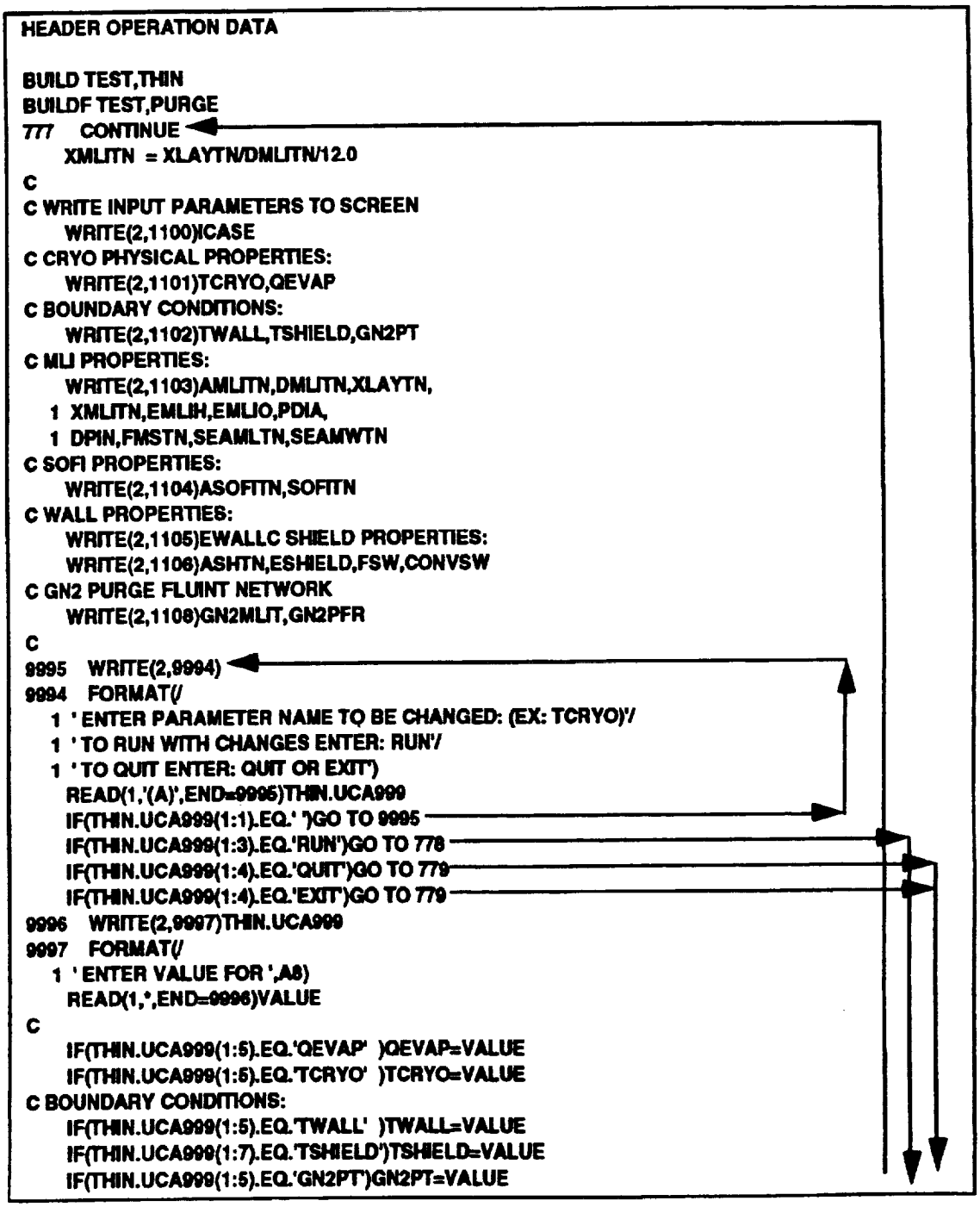
PROBLEM DESCRIPTION

- SINDA'85/Fluint Model FMLI.INP (cont)

```
C G(sofi) (106) = Ksofi*A/(Tsofi/2)
C G(sofi) (107) = Ksofi*A/(Tsofi/2)
C G(wall-shield) (108) = A*Fv*Fe*STEF
C G(GN2-SHIELD) (109) = h*A
C
     -100,      10,   20,   1.0        $ SHIELD TO MLI
     101,       20,   30,   1.0        $ MLI CONDUCTION
     102,       20,   30,   1.0        $ MLI RADIATION
     SIV 103,   20,   30,   A3, K501   $ MLI GAS
     -104,      20,   30,   1.0        $ MLI SEAM
     SPV 105,   20,   30,   A1, K502   $ MLI PIN
     SPV 106,   30,   40,   A2, K503   $ SOFI CONDUCTION
     SPV 107,   40,   50,   A2, K504   $ SOFI CONDUCTION
     -108,      10,   8,    1.0        $ WALL TO SHIELD
     109,       10,   9,    1.0        $ GN2 CONV SHIELD-WALL

HEADER ARRAY DATA, THIN

     1=3.23365E-2,3.35183E-4,-4.6414E-7,3.23797E-10  $ KPIN
     2=0.00259,0.0000231                  $ K SOFI BX250
     3= 115.0, 0.094                      $ K (GN2)      139.1, 0.0787
       139.2, 0.00439
       460.0, 0.0131
       800.0, 0.0204
       1000.0, 0.0243

HEADER CARRAY DATA, THIN

     999=PARAMETER

HEADER FLOW DATA,PURGE,FID=8728

LU PLEN,10,PL = 14.7,  TL = 530.
LU JUNC,1, PL = 14.7,  TL = 530.
LU PLEN,20,PL = 14.7,  TL = 530.
PA CONN,1,10,1            $ SEE OPERATIONS BLOCK
     DEV   = MFRSET
     SMFR  = 1.0
PA CONN,2,1,20            $ SEE OPERATIONS BLOCK
     DEV   = STUBE
     TLEN  = 1.0     DH   = 1.0
     AF    = 1.0
T HTN,1,1,THIN.10,2,0.5
T HTN,2,1,THIN.20,2,0.5
```

