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Structural Damage Prediction and Analysis for Hypervelocity Impact

BUMPERII Suggestion and Problem Reports

Prepared for:
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MAF/MMA 31-100 (3/95)
BUMPERII SUGGESTIONS AND PROBLEM REPORTS

FOREWORD

The SD_SURF computer programs and user's guide were prepared under contract NAS8-38856 from NASA Marshall Space Flight Center (MSFC). In the course of preparing the SD_SURF space debris analysis code, several problems and possibilities for improvement of the BUMPERII code were documented and sent to MSFC. These suggestions and problem reports are included here as part of the contract final report.

The study contract (NAS8-38856) title was "Structural Damage Prediction and Analysis for Hypervelocity Impacts." The Technical Monitors were Joel Williamsen, Greg Olsen, and Jennifer Robinson. The code and user's manual were created between October, 1990 and September, 1992.
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>i</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>ii</td>
</tr>
<tr>
<td>Reducing BUMPERII Memory Requirements</td>
<td>1</td>
</tr>
<tr>
<td>Recommended Changes to BUMPERII Read/Write</td>
<td>2</td>
</tr>
<tr>
<td>Compile Problems with BUMPERII</td>
<td>3</td>
</tr>
<tr>
<td>BUMPERII Compatability with Language Systems FORTRAN</td>
<td>11</td>
</tr>
<tr>
<td>FORTRAN-lint Analysis of BUMPERII</td>
<td>13</td>
</tr>
<tr>
<td>Error in Function PRV in BUMPERII</td>
<td>30</td>
</tr>
</tbody>
</table>
Date: January 28, 1992

Subject: Reducing BUMPERII Memory Requirements

- Error in Dimensioning IDG
- RESPONSE Array Size

This describes two changes to BUMPERII version 1.2.a which should significantly reduce the memory requirements.

Error in Dimensioning IDG

The variable IDG is dimensioned improperly in the DATA subroutine in GEOMETRY. (IDG is the working array which contains grid point locations in global coordinates.) It is INTEGER*4 IDG(IELM) but it should be INTEGER*4 IDG(IELM*4) to allow for four nodes per element. IELM, in COMMON1.BLK, is a parameter for the number of elements to be processed. This would be consistent with the dimensioning of the grid point locations, DIMENSION GRID(3,IELM*4), in the preceding line in BUMPERII. (It also may be appropriate to define GRID as REAL*4 for some compilers.) When IDG was improperly dimensioned, garbage was being written into other variables if the number of elements in the Supertab file was more than one fourth of IELM. BUMPERII internal checks found no node data for some elements. It is not known whether there could be any cases the error would not be detected.

RESPONSE Array Size

The RESPONSE array was dimensioned as (70,90,100) in COMMON2.BLK and COMMON4.BLK. The 70 is for the number of velocities and is appropriate for the RESPONSE output. The 100 is the number of shield PIDs being processed. It may need to be 100 for CONTOUR, but any number greater than or equal to the PIDs in the Supertab file will suffice. The only issue is whether the 90 is necessary to cover the obliquities. I believe that the RESPONSE subroutine only creates arrays in 5 degree increments which requires a dimension of 19 rather than 90. This will significantly reduce BUMPERII memory requirements.

These changes allow BUMPERII version 1.2.a to run realistic space debris problems on a Macintosh using 4 Meg of RAM using LANGUAGE SYSTEMS FORTRAN version 2.1. (Changes to If-Then loops were also included as previously described.) (This was without dynamic memory allocation due to problems encountered in execution. LS FORTRAN Version 3 may be able to further reduce this size with dynamic memory allocation.) With proper dimensioning IELM need only be larger than the number of elements in the Supertab file. MB17-ALL.UNI with 2100 elements was processed on the Macintosh with IELM set at 2500 rather than 15000 as distributed. The Macintosh version was set for 35 PIDs to cover MB17-ALL.UNI. The number of threats strongly influences the total memory requirements. To run the above conditions the space debris default of 45 was set as the maximum number of threats. To run a meteoroid analysis on a Macintosh, drastic changes are still needed (such as dynamic memory allocation or virtual memory).
Recommended Changes to BUMPERII Read/Write

Revise READ and WRITE Statements for arrays in binary files in BUMPER, GEOM

- READ or WRITE in a DO-LOOP writes out control information for each record

- READ or WRITE of an array writes out control information once
  - For example READ ((GEOMETRY(I,J),I=1,EXPOSED(IT))J=1,IT)

- Example of a test GEOREAD subprogram on TUBES

<table>
<thead>
<tr>
<th></th>
<th>DO-LOOP</th>
<th>Array</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>file size on VAX</td>
<td>95 blocks</td>
<td>58 blocks</td>
<td>39% variable</td>
</tr>
<tr>
<td>CPU time to Read</td>
<td>4.58 sec</td>
<td>1.45 sec</td>
<td></td>
</tr>
</tbody>
</table>

- Similar file size savings are available with RESPONSE files
  - File sizes are not as large and therefore not as critical

- A flag could be used to make BUMPERII "downward" compatible
  - For example the 1 or 2 for debris/meteoroid analysis could be written out 3 or 4
to set a flag that the new read and writes are used
Compile Problems with BUMPERII version 1.2a  1/16/92

The following sections show the changes made to BUMPERII Version 1.2.a to allow it to compile and run using LANGUAGE SYSTEMS FORTRAN for the Macintosh.

The array size in the common blocks was reduced to ensure compatibility with Macintosh memory limitations. A parameter was introduced in the COMMON4.BLK so that the number of shields would not have to be reentered each time. The entire Common4.blk is attached at the end. It should be noted that the memory manager got confused in RESPONSE when the "-dyn" switch was used for dynamic memory allocation.

The original compile instruction and errors are reported first. The changes to the code to fix these errors is then given. "!!!!" is used to highlight the specific lines or sections which were changed. The only problem was that Language Systems FORTRAN does not support jumping into a DO loop, or IF...THEN..ELSE block. Relatively minor changes to the code could avoid this problem in the future if compatibility with Language Systems FORTRAN is desired.

