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GPPR - A MULTIPURPOSE COMPUTER CODE FOR DATA PLOTTING

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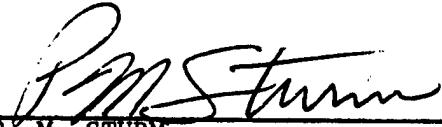
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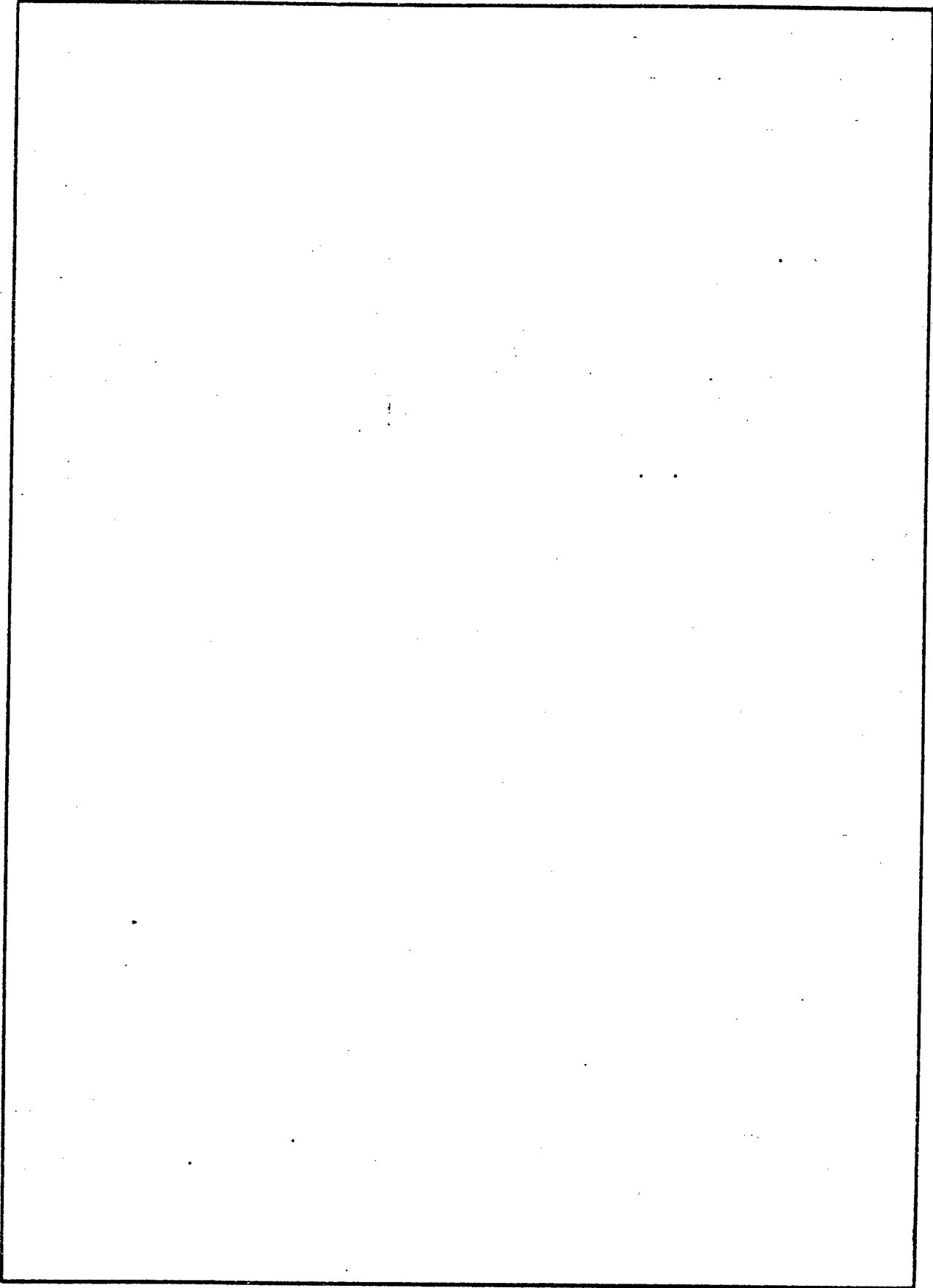
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TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION.	3
DISCUSSION.	3
Code Description.	3
Plot Size.	3
Titles, Axis Labeling and Increment Size	5
Data Presentation.	5
Option 1	5
Option 2..	5
Option 3	5
Grid Option.	6
CONCLUSIONS	6
RECOMMENDATIONS	6
REFERENCES.	6
APPENDIX A - User's Guide	A-1
APPENDIX B - Sample Problem	B-1
APPENDIX C - Program Listing.	C-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page</u>
1	GPPR Output From Calcomp Pen Plotter	4
A-1	GPPR Example Plot Option I	A-4
B-1	Example GPPR Plot.	B-4