PROBLEM DESCRIPTION

- **SINDA'85/Fluint Model FMLI.INP (cont)**



```
HEADER OPERATION DATA

BUILD TEST,THIN
BUILDF TEST,PURGE
777   CONTINUE
      XMLITN = XLAYTN/DMLITN/12.0
C
C WRITE INPUT PARAMETERS TO SCREEN
      WRITE(2,1100)ICASE
C CRYO PHYSICAL PROPERTIES:
      WRITE(2,1101)TCRYO,QEVAP
C BOUNDARY CONDITIONS:
      WRITE(2,1102)TWALL,TSHIELD,GN2PT
C MLI PROPERTIES:
      WRITE(2,1103)AMLITN,DMLITN,XLAYTN,
     1 XMLITN,EMLIH,EMLIO,PDIA,
     1 DPIN,FMSTN,SEAMLTN,SEAMWTN
C SOFI PROPERTIES:
      WRITE(2,1104)ASOFITN,SOFITN
C WALL PROPERTIES:
      WRITE(2,1105)EWALLC SHIELD PROPERTIES:
      WRITE(2,1106)ASHTN,ESHIELD,FSW,CONVSW
C GN2 PURGE FLUINT NETWORK
      WRITE(2,1108)GN2MLIT,GN2PFR
C
9995  WRITE(2,9994)
9994  FORMAT(/
     1 ' ENTER PARAMETER NAME TO BE CHANGED: (EX: TCRYO)'/
     1 ' TO RUN WITH CHANGES ENTER: RUN'/
     1 ' TO QUIT ENTER: QUIT OR EXIT')
      READ(1,'(A)',END=9995)THIN.UCA999
      IF(THIN.UCA999(1:1).EQ.' ')GO TO 9995
      IF(THIN.UCA999(1:3).EQ.'RUN')GO TO 778
      IF(THIN.UCA999(1:4).EQ.'QUIT')GO TO 779
      IF(THIN.UCA999(1:4).EQ.'EXIT')GO TO 779
9996  WRITE(2,9997)THIN.UCA999
9997  FORMAT(/
     1 ' ENTER VALUE FOR ',A8)
      READ(1,*,END=9996)VALUE
C
      IF(THIN.UCA999(1:5).EQ.'QEVAP' )QEVAP=VALUE
      IF(THIN.UCA999(1:5).EQ.'TCRYO' )TCRYO=VALUE
C BOUNDARY CONDITIONS:
      IF(THIN.UCA999(1:5).EQ.'TWALL' )TWALL=VALUE
      IF(THIN.UCA999(1:7).EQ.'TSHIELD')TSHIELD=VALUE
      IF(THIN.UCA999(1:5).EQ.'GN2PT')GN2PT=VALUE
```

PROBLEM DESCRIPTION

- SINDA'85/Fluint Model FMLI.INP (cont)

```
C MLI PROPERTIES:
      IF(THIN.UCA999(1:6).EQ.'AMLITN' )AMLITN=VALUE
      IF(THIN.UCA999(1:6).EQ.'DMLITN' )DMLITN=VALUE
      IF(THIN.UCA999(1:6).EQ.'XLAYTN' )XLAYTN=VALUE
      IF(THIN.UCA999(1:5).EQ.'EMLIH'  )EMLIH=VALUE
      IF(THIN.UCA999(1:5).EQ.'EMLIO'  )EMLIO=VALUE
      IF(THIN.UCA999(1:4).EQ.'PDIA'   )PDIA=VALUE
      IF(THIN.UCA999(1:4).EQ.'DPIN'   )DPIN=VALUE
      IF(THIN.UCA999(1:5).EQ.'FMSTN'  )FMSTN=VALUE
      IF(THIN.UCA999(1:7).EQ.'SEAMLTN')SEAMLTN=VALUE
      IF(THIN.UCA999(1:7).EQ.'SEAMWTN')SEAMWTN=VALUE
C SOFI PROPERTIES:
      IF(THIN.UCA999(1:7).EQ.'ASOFITN')ASOFITN=VALUE
      IF(THIN.UCA999(1:6).EQ.'SOFITN' )SOFITN=VALUE
C WALL PROPERTIES:
      IF(THIN.UCA999(1:5).EQ.'EWALL'  )EWALL=VALUE
C SHIELD PROPERTIES:
      IF(THIN.UCA999(1:5).EQ.'ASHTN'  )ASHTN=VALUE
      IF(THIN.UCA999(1:7).EQ.'ESHIELD')ESHIELD=VALUE
      IF(THIN.UCA999(1:3).EQ.'FSW'    )FSW=VALUE
      IF(THIN.UCA999(1:6).EQ.'CONVSW' )CONVSW=VALUE
<C GN2 PURGE FLUINT NETWORK
      IF(THIN.UCA999(1:7).EQ.'GN2MLIT')GN2MLIT=VALUE
      IF(THIN.UCA999(1:6).EQ.'GN2PFR' )GN2PFR=VALUE
C
      GO TO 777
C
778   CONTINUE
C
C WRITE INPUT PARAMETERS TO USER1 FILE
      WRITE(NUSER1,100)ICASE
C CRYO PHYSICAL PROPERTIES:
      WRITE(NUSER1,101)TCRYO,QEVAP
C BOUNDARY CONDITIONS:
      WRITE(NUSER1,102)TWALL,TSHIELD,GN2PT
C MLI PROPERTIES:
      WRITE(NUSER1,103)AMLITN,DMLITN,XLAYTN,
     1  XMLITN,EMLIH,EMLIO,PDIA,
     1  DPIN,FMSTN,SEAMLTN,SEAMWTN
C SOFI PROPERTIES:
      WRITE(NUSER1,104)ASOFITN,SOFITN
C WALL PROPERTIES:      WRITE(NUSER1,105)EWALL
C SHIELD PROPERTIES:
      WRITE(NUSER1,106)ASHTN,ESHIELD,FSW,CONVSW
C GN2 PURGE FLUINT NETWORK
      WRITE(NUSER1,108)GN2MLIT,GN2PFR
```