The use of a Line Feed in the output is not needed on the Macintosh and the character was replaced with a space. (Exact change is shown at end.)

Finally, the LIBSDATE TIME call on the VAX is different than the Macintosh. This cannot be changed but it is only a minor nuisance.

This is the compile command. The first three switches maximize VAX compatibility. The last switch allows the program to run in the background under MULTIFINDER.

RUNBIGMACII MacBumperIIvl2a -ansi -saveall -u -bkg=2

This is the original diagnostics. The corrections will follow.

90 READ ( 2,20 )DLINE

Δ
### FORTRAN - A GOTO or IF is Attempting to jump into a DO loop, IF...THEN..ELSE or a SELECT CASE block
File "MacBumperIIvl2a.f"; Line 3944

#-----------------------------------------------

200 CONTINUE

Δ
### FORTRAN - A GOTO or IF is Attempting to jump into a DO loop, IF...THEN..ELSE or a SELECT CASE block
File "MacBumperIIvl2a.f"; Line 4360

#-----------------------------------------------

600 IF (IBOTH.R.EQ.2) PENTABFILE=SPENTFILE(IC)

Δ
### FORTRAN - A GOTO or IF is Attempting to jump into a DO loop, IF...THEN..ELSE or a SELECT CASE block
File "MacBumperIIvl2a.f"; Line 5054

#-----------------------------------------------

### MPW Shell - Execution of RUNBIGMACII7000 terminated.
THE FOLLOWING SECTIONS SHOW THE CHANGES MADE TO BUMPERII VERSION 1.2.A TO ALLOW IT TO COMPILE USING LANGUAGE SYSTEMS FORTRAN FOR THE MACINTOSH.

File "MacBumperIIv12a.f"; Line 3944
C
C 90  READ ( 2,20 )DLINE
C !!!! THE ABOVE WAS COMMENTED OUT AND REPEATED WITHOUT THE 90
C !!!! THIS SECTION IS THE REPEATED BELOW (OUT OF IF-BLOCK) WITH THE 90
   READ ( 2,20 )DLINE
   READ ( DLINE(1:6),30,ERR=90,END=100 )IVAL
   IF ( IVAL.NE.-1 ) GO TO 90
   GO TO 10
C
   END IF
C
   END IF
C !!!! MAC VERSION: THIS SECTION IS REPEATED FROM ABOVE WITH THE 90
   90 READ ( 2,20 )DLINE
   READ ( DLINE(1:6),30,ERR=90,END=100 )IVAL
   IF ( IVAL.NE.-1 ) GO TO 90
   GO TO 10

File "MacBumperIIv12a.f"; Line 4360
CALL INPUT_R (CTYPE,IC,ITYPE,MLI,PFUNC,PFuncl,IMat,
   1 SHTHK,STAND,VWTHK,BHARD,C,DENS,FSU,FTU,FY,SHPV,WILKC,
   2 SMATRL,METRIC,SCType,SavTk,SMLI,ShDen,VWDen,IDens,
   3 INTERP_DIAM,THICK,ANGLE,ADEN,ADAR,MODWILK,IBOTH,
   4 WILKMULT,SMODWILK,SWILKMULT,SPUNC,SIMAT,SPENTFILE,
   5 PID,IASTPID)
C
C !!!! THE FOLLOWING LINE WAS CHANGED FROM 200 TO 201 AND 201 IS
C ADDED LATER FOR MAC COMPATABILITY
   IF(IBATCOM.EQ.1) GOTO 201
C
   IF (IBOTH.EQ.2.AND.IC.EQ.1) THEN
      ...
      ...
      ...
      ENDIF
C
   Convert the diameter to cm
   DIAM = DIA * 2.54
C
   Store the diameter in RTABLE
   RTABLE(J,I,IC)=DIAM

100 CONTINUE
200 CONTINUE
C !!!! THE FOLLOWING LINE WAS ADDED FOR MAC COMPATIBILITY
201 CONTINUE
C
C SKIP IF SECOND PASS DURING A COMBINED RUN
IF (PFUNC.NE.5) GO TO 145
GOTO 143
144 WRITE (6,151)
151 FORMAT (/', 'UNABLE TO OPEN PENETRATION FILE')
143 PENTABOLD=PENTABFILE//'
IF (INDEX(PENTABOLD,' ').LT.2) PENTABFILE='PEN.TAB'
JOT = INDEX (PENTABFILE, ' ')
WRITE (LENGTH, '('I2') ') JOT+3
FORM='(/IX, 'PENETRATION TABLE FILENAME <CR=',A',//LENGTH//',',',') > ',$)'
PENTABOLD=PENTABFILE
149 WRITE (6,FORM) PENTABFILE
READ ( 5, ' (A)' ,ERR=I43 ) ANSWER
IF (ANSWER(I:1) .EQ.'?') THEN
CALL DIRLIST
GOTO 149
END IF
IF ( ANSWER(I:4).EQ.'') THEN
PENTABFILE=PENTABOLD
ELSE
READ ( ANSWER(I:80),' (BN, A) ',ERR=I43 ) PENTABFILE
END IF
C !!!! 600 WAS DELETED FROM THE FOLLOWING LINE AND THE ENTIRE SECTION
C IS REPEATED OUTSIDE OF THE IF BLOCK FOR MACINTOSH COMPATABILITY
IF (IBOTHR.EQ.2) PENTABFILE=SPENTFILE (IC)
Open (Unit=20, file=pentabfile, status=' old', ERR=I44)
IF (IBATCOM. EQ. I. AND. IBOTHR. NE. 2 ) THEN
WRITE (13, 'A') PENTABFILE
GOTO 146
END IF
C ANGLE INDICE
Do 146 I=1,3
C PLATE THICKNESS INDICE IN INCHES.
Do 147 J=1,4
Read (20,*), Thick(J),Angle(I)
C VELOCITY INDICE IN INCHES
Do 148 K=1,7
Read (20,*), Interp_Diam(K,J,I)
148 CONTINUE
147 CONTINUE
146 CONTINUE
REWIND 20
Close (Unit=20)
145 CONTINUE
C THE ABOVE SECTION WAS DONE BY BJORKMAN & CO. (WP-01).
C IF (IBOTH. EQ.2) GOTO 425
C Determine the shield material.
C 150 WRITE ( 6,160 )
160 FORMAT ('/IX, 'SHIELD MATERIAL ')
C Write out the material list.
DO 180 I=1,ML
WRITE ( 6,170 )I,MATERIAL(I)
170 FORMAT ( 3X,I2,'-',A )
CONTINUE

