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COMPUTER PROGRAM DOCUMENTATION
DISSPLA PLOTTING ROUTINES FOR THE
G-189A EC&LS COMPUTER PROGRAM

Job Order 51-209

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FOR THE G189A EC/LS COMPUTER PROGRAM
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Contract NAS 9-15800

For

CREW SYSTEMS DIVISION

May 1979

LEC-13339

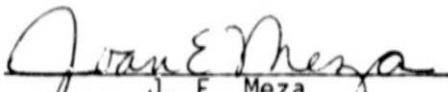
JSC-14925

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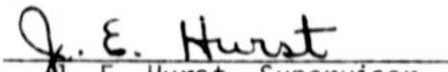
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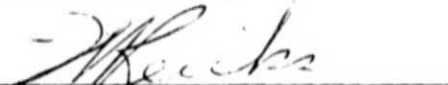
CPD-913

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LEC-13339

1. INTRODUCTION

The G-189A computer program plotting package has been expanded to provide, as a user option, the utilization of the DISSPLA software system for both the post-plot data tape processing and the on-line data plotting capabilities described in the reference. This option has been incorporated into the G-189A Master Program File and is currently available for all G-189A program users.

2. POSTPROCESSOR PLOTTING ROUTINE LECPLT

2.1 PROGRAM DESCRIPTION

LECPLT is a separately executable program used to process G-189A post-plotting data tapes. It is similar to G-189PL/P (documented in the reference) but provides more capabilities through the utilization of the DISSPLA plotting routines.

LECPLT can be executed in demand mode from the Tektronix or MOPS terminals to produce the desired graphical output directly from these terminals and can be executed from any remote terminal to provide CalComp plots or FR80 microfilm. LECPLT can also be executed in batch mode to produce CalComp plots or FR80 microfilm.

2.2 PROGRAM CAPABILITIES

All of the capabilities available in G-189PL/P are also available in LECPLT, including the following:

- a. Graphs can be produced that plot any variable as a function of any other variable (use of this option requires a thorough study of the detailed discussion shown in section 10.2.1 of the reference.)
- b. The automatic scaling feature may be overridden and the user may set the y-axis minimum and maximum limits. This option is also available for the x-axis limits when the independent variable is Mission Time.
- c. The user may choose to plot every point along the x-axis or every nth point (where n is greater than 0 and less than the number of data points written on the postprocessing data tape).

2.3 INPUT DESCRIPTION

Input required for execution of LECPLT consists of a data tape that was generated by a G-189A simulation (input on FORTRAN logical unit 16) and a set of data cards specifying the format in which the data is to be plotted. When executing LECPLT from a remote terminal, these "data cards" will be typed in at the keyboard.

The first data card must specify the hardware device on which data is to be plotted. Beginning in card column 5, the user will input the hardware device selected FR80, CalComp, MOPS, or Tektronix (correct spelling is not necessary since the first character is the only one interrogated).

All other data cards are identical to those required for execution for G-189PL/P and are described in detail in section 10 of the reference. See figure 1 for a sample data card deck.

```

FR80
$CASE
NCASE=1, ILCRD=13, NPPTS=44, TSTART=-15., TEND=600.,
IPFREQ=1, NUMCAS=1, IFPLOT=0, IPLOT=1
IEND=1, IPRINT=1
NOLIM=0,
$END
$PONLY
INDX=4, NYPTS(1)=4, NYPTS(2)=2, NYPTS(3)=3, NYPTS(4)=3
$END
PLOT00
PLOT24      8  77  -200.0  500.0  EVA SHIVER
PLOT20      15 77  BODY STORAGE (BTU)
PLOT20      15 77  CALCULATED
PLOT20      15 78  COMFORT
PLOT20      15 79  LOWER LIMIT
PLOT22      8  81  -300.0  300.0  UPPER LIMIT
PLOT20      8  80  MAN HEAT (LB/HR)
PLOT23      8  92  300.0  2400.0  QSHIV
PLOT20      8  66  STORAGE RATE
PLOT20      8  67  ENERGY TRANSFER RATE
PLOT20      8  75  METABOLIC RATE
PLOT20      8  76  SENSIBLE (MAN)
PLOT20      8  74  LATENT (MAN)
PLOT20      8  75  BODY TEMPERATURES (F)
PLOT20      8  76  AVERAGE SKIN
PLOT20      8  74  COOLED SKIN
PLOT20      8  74  HEAD CORE
ENDC
$CASE
TSTART=200., TEND=500., NUMCAS=0, IFPLOT=1,
IEND=0,
$END
PLOT0
PLOT0
ENDC
$CASE
IEND=1, TSTART=-15., TEND=600., NUMCAS=0, IPLOT=0, IFPLOT=0,
$END
PLOT0
PLOT22      11  60.  110.  MISS EVA SHIVER
PLOT22      17  BODY TEMPERATURE (F)
PLOT22      6  -300.  300.  AVERAGE SKIN
PLOT23      3  -200.  500.  HEAD CORE
PLOT22      4  QSHIVER (LB/HR)
PLOT22      5  BODY STORAGE (BTU)
PLOT22      2  COMFORT LIMIT
PLOT22      2  UPPER LIMIT
PLOT22      2  LOWER LIMIT
PLOT22      10  -200.  200.  CALCULATED BODY STORAGE (BTU)
PLOT22      9  200.  2400.  ENERGY TRANSFER RATE
PLOT22      9  LATENT (MAN)
PLOT22      9  SENSIBLE (MAN)
ENDC