PROBLEM DESCRIPTION

- SINDA'85/Fluint Model FMLI.INP (cont)

```
      CALL CHGLMP('PURGE',10,'TL',GN2MLIT,'PL')
      PURGE.SMFR1    = GN2PFR*60.0
C THIN MLI WETTED HEAT TRANSFER AREA = 4.0*TLEN*AF/DH
      PURGE.DH2      = 3.5-3.0
      PURGE.AF2      = PI/4.*(3.5**2-3.0**2)
      PURGE.TLEN2    = (2.*AMLITN)*PURGE.DH2/4./PURGE.AF2

      THIN.T8        = TWALL
      THIN.T9        = GN2PT
      THIN.T50       = TCRYO
      CALL HNQCAL ('THICK')
      CALL STDSTL
      THIN.XK888  = -THIN.Q50
      THIN.XK999  = THIN.XK888/QEVAP

C WRITE TEMPERATURE OUTPUT TO USER1 FILE
      WRITE(NUSER1,201)
     1  THIN.T50,THIN.T30,THIN.T20,THIN.T10,THIN.T8
      WRITE(NUSER1,203)   1  PURGE.FR2/60.,PURGE.TL1,PURGE.TL1,PURGE.PL1,
     1  HTCTN,VPURTN,RENTN

      WRITE(NUSER1,301)
     1  THIN.XK888,THIN.XK999

      ICASE  = ICASE+1
      GO TO 777
779   CONTINUE

100   FORMAT(
     1 '------GROUND HOLD TEST PREDICTIONS------',/
     1 '---INPUT PARAMETERS FOR CASE NO.',I4,'  ---'/
     1 '-------------------------------')
101   FORMAT(
     1 ' CRYO PHYSICAL PROPERTIES :',/
     1 ' TCRYO  = ',E10.4,' CRYO TANK TEMP (DEG R)',/
     1 ' QEVAP  = ',E10.4,' HEAT OF VAPORIZATION OF CRYO (BTU/LBM)')
102   FORMAT(/
     1 ' BOUNDARY CONDITIONS :',/
     1 ' TWALL  = ',E10.4,' CHAMBER WALL AND PLATFORM TEMP (DEG R)',/
     1 ' TSHIELD = ',E10.4,' ALUMINUM SHIELD TEMP (DEG R)',/
     1 ' GN2PT  = ',E10.4,' CHAMBER GNE PURGE TEMP (DEG R)')
103   FORMAT(/   1 ' MLI PROPERTIES :',/
     1 ' AMLITN = ',E10.4,' THIN  MLI SURFACE AREA',/
     1 ' DMLITN = ',E10.4,' THIN  MLI DENSITY (LAYERS/IN)',/
     1 ' XLAYTN = ',E10.4,' NO. OF MLI LAYERS ON THIN + 2',/
     1 ' XMLITN = ',E10.4,' THIN  MLI THICKNESS (FT) (OUTPUT ONLY)',/
     1 ' EMLIH  = ',E10.4,' MLI HEMISPHERICAL EMISIVITY',/
     1 ' EMLIO  = ',E10.4,' MLI OUTER LAYER  EMISIVITY',/
     1 ' PDIA   = ',E10.4,' LEXAN PIN DIA (FT)',/
```

PROBLEM DESCRIPTION

- SINDA'85/Fluint Model FMLI.INP (cont)

```
     1 ' DPIN   = ',E10.4,' PIN DENSITY (NO./SQFT)',/
     1 ' FMSTN  = ',E10.4,' THIN  MLI-SHIELD VIEW FACTOR',/
     1 ' SEAMLTN = ',E10.4,' SEAM LENGTH (FT)',/
     1 ' SEAMWTN = ',E10.4,' SEAM WIDTH (FT)')
 104   FORMAT(/
     1 ' SOFI PROPERTIES :',/
     1 ' ASOFITN = ',E10.4,' THIN SOFI AREA (FT2)',/
     1 ' SOFITN  = ',E10.4,' THIN SOFI THICKNESS (FT)')
 105   FORMAT(/
     1 ' VACUUM CHAMBER WALL PROPERTIES :',/
     1 ' EWALL  = ',E10.4,' EMISSIVITY OF VAC WALL CHAMBER')
 106   FORMAT(/
     1 ' SHIELD PROPERTIES :',/
     1 ' ASHTN  = ',E10.4,' SHIELD AREA (FT2)',/
     1 ' ESHIELD = ',E10.4,' EMISSIVITY OF AL SHIELD',/
     1 ' FSW    = ',E10.4,' SHIELD-WALL VIEW FACTOR',/
     1 ' CONVSW  = ',E10.4,' GN2 CONV SHIELD-WALL (BTU/HR-FT2-F)'/)
 C
 C GN2 PURGE FLUINT NETWORK
 108   FORMAT(
     1 ' GN2 PURGE FLUINT NETWORK :'/   1 ' GN2MLIT = ',E10.4,' MLI GN2 PURGE GAS TEMP
       (DEG R)',/
     1 ' GN2PFR  = ',E10.4,' MLI GN2 PURGE FLOWRATE (LBS/MIN)')
 C
 201   FORMAT(/
     1 ' FOAM/MLI TEMPERATURES (DEG R) BY SUB-MODELS :',/
     1 '-------------------------------',/
     1 ' THIN MLI :'/,
     1 '    CRYO    SOFI     MLI   AL SHIELD',
     1 '   WALL',/,5(2X,F8.2))
 C
 C SUBMODEL PURGE OUTPUT
 C
 203   FORMAT(
     1 ' THIN PURGE FLOW NETWORK INFO'/
     1 '-------------------'/
     1 ' FR2(LB/MIN) TL1 (F)   TL2 (F)   PL2 (PSI) '
     1 'H(B/HR-FT2-F) V(FT/SEC)   REN NO.'/
     1 4(1X,E10.5),3(2X,E10.5))
 C
 301   FORMAT(/
     1 '       HEAT LEAK   BOIL-OFF RATE'/   1 '       (BTU/HR)    (LBS/HR)   '/
     1 '-----------------------'/
     1 ' THIN  ',E12.4,'  ',E10.4,/)
 C
 1100  FORMAT(///' GROUND HOLD TEST PREDICTIONS INPUT PARAMETERS '
     1 'FOR CASE NO. ',I4)
 C
```