For the initial case, set the material default number equal to one. For all other cases use the previous shield material number as the default. If an error is detected on the read, repeat the process.

IF ( IC .EQ. 1 ) THEN
WRITE ( 6,220 )
READ ( 5,'(A)') ANSWER
IF ( ANSWER(1:4).EQ.'' ) ANSWER='1'
READ (ANSWER(1:4),200,ERR=190) MATIN
200 FORMAT (BN, I4)
ELSE
IF (MATIN.EQ.0) MATIN=I
WRITE ( 6,230 ) MATIN
READ ( 5,'(A)') ANSWER
IF (ANSWER(I:4).NE.'' ) THEN
READ (ANSWER(I:4),200,ERR=210) MATIN
END IF
ENDIF
MAT(1)=MATIN
220 FORMAT (IX,'SELECT MATERIAL NUMBER (<CR>=I) > ',$)
230 FORMAT (IX,'SELECT MATERIAL NUMBER (<CR>=',I2,') > ',$)

Check that the value read in is contained in the list.

IF (MAT(1).LT.1 .OR. MAT(1).GT. ML ) GO TO 150
IF(IBATCOM.EQ.I) WRITE(13,'(I1)') MAT(1)
SMATRL(IC, I) = MATERIAL ( MAT(1) )

Determine the shield thickness. For the initial case there is no default, for all other cases use the previous value as the default.

IF ( IC.EQ.1 .OR. SHTHK.LT.0. ) THEN
WRITE ( 6,270 )LUNITS
READ ( 5,* ,ERR=240 ) SHTHKIN
ELSE
WRITE ( 6,280 ) SHTHKIN,LUNITS
READ ( 5,'(A)') ANSWER
IF ( ANSWER(1:4).NE.'' ) THEN
READ (ANSWER(1:12),260,ERR=250) SHTHKIN
260 FORMAT (BN,E12.0)
ENDIF
FORMAT (/IX,'SHIELD THICKNESS (',A,' ) = > ',$,)
270 FORMAT (/IX,'SHIELD THICKNESS <CR> = ',F10.5,'(',A,' ) > ',$)
IF(IBATCOM.EQ.I) WRITE(13,* ) SHTHKIN
ENDIF

Determine the vessel wall material. Use the same technique as used
to determine the shield material.

290 IF (CTYPE.EQ.1 .AND. IMAT.NE.1) GOTO 339
WRITE (6,300)
300 FORMAT (/IX,'VESSEL WALL MATERIAL ')

IF (CTYPE.EQ.1) MAT(1) = 1

DO 310 I=1,ML
WRITE (6,170)I,MATERIAL(I)
310 CONTINUE

IF (IC.EQ.1) THEN
WRITE (6,220)
READ (5,'(A)') ANSWER
IF (ANSWER(1:4),EQ.' ') ANSWER='1'
READ (ANSWER(1:4),200,ERR=320) MAT(2)
ELSE
WRITE (6,230) MAT(2)
READ (5,'(A)') ANSWER
IF (ANSWER(1:4).NE.' ') THEN
READ (ANSWER(I:4),200,ERR=330) MAT(2)
END IF
ENDIF

IF (MAT(2).LT.1 .OR. MAT(2).GT.ML) GO TO 290
IF(IBATCOM.EQ.1) WRITE(13,'(I)') MAT(2)
SMATRL(IC,2) = MATERIAL(MAT(2))

Determine the vessel wall thickness.

339 IF (IC.EQ.1) THEN
340 WRITE (6,360)LUNIT$ READ (5,*),ERR=340) VWTHKIN
ELSE
350 WRITE (6,370) VWTHKIN,LUNIT$ READ (5,'(A)') ANSWER
IF (ANSWER(1:12).NE.' ') THEN
READ (ANSWER(1:12),260,ERR=350) VWTHKIN
END IF
ENDIF

360 FORMAT (/IX,'VESSEL WALL THICKNESS (',A,' ) = > ',$)
370 FORMAT (/IX,'VESSEL WALL THICKNESS <CR> = ',F10.5,' (',A,' ) > ',$)
IF(IBATCOM.EQ.1) WRITE(13,*) VWTHKIN

 Determine the shield stand-off distance.

380 IF (IC.EQ.1) THEN
IF (CTYPE.EQ.3) THEN
WRITE (6,371)LUNIT$ ELSE
WRITE (6,400)LUNIT$ END IF
READ (5,*),ERR=380) STANDIN
ELSE

HVIS BUMPER II Suggestions - page 7
Hypervelocity Impact Study - BUMPERII Suggestions

390 IF (CTYPE.EQ.3) THEN
   WRITE ( 6,381 ) STANDIN,LUNITS
ELSE
   WRITE ( 6,410 )STANDIN,LUNITS
END IF
READ ( 5,'(A)' ) ANSWER
IF ( ANSWER(1:4).NE.' ') THEN
   IF (IBATCOM.EQ.I) WRITE (13,*) STANDIN
   END IF
   READ (ANSWER(I:I2),260,ERR=390 ) STANDIN
ENDIF