```

Figure 1. - Data cards for sample case.

In addition to the post-plotting data tape, LECPLT requires the assignment of the input unit on which the program is stored. The program also uses four FASTRAND files (assigned to units 2.,3.,4.,7.) each of which is assigned by the operating system with the default size of 128 tracks. No other devices are required for generation of Tektronix or MOPS plots (see figure 2(a) for a sample runstream). Runs generating FR80 microfilm or CalComp plots require the assignment of a magnetic tape with the filename PLOT. This filename is equated to unit 8. for FR80 microfilm (see figure 2(b)) and is equated to unit 19. for CalComp plots see figure 2(c) .

2.4 OUTPUT DESCRIPTION

See figures 3 through 6 for FR80, Tektronix, CalComp, and MOPS graphs as they are generated by LECPLT.

```

@RUN
@ASG,T TAPE1.,8C,XNNNNN          (PROGRAM TAPE)
@COPY,G TAPE1.,TPFS.
@FREE TAPE1.
@ASG,T 16.,8C,XMMMMM            (DATA TAPE)
@PREP
@MAP,SW SEGPRG/LECPLT,SEGPRG/LECPLT
@XQT SEGPRG/LECPLT

```

(a) Tektronix or MOPS.

```

@RUN
@ASG,T TAPE1.,8C,XNNNNN          (PROGRAM TAPE)
@COPY,G TAPE1.,TPFS.
@FREE TAPE1.
@JSC*CALLUP.TAPELABEL           (REQUIRED FOR FR80)
@ASG,T PLOT.,8C,,8 . FR80 16MM  (REQUIRED FOR FR80)
@USE 8.,PLOT.                   (REQUIRED FOR FR80)
@MSG PLOT PROC REQ'D FR80 16MM  (REQUIRED FOR FR80)
@ASG,T 16.,8C,XMMMMM            (DATA TAPE)
@PREP
@MAP,SW SEGPRG/LECPLT,SEGPRG/LECPLT
@XQT SEGPRG/LECPLT