I N T R O D U C T I O N

The NAVAIRDEVCEN (Naval Air Development Center) is a large user of vehicle and propulsion design and performance computer codes. A significant number of these programs is dependent on the use of input tabular data sets. Experience has shown that it is desirable to have a visual representation of these data sets prior to use in these programs to avoid employing incorrect data. In addition, the programs often require a means of expressing output results in a form other than digital data. This present report describes a general purpose routine which will generate data plots in terms of one or two independent variables. This code, entitled GPPR (General Purpose Plotting Routine) for plotting data, was developed for the NAVAIRDEVCEN CDC 6600/CYBER 175 computer facilities and is used in conjunction with a model 735 CALCOMP pen plotter. A user's guide for this code is shown in Appendix A. A sample problem is illustrated in Appendix B and a FORTRAN code listing is given in Appendix C.

D I S C U S S I O N

CODE DESCRIPTION

The GPPR code was developed as a computer tool to permit users to easily and quickly plot digital data for both use in reports and editing of table data sets used as inputs in other computer codes. A completely general plotting routine was thought to be awkward and inconvenient to the user, because of the large numbers of inputs that would be required. For this reason decisions were made which restrict the options related to the plot size and axis labeling. The code package consists of subroutines GPPR, AXSCALE, and function SPLNQL. A user written main program is required to use the plot package. An example of a main program is shown in Appendix C.

The basic features and options selected for the GPPR subroutine are as follows:

Plot Size

The standard size GPPR plot is 8.5 by 11 inches which is compatible with present NAVAIRDEVCEN report page size. The manner in which these plots are produced on the CALCOMP Pen Plotter is shown in Figure 1. The entire plot size (all symbols, scales, and other characters) may be changed from the standard size through an input size factor. For example plots of 4.25 by 5.5 inches would be obtained with an input size factor equal to .5.

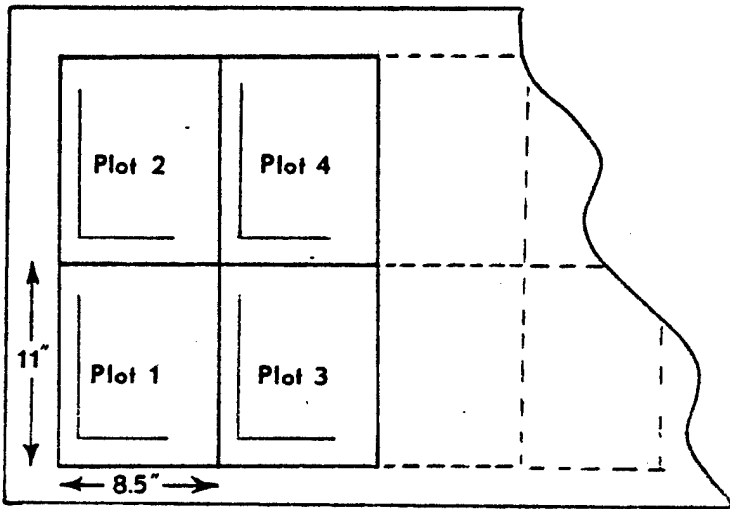


FIGURE 1. GPPR OUTPUT FROM CALCOMP PEN PLOTTER

Titles, Axis Labeling and Increment Size

The standard size axis lengths are 5 and 7 inches, respectively, with tic marks provided at one inch intervals. The scale and increment size for each axis is determined from another subroutine, AXSCALE. The AXSCALE routine determines the largest scale and increment size that will permit all data points to lie within the boundary, .01 inch less than the start of and .05 inch greater than the end of each axis. The AXSCALE routine will select the correct scale and increment size in multiples of 1, 2, or 5. This particular scale selection procedure enables the user to overlay the GPPR plot with 10 divisions per inch graph paper and accurately read values from the GPPR plot. For example, if y axis values ranged from 0 to 200, the axis label values would be 50 units per inch with a full scale value of 350. A FORTRAN listing of the AXSCALE code is found in Appendix C.

Each axis title label is input by the user. A title label option for a second independent variable is also provided. Each line of the main title heading is automatically centered over the plot. The entire main title heading may contain a maximum of four lines with no more than 35 characters per line.

Data Presentation

The GPPR routine has three options concerning presentation of data on each plot.

1. Option 1

The first option is to plot symbols for each input data point. If two or more second independent variables are input then different type symbols will be used for each group of points representing a constant value of the second independent variable.

2. Option 2

The second option is an extension of the first option. The symbols are plotted as in option 1 and an in-house developed cubic spline interpolation code, function SPLNQ1, based on methods in reference (a), is used to draw a smooth curve between each set of symbol types. The cubic spline interpolation technique is unique in that the interpolated curve passes through each data point and has continuous first and second derivatives. A FORTRAN code listing for function SPLNQ1 is given in Appendix C.