PROBLEM DESCRIPTION

- **SINDA'85/Fluint Model FMLI.INP (cont)**

```
1101   FORMAT(
   1 ' TCRYO  = ',E10.4,' QEVAP  = ',E10.4)
1102   FORMAT(
   1 ' TWALL  = ',E10.4,' TSHIELD = ',E10.4,/
   1 ' GN2PT  = ',E10.4)
1103   FORMAT(
   1 ' AMLITN = ',E10.4,' DMLITN = ',E10.4,/
   1 ' XLAYTN = ',E10.4,' XMLITN = ',E10.4,/
   1 ' EMLIH  = ',E10.4,' EMLIO  = ',E10.4,/
   1 ' PDIA   = ',E10.4,' DPIN   = ',E10.4,/
   1 ' FMSTN  = ',E10.4,' SEAMLTN = ',E10.4,/
   1 ' SEAMWTN = ',E10.4)
1104   FORMAT(
   1 ' ASOFITN = ',E10.4,' SOFITN  = ',E10.4)
1105   FORMAT(
   1 ' EWALL  = ',E10.4)
1106   FORMAT(
   1 ' ASHTN  = ',E10.4,' ESHIELD = ',E10.4,/
   1 ' FSW    = ',E10.4,' CONVSW  = ',E10.4)
C GN2 PURGE FLUINT NETWORK
1108   FORMAT(   1 ' GN2MLIT = ',E10.4,' GN2PFR  = ',E10.4)
C
HEADER VARIABLES 1, THIN

C CALCULATING VALUES FOR BASIC MLI HEAT LEAK COMPONENTS
C Q(mli cond) =  [A*8.95E-8*NLC^2.56/(2*(N-1))]*[Tm^2 - Ts^2]
C Q(mli rad) = [A*5.39E-10*etoth/(N-1)]*[Tm^4.67 - Ts^4.67]
C
C NOTE:  THE ABOVE EQUATIONS UTILIZE SI UNITS B/C EQUATIONS ARE GIVEN
C      AS SUCH.
C
C      CONVERSION FACTORS WERE USED FOR CONTINUITY OF INPUTS.
C      AREA:  1 FT**2 = .092903 M**2
C      LENGTH: 1 IN   = 2.54 CM
C      HEAT:  1 BTU/HR= .29307 WATTS
C      TEMPERATURE: DEG R = T(DEG R) = 1.8 T(DEG K)
C       G100 = AMLITN*FMSTN*(1./(1./EMLIO+1./ESHIELD-1.))*STEF
       XK201 = 8.95E-8*((DMLITN/2.54)**2.56)/(2.*(XLAYTN-1.))
       XK102 = (AMLITN*.092903*XK201)*((T20/1.8)**2.-(T30/1.8)**2.)/.29307
       G101  = XK102/(T20-T30)
       XK301 = 5.39E-10*EMLIH/(XLAYTN-1.)
       XK101 = (AMLITN*.092903*XK301)*((T20/1.8)**4.67-(T30/1.8)**4.67)/.29307
       G102  = XK101/(T20-T30)
       XK501 = AMLITN/XMLITN
```

PROBLEM DESCRIPTION

- **SINDA'85/Fluint Model FMLI.INP (cont)**

```
      G104  = SEAMLTN*SEAMWTN*(SQRT(1.+XMLITN**2/SEAMWTN**2)-XMLITN/SEAMWTN)*
      XK502 = DPIN*AMLITN*PI*PDIA**2/XMLITN
      XK503 = ASOFITN/(SOFITN/2.)
      XK504 = XK503
      G108  = ASHTN*FSW*(1./(1./ESHIELD+1./EWALL-1.))*STEF
      G109  = CONVSW*ASHTN

HEADER OUTPUT CALLS, THIN

      IF(LOOPCT.GT.1) THEN
      CALL TPRINT ('THIN')
      CALL HNQPNT ('THIN')
      END IF

HEADER OUTPUT CALLS, PURGE

      IF(LOOPCT.GT.1) THEN
      CALL LMPTAB ('PURGE')
      CALL TIETAB ('PURGE')
      CALL PTHTAB ('PURGE')
      END IF
<
HEADER FLOGIC 1, PURGE

C OBTAIN PURGE GAS V AND Re BETWEEN SHIELD AND THIN MLI (FT/SEC)
C V = MDOT * SPEC VOL / FLOW AREA
      VPURTN = PURGE.SMFR1*VSV(PL1,TL1,PURGE.FI)/PURGE.AF2/3600.
      HTCTN = DITTUS(PURGE.FR2,PURGE.DH2,PURGE.AF2,THIN.T20,PURGE.PL1,
     1  PURGE.TL1,PURGE.XL1,PURGE.FI)
      RENTN = VPURTN*3600.*PURGE.DH2/VSV(PL1,TL1,PURGE.FI)/
     1  VVISCV(PL1,TL1,PURGE.FI)
C
END OF DATA
```