```

(b) FR80.

```

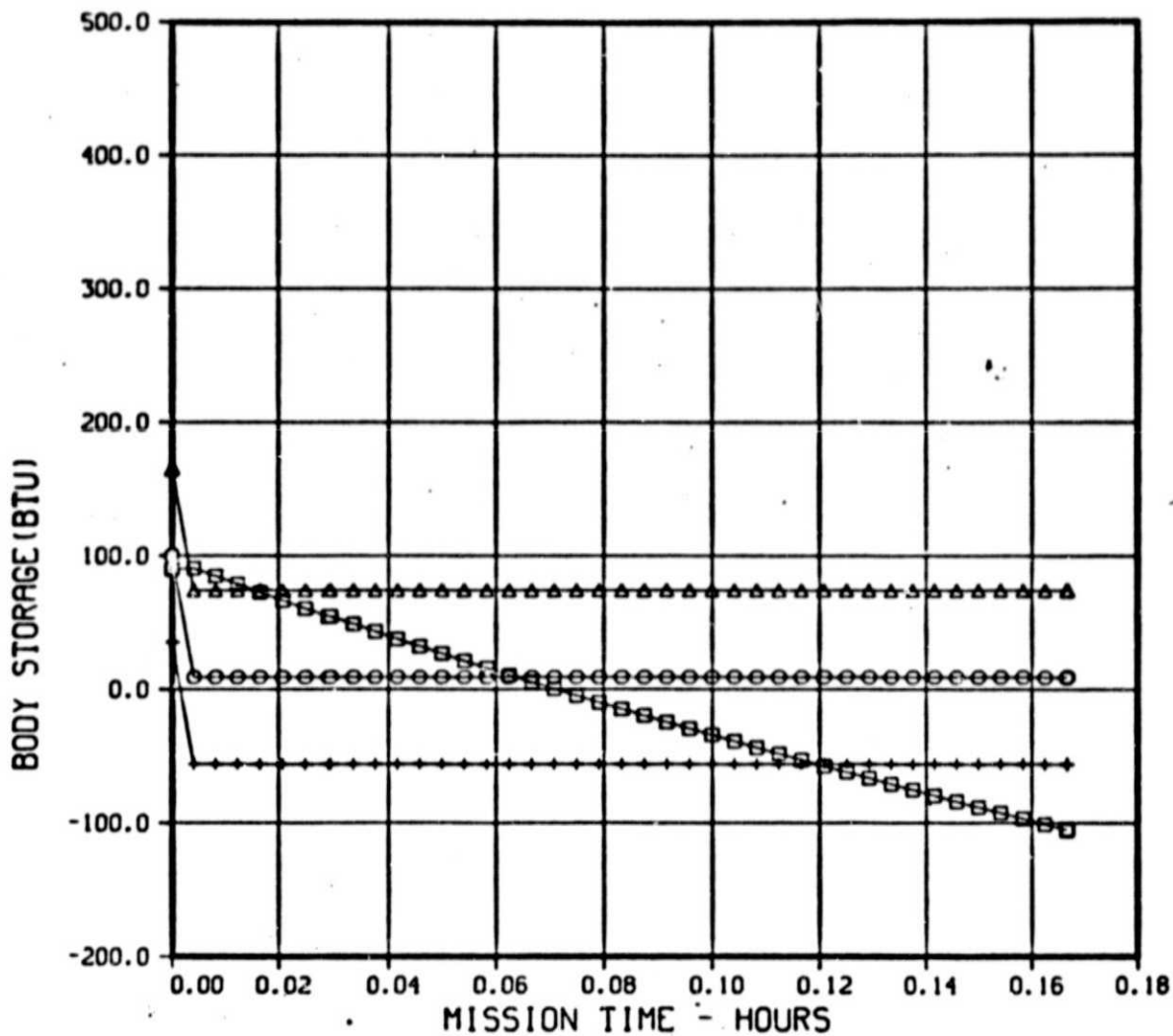
@RUN
@ASG,T TAPE1.,8C,XNNNNN          (PROGRAM TAPE)
@COPY,G TAPE1.,TPFS.
@FREE TAPE1.
@JSC*CALLUP.TAPELABEL           (REQUIRED FOR CALCOMP)
@ASG,T PLOT.,8C,,8 . FORM 01 11 PLOTS (REQUIRED FOR CALCOMP)
@USE 19.,PLOT.                  (REQUIRED FOR CALCOMP)
@MSG PLOT PROC REQ'D CALCOMP FORM 01 (REQUIRED FOR CALCOMP)
@ASG,T 16.,8C,XMMMMM            (DATA TAPE)
@PREP
@MAP,SW SEGPRG/LECPLT,SEGPRG/LECPLT
@XQT SEGPRG/LECPLT

```

(c) Calcomp.

Figure 2. - Sample runstreams.

EVA SHIVER



PLOT 1 11.02.03 Hour 5 AM, 1979 JOB-170JMS WSA-J 0155PLA VER 7.3

LEGEND
 □ - CALCULATED
 ○ - COMFORT
 △ - LOWER LIMIT
 + - UPPER LIMIT

Figure 3. - Sample FR80 plot.

