#210

APOLLO 15 & 17

HEAT FLOW THERMAL CONDUCTIVITY

71-063C-06A

72-096C-01A

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1. INTRODUCTION:

The documentation for this data set was originally on paper, kept in NSSDC's Data Set Catalogs (DSCs). The paper documentation in the Data Set Catalogs have been made into digital images, and then collected into a single PDF file for each Data Set Catalog. The inventory information in these DSCs is current as of July 1, 2004. This inventory information is now no longer maintained in the DSCs, but is now managed in the inventory part of the NSSDC information system. The information existing in the DSCs is now not needed for locating the data files, but we did not remove that inventory information.

The offline tape datasets have now been migrated from the original magnetic tape to Archival Information Packages (AIP’s).

A prior restoration may have been done on data sets, if a requestor of this data set has questions; they should send an inquiry to the request office to see if additional information exists.

2. ERRATA/CHANGE LOG:

NOTE: Changes are made in a text box, and will show up that way when displayed on screen with a PDF reader.

When printing, special settings may be required to make the text box appear on the printed output.

Version	Date	Person	Page	Description of Change
01				
02				

3 LINKS TO RELEVANT INFORMATION IN THE ONLINE NSSDC INFORMATION SYSTEM:

http://nssdc.gsfc.nasa.gov/nmc/

[NOTE: This link will take you to the main page of the NSSDC Master Catalog. There you will be able to perform searches to find additional information]

4. CATALOG MATERIALS:

a. Associated Documents — To find associated documents you will need to know the document ID number and then click here. http://nssdcftp.gsfc.nasa.gov/miscellaneous/documents/

b. Core Catalog Materials

APOLLO 17 LM/ALSEP

HEAT FLOW, THERMAL CONDUCTIVITY

72-096C-01A

This data set has been restored. There were originally two 7-track, 800 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tapes were created on a 1130 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR005597	DS005597	D019539	1	12/12/72 - 12/28/74
		D019540	2	12/12/72 - 12/28/74

See 71-063C-06A

APOLLO 15 LM/ALSEP

HEAT FLOW, THERMAL CONDUCTIVITY

71-063C-06A

This data set has been restored. There were originally two 7-track, 800 BPI tapes written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tapes were created on a 1130 computer and the restored tapes were created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D numbers are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR005595	DS005595	D019537	1	07/31/71 - 12/28/74
		D019538	2	07/31/71 - 12/28/74

REQ. AGENT	RAND NO.	ACQ. AGENT
WPP	RB3291	RWV
CMM	RC0825	
JVD	RC3820	

APOLLO 15 & 17

HEAT FLOW THERMAL CONDUCTIVITY

71-063C-06A

72-096C-01A

These data sets consist of 2 Apollo 15 and 2 Apollo 17 data tapes. They are 7-track, 800 BPI, binary, produced on an IBM 1130 computer. The time, located in word 1 of each logical record, is measured in milliseconds since the beginning of 1971.

The tapes contain 5 types of logical records. Each record type is written as a group. For instance, on Apollo 15 tape D-19537, the first 281 physical records are type 1, the next 281 records are type 2, the next 6 are type 4, etc .... (the lables on the tape indicate the number of records of each record type on the tape). Each record type contains its own time span. The time spans may vary for each record type. Therefore, the actual time span for a tape might be found in the middle of the tape.

Also, the records are written cronologically backwards on each tape. That is, the first logical record of each physical record contains the latest time for that physical record.

The time spans for the tapes are as follows:

APOLLO 15 71-063C-06A

D#	C#	FILES	TIME SPAN	PROBE#
D-19537	C-15748	1	7/31/71 - 12/28/74	2
D-19538	C-15749	1	7/31/71 - 12/28/74	1

APOLLO 17 72-096C-01A

D#	C#	FILES	TIME SPAN	PROBE#
D-19539	C-15750	1	12/12/72 - 12/28/74	2
D-19540	C-15751	1	12/12/72 - 12/28/74	1

71-063C-06A

DESCRIPTION OF APOLLO HEAT FLOW EXPERIMENT DATA TAPES

I. Tape Specifications.

These tapes were written on an IBM 1130 Model 2415 tape unit at a density of 800 BPI with odd parity, data convert onand translate off. They are 7-track tapes. There are standard IBM inter-record gaps and a standard IBM end of file (2 consecutive inter-record gaps) at the end of the data.