3. Option 3

The third option permits the user to plot the interpolated spline curve with symbols appearing only at each end of the spline curve. The symbols at the end of each spline curve are retained only to identify each curve in terms of the associated second independent variable value.

4. Grid Option

The grid option permits a 1 inch grid to be drawn at the tic marks on the axes. Instructions for using these options are given in Appendix A.

C O N C L U S I O N S A N D R E C O M M E N D A T I O N S

The general purpose plotting routine discussed in this report is a valuable computer based tool. The GPPR subroutine is flexible and easily incorporated into new or existing computer codes.

The present structure of GPPR restricts usage to curves with open arcs and single values of the dependent variable at each independent variable. It is recommended that program development proceed which will extend GPPR to permit the plotting of data which can be the form of a closed arc.

R E F E R E N C E S

- (a) Pennington, Ralph H., "Introductory Computer Methods and Numerical Analysis", Macmillian Company, London, 1970

NADC-76367-30

APPENDIX A
USER'S GUIDE

NADC-76367-30

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APPENDIX A
USER'S GUIDE

All inputs into the GPPR routine are passed as formal parameters in the call statement to GPPR. The order of the parameters in the call statement is as follows:

CALL GPPR (NPLOT, LABY, N1, LABX, N2, LABTL, NT, X, Y, NPTS, LABVAL, NCC, VLABL, NDECV, ITIP, IGRID, FAC)

These parameters are defined as follows:

NPLOT is an initializing parameter which is set to 0 before the first call to GPPR. NPLOT is only set once.

LABY is an array containing the Hollerith data for the Y axis label.

N1 is the number of elements in the LABY array comprising the Y axis label. (1 element = 10 characters)

LABX is an array containing the Hollerith data for the X axis label.

N2 is the number of elements in the LABX array comparisons for the X axis label (1 element = 10 characters).

LABTL is an array containing the Hollerith data for the main title label. Groups of 3 or more consecutive blank characters between non blank characters indicate the beginning of a new line in the title label. Space limitations permit a maximum of 4 lines with approximately 35 characters per title line. If the user attempts to use a title line longer than 35 characters, the line will terminate at the next blank after the thirty-fifth character in that line. Leading and trailing blank characters for each line are ignored and each line of title is centered on the plot.

NT is the number of elements in the LABTL array comprising the main title label (all lines) (1 element = 10 characters). If NT is equal to 0, no main title is written.

X is an array containing the X axis values of data for the entire plot. For example, consider a plot with three curves to be drawn as shown in Figure A-1. If the first curve has 6 data points and the second curve has 4 data points, then elements X(1) to X(6) are the X axis coordinate values for the first curve and elements X(7) to X(10) are the X axis coordinate values of the second curve. The third curve points would follow in X(11) to X(15). The order of the 6 points in the X array comprising the first curve is unimportant. Similarly, the order of the points comprising any curve is unimportant.