EXAMPLE PROBLEM

- **Interactive Run:**
Compile and Link Input File FMLLINP

```
EPVAX>dir

Directory DISK$USER4:[SIMMONDS.WORK.TFAWS]

FMLLINP;3

Total of 1 file, 31 blocks.
EPVAX>sinda85serve fmllinp
INPUT DATA FILE: FMLLINP
SINDA '85 PREPROCESSOR RUN OF PROBLEM: FMLLINP
STARTING: 11-AUG-1992 07:37:20.31
FORTRAN STOP
 The Pre-Processor ran for 6 cpu seconds
PREPROCESSOR ENDS   : 11-AUG-1992 07:37:55.94
BEGINNING COMPILE AND LINK
STARTING: 11-AUG-1992 07:37:55.95
 The compiler ran for 4 cpu seconds
  DOING THE LINK
 The link ran for 7 cpu seconds
COMPILE AND LINK ENDS   : 11-AUG-1992 07:38:23.33
SINDA '85 PROCESSOR RUN OF PROBLEM: FMLLINP
STARTING: 11-AUG-1992 07:38:23.73
EPVAX>
```

EXAMPLE PROBLEM

- **Interactive Run:**
Output Files (Created in Scratch Directory ZZZZZZ.DIR)

```
EPVAX>dir

Directory DISK$USER4:[SIMMONDS.WORK.TFAWS.ZZZZZZ]

ARYDAT.DAT;1      ARYTRE.DAT;1      CARTRE.DAT;1      CNTDAT.DAT;1
CNTTRE.DAT;1      CONNAM.DAT;1      CONTRE.DAT;1      CRYDAT.DAT;1
FLOCON.DAT;1      FLODEV.DAT;1      FLOJUN.DAT;1      FLOMOD.DAT;1
FLOPLN.DAT;1      FLOPRP.DAT;1      FLOTIE.DAT;1      FLOTNK.DAT;1
FLOTUB.DAT;1      FMLLEXE;1         LMPTRE.DAT;1      NODDAT.DAT;1
NODTRE.DAT;1      NOUSER.DAT;1      NUMTRE.DAT;1      NVCDAT.DAT;1
NVQDAT.DAT;1      OPTION.DAT;1      OPTIONS.DAT;1     PCSDAT.DAT;1
SORDAT.DAT;1      TIETRE.DAT;1      TRYDAT.DAT;1      USEDAT.DAT;1

Total of 32 files.
EPVAX>
```

EXAMPLE PROBLEM

- **Interactive Run:**
Running Interactive (File FMLI.EXE)

```
EPVAX>run fmli


GROUND HOLD TEST PREDICTIONS INPUT PARAMETERS FOR CASE NO.  1
TCRYO  = 0.3700E+02  QEVAP  = 0.1919E+03
TWALL  = 0.5300E+03  TSHIELD = 0.5200E+03
GN2PT  = 0.5300E+03
AMLITN = 0.4581E+02  DMLITN = 0.5000E+02
XLAYTN = 0.1700E+02  XMLITN = 0.2833E-01
EMLIH  = 0.5000E-01  EMLIO  = 0.1000E+00
PDIA   = 0.2804E-02  DPIN   = 0.1000E+01
FMSTN  = 0.1000E+01  SEAMLTN = 0.3606E+02
SEAMWTN = 0.1042E-01
ASOFITN = 0.4399E+02  SOFITN = 0.3760E-01
EWALL  = 0.8000E+00
ASHTN  = 0.6203E+02  ESHIELD = 0.8000E+00
FSW    = 0.1000E+01  CONVSW = 0.1000E+01
GN2MLIT = 0.5300E+03  GN2PFR = 0.1000E+02

ENTER PARAMETER NAME TO BE CHANGED: (EX: TCRYO)
TO RUN WITH CHANGES ENTER: RUN
TO QUIT ENTER: QUIT OR EXIT
```

EXAMPLE PROBLEM

- **Interactive Run:**
Entering Inputs (Modify TCRYO User Data to 140)

```
TCRYO

ENTER VALUE FOR TCRYO
140


GROUND HOLD TEST PREDICTIONS INPUT PARAMETERS FOR CASE NO.  1
TCRYO  = 0.1400E+03  QEVAP  = 0.1919E+03
TWALL  = 0.5300E+03  TSHIELD = 0.5200E+03
GN2PT  = 0.5300E+03
AMLITN = 0.4581E+02  DMLITN = 0.5000E+02
XLAYTN = 0.1700E+02  XMLITN = 0.2833E-01
EMLIH  = 0.5000E-01  EMLIO  = 0.1000E+00
PDIA   = 0.2804E-02  DPIN   = 0.1000E+01
FMSTN  = 0.1000E+01  SEAMLTN = 0.3606E+02
SEAMWTN = 0.1042E-01
ASOFITN = 0.4399E+02  SOFITN = 0.3760E-01
EWALL  = 0.8000E+00
ASHTN  = 0.6203E+02  ESHIELD = 0.8000E+00
FSW    = 0.1000E+01  CONVSW = 0.1000E+01
GN2MLIT = 0.5300E+03  GN2PFR = 0.1000E+02

ENTER PARAMETER NAME TO BE CHANGED: (EX: TCRYO)
TO RUN WITH CHANGES ENTER: RUN
TO QUIT ENTER: QUIT OR EXIT
```