371 FORMAT ( /IX,'TOTAL BUMPER SPACING (',A,') = > ',$,)
400 FORMAT ( /IX,'SHIELD STAND-OFF (',A,') = > ',$,)
381 FORMAT ( /IX,'TOTAL BUMPER SPACING <CR> = ',F10.5,'(',A,') > ',$)
410 IF(IBATCOM.EQ.1) WRITE(13,*) STANDIN

Determine if MLI is to be included, but not for the pen4 penetration function

IF ( PFUNC.EQ.1.OR.PFUNC.EQ.3.OR.PFUNC.EQ.4 ) THEN

WRITE ( 6,420 )
420 FORMAT ( /IX,'INCLUDE 30 LAYERS OF MLI AGAINST VESSEL WALL',
   ' (CR)=YES) > ',$)
READ ( 5,'(A)' ) ANSWER
IF ( ANSWER(I:4).EQ.' ') ANSWER='Y'
IF (IBATCOM.EQ.I) THEN
   WRITE (13,'(A) ' ) ANSWER
   RETURN
ENDIF
IF ( ANSWER(1:1).EQ.'Y' .OR. ANSWER(1:1).EQ.'y' ) THEN
   MLI=. TRUE.
ELSE
   MLI=. FALSE.
ENDIF
ENDIF

THE FOLLOWING SECTIONS WERE EXTRACTED FROM ABOVE IF-BLOCK
FOR MAC COMPATIBILITY. - N.ELFER

GOTO 425
644 WRITE(6,651)
651 FORMAT ( '',UNABLE TO OPEN PENETRATION FILE' )
643 PENTABOLD=PENTABFILE//'.'
   IF (INDEX(PENTABOLD,'.'),LT.2) PENTABFILE='PEN.TAB'
   JOT = INDEX( 'PENTABFILE','.')
   WRITE (LENGTH, '(I2)') JOT+3
   FORM=('/IX,'PENETRATION TABLE FILENAME <CR='A'/LENGTH/
   '.','>) > ',$)
   PENTABOLD=PENTABFILE
   WRITE(6,FORM) PENTABFILE
649 READ ( 5,'(A)',ERR=643 ) ANSWER
   IF (ANSWER(1:1).EQ.'?' ) THEN
CALL DIRLIST
GOTO 649
END IF
IF ( ANSWER(1:1).EQ.' ' ) THEN
PENTABFILE=PENTABOLD
ELSE
READ ( ANSWER(1:80),'(BN,A)',ERR=643 ) PENTABFILE
END IF
IF (IBOTHR.EQ.2) PENTABFILE=SPENTFILE(IC)
Open (Unit=20,file=pentabfile,status='old',ERR=644)
IF(IBATCOM.EQ.1.AND.IBOTHR.NE.2) THEN
WRITE(13,'(A)') PENTABFILE
GOTO 646
END IF
C ANGLE INDICE
Do 646 I=1,3
C PLATE THICKNESS INDICE IN INCHES.
Do 647 J=1,4
Read (20,*), Thick(J),Angle(I)
C VELOCITY INDICE IN INCHES
Do 648 K=1,7
Read (20,*), Interp_Diam(K,J,I)
648 CONTINUE
647 CONTINUE
646 CONTINUE
REWIND 20
Close (Unit=20)
645 CONTINUE
C
THE ABOVE SECTION WAS DONE BY BJORKMAN & CO. (WP-01).
C
THE ABOVE SECTION WAS REPEATED FOR MAC COMPATIBILITY
C IXX WAS CHANGED TO 6XX (600 STAYED THE SAME) - N.ELFER
C !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

TO AVOID A NON-PRINTING CHARACTER IN THE MAC OUTPUT THE FOLLOWING
CHANGE WAS MADE.
C DS=CHAR(10)
C !!!! DS WAS CHANGED FROM CHAR(10)=LF TO (32)=SPACE
DS=CHAR(32)

DUE TO DIFFERENCES IN THE LIBRARY CALL THE FOLLOWING CHANGES WERE MADE AS
NEEDED (3 PLACES):
C CALL LIB$DATE_TIME(BUMDTTM)
C !!!!! DATE ONLY RECORDED FOR MAC VERSION
CALL DATE(BUMDTTM)
or
CALL TIME(BUMDTTM)

THIS IS THE REVISED COMMON4.BLK TO SET THE SIZE OF THE THREAT ARRAYS:
C
C Common Block for Response in BUMPERII
C
Hypervelocity Impact Study - BUMPERII Suggestions

C icase = maximum number of shield cases
C
C INTEGER*4 ICASE
PARAMETER (ICASE=3)
C
C CHARACTER*30 OFILE1, OFILE2, MATFILE
CHARACTER*80 ANSWER
CHARACTER*12 UNITS, SMATRL(ICASE,2)
REAL*4 RTABLE(70,90,ICASE), WILMKL
C WAS 50 - MAC
REAL*4 SAVTK(ICASE,3), SHDEN(ICASE), VWDEN(ICASE)
REAL*4 BHRD(3), C(3), DENS(3), FSU(3), FTU(3), FY(3), SHPV(3),
1 WILK(3), ANGLE(3), INTERP_DIAM(7,4,3),
2 ADAR(ICASE)

INTEGER*4 CTYPE, IC, ITYPE, NANG, NVEL, PFUNC, PFUNCI, SCTYPE(ICASE),
1 IDENS, IBATCOM, ITYPEIN, MODWILK, IBOTH

LOGICAL INITIAL, METRIC, MLI, SMLI(ICASE)