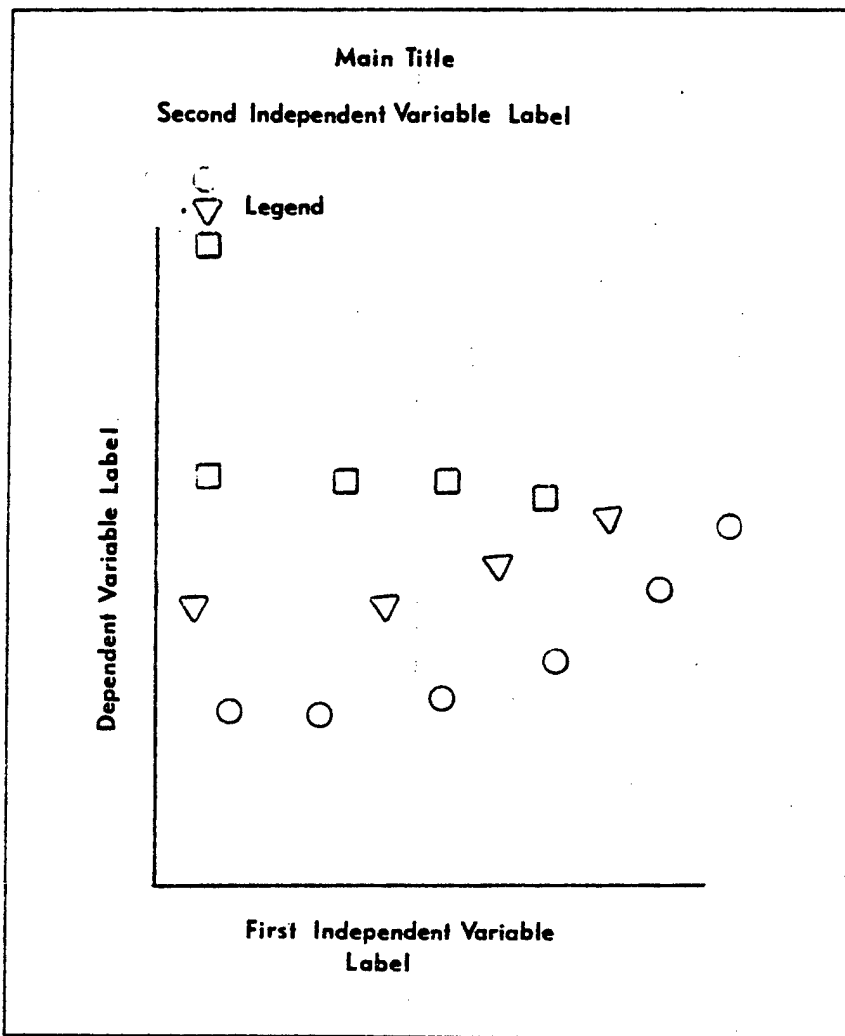


FIGURE A-1. GPPR EXAMPLE PLOT OPTION 1

Y is an array containing the Y axis values of data for the entire plot. There must be a one to one correspondence between the Y array values and the X array values. For example, X(1) and Y(1) are the X and Y axis coordinate values of the first input data point.

NPTS is an array containing the number of data points for each curve on the plot. In the preceding example, NPTS (1) = 6, NPTS (2) = 4, and NPTS (3) = 5. The NPTS element following the last element used to identify the last curve must be set equal to zero. In this example, NPTS (4) must be set equal to 0.

LABVAL is an array containing the Hollerith data for the second independent title label. This title label is used identify the value held constant for each curve on the plot. (1 element of the array will contain 10 characters.)

NCC is the number of elements in the LABVAL array comprising the second independent variable (if NCC = 0 no second independent variable title is generated on the plot) title label (1 element = 10 characters).

VLABL is an array containing the values of the second independent variable associated with each curve. The first element of VLABL is associated with the first set of points in the X and Y arrays. If NCC is set equal to zero then VLABL is not applicable.

NDECV is the number of significant figures to the right of the decimal for the VLABL array to be used on the plot.

ITIP is a switch used to indicate the following options.

<u>ITIP</u>	<u>OPTION</u>
1	plot symbols only
2	plot symbols and draw a spline curve fitted with respect to X axis
3	same as ITIP = 2 except symbols are only plotted at end points of spline curve
-2	plot symbols and draw a spline curve fitted with respect to Y axis
-3	same as ITIP = -2 except symbols are only plotted at end points of the spline curve

IGRID is a switch used to indicate grid options. If IGRID = 1, a one inch grid is drawn on the plot. Otherwise, no grid is drawn.

FAC is a value indicating the size factor of the plots. FAC set to 1.0 is the standard size indicating plots 8.5 by 11 inches will be drawn.

The last step in any program using the GPPR subroutine is to end the plotting tape. To end the plotting tape the user must enter a call to GPPREND using the same formal parameters previously defined in the call to the GPPR subroutine.

NADC-76367-30

APPENDIX B
SAMPLE PROBLEM

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APPENDIX B
SAMPLE PROBLEM

In this appendix an example problem using the GPPR subroutine is illustrated. In this example, a 2 independent variable function is plotted, standard size. In order for the user to implement the plotting package, data must be input into the GPPR subroutine from another program or subroutine. In this example, program EXPLOT is the means by which the plot inputs are transferred into the GPPR subroutine. In Appendix C the FORTRAN listings of program EXPLOT and the other routines forming the plotting package (GPPR, AXSCALE, and SPLNQ1) are shown. On cards 3 and 4 of EXPLOT (see page C-2), the input data points (X is the first independent variable, Y is the dependent variable) are set using a DATA card statement. The NPTS array is set to 7, 5, and 0 on card 6 indicating two curves are input. The first curve has 7 points (X and Y array elements 1-7) and the second curve has 5 points (X and Y array elements 8-12). The elements of the second independent variable array are set on card 5, page C-2, to values .5 and .821 respectively. The axis labels, main title label and second independent variable label are set on cards 7 through 11, page C-2. The call to the GPPR subroutine is shown on card 12. Most of the formal parameters have been defined above. The remaining parameters are defined with numerical values in the call statement to GPPR indicating the following:

The Y axis label has 2 elements

The X axis label has 2 elements

The main title label has 6 elements

The second independent variable label has 3 elements

The values of the Z array on the plot will have 3 significant figures to the right of the decimal

The plot will be standard size with symbols, spline curve, and grid drawn

The resulting plot generated from the CALCOMP Pen Plotter is shown in Figure B-1. The computer time required to generate the CALCOMP Pen Plotter instructions for this problem was about .6 CP (Central Processor) seconds.