EXAMPLE PROBLEM

- **Interactive Run:**

Entering Inputs (Modify CONVW User Constant to .5)

```
CONVSW

ENTER VALUE FOR CONVSW
.5



GROUND HOLD TEST PREDICTIONS INPUT PARAMETERS FOR CASE NO.  1
TCRYO  = 0.1400E+03  QEVAP  = 0.1919E+03
TWALL  = 0.5300E+03  TSHIELD = 0.5200E+03
GN2PT  = 0.5300E+03
AMLITN = 0.4581E+02  DMLITN = 0.5000E+02
XLAYTN = 0.1700E+02  XMLITN = 0.2833E-01
EMLIH  = 0.5000E-01  EMLIO  = 0.1000E+00
PDIA   = 0.2804E-02  DPIN   = 0.1000E+01
FMSTN  = 0.1000E+01  SEAMLTN = 0.3806E+02
SEAMWTN = 0.1042E-01
ASOFITN = 0.4388E+02  SOFITN = 0.3750E-01
EWALL  = 0.8000E+00
ASHTN  = 0.6203E+02  ESHIELD = 0.9000E+00
FSW    = 0.1000E+01  CONVSW = 0.5000E+00
GN2MLIT = 0.5300E+03  GN2PFR = 0.1000E+02

ENTER PARAMETER NAME TO BE CHANGED: (EX: TCRYO)
TO RUN WITH CHANGES ENTER: RUN
TO QUIT ENTER: QUIT OR EXIT
```

EXAMPLE PROBLEM

- **Interactive Run:**

Run Case1

```
RUN



GROUND HOLD TEST PREDICTIONS INPUT PARAMETERS FOR CASE NO.  2
TCRYO  = 0.1400E+03  QEVAP  = 0.1919E+03
TWALL  = 0.5300E+03  TSHIELD = 0.5200E+03
GN2PT  = 0.5300E+03
AMLITN = 0.4581E+02  DMLITN = 0.5000E+02
XLAYTN = 0.1700E+02  XMLITN = 0.2833E-01
EMLIH  = 0.5000E-01  EMLIO  = 0.1000E+00
PDIA   = 0.2804E-02  DPIN   = 0.1000E+01
FMSTN  = 0.1000E+01  SEAMLTN = 0.3806E+02
SEAMWTN = 0.1042E-01
ASOFITN = 0.4388E+02  SOFITN = 0.3750E-01
EWALL  = 0.8000E+00
ASHTN  = 0.6203E+02  ESHIELD = 0.9000E+00
FSW    = 0.1000E+01  CONVSW = 0.5000E+00
GN2MLIT = 0.5300E+03  GN2PFR = 0.1000E+02

ENTER PARAMETER NAME TO BE CHANGED: (EX: TCRYO)
TO RUN WITH CHANGES ENTER: RUN
TO QUIT ENTER: QUIT OR EXIT
```

EXAMPLE PROBLEM

- **Interactive Run:**
  Exit and Show Result Files in TFAWS.DIR

```
EXIT
FORTRAN STOP
EPVAX>dir [-]
Directory DISK$USER4:[SIMMONDS.WORK.TFAWS]

FMLI.INP;3      FMLI.LIS;1      FMLI.OPP;1      FMLI.OUT;1
FMLI.US1;1      ZZZZZZ.DIR;1

Total of 6 files.
EPVAX>
```

SUMMARY

- **The Interactive Process Saves Time.**
- **Permits Modifications to Thermal/Fluids Model Parameters During Run Time.**
- **Permits User to Examine Results and Make Decisions During Parametric Studies.**
- **Executable Models Can be Run by Non-SINDA'85/Fluint Users.**
- **Open the Doors for Unlimited Creativity and Interaction with the SINDA'85/Fluint Models.**