II. Data Organization.

For each heat Flow experiment (Apollo 15 and 17) there are two data tapes, one for probe 1 and one for probe 2. On each tape there are five groups (files) of data in the indicated order:

File #	Record Content	Logical Record size	Physical Record Size
1	Time, T, ΔT for upper section gradient bridge	3 real words	100 logical records
2	Time, T, ΔT for lower section gradient bridge	"	"
4	Time, T, ΔT for upper section ring bridge	"	"
5	Time, T, ΔT for lower section ring bridge	"	"
3	Time, HTR, TREF, TC1, TC2, TC3, TC4	7 real words	"

Time is measured in milliseconds, since the beginning of the year in which the experiment was activated.
T is the average temperature for a given bridge
ΔT is the temperature difference between the upper and lower ends of a bridge.
HTR is the heater state - an integer between 1 and 16 converted to real mode.
TREF is the reference bridge temperature.
TCL, TC2, TC3, and TC4 are the thermocouple temperatures for each probe cable.

All temperatures and temperature differences are in degrees absolute and the order of the logical records in each file is chronological.

Note: This description applies to the data array for a physical record in core before it is written on tape. When the data are written on tape, the order is reversed; that is, for each physical record, the first word, in core (a time) becomes the last word on the tape record, and the last word in core (either a ΔT or TC4) becomes the first word on tape.

Each tape contains all the data for a particular probe since the experiment was activated until the end of 1974. The first time on the Apollo 15 tapes is 1971/212/19/48/00. The first time on the Apollo 17 tapes is 1972/347/3/5/40. The nominal data density is one point (Logical record) per hour.

The number of physical records for files 1 through 5 for these tapes are:

Tape	Experiment		Probe #		Sequence #				Number of Physical Records for				
Designation	A15	A17	1	2	1	2	3	4	File #1	2	4	5	3
A15P1#3	X		X				X		291	291	7	7	299
A15P2#3	X			X			X		281	281	6	7	289
A17P1#2		X	X			X			207	207	4	4	210
A17P2#2		X		X		X			206	206	4	4	210

Apollo 15 Heat Flow Thermal data (71-063C-06A) is written in IBM 1130 Floating point. 1130 Floating point uses two words in storage, and is oriented as follows:

```
                0 1                    15
1st WORD        [S|  MANTISSA          15] most significant bits

2nd WORD        [MANTISSA|CHARACTERISTIC] equals exponent plus 128
                0       7 8            15
```

The number can contain up to 23 significant bits of mantissa, with a binary exponent ranging from —128 to plus 127. The sign of the mantissa is in bit zero of the first word. The next 23 bits represent the mantissa, and the remaining 8 bits represent the characteristic. The mantissa is normalized to fractional form, i.e., the implied binary point is between bits zero and one. The characteristic is derived by adding 128 to the exponent, thereby representing all exponents as positive numbers in core. This eliminates the problem of having to allow for a sign bit for the exponent. All characteristics between 0 and 127 represent negative exponents, and characteristics from 128 to 255 represent exponents from 0 to 127 (positive). The exponent is, in actuality, the number of places that the binary bit should be moved either to the left or right or its original position.

The following is an example of how to convert eight hex characters into a decimal equivalent:

```
sign bit and
   mantissa
  448081 A3 ----characteristic
```

1) Break the mantissa down into bits.

```
implied   sign bit
binary
point    0.100 0100 1000 0000 1000 0001
```

2) Then calculate the characteristic, and from that, the exponent.

```
A3 = 163        163
               -128
                 35-----exponent
```

3) Now extend the mantissa out 35 places to the right to locate the correct position of the binary point (padding with zeros if necessary).

```
  sign bit
0.100/0100/1000/0000/1000/0001/0000/0000/0000/.  relocation of binary
                                 padding               point
```

4) Then convert to hex characters, starting from right to left.