EXAMPLE GPPR
PLOT
TWO INDEPENDENT VARIABLES
X AND Z

SECOND INDEPENDENT VARIABLE

- ⊙ 0.500
- △ 0.821

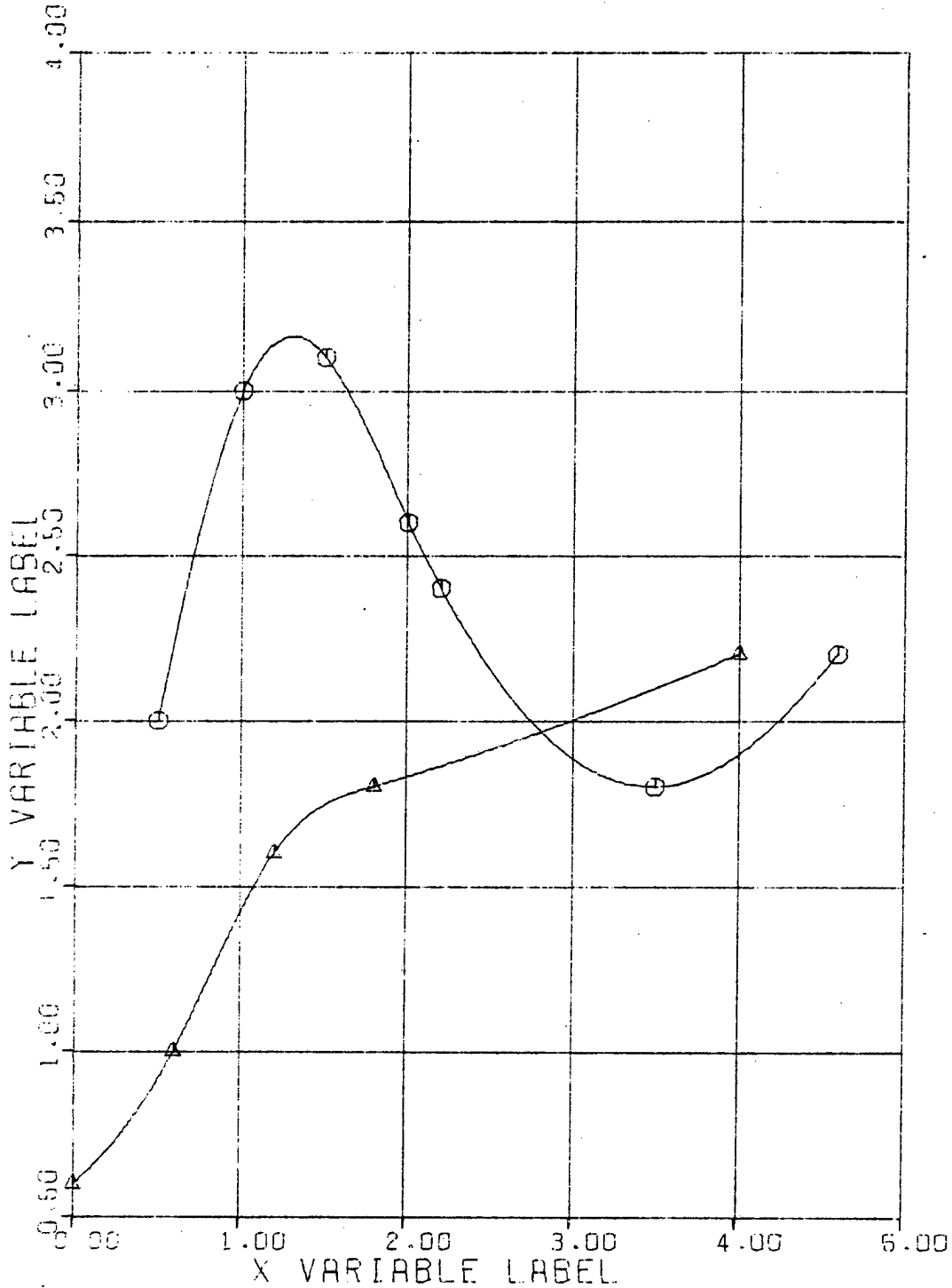


FIGURE B-1. EXAMPLE GPPR PLOT

NADC-76367-30

APPENDIX C
PROGRAM LISTING

NADC-76367-30

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PROGRAM EXPLOT

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PROGRAM EXPLOT(INPUT,OUTPUT,TAPE1)
DIMENSION X(100),Y(100),Z(4),NPTS(5),IYT(3),IT(R),IT(R),ITZ(3)
DATA X/1.2,2.2,3.5,4.6,1.5,5.6,1.2,1.9,4.0,0. /
DATA Y/2.6,2.4,1.8,2.2,3.1,2.1,1.6,1.8,2.2,6. /
DATA Z/5.821 /
DATA NPTS/7,5,0 /
DATA IYT/10X VARIABLE,10H LABEL /
DATA IY/10Y VARIABLE,10H LABEL /
DATA IT /10H EXAMPLE G,10HDPB PIOT,10H TWO IND,10HDEPENDENT V,
10H VARIABLES ,10H Y AND Z /
DATA ITZ/10H SECOND IN,10HDEPENDENT ,10H VARIABLE /
CALL GPPR (NPLOT,IYT,2,IYT,2,IT,6,X,Y,NPTS,ITZ,3,2,3, 2,1,1,0)
CALL GPPRND(NPLOT,IYT,2,IYT,2,IT,6,X,Y,NPTS,ITZ,3,2,3, 2,1,1,0)
END
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SUBROUTINE GPPR