SUMMARY

• Output File FMLI.US1

```
——GROUND HOLD TEST PREDICTIONS——
—INPUT PARAMETERS FOR CASE NO.  1 –
CRYO PHYSICAL PROPERTIES :
TCRYO  = 0.1400E+03 CRYO TANK TEMP (DEG R)
QEVAP  = 0.1919E+03 HEAT OF VAPORIZATION OF CRYO (BTU/LBM)
BOUNDARY CONDITIONS :
TWALL  = 0.5300E+03 CHAMBER WALL AND PLATFORM TEMP (DEG R)
TSHIELD = 0.5200E+03 ALUMINUM SHIELD TEMP (DEG R)
GN2PT  = 0.5300E+03 CHAMBER GNE PURGE TEMP (DEG R)
MLI PROPERTIES :
AMLITN  = 0.4581E+02 THIN  MLI SURFACE AREA
DMLITN  = 0.5000E+02 THIN  MLI DENSITY (LAYERS/IN)
XLAYTN  = 0.1700E+02 NO. OF MLI LAYERS ON THIN + 2
XMLITN  = 0.2833E-01 THIN  MLI THICKNESS (FT) (OUTPUT ONLY)
EMLIH  = 0.5000E-01 MLI HEMISPHERICAL EMISIVITY
EMLIO  = 0.1000E+00 MLI OUTER LAYER  EMISIVITY
PDIA   = 0.2604E-02 LEXAN PIN DIA (FT)
DPIN   = 0.1000E+01 PIN DENSITY (NO./SQFT)
FMSTN  = 0.1000E+01 THIN  MLI-SHIELD VIEW FACTOR
SEAMLTN = 0.3606E+02 SEAM LENGTH (FT)
SEAMWTN = 0.1042E-01 SEAM WIDTH (FT)
SOFI PROPERTIES :
ASOFITN = 0.4399E+02 THIN SOFI AREA (FT2)
SOFITN  = 0.3750E-01 THIN SOFI THICKNESS (FT)
VACUUM CHAMBER WALL PROPERTIES :
EWALL  = 0.8000E+00 EMISSIVITY OF VAC WALL CHAMBER
SHIELD PROPERTIES :
ASHTN  = 0.6203E+02 SHIELD AREA (FT2)
ESHIELD = 0.9000E+00 EMISSIVITY OF AL SHIELD
FSW    = 0.1000E+01 SHIELD-WALL VIEW FACTOR
CONVSW  = 0.5000E+00 GN2 CONV SHIELD-WALL (BTU/HR-FT2-F)
GN2 PURGE FLUINT NETWORK :
GN2MLIT = 0.5300E+03 MLI GN2 PURGE GAS TEMP (DEG R)
GN2PFR  = 0.1000E+02 MLI GN2 PURGE FLOWRATE (LBS/MIN)
FOAM/MLI TEMPERATURES (DEG R) BY SUB-MODELS :

THIN MLI :
   CRYO    SOFI     MLI  AL SHIELD   WALL
  140.00   312.56   406.56   524.75   530.00
THIN PURGE FLOW NETWORK INFO

FR2(LB/MIN) TL1 (F)   TL2 (F)   PL2 (PSI) H(B/HR-FT2-F) V(FT/SEC)  REN NO.
.10000E+02 .52208E+03 .52208E+03 .14700E+02  .22781E+00 .88730E+00  .27915E+04
      HEAT LEAK   BOIL-OFF RATE
      (BTU/HR)    (LBS/HR)

THIN    0.1582E+04  0.8245E+01
```

SUMMARY

- VAX FILES (Command Procedures) to Run SINDA'85

```
EPVAX>d

Directory DISK$USER4:[SIMMONDS.THERMAL.SINDA85]

ASTA.COM;20             7  16-OCT-1991 13:25:41.10  (RWED,RWED,RE,RE)
ASTAPP.EXE;1          902  19-APR-1990 14:55:33.00  (RWED,RWED,RE,RE)
ASTASAVE.COM;3          7  22-APR-1991 15:37:31.10  (RWED,RWED,RE,RE)
BANNER.TXT;7            3  21-JUL-1989 12:54:24.00  (RWED,RWED,RE,RE)
BANNER2.TXT;3           7  21-JUL-1989 12:54:35.00  (RWED,RWED,RE,RE)
DATA_ONLY.DIR;1         1  26-SEP-1990 07:51:56.12  (RWED,RWED,RE,RE)
DELWORK.COM;24          2  29-JUN-1989 16:34:40.00  (RWED,RWED,RE,RE)
EXPLOT.DIR;1            1  25-SEP-1990 16:18:12.00  (RWED,RWED,RE,RE)
FINCLUDE.DIR;1          3  26-SEP-1990 11:20:28.10  (RWED,RWED,RE,RE)
FLUINTP.OLB;2        2204  19-APR-1990 14:20:42.00  (RWED,RWED,RE,RE)
FLUINTPP.OLB;1       1480  19-APR-1990 14:19:31.00  (RWED,RWED,RE,RE)
FS_ROUTINES.OLB;1     116  4-OCT-1991 14:19:03.27  (RWED,RWED,RE,RE)
INCLUDE.DIR;1           4  26-SEP-1990 11:20:22.93  (RWED,RWED,RE,RE)
LINKPPF.COM;3           1  24-JUL-1986 11:16:36.00  (RWED,RWED,RE,RE)
LINKRAP.COM;2           1  6-SEP-1989 08:15:49.00  (RWED,RWED,RE,RE)
MKNAME.COM;1            1  15-AUG-1984 10:30:06.00  (RWED,RWED,RE,RE)
MKWORK.COM;17           2  29-JUN-1989 08:33:50.00  (RWED,RWED,RE,RE)
NEW_FS_ROUTINES.OLB;1
                       48  19-FEB-1991 13:23:30.60  (RWED,RWED,RE,RE)
OLD_FS_ROUTINES.OLB;1
                      116  20-JUL-1989 16:24:38.00  (RWED,RWED,RE,RE)
OLD_TSAVE_ASCII.OBJ;1
                        3  10-OCT-1990 11:56:28.20  (RWED,RWED,RE,RE)
SAMPLES.DIR;1           1  10-AUG-1990 09:55:56.44  (RWED,RWED,RE,RE)
SETHOME.COM;7           1  29-JUN-1989 08:28:58.00  (RWED,RWED,RE,RE)
SINDA85.COM;24         12  20-APR-1990 10:21:41.00  (RWED,RWED,RE,RE)
SINDA85.USAGE;6        20  9-JUL-1992 13:28:21.82  (RWED,RWED,RWE,RWE)
SINDA85SAVE.USAGE;4
                        1  9-JUL-1992 13:28:44.40  (RWED,RWED,RWE,RWE)
TSAVE_ASCII.OBJ;4       3  19-FEB-1991 13:30:13.31  (RWED,RWED,RE,RE)
UTILITY.OLB;1         113  19-APR-1990 14:18:43.00  (RWED,RWED,RE,RE)

Total of 27 files, 5060 blocks.
EPVAX>
```