4 4 8 0 8 1 0 0 0

This is your hex number. In this case, converting to decimal, we obtain a value in milliseconds of the year, which is 18,388,357,120---or 212.828 days.

```
// JCB          CA21

LCG CRIVE   CART SPEC   CART AVAIL   PHY DRIVE
  CCCC        CAF5        CAF5         CCCC
  CCC1        CA21        CA21         0001

V2 M11   ACTUAL 16K  CONFIG 16K

// FCR
        *LIST ALL
        *CNE WORC INTEGERS
        *ICCS(CISK,1403 PRINTER,PAPER TAPE,CARC)

C-ERRS...STNC.C..... F C R T R A N   S C U R C E   S T A T E M E N T S ........ IDENTFCN    **CCMPILER MESSAGES**

              INTEGER HTR
              CIMENSICN JP(5),IV(5),JNCX(5),IP(5)
              CIMENSICN A(70C)
              CATA JNCX/1,2,4,5,3/
              CEFINE FILE 7(1,7,L,IF7)
              CEFINE FILE 1(30CCC,4,U,IF1)
              CEFINE FILE 2(3000C,4,U,IF2)
              CEFINE FILE 3(30CCC,8,U,IF3)
              CEFINE FILE 4(1200,4,U,IF4)
              CEFINE FILE 5(12CC,4,U,IF5)
              READ(2,2CCC) TI,TF
         2CCC FORMAT(1X,2F13.C)
              WRITE(5,20CC) TI,TF
              READ(7'1) T,IP
              WRITE(5,5CCC) IP,T
         5CCC FORMAT(5(1X,I5),2X,F13.C)
              CC 2 I=1,4
              J=JNCX(I)
              L1=1
           22 READ(J'L1) T,IX,IY
              L1=L1+1
              IF(T-TI) 22,22,23
           23 L2=L1-1
              L1=L1-2
           2C CC 21 L=1,10C
              READ(J'L2) T,IX,IY
              L2=L2+1
              IF(L2-(IP(J)-1)) 27,27,25
           27 IF(T-TF) 24,25,25
           24 M=L-1
              A(3*M+1)=T
              A(3*M+2)=IX/10CC.
           21 A(3*M+3)=IY/10C.
              CALL MAGTA(2,0,3CC,A,2)
              GC TC 2C
           25 L3=3*(L-1)+1
              CC 26 L=L3,3CC
           26 A(L)=C.
              CALL MAGTA(2,C,3CC,A,2)
              JP(J)=(L2-L1)/1CC+1
            2 CCNTINUE
              L1=1
           32 READ(3'L1) T,HTR,IV
              L1=L1+1
```

```
C-ERRS...STNC.C.....  F C R T R A N   S C U R C E   S T A T E M E N T S  ........  ICENTFCN    **CCMPILER MESSAGES**
         IF(T-TI) 32,32,33
      33 L2=L1-1
         L1=L1-2
      3C DC 31 L=1,1CC
         READ(3'L2) T,HTR,IV
         L2=L2+1