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SUBROUTINE GPPR(NPLOT,LARY,N1,LARY,N2,LARTL,NT,X,Y,
1 LARVAL,NCC,VLARI,MFCV,ITIP,IGPIO,FAC)
C *** GENERAL PURPOSE PLOTTING ROUTINE
C *** M CARRY AVOID
DIMENSION X(50),Y(50),LARY(5),LARY(5),LARTL(9),NPTS(30),VLARI(6),
1 LARVAL(6),DATA(1024),C(101),NA(100),OS(303)
DIMENSION I7(10),I8(80)
IFIT=0
ITYP=ITIP
IF(ITIP.GT.0) GO TO 10
ITYP=-ITYP
IFIT=1
10 NY=N1*10
NX=N2*10
NCL=NCC*10
NT=NT
IF(NPLOT.NE.0) GO TO 20
CALL PLOTS(DATA,1024,1)
CALL FACTOR(FAC)
GO TO 60
20 IF(FAC.GT.1.) GO TO 50
GO TO (30,40),NPLOT
30 CALL PLOT(0.,11.0,-3)
GO TO 60
40 CALL PLOT(8.5,-11.0,-3)
NPLOT=0
GO TO 60
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GPPR (CONTINUED)

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130 K1=1
    ITL1=ITL1-NBPK
140 X1=(5.-.13333*ITL1)/2.
    NTS=I
    K1=K+1
    DO 150 I=1,ITL1
        JI=IP(I)
        CALL SYMROL(Y1,Y1,.14,.IL,.0,.1)
150 X1=X1+.13333
    Y1=Y1-.21
    IF(NBPK.F0.3) GO TO 70
160 CALL PLOT(6.75,9.5,0.3) $ CALL PLOT(6.75,-1.5,2)
    CALL PLOT(-1.75,-1.5,2) $ CALL PLOT(-1.75,9.5,2)
    CALL PLOT(6.75,9.5,2)
    NL=0
    NPLOT=0
    DO 170 I=1,30
        IF(NPTS(I).F0.0) GO TO 180
        NL=NL+1
170 NPLOT=NPLOT+NPTS(I)
180 CONTINUE
    IF(NCL.F.0) GO TO 210
    YW=Y1
    CALL SYMROL(.5,YW,.10,LARVAL,.0,.NCL)
    XW=.5
    YW=YW-.2
    YSAVE=YW

```

GPPR (CONTINUED)

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0082 NS=NI, IIS=1, NP=NS
0083 IF(NS.GT.5) NP=5
0084 NS=NS-5
0085 DO 200 J=1,ND
0086 CALL SYMBOL(XW,YW,.10,TS,0,.-1)
0087 XV=XW+.2
0088 CALL NUMBER(XV,YW,.10,VLARL(TS),0,NDFCV)
0089 TS=IS+1
0090 YW=YW-.15
0091 NP=NS
0092 IF(NS.LE.0) GO TO 210
0093 CALL WHERE(XW,YW,FAC)
0094 XW=XW+.5
0095 YW=YSAVE
0096 GO TO 190
0097 210 CONTINUE
0098 CALL AXSCALE(Y,7, NPLOT, YBEGIN, DELY, 0)
0099 CALL AXSCALE(X,5, NPLOT, XBEGIN, DELX, 0)
0100 CALL AXYS(0,0, LABY, MY, 7, 90, YBEGIN, DELY)
0101 CALL AXYS(0,0, LAPX, -PX, 5, 0, XBEGIN, DELX)
0102 IF(ITYP.NE.1) GO TO 230
0103 J=0
0104 DO 220 I=1,NI
0105 NPT=NPTS(I)
0106 DO 220 K=1,NPT
0107 J=J+1
0108 XD=(X(J)-YBEGIN)/DELX

```

GPPR (CONTINUED)

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YP=(Y(J)-YREGIN)/DELY
CALL SYMROL(XD,YP,.10,.1,0.,.-1)
220 CONTINUE
GO TO 420
230 NWAY=-1
NC=0
DO 420 I=1,NL
NC=NC
NPT=NPTC(I)
NC=NC+NPT
DO 240 I=1,100
240 NA(L)=L+NS
IF(NPT-I)300,300,250
250 NDNF=1
DO 280 I=2,NPT
K1=NA(L-1)
K2=NA(L)
IF(IFIT,0,1) GO TO 260
IF(X(K1)-X(K2))280,290,270
260 IF(Y(K1)-Y(K2))280,290,270
270 NA(L-1)=K2
NA(L)=K1
NDNF=0
280 CONTINUE
IF(NDNF)250,250,300
290 NA(L)=NA(NPT)
NPT=NPT-1