EVA SHIVER

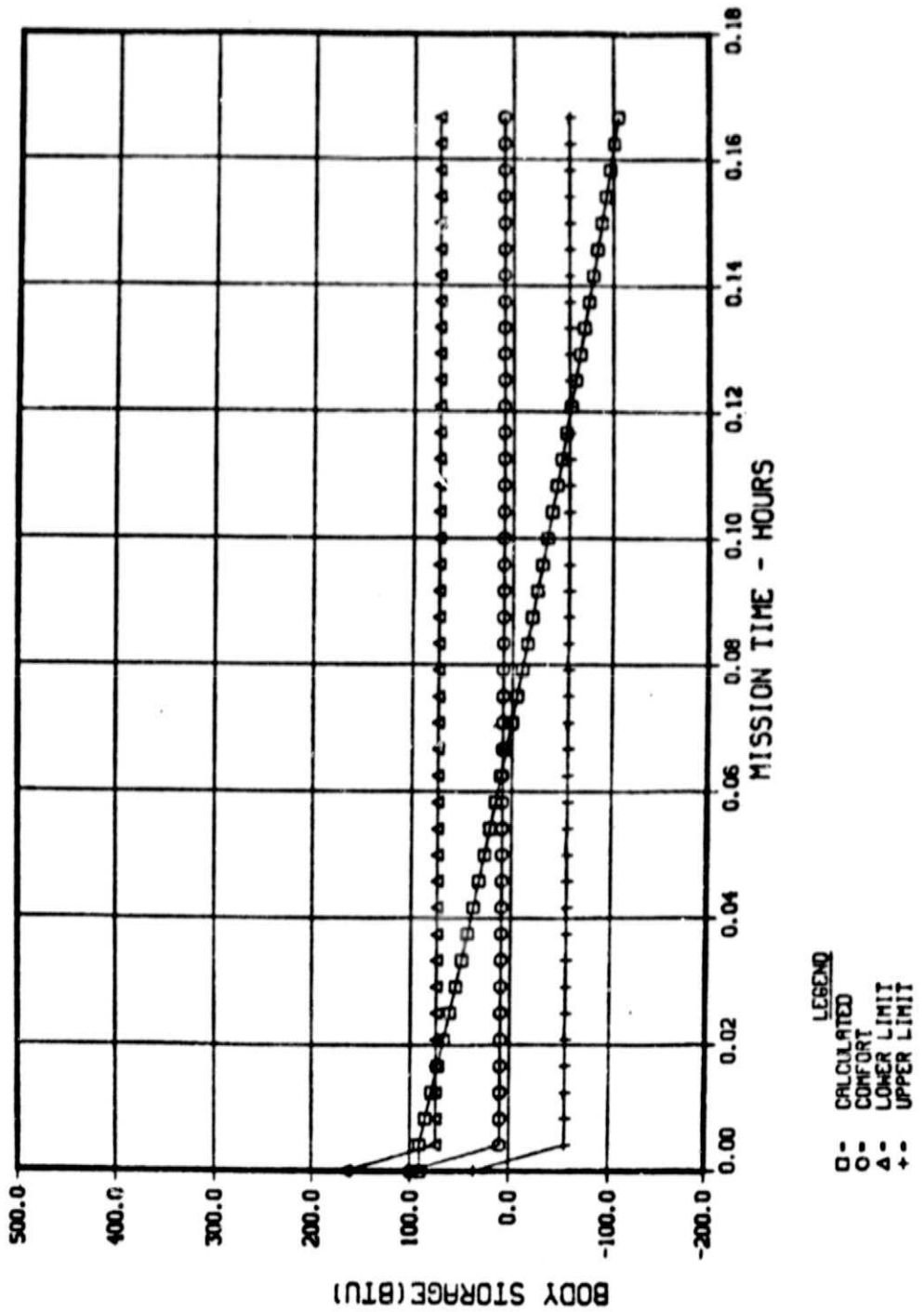