SUMMARY

- **ASTASAVE.COMWith Minimum Modifications Required**

```
$ SET NOVERI
$ SET WORK/LIMIT=1024
$ On WARNING  then goto EXIT1
$ On CONTROL_Y then goto EXIT1
$ ASSIGN $1$dua4:[user.SIMMONDS.THERMAL.SINDA85] AST
$!
$!
$ node = f$getsyi("NODENAME") - "SYS"
$ start_time = f$time()
$ start_cpu  = f$getjpi("","cputim")
$!
$!     GET THE CURRENT LOCATION AND PLACE TO  KEEP THE RESULTS
$!
$ IF P1 .NES. "" THEN GOTO ISINPUT
$      WRITE SYS$OUTPUT " ***** ERROR - NO INPUT "
$      GOTO EXIT1
$ ISINPUT:
$ WRITE SYS$OUTPUT "INPUT DATA FILE: "P1""
$ @AST:SETHOME 'P1
$!
$ FNAME = F$PARSE(P1,,,"NAME") + F$PARSE(P1,,,"TYPE")$ ASSIGN
        'SINDA85_KEEP_DIR"FNAME FOR005
$ FNAME = F$PARSE(P1,,,"NAME")
$ Assign 'SINDA85_KEEP_DIR"FNAME.OPP  FOR006
$!
$! Assign the MITAS Processor TSAVE Plot file.
$ Assign 'SINDA85_KEEP_DIR"FNAME'  KEEP$FILE
$!
$!  CREATE WORKING DIRECTORY ON SCRATCH OR LOCALLY
$!
$ SET NOCONTROL=Y
$ @AST:MKWORK
$ SET CONTROL=Y
$!
$!      RUN THE PRE PROCESSOR
$!
$ On WARNING  then goto EXIT
$ On CONTROL_Y then goto EXIT
$ WRITE SYS$OUTPUT "SINDA '85 PREPROCESSOR RUN OF PROBLEM: "P1""
$ WRITE SYS$OUTPUT "STARTING: "F$TIME()""
$ T1 = F$GETJPI("","CPUTIM")
$! RUN/NODEB AST:fluintPP$ RUN/NODEB AST:ASTAPP
$ T2 = (F$GETJPI("","CPUTIM") - T1)/100
$ WRITE SYS$OUTPUT "  The Pre-Processor ran for "T2' cpu seconds"
$ WRITE SYS$OUTPUT "PREPROCESSOR ENDS   : "F$TIME()""
$ DEASSIGN FOR005
```

SUMMARY

• ASTASAVE.COMWith Minimum Modifications Required (cont)

```
$!
$!
$!      COMPILE AND LINK
$!
$ On WARNING  then goto EXIT
$ On CONTROL_Y then goto EXIT
$ WRITE SYS$OUTPUT "BEGINNING COMPILE AND LINK"
$ WRITE SYS$OUTPUT "STARTING: "F$TIME()"
$ T1 = F$GETJPI("","CPUTIM")
$ FOR/LIS='SINDA85_KEEP_DIR"FNAME.LIS/CROSS ASTAP.DAT
$ T2 = (F$GETJPI("","CPUTIM") - T1)/100
$ WRITE SYS$OUTPUT "  The compiler ran for "T2' cpu seconds"
$ Write SYS$OUTPUT "  DOING THE LINK "
$ T1 = F$GETJPI("","CPUTIM")
$ LINK/EXEC='FNAME.EXE ASTAP,AST:fluintp/L,UTILITY/L,FS_ROUTINES/L
$ T2 = (F$GETJPI("","CPUTIM") - T1)/100
$ WRITE SYS$OUTPUT "  The link ran for "T2' cpu seconds"
$ WRITE SYS$OUTPUT "COMPILE AND LINK ENDS    : "F$TIME()"
$ DEL ASTAP.*;*
$!
$!   RUN THE PROCESSOR
$!
$ On WARNING  then goto EXIT
$ On CONTROL_Y then goto EXIT
$ ASSIGN 'SINDA85_KEEP_DIR"FNAME.TSV FOR021
$ ASSIGN 'SINDA85_KEEP_DIR"FNAME.RP  FOR025
$ IF P2 .EQS. "" THEN  GOTO ENT1
$      WRITE SYS$OUTPUT "RSI DATA FILE: "P2'.RP"
$      @AST:MKNAME 'P2
$      PP2 = TNAME
$      ASSIGN 'PP2.RP FOR024
$ ENT1:
$ WRITE SYS$OUTPUT "SINDA '85 PROCESSOR RUN OF PROBLEM: "P1'"
$ WRITE SYS$OUTPUT "STARTING: "F$TIME()"
$ T1 = F$GETJPI("","CPUTIM")
$!
$ ASSIGN SYS$INPUT FOR001
$ ASSIGN SYS$OUTPUT FOR002
$!
$!RUN 'FNAME
$!T2 = (F$GETJPI("","CPUTIM") - T1)/100
$!WRITE SYS$OUTPUT "  The processor ran for "T2' cpu seconds"
$!WRITE SYS$OUTPUT "PROCESSOR ENDS    : "F$TIME()"
$!
$!      DEL WORKING FILES AND DIRECTORIES
$!
$ EXIT:
$!
```

SUMMARY

• ASTASAVE.COM With Minimum Modifications Required (cont)

```
$ open/append usage aet:sinda85save.usage
$ write usage f$getjpi("","username")," ","node"," ","start_time", -
        " ",f$time()
$ close usage
$!
$ On WARNING  then continue
$ On CONTROL_Y then continue
$ On ERROR then continue
$ IF ""F$LOGICAL("FOR005")'".NES."" THEN DEASSIGN FOR005
$ IF ""F$LOGICAL("FOR006")'".NES."" THEN DEASSIGN FOR006
$!@AST:DELWORK
$ EXIT1:
```