         IF(L2-(IP(3)-1)) 37,37,35
      37 IF(T-TF) 34,35,35
      34 M=L-1
         A(7*M+1)=T
         A(7*M+2)=HTR
         A(7*M+3)=IV(1)/1C.
         A(7*M+4)=IV(2)/1C.
         A(7*M+5)=IV(3)/1C.
         A(7*M+6)=IV(4)/1C.
      31 A(7*M+7)=IV(5)/1C.
         CALL MAGTA(2,0,7CC,A,2)
         GC TC 3C
      35 L3=7*(L-1)+1
         DC 36 L=L3,7CO
      36 A(L)=0.
         CALL MAGTA(2,0,7CC,A,2)
         JP(3)=(L2-L1)/1CC+1
         CALL MAGTA(5,0)
         CALL MAGTA(3,C)
         WRITE(5,500C) JP
         CALL EXIT
         END
VARIABLE ALLCCATIONS
     A(R )=C5AC-002A    TI(R )=C5A2        TF(R )=05A4         T(R )=05A6        JP(I )=05AC-05A8    IV(I )=05B1-05AD
  JNCX(I )=C5B6-C5B2    IP(I )=C5B8-C5B7  HTR(I )=05BC       IF7(I )=05BD       IF1(I )=05BE        IF2(I )=05BF
   IF3(I )=C5CC        IF4(I )=C5C1       IF5(I )=05C2         I(I )=05C3         J(I )=05C4         L1(I )=05C5
    IX(I )=05C6         IY(I )=05C7        L2(I )=05C8         L(I )=C5C9         M(I )=05CA         L3(I )=05CB

STATEMENT ALLCCATICNS
  2CCC=C5EA   5C00=C5EE      22=C63F      23=0655      2C=0661      27=0683      24=068A      21=06A5      25=06C3      26=06D2
     2=06FE     32=0708      33=C71F      3C=072B      37=074B      34=0752      31=07AB      35=07CD      36=C7DC

FEATURES SUPPCRTED
 CNE WCRD INTEGERS
 STANCARC PRECISICN
 ICCS-
   DISK
   14C3 PRINTER
   PAPER TAPE
   CARC

CALLEC SUBPRCGRAMS
 MAGTA   FSUB    FCIV    FLC     FSTC    FSTCX   FLCAT   CARDZ   PAPTZ   SRED    SWRT    SCOMP   SFIC    SICAI   SIOF
 SUBSC   PRNZ    SCFIC   SCREC   SCAI    SCF     SCI

REAL CCNSTANTS
  .1CCCCCE 04=C5D8    .1CCCCCE C3=C5DA    .CCCCCCE CC=C5DC    .100000E 02=C5DE

INTEGER CCNSTANTS
     2=C5EC       5=C5E1       7=C5E2       1=05E3       4=05E4     1CC=05E5      0=05E6     30C=05E7      3=C5E8     7CC=C5E9
```

```
CCRE RECUIREMENTS FCR -
 CCMMCN-      C,    VARIABLES ANC TEMPORARIES-  1496,    CCNSTANTS ANC PRCGRAM-    570

ENC OF SUCCESSFUL CCMPILATICN

// XEC           2

*FILES(1,G11,A21),(2,G12,A21),(3,TCP1,A21),(4,R11,A21),(5,R12,A21)

*FILES(7,PNTR,A21)

          C.2C0000012736.
29C33 29033 29846    615    616  12631379168C.
  291   291   299      7      7
```