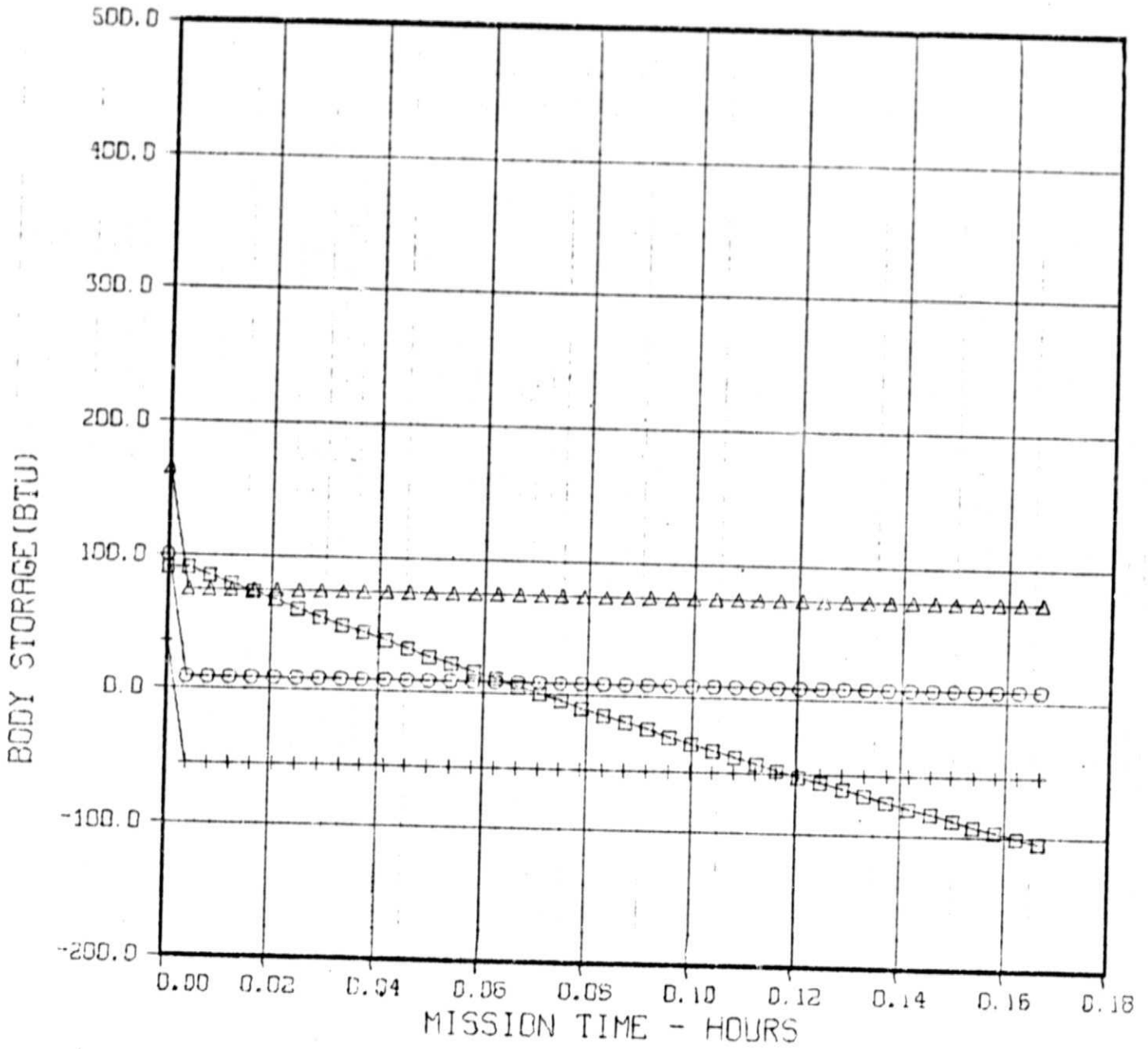