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GPPR (CONTINUED)

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GO TO 250
300 QS(L)=NPT
    DO 320 M=J,NPT
        M=M+1
        KA=NA(M)
        L=N+NPT
        XXXP=(X(KA)-XREGIN)/DEFIX
        YYYP=(Y(KA)-YREGIN)/DEFY
        Q(N)=XXXP
        Q(I)=YYYP
        IF (FIT.NE.1) GO TO 310
        QS(N)=YYYP
        QS(L)=XXXP
        GO TO 320
310 QS(N)=XXXP
        QS(L)=YYYP
320 CONTINUE
        QS(L+1)=0.
        QS(L+2)=1.
        LJK=NPT*2+1
        KF=10+40*(QS(N)-QS(L))
        NWAY=-NWAY
        IF (NWAY.LT.0) GO TO 330
        KP=0(2)
        YTM=0(NPT+2)
        NXCF=1
        GO TO 340
    
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GPPR (CONTINUED)

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0163 330 XIN=0(N)
0164   YIN=C(L)
0165   NXS=N-1
0166   CALL PLAT(XIN,YIN,3)
0167   CALL SYMROL(XIN,YIN,10,1,0,.-1)
0168   IF(NPT,IF,1) GO TO 420
0169   NCSP=1
0170   DO 410 H=1,KF
0171   IF(IFIT,FO,1) GO TO 350
0172   XP=XIN+.025#M#NWAY
0173   YP=SPLNO(1,05,XP)
0174   XX=XP
0175   GO TO 360
0176   350 YP=YIN+.025#M#NWAY
0177   XP=SPLNO(1,05,YP)
0178   XY=YP
0179   360 IF((XX-OS(NXS))*NWAY)410,410,370
0180   370 XSYP=0(NXS)
0181   NYS=NXS+NPT
0182   YSYP=0(NYS)
0183   CALL PLAT(XSYP,YSYP,2)
0184   IF(ITYP,FO,3) GO TO 390
0185   380 CALL SYMROL(XSYP,YSYP,10,1,0,.-1)
0186   390 NCSP=NCSP+1
0187   NXS=NXS+NWAY
0188   IF(NCSP-NPT)360,400,420
0189   400 IF(ITYP,FO,3) 390,420

```

GPPR (END)

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0208
0209

```

410 CALL PLOT(XP,YP,2)
420 CONTINUE
430 IF (IGPID.NE.1) GO TO 440
    XH=0.
    DO 440 IH=1,7
        YH=IH
        CALL PLOT(XH,YH,3)
        XH=5.*(IH-2)*(IH/2)
440 CALL PLOT(XH,YH,2)
        YH=0.
    DO 450 IH=1,5
        CALL PLOT(XH,YH,2)
        XH=XH-1.
        CALL PLOT(XH,YH,3)
450 YH=7.*(IH-2)*(IH/2)
460 RETURN
    ENTRY GPPEND
    CALL PLOT(14.,0.,999)
    RETURN
    END
    
```

SUBROUTINE AXSCALE

```

SUBROUTINE AXSCALE(X,AYL,N,XSTART,XINC,YSIZE)
C *** X-APPLY OF DATA AXI-AXIS LENGTH INCHES
C *** N- NO. OF POINTS IN ARRAY $ XINC-INCREMENT PER INCH
C *** XSTART FIRST NO. ON AXIS
C *** ISIZE=0 USE 10 TO THE TNCH SCALING ,NOT =0 USE 20
DIMENSION X(1),L(5)
XMAX=XMIN=X(1) $ L(1)=1 $ L(2)=2 $ L(3)=5 $ L(4)=10 $ L(5)=20
IF (ISIZE.NE.0) L(3)=4
IF (N.LF.1) GO TO 70
DO 60 I=2,N
XCHECK=X(I)
IF (XCHECK.GT.XMAX) 30,40
XMAX=XCHECK
IF (XCHECK.LT.XMIN) 50,60
XMIN=XCHECK
CONTINUE
F=(XMAX-YMIN)/AXL
IF (F) 90,80
F=XMAX/AXL
J=-10
DO 100 I=1,20
K=10.**I#F
IF (K) 110,100
J=I+1
DO 120 I=2,4
IF (L(I).GT.K) 130,120
CONTINUE
130 XINC=L(I-1)/10.**J
K=XMIN/XINC
30
40
50
60
70
80
90
100
110
120

```

AXSCALE (END)

```
XSTART=K*XINC  
XH=(XMAX-XSTART)/XINC  
XI=(XMIN-XSTART)/XINC  
IF(XH.GT.(AXL+.05).OR.YL.LT.-.01) 140,150  
140 I=I+1  
GO TO 130  
150 CONTINUE  
RETURN  
END
```

FUNCTION SPLNQ1