C /BATCH/IBATCOM, IBOTH

C Common Block for PEN_4 Subroutine of BUMPERII
C
CHARACTER SHAPE*3
LOGICAL PENNON, SHATER
INTEGER MAXK(10), PRMAT, PRMATI, TARMAT(10), TMATSP(10), PLATE,
1 RF (10), RC (10), NF, J, MR, MPROJ, LASTSP, LRM, FMASS(10),
1 DIAM, VI, VR, VILRM, VRLRM, EPSIL, GAMMA, VI1, PI, THETA, SUMSP,
1 A, B, D, R, X, Y, TOVERD, RH, PLATEM, FTHETA, ALIMAS, VC, DELJ, DELJ2,
1 P, EFFP, FET, PGRADY, THETAI, AVGMAS, RP, FI, VF, THICK(10), SPACE(9),
1 THICK1(10), PDENSE(3), PSTRN(3), PSNDV(3), FRTUFF(3),
1 VIX, MFMAX, MPROJX, DENSE(10)

DOUBLE PRECISION INTACT, HOAREA, SUMPR(10), NR, PCR, LAMBDA, SIGSQ,
1 SIGMA, AS, AC, THETAR

8
HVIS BUMPERII Suggestions · page 10
To: Greg Olsen NASA-MSFC ED52  
Scott Hill NASA-MSFC ED52

Date: May 19, 1992

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Subject: BUMPERII compatability problems with Language Systems FORTRAN

A problem was discovered using the REGRESSION option of RESPONSE on the Macintosh. The problem did not occur on the VAX. It occurred because of inconsistent variable data types when calling a subroutine.

The subroutine SETBIN called the subroutine BINOMI:

CALL Binomi(k,N1,Pk,P1)

The variable "k" was INTEGER*2 in SETBIN. The others were REAL*8.

The BINOMI subroutine received k1 as REAL*8. The original line was:

SUBROUTINE Binomi(k1,NrBIN,Pk,PcrBIN)

where "k1" was declared as REAL*8 in the subroutine. (All of the variables were REAL*8 in the subroutine.) However, on the Macintosh, using Language Systems FORTRAN, this lack of agreement left "k1" with a value of 3.1...E-310. While this was effectively zero, BINOMI was very sensitive to the differences and produced erroneous results.

A work around was devised:

The subroutine was changed to introduce an integer*2 dummy variable. The dummy variable could then be properly transformed to a REAL*8:

SUBROUTINE Binomi(kintbin,NrBIN,Pk,PcrBIN)

integer*2 kintbin

kl=kintbin*1.0D0

This works and will be incorporated in the Macintosh version. Other potential changes in the BINOMI subroutine include:

- Deleting LAMDBABIN since it is not used.
- Defining LOWER1 and KB as INTEGER*2 instead of REAL*8
- Deleting LAMBDA in COMMON.BLK since it is not used. (It was left over from version 1.2)
- The following line seems to be in error:

3060 IF (Top.GE.NrBIN.OR.Pk.GE.1E23) GOTO 3050

Ppk is a probability and should never exceed 1.0. The comparison to 1E23 seems to be incorrect. Perhaps 1E-3? All in all it seems irrelevant to the cases encountered under the REGRESSION subroutine.

HVIS BUMPERII Suggestions - page 11
To determine if this problem exists in other subroutines, the FORTRAN-lint program was run. It identified one other location where different variable types were used in calling and running a subroutine. This will also have to be fixed for the Language Systems FORTRAN compiled code to operate correctly. The entire LINT output is included for reference since it may be of use in cleaning up BUMPERII.

Norman Elfer 5/19/92
(504)-863-2284
HVIS BUMPERII Suggestions - page 13
Subroutine INPUT_G

File BUMPERII.FOR   Line 1220

> 179   READ ( ANSWER(1:80),215,ERR=206 ) AREAMAX

**SYNTAX WARNING #46-** branch into block if via label 206.

**USAGE FYI #128-** local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine MAKETHREAT

File BUMPERII.FOR   Line 1465

**USAGE FYI #128-** local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine DTHREAT_SUB

File BUMPERII.FOR   Line 1490

> 43   VELFILEOLD=VELFILE//'.'

**SYNTAX WARNING #105-** string will be truncated (from 51 to 50 chars).

**USAGE FYI #128-** local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

**SYNTAX FYI #138-** unused labels: 290, 200

Subroutine NDTHREAT

File BUMPERII.FOR   Line 1848

>   CALL GAUSS(PRV,V1,V2,PROB)

**INTERFACE ERROR #55-** R*8 actual arg passed to a R*4 dummy arg.

**USAGE WARNING #127-** local variables set but never referenced: H (Line 2061)

**USAGE FYI #128-** local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, CHRDUMMY, I1, I2, VDISTA, C1, C2, C3, C4, VBEG, VEND

**SYNTAX FYI #138-** unused labels: 290

Subroutine GAUSS

File BUMPERII.FOR   Line 2141

**IMPLICIT #125-** symbols were implicitly typed:

(R*4) FUN

Function PRV

File BUMPERII.FOR   Line 2173

**USAGE ERROR #126-** local variables referenced but never set: H (Line 2181)

**USAGE FYI #128-** local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, CHRDUMMY
Subroutine NMTHREAT
File BUMPERII.FOR
Line 2188
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, RESF

Subroutine MTHREAT
File BUMPERII.FOR
Line 2455
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, ALTA, HNMT, RESF

Subroutine NORMAL
File BUMPERII.FOR
Line 2716
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine BREAKER
File BUMPERII.FOR
Line 2823
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, H, CHRDUMMY

Subroutine JOINER
File BUMPERII.FOR
Line 2873
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine DIVIDE4
File BUMPERII.FOR
Line 2907
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, H, CHRDUMMY

Subroutine DMDE3
File BUMPERII.FOR
Line 2975
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine CENTROID
File BUMPERII.FOR
Line 3104
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INTEKSEC
File BUMPERII.FOR
Line 3210
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine AREA_SUB
File BUMPERII.FOR
Line 3338
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine WRITEAREA
File BUMPERII.FOR
Line 3454
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
Subroutine RADIUS  File BUMPERII.FOR  Line 3490  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine BACKSIDE  File BUMPERII.FOR  Line 3575  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Usage ERROR #126- local variables referenced but never set:  TR (Line 3791)  
Usage FYI #128-local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine TRANS  File BUMPERII.FOR  Line 3814  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine QSORT  File BUMPERII.FOR  Line 3915  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine SHADOW  File BUMPERII.FOR  Line 4068  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine OUTPUT  File BUMPERII.FOR  Line 4433  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine ROTATOR  File BUMPERII.FOR  Line 4497  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine DATA  File BUMPERII.FOR  Line 4561  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