— APOLLO 15, Probe 1, Tape 3 —

```
// JCB          CA22

LCG CRIVE    CART SPEC    CART AVAIL   PHY CRIVE
  CCCC          CAF5         CAF5         CCCC
  CCC1          CA22         CA22         CCC1

V2 M11    ACTUAL 16K   CCNFIG 16K

// FCR
         *LIST ALL
         *CNE WCRC INTEGERS
         *ICCS(CISK,14C3 PRINTER,PAPER TAPE,CARD)

C-ERRS...STNC.C.....  F C R T R A N   S C U R C E   S T A T E M E N T S  ........  IDENTFCN    **CCMPILER MESSAGES**

                 INTEGER HTR
                 CIMENSICN JP(5),IV(5),JNDX(5),IP(5)
                 CIMENSICN A(7CC)
                 CATA JNCX/1,2,4,5,3/
                 CEFINE FILE 7(1,7,U,IF7)
                 CEFINE FILE 1(3000C,4,U,IF1)
                 CEFINE FILE 2(3000C,4,U,IF2)
                 CEFINE FILE 3(30CCC,8,U,IF3)
                 CEFINE FILE 4(12C0,4,U,IF4)
                 CEFINE FILE 5(12C0,4,U,IF5)
                 READ(2,2CCC) TI,TF
            2CCC FORMAT(1X,2F13.0)
                 WRITE(5,2CCC) TI,TF
                 READ(7'1) T,IP
                 WRITE(5,5CCC) IP,T
            5CCC FORMAT(5(1X,I5),2X,F13.C)
                 CC 2 I=1,4
                 J=JNCX(I)
                 L1=1
              22 READ(J'L1) T,IX,IY
                 L1=L1+1
                 IF(T-TI) 22,22,23
              23 L2=L1-1
                 L1=L1-2
              20 CC 21 L=1,10C
                 READ(J'L2) T,IX,IY
                 L2=L2+1
                 IF(L2-(IP(J)-1)) 27,27,25
              27 IF(T-TF) 24,25,25
              24 M=L-1
                 A(3*M+1)=T
                 A(3*M+2)=IX/10CC.
              21 A(3*M+3)=IY/10C.
                 CALL MAGTA(2,C,3CC,A,2)
                 GC TC 2C
              25 L3=3*(L-1)+1
                 CC 26 L=L3,3CC
              26 A(L)=C.
                 CALL MAGTA(2,C,3C0,A,2)
                 JP(J)=(L2-L1)/1CC+1
               2 CCNTINUE
                 L1=1
              32 READ(3'L1) T,HTR,IV
                 L1=L1+1
```

```
C-ERRS...STNC.C.....  F C R T R A N   S C U R C E   S T A T E M E N T S  ........  IDENTFCN    **CCMPILER MESSAGES**
                IF(T-TI) 32,32,33
             33 L2=L1-1
                L1=L1-2
             3C DC 31 L=1,1CC
                REAC(3'L2) T,HTR,IV
                L2=L2+1
                IF(L2-(IP(3)-1)) 37,37,35
             37 IF(T-TF) 34,35,35
             34 M=L-1
                A(7*M+1)=T
                A(7*M+2)=HTR
                A(7*M+3)=IV(1)/1C.
                A(7*M+4)=IV(2)/1C.
                A(7*M+5)=IV(3)/1C.
                A(7*M+6)=IV(4)/1C.
             31 A(7*M+7)=IV(5)/1C.
                CALL MAGTA(2,0,7C0,A,2)
                GC TC 3C
             35 L3=7*(L-1)+1
                DC 36 L=L3,7C0
             36 A(L)=0.
                CALL MAGTA(2,C,7C0,A,2)
                JP(3)=(L2-L1)/100+1
                CALL MAGTA(5,0)
                CALL MAGTA(3,C)
                WRITE(5,5CCC) JP
                CALL EXIT
                ENC
VARIABLE ALLCCATICNS
     A(R )=C5AC-002A    TI(R )=C5A2       TF(R )=C5A4       T(R )=05A6        JP(I )=05AC-05A8   IV(I )=05B1-05AC
  JNCX(I )=C5B6-C5B2    IP(I )=05BB-05B7  HTR(I )=05BC    IF7(I )=05BD       IF1(I )=05BE      IF2(I )=05BF
   IF3(I )=05C0        IF4(I )=05C1      IF5(I )=05C2       I(I )=C5C3        J(I )=05C4        L1(I )=05C5
    IX(I )=05C6         IY(I )=C5C7       L2(I )=05C8       L(I )=05C9        M(I )=05CA        L3(I )=05CB

STATEMENT ALLCCATICNS
  2CCC=C5EA  5CC0=C5EE    22=C63F    23=0655    20=0661    27=0683    24=068A    21=06A5    25=06C3    26=06D2
     2=06FB    32=C7C8    33=071F    3C=072B    37=074B    34=C752    31=07AB    35=07CC    36=07DC

FEATURES SUPPCRTEC
 CNE WCRC INTEGERS
 STANCARC PRECISICN
 ICCS-
   DISK
   14C3 PRINTER
   PAPER TAPE
   CARC

CALLEC SUBPRCGRAMS
 MAGTA  FSUB   FCIV   FLC    FSTO   FSTCX  FLCAT  CARCZ  PAPTZ  SRED   SWRT   SCOMF  SFIC   SIOAI  SICF
 SLBSC  FRNZ   SCFIC  SCREC  SDAI   SCF    SCI

REAL CCNSTANTS
  .1CCCCCE C4=C5C8   .1C0CCCE C3=C5DA   .CCC000E 00=05CC   .100000E 02=05DE

INTEGER CCNSTANTS
     2=C5EC      5=C5E1      7=C5E2      1=C5E3      4=05E4    1C0=05E5      0=05E6    300=05E7      3=05E8    700=C5E9
```

```
CCRE REQUIREMENTS FCR -
 CCMMCN-      C,   VARIABLES ANC TEMPCRARIES-  1496,   CCNSTANTS ANC PRCGRAM-   570

END CF SUCCESSFUL CCMPILATICN

// XEC           2

*FILES(1,G21,A22),(2,G22,A22),(3,TCP2,A22),(4,R21,A22),(5,R22,A22)

*FILES(7,PNTR,A22)

           C.2C000CCC12736.
28C4C 28C55 28848   598   618  12631384C832.
  281   281   289     6     7
```