```

0001 FUNCTION SPLNQ1 (MLOC,X,XINDEX)
0002 CUBIC SPLINE FIT REVISED 10/21/71 M CADDY
0003 THIS VERSION HAS GAO OPTION WHERE ALL OF THE SPLINE COEFFICIENTS
0004 ARE COMPUTED AND STORED IN THE ARRAY. FOR N DATA POINTS 3*N+3
0005 STORAGE LOCATIONS ARE REQUIRED FOR THE DATA AND THE COEFFICIENTS
0006 NEW FEATURE IS QUICK LOOK-UP FOR LARGE ARRAYS
0007 DIMENSION G(100),SR(100),X(1)
0008 XIN=XINDEX
0009 NS=MLOC
0010 NOPTS=X(NS)
0011 ID=NS+NOPTS
0012 NSP1=NS+1
0013 NSP2=NS+2
0014 NSP=NOPTS*2+NSP1
0015 L=X(NSP)
0016 LSC=NSP+1
0017 IOMODE=X(I SC)
0018 K=1
0019 NL=NSP1
0020 NH=ID
0021 NTPAP=-1
0022 IF (NOPTS-1) 130,130,10
0023 IF (XIN-X(ID)) 30,140,20
0024 NTPAP=0
0025 GO TO 140
0026 IF (XIN-X(NSP)) 40,50,60
0027 NTPAP=1

```

10
20
30
40

SPLNQ1 (CONTINUED)

50	K=NSP2	0028
	GO TO 150	0029
60	IF(L)120,120.70	0030
70	IF(XIN-Y(K))90,150,100	0031
80	NH=K	0032
	K=K-1	0033
90	IF(XIN-X(K))110,150,100	0034
100	NL=K	0035
	GO TO 120	0036
110	NH=K	0037
120	K=(NH-NL)/2+NL	0038
	IF(K-NL)90,140,90	0039
130	YOUT=Y(NSP2)	0040
	GO TO 260	0041
140	K=NH	0042
150	M=K	0043
	X(NSP)=M	0044
	N=M+NOPTS	0045
	IF(L*(10MODE))160,160,220	0046
160	X2=X(NSP1)	0047
	X3=X(NSP2)	0048
	X32=X3-Y2	0049
	Y3=X(ID+2)	0050
	Y32=Y3-X(ID+1)	0051
	G(1)=0.	0052
	S(1)=-.5	0053
	N1=NOPTS-1	0054

SPLNQ1 (CONTINUED)

DO 170 I=2,M1	0055
J=NSP1+7	0056
K1=J+NOPTS	0057
X1=X2	0058
X2=X3	0059
X21=X32	0060
X3=X(J)	0061
X32=X3-Y2	0062
Y2=Y3	0063
Y3=X(K1)	0064
Y21=Y32	0065
Y32=Y3-Y2	0066
W=(X3-X1)/3.-X21*SR(I-1)/6.	0067
SR(I)=X32/(W*6.)	0068
G(I)=(Y32/X32-Y21/X21-X21*G(I-1)/6.)/W	0069
FM1=G(N1)/(2.+SR(N1))	0070
IF(L)180,180,190	0071
IO1=NOPTS	0072
KOAS=NOPTS+LSC	0073
X(KOAS)=FM1	0074
GO TO 200	0075
IO1=IO+2-M	0076
DO 210 I=2,IO1	0077
EM2=FM1	0080
FM1=G(N1)-SR(N1)*EM2	0081

SPLNQ1 (END)

```

210 X(N1+LSC)=FM1
211 N1=N1-1
220 IF(L)220,220,230
221 NSM=NSP+M-NS+1
222 EM1=X(NSM-1)
223 FM2=X(NSM)
230 S=X(M)-X(M-1)
240 IF(NTRAP)250,240,240
241 IX=M-NTRAP
242 IY=IX+NOPTS
243 XS=XTN
244 XTN=X(IY)
245 Z1=X(M)-XTN
246 Z2=XTN-Y(M-1)
247 YOUT=((FM2*Z2*72-FM1*71*71)/2.+ Y(N)-X(N-1))/S
248 1-(FM2-FM1)*S/6.)*(YS-XTN)+X(IY)
249 GO TO 240
250 Z2=XTN-X(M-1)
251 Z1=X(M)-XTN
252 YOUT=(EM1*71*71+FM2*72*72*72)/6./S+(X(N)/S-FM2*S/6.)*Z2
253 1+(Y(N-1)/S-FM1*S/6.)*71
254 SPLNQ1=YOUT
255 RETURN
256 END

```

```

00R2
0CR2
00R3
00R4
00R5
00R6
00P7
00R8
00R9
0090
0091
0092
0093
0094
0095
0096
0097
0098
0099
0100
0101
0102
0103
0104

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