> 90  READ ( 2,20 )DLINE  
> ^  
BUMPERII.FOR:DATA line 4790:  
Syntax Warning #53- branch to label 90 from outside block if.  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY  

Subroutine PATOUT  File BUMPERII.FOR  Line 4907  
Usage FYI #128- local variables declared but unused:  WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, VERS  

Subroutine RESPONSE  File BUMPERII.FOR  Line 4992
Hypervelocity Impact Study - BUMPERII Suggestions


> 200 CONTINUE
> ^
BUMPERII.FOR:RESPONSE line 5347:
SYNTAX WARNING #54- branch to label 200 from outside do loop.

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
******************************************************************************
Subroutine ZERO_R File BUMPERII.FOR Line 5413
USAGE WARNING #127- local variables set but never referenced: EL (Line 5433), H (Line 5439)
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, CHRDUMMY
******************************************************************************
Subroutine INITANGVEL File BUMPERII.FOR Line 5497
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
******************************************************************************
Subroutine OPENRSP File BUMPERII.FOR Line 5534
> OFILE1=ANSWER
> ^
BUMPERII.FOR:OPENRSP line 5560:
SYNTAX FYI #105- string will be truncated (from 80 to 50 chars).
> IF (OFILE2(1:4).EQ. ' ' )OFILE2=ANSWER
> ^
BUMPERII.FOR:OPENRSP line 5597:
SYNTAX FYI #105- string will be truncated (from 80 to 50 chars).
 USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
******************************************************************************
Subroutine OUTPUT_R File BUMPERII.FOR Line 5627
******************************************************************************
Subroutine HEADER_R File BUMPERII.FOR Line 5669
******************************************************************************
Subroutine INPUT_R File BUMPERII.FOR Line 5840
******************************************************************************
Subroutine INPUT_R_MATRL File BUMPERII.FOR Line 6026
******************************************************************************

HVIS BUMPERII Suggestions - page 17
Subroutine INPUT_R_UNITS  File BUMPERII.FOR  Line 6095
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INPUT_R_CONFIG  File BUMPERII.FOR  Line 6148
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine SPINPUT_R  File BUMPERII.FOR  Line 6204
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine DPINPUT_R  File BUMPERII.FOR  Line 6330
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INPUT_R_GETPENTAB  File BUMPERII.FOR  Line 6449

> 143 PENTABOLD=PENTABFILE//' . '
> 145 ^
BUMPERII.FOR:INPUT_R_GETPENTAB line 6458:
syntax FYI #105- string will be truncated (from 51 to 50 chars).
>148 CONTINUE
> 148 ^
BUMPERII.FOR:INPUT_R_GETPENTAB line 6507:
syntax WARNING #54- branch to label 148 from outside do loop.
>146 CONTINUE
> 146 ^
BUMPERII.FOR:INPUT_R_GETPENTAB line 6509:
syntax WARNING #54- branch to label 146 from outside do loop.

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

syntax FYI #138- unused labels: 145

Subroutine INPUT_R_WILK  File BUMPERII.FOR  Line 6522
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine MWINPUT_R  File BUMPERII.FOR  Line 6630
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine MWINPUT  File BUMPERII.FOR  Line 6693
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

*******************************************************************************

HVIS BUMPERII Suggestions - page 18
Subroutine INPUT_R_VW  File BUMPERII.FOR  Line 6788

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

Subroutine INPUT_R_SHIELD  File BUMPERII.FOR  Line 6923

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

SYNTAX FYI #138- unused labels: 180

Subroutine INPUT_R_STAND  File BUMPERII.FOR  Line 7076

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

Subroutine INPUT_R_MLI  File BUMPERII.FOR  Line 7143

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

Subroutine INPUT_R_VARS  File BUMPERII.FOR  Line 7187

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

Subroutine SETMETRICS  File BUMPERII.FOR  Line 7336

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

Subroutine INPUT_R_OUT  File BUMPERII.FOR  Line 7369

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

Subroutine DOUBLE  File BUMPERII.FOR  Line 7590

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

USAGE WARNING #245- local variables may be referenced before set: C2 (Line 7752), DIAM2 (Line 7753), DIAM4 (Line 7780), ERFILE (Line 7766)

Subroutine BALLIST  File BUMPERII.FOR  Line 7851

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

USAGE WARNING #245- local variables may be referenced before set: DIA1 (Line 7994), DIA2 (Line 7994), VEL1 (Line 7994), VEL2 (Line 7994)

Subroutine MLIADJUST  File BUMPERII.FOR  Line 8021

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY

*******************************************************************************

HVIS BUMPERII Suggestions - page 19
Subroutine COUPAL
File BUMPERII.FOR
Line 8052

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

Subroutine GLASS
File BUMPERII.FOR
Line 8147

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

Subroutine TILE
File BUMPERII.FOR
Line 8210

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

Subroutine SPDEVEL2
File BUMPERII.FOR
Line 8271

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

Subroutine BRISTOW
File BUMPERII.FOR
Line 8283

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

**Usage Warning #245- local variables may be referenced before set: PLPI (Line 8401), DIAL (Line 8401)**

Subroutine WILKIN
File BUMPERII.FOR
Line 8475

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

Subroutine REGRESS
File BUMPERII.FOR
Line 8595

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

Subroutine OPEN4
File BUMPERII.FOR
Line 8729

**Usage Warning #127- local variables set but never referenced: SMALL (Line 8751), RECIP SQRT2PI (Line 8752)**

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, NR2, NHT, LASTPK, EXPONENT, TOPCOUNT, BOTTOMCOUNT1, BOTTOMCOUNT2, SPACING, SOUNDVEL, THETDIAM, SHOCKPROJVEL, HARDNESS, EPSILON4**