APOLLO 15, Probe 2, Tape 3

TIME

APOLLO 15

D-19537

7/31/71 - 12/28/74

REC 1. LENGTH 1201

4AB0008986343A8545E173A34AB00089863F7D8545DD4DA34AB000898628F68545D9FEA34AAD708986343A8545D6A9A34AAC
2889862F1B8545D35AA34AB00089862E158545D009A34AB33389862E158545CD8BA34AAC28898628F68545CA3CA34AAB8589
862F1B8545C6EBA34AAC2889862F1B8545C616A34AB00089862E158545C2C5A34AA70A89862F1B8545BF73A34AA8F5898635
408545BC21A34AAC2889862F1B8545B8D2A34AA70A898623D88545B581A34AA8F5898623D88545B22FA34AA8F5898623D885
45AEDDA34AA5C2898623D88545AB8EA34AA3D7898629FC8545A83DA34AA5C2898618948545A4FBA34AA000898628038545A1
99A34AA000898624DE85459F1FA34AA000898624DE85459BCDA34A9F5C898624DE8545987CA34A9CCC898624DE8545966AA3
4A9CCC8986312785459318A34A9CCC898631278545904AA34A9CCC8986199A8545885EA34A999989861AA08545850EA34A99
9989861AA0854581BDA34A966689860F5D85457E6BA34A9666898620C585457B1AA34A966689861AA0854577CAA34A966689
86147B85457479A34A933389861AA08545740DA34A90A389861BA685457339A34A90008986158285456FE7A34A8D7089861B
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455EF7A34A8A3D89861CAD85455BA6A34A847A89861 78E85455854A34A8147898617 8E85455503A34A83D789861169854551
B3A34A83D78986116985454E62A34A8147898611698545 4B10A34A80A38986126F854547BFA34A7CCC89860C4A8545446FA3
4A7AE18986126F8545411EA34A7E1489860C4A85453FE0A34A7AE189860D5085453C8FA34A76668986072C85453648A34A79
998986072C854532F9A34A77AE8986020D85452FA8A34A77AE89860D5085452C56A34A747A8985FCEE85452904A34A747A89
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3885451D00A34A651E89861582854519AFA34A6A3D898609388545165DA34A68518986093885451 30BA34A6D7089 85F1AA85
450D5AA34A73338985F6C985450A08A34A76668985E561854506B7A34A7CCC8985D2F285450367A34A851F8985C6A8854500
16A34A8B858985BA5F8544FCC4A34A99998985AD0F8544F973A34AA3D7898589388544F623A34AA3D789858F5D8544F54FA3
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REC 2. LENGTH 1201

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REC 3. LENGTH 1201

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