Figure 4. - Sample Tektronix plot.

EVA SHIVER

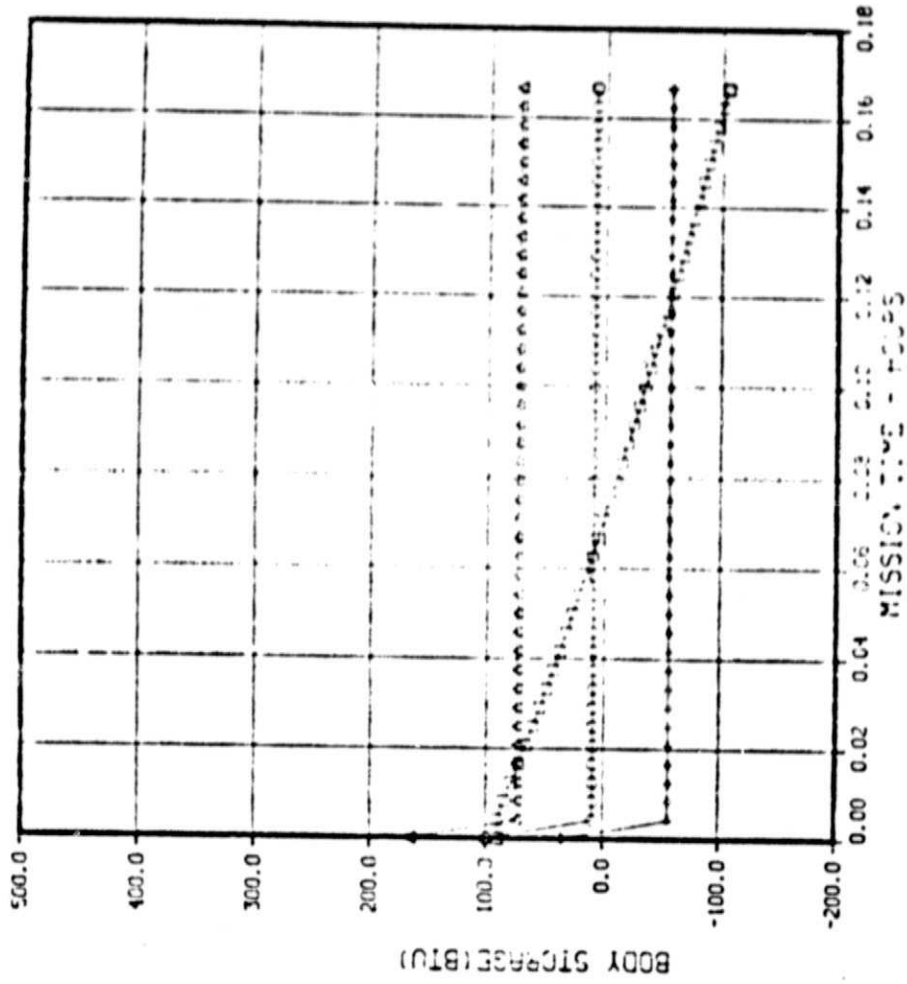


- LEGEND**
- - CALCULATED
 - - COMFORT
 - △ - LOWER LIMIT
 - + - UPPER LIMIT

ORIGINAL PAGE IS
OF POOR QUALITY

Figure 5. - Sample CalComp plot.

E.P. SHIVER



LEGEND
O- CALCULATED
O- COMFORT
A- LOWER LIMIT
+ - UPPER LIMIT

PL071 20.24.13 05A-2 1979 08-170241 05A-2 0159-4 00 2.3

Figure 6. - Sample MOPS plot.

3. ON-LINE G189A PLOTTING ROUTINE MAINPL/LEC

3.1 PROGRAM DESCRIPTION

MAINPL/LEC is a modified version of MAINPL/G that provides for the utilization of the DISSPLA plotting software, replacing the original SC4060 software package. These modifications do not alter the program description as it appears in the reference.

3.2 PROGRAM CAPABILITIES

In addition to the capabilities and program options offered by MAINPL/G that are documented in the reference, MAINPL/LEC provides the user with a choice of plotted output types consisting of CalComp, Tektronix, or MOPS plots or FR80 microfilm. It should be noted, however, that since most G-189A computer models exceed the present demand mode core restriction of 40,000 words exclusive of the core storage required by the DISSPLA package (approximately 25,000), the Tektronix or MOPS options will rarely be available.

3.3 INPUT DESCRIPTION

Data input required by MAINPL/LEC is identical to that required by MAINPL/G with the exception of one card - a device designating card that must be placed in the data deck immediately following the ENDC card. The user specifies the plotting hardware device by simply putting the device name on this card, starting in card column 5. For example, for CalComp plots, the user punches the letters CALCOMP onto the card; for FR80 microfilm plotting, the user punches the letters FR80, etc.

3.4 OUTPUT DESCRIPTION

See figures 3 through 6 for sample FR80, Tektronix, CalComp and MOPS plots.

4. REFERENCE

G-189A Generalized Environmental/Thermal Control and Life Support Systems Computer Program, MDAC-G2444 McDonnell Douglas Aeronautics Co., Huntington Beach, CA., Sept. 1971.