Subroutine FRACT
File BUMPERII.FOR
Line 8814

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**

Subroutine LARMR
File BUMPERII.FOR
Line 8828

**Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY**
Subroutine MASSERR

File BUMPERII.FOR

Line 8843

USAGE ERROR #126- local variables referenced but never set: THETA (Line 8855)

USAGE FYI #128- local variables declared but unused: THOS

Subroutine PEN4

File BUMPERII.FOR

Line 8864

USAGE WARNING #127- local variables set but never referenced: DIA2 (Line 9061), VEL2 (Line 9063)

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

USAGE WARNING #245- local variables may be referenced before set: DIAL (Line 9061), VEL1 (Line 9063)

Subroutine NPEN4

File BUMPERII.FOR

Line 9075

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine PENK

File BUMPERII.FOR

Line 9409

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, PK2, LNPK, LNKFAC

Subroutine MINII

File BUMPERII.FOR

Line 9484

USAGE FYI #128- local variables declared but unused: BINSDO

Subroutine PRS

File BUMPERII.FOR

Line 9499

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

USAGE WARNING #245- local variables may be referenced before set: LASTTE (Line 9520)

Subroutine SETBIN

File BUMPERII.FOR

Line 9556

CALL Binomi(k,Ni,Pk,Pl)

BUMPERII.FOR:SETBIN line 9572:

INTERFACE ERROR #55- I*2 actual arg passed to a R*8 dummy arg.

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine BINOMI

File BUMPERII.FOR

Line 9584

USAGE WARNING #127- local variables set but never referenced: LAMBDABIN (Line 9590)

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

******************************************************************************
Subroutine MASCHR File BUMPERII.FOR Line 9632
USAGE ERROR #126- local variables referenced but never set: ALFA (Line 9662)
USAGE WARNING #127- local variables set but never referenced: FRGLIM (Line 9670)
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, TD

Subroutine SHCONS File BUMPERII.FOR Line 9720
USAGE ERROR #126- local variables referenced but never set: ALPHA (Line 9724)

Subroutine SHHOLD File BUMPERII.FOR Line 9768
USAGE FYI #128- local variables declared but unused: M
USAGE FYI #124- unused dummy arguments: VI, TD, THETA1

Subroutine BINLIM File BUMPERII.FOR Line 9791
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, BININT

Subroutine COUNTR File BUMPERII.FOR Line 9841
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
USAGE WARNING #245- local variables may be referenced before set: ITARSI (Line 9907), DIGTPI (Line 9906), DIGTP2 (Line 9910), DIGTP3 (Line 9911), DIGTP4 (Line 9912), DIGTP5 (Line 9913)

Subroutine RESVEL File BUMPERII.FOR Line 9978
USAGE FYI #128- local variables declared but unused: VOCM

Subroutine INTERP File BUMPERII.FOR Line 10037
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INTERPOLATE File BUMPERII.FOR Line 10071
USAGE WARNING #245- local variables may be referenced before set: NSAV (Line 10106)

Function HS3TBL File BUMPERII.FOR Line 10113
USAGE FYI #128- local variables declared but unused: HSMCON, SUBNAM
Hypervelocity Impact Study - BUMPERII Suggestions

FORTRAN-lint Rev 2.83
18-May-92 16:37:29 Page 11

*******************************************************************************
Subroutine RICHARDSON
File BUMPERII.FOR
Line 10317
USAGE
WARNING #127- local variables set but never referenced: E1 (Line 10343)
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, RHP
*******************************************************************************
Subroutine DEVELOPMENTAL7
File BUMPERII.FOR
Line 10485
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL8
File BUMPERII.FOR
Line 10546
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL9
File BUMPERII.FOR
Line 10609
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL10
File BUMPERII.FOR
Line 10672
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL11
File BUMPERII.FOR
Line 10735
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL12
File BUMPERII.FOR
Line 10798
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL13
File BUMPERII.FOR
Line 10861
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL14
File BUMPERII.FOR
Line 10924
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL15
File BUMPERII.FOR
Line 10987
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine DEVELOPMENTAL16
File BUMPERII.FOR
Line 11050
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
**Hypervelocity Impact Study - BUMPERII Suggestions**


*******************************************************************************
Subroutine MULTISHOCK  File BUMPERII.FOR  Line 11113
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
USAGE WARNING #245- local variables may be referenced before set: ERFILE (Line 11177)
*******************************************************************************
Subroutine MESH  File BUMPERII.FOR  Line 11273
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, TSCD
USAGE WARNING #245- local variables may be referenced before set: ERFILE (Line 11341)
*******************************************************************************
Subroutine HYBRID_MS  File BUMPERII.FOR  Line 11427
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine MWDEVELOPMENTAL1  File BUMPERII.FOR  Line 11530
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine MWDEVELOPMENTAL2  File BUMPERII.FOR  Line 11542
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine MWDEVELOPMENTAL3  File BUMPERII.FOR  Line 11555
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine SINGLE  File BUMPERII.FOR  Line 11567
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine SPDEVEL1  File BUMPERII.FOR  Line 11639
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
*******************************************************************************
Subroutine NONOPTIMUM  File BUMPERII.FOR  Line 11651
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
USAGE WARNING #245- local variables may be referenced before set: ERFILE (Line 11721)
*******************************************************************************
Subroutine NEWNONOPTIMUM  File BUMPERII.FOR  Line 11808
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
USAGE WARNING #245- local variables may be referenced before set: ERFILE (Line 11883)
Subroutine SHIELD File BUMPERII.FOR Line 11969

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
SYNTAX FYI #138- unused labels: 314

Subroutine ZERO_S File BUMPERII.FOR Line 12327

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine SETDIAMS File BUMPERII.FOR Line 12342

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine LASTOUT File BUMPERII.FOR Line 12369

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H

Subroutine HEADER_S File BUMPERII.FOR Line 12557

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INPUT File BUMPERII.FOR Line 12745

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, ALTMAX, ALTMIN
SYNTAX FYI #138- unused labels: 365

Subroutine GEOREAD File BUMPERII.FOR Line 13147

> GFILE=ANSWER
> BUMPERII.FOR:GEOREAD line 13203:
SYNTAX FYI #105- string will be truncated (from 80 to 50 chars).
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, ITF
SYNTAX FYI #138- unused labels: 56

Subroutine RESREAD File BUMPERII.FOR Line 13413

> RFILE=ANSWER
> BUMPERII.FOR:RESREAD line 13468:
SYNTAX FYI #105- string will be truncated (from 80 to 50 chars).
USAGE WARNING #127- local variables set but never referenced: C8A (Line 13639), C8B (Line 13639), D2 (Line 13653)
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
Subroutine CRITDIA  File BUMPERII.FOR  Line 13784
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H

Subroutine FLUX  File BUMPERII.FOR  Line 13947
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine FLUX20001  File BUMPERII.FOR  Line 13970
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine FLUX791  File BUMPERII.FOR  Line 14065
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Function DEBFLUX  File BUMPERII.FOR  Line 14125
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, PDF

Subroutine SOLKEAD  File BUMPERII.FOR  Line 14262
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, LUXMON, LUXYR

Subroutine FILL  File BUMPERII.FOR  Line 14355
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine FORMATOUT  File BUMPERII.FOR  Line 14425
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
SYNTAX FYI #138- unused labels: 60

Subroutine SUPER  File BUMPERII.FOR  Line 14653
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
SYNTAX FYI #138- unused labels: 70

Subroutine PATRES  File BUMPERII.FOR  Line 14804
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, IFL
Hypervelocity Impact Study - BUMPERII Suggestions

FORTRAN-lint Rev 2.83 18-May-92 16:37:29 Page 15

Subroutine CONTOUR File BUMPERII.FOR Line 14878

USAGE WARNING #127- local variables set but never referenced: CHRDUMMY (Line 15255)
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, FNPS
SYNTAX FYI #138- unused labels: 320

Subroutine OPENCTR File BUMPERII.FOR Line 15274

> CFILE=ANSWER
BUMPERII.FOR:OPENCTR line 15300:
SYNTAX FYI #105- string will be truncated (from 80 to 50 chars).

> OFILE1=ANSWER
BUMPERII.FOR:OPENCTR line 15301:
SYNTAX FYI #105- string will be truncated (from 80 to 50 chars).

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, LLENGTH

Subroutine ZERO_C File BUMPERII.FOR Line 15332

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine CINPUT File BUMPERII.FOR Line 15349

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
SYNTAX FYI #138- unused labels: 65

Subroutine ALTITUDE File BUMPERII.FOR Line 15916

> READ ( ANSWER(1:80),215,ERR=172 ) ALT
BUMPERII.FOR:ALTITUDE line 16006:
SYNTAX WARNING #46- branch into block if via label 172.

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
SYNTAX FYI #138- unused labels: 151

Subroutine CINPUT_RANGE File BUMPERII.FOR Line 16038

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

**HVIS BUMPERII Suggestions - page 27**
Subroutine INPUT_C_SHIELD
File BUMPERII.FOR Line 16121
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INPUT_C_MW
File BUMPERII.FOR Line 16296

> 360 IF ( IBATCOM.NE.3 ) WRITE ( OU, 370 ) LUNITD
*BUMPERII.FOR: INPUT_C_MW line 16368:
SYNTAX WARNING #53- Branch to label 360 from outside block if.

Subroutine INPUT_C_VW
File BUMPERII.FOR Line 16545
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine CRESPONSE
File BUMPERII.FOR Line 16659
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine LASTOUT_C
File BUMPERII.FOR Line 17163
SYNTAX FYI #138- unused labels: 314

Subroutine DP_C_OUT
File BUMPERII.FOR Line 17225
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine SP_C_OUT
File BUMPERII.FOR Line 17287
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine MW_C_OUT1
File BUMPERII.FOR Line 17347
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine MW_C_OUT2
File BUMPERII.FOR Line 17418
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
Global checking:

INTERFACE FYI #131- unused functions: PRV

INTERFACE FYI #132- unused subroutines: DEVELOPMENTAL7

USAGE ERROR #133- common block members referenced but not set: /ALL1/SHAPE


USAGE FYI #135- unused common block members: /ALL1/VINC, /ALL1/PYSTRN, /ALL1/PCR, /ALL1/LAMBDA, /ALL1/SIGSQ, /ALL1/SIGMA, /ALL1/VDIST, /ALL1/RHO, /ALL1/DENSE1, /ALL1/YSTRN1, /ALL1/SOUNDV, /ALL2/PIDC, /ALL2/IPID1, /ALL2/PIDRANGE, /ALL2/NPIDS, /ALL2/ICSTOR, /ALL2/NPIDS
To determine the space debris probability distribution for various velocities, the subroutine GAUSS calls an EXTERNAL function PRV using function FUN. The calling line is:

\[ SS = SS + W(JLOC) \times (FUN(XM+DX) + FUN(XM-DX)) \]

BUMPERII version 1.2a used a REAL FUNCTION PRV(VR) where VR was a local dummy variable. However, BUMPERII version 1.3 has no local dummy variable ("REAL FUNCTION PRV"). VR used in the equation is a global variable that is defined elsewhere. The variables in the calling subroutine are not passed to PRV and the equation is evaluated twice at the same velocity. To correct this problem a dummy variable VV was used:

\[ \text{REAL FUNCTION PRV(VV)} \]

The effect on SS (unnormalized) is negligible (<1% typically), as shown below. However, in the interest of producing accurate, readable and transportable code, it should be corrected.

Norman Elfer