Structural Damage Prediction and Analysis for Hypervelocity Impact

BUMPERII Suggestion and Problem Reports

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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 of Contents

- Foreword ................................................................. i
- Table of Contents ........................................................ ii
- Reducing BUMPERII Memory Requirements ....................... 1
- Recommended Changes to BUMPERII Read/Write .................. 2
- Compile Problems with BUMPERII ................................... 3
- BUMPERII Compatability with Language Systems FORTRAN .... 11
- FORTRAN-lint Analysis of BUMPERII .............................. 13
- Error in Function PRV in BUMPERII ................................. 30
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 PID's being processed. It may need to be 100 for CONTOUR, but any number greater than or equal to the PID's 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 PID's 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).

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Program Manager
Hypervelocity Impacts Study
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>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>
</tr>
<tr>
<td>CPU time to Read</td>
<td>4.58 sec</td>
<td>1.45 sec</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
Hypervelocity Impact Study - BUMPERII Suggestions

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

!!! 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

!!! 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 (IBOTHRL.EQ.2) PENTABFILE=SPENTFILE(IC)

!!! 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.

1

HVIS BUMPERII Suggestions - page 3
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 "MacBumperIIvl2a.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
C  READ ( 2,20 )DLINE
C    READ ( DLINE(I:6),30,ERR=90,END=100 )IVAL
C    IF ( IVAL.NE.-1 ) GO TO 90
C    GO TO 10
C
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(I:6),30,ERR=90,END=100 )IVAL
   IF ( IVAL.NE.-1 ) GO TO 90
   GO TO 10

File "MacBumperIIvl2a.f"; Line 4360
CALL INPUT_R (CTYPE,IC,ITYPE,MLI,PFUNC,PFunc1,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,IBOTHr,4 WILKMULT,SMODWILK,SWILKMULT,SPUNC,SMAT,SPENFILE,5 PID,LASTPID)
C
!!!! THE FOLLOWING LINE WAS CHANGED FROM 200 TO 201 AND 201 IS ADDED LATER FOR MAC COMPATABILITY
IF(IBATCOM.EQ.1) GOTO 201
C
IF (IBOTHr.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 COMPATBAILITY
201 CONTINUE
C
C SKIP IF SECOND PASS DURING A COMBINED RUN
Hypervelocity Impact Study - BUMPERII Suggestions

File "MacBumperIIv12a.f": Line 5054
C THE FOLLOWING SECTION WAS DONE BY BJORKMAN & CO. (WP-01).
C
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=' //LENGTH//' .',',') > ',S)' PENTABOLD=PENTABFILE
149 WRITE (6,FORM) PENTABFILE
READ ( 5,'(A)' ,ERR=143 ) ANSWER
IF (ANSWER(1:1).EQ.'?') THEN
CALL DIRLIST
GOTO 149
END IF
IF ( ANSWER(1:4).EQ. ' ') THEN
PENTABFILE=PENTABOLD
ELSE
READ ( ANSWER(1:80),'(BN, A)' ,ERR=143 ) PENTABFILE
END IF
C !!!! 600 WAS DELETED FROM THE FOLLOWING LINE AND THE ENTIRE SECTION IS REPEATED OUTSIDE OF THE IF BLOCK FOR MACINTOSH COMPATIBILITY
C
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 C
C Determine the shield material.
C
150 WRITE ( 6,160 )
160 FORMAT (//IX, 'SHIELD MATERIAL ')
C C
C Write out the material list.

HVIS BUMPERII Suggestions - page 5
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
210 FORMAT (IX,'SELECT MATERIAL NUMBER (<CR>=I) > ',$)
ENDIF
END IF
ENDIF
MAT(1)=MATIN
220 FORMAT (1X,'SELECT MATERIAL NUMBER (<CR>=1) > ',$)
230 FORMAT (1X,'SELECT MATERIAL NUMBER (<CR>=',I2,') > ',$)

Check that the value read in is contained in the list.
IF (MAT(1).LT.I.OR.MAT(1).GT.ML) GO TO 150
IF(IBATCOM.EQ.I) WRITE(13,'(I1)')MAT(1)
SMATRL(IC,1)=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(I:4).NE.') THEN
READ (ANSWER(I:12),260,ERR=250)SHTHKIN
260 FORMAT (BN,E12.0)
ENDIF
ENDIF
 fmt (/IX,'SHIELD THICKNESS (',A,') = > ',$)
270 FORMAT (/IX,'SHIELD THICKNESS <CR> = ',F10.5,'(',A,') > ',$)
280 IF(IBATCOM.EQ.1) WRITE(13,*SHTHKIN

END IF

Determine the vessel wall material. Use the same technique as used
Hypervelocity Impact Study - BUMPERII Suggestions

C to determine the shield material.
C
290 IF (CTYPE.EQ.1.AND.IMAT.NE.1) GOTO 339
WRITE ( 6,300 )
300 FORMAT (/IX,'VESSEL WALL MATERIAL' )
C
IF ( CTYPE.EQ.1 ) MAT(1) = 1
C
DO 310 I=1,ML
WRITE ( 6,170 )I,MATERIAL(I)
310 CONTINUE
C
IF ( IC.EQ.1 ) THEN
320 WRITE ( 6,220 )
READ ( 5,'(A)') ANSWER
IF ( ANSWER(1:4) .EQ. ' ' ) ANSWER='1'
READ ( ANSWER(1:4),200,ERR=320 ) MAT(2)
ELSE
330 WRITE ( 6,230 ) MAT(2)
READ ( 5,'(A)') ANSWER
IF ( ANSWER(1:4).NE.' ') THEN
READ ( ANSWER(1:4),200,ERR=330 )MAT(2)
END IF
END IF
C
IF ( MAT(2).LT.1 .OR. MAT(2).GT.ML ) GO TO 290
IF(IBATCOM.EQ.1) WRITE(13,' (Ii) ') MAT(2)
SMATRL(IC,2) = MATERIAL(MAT(2))
C
Determine the vessel wall thickness.
C
339 IF ( IC.EQ.1 ) THEN
340 WRITE ( 6,360 )LUNITS
READ ( 5,* ,ERR=340 ) VWTHKIN
ELSE
350 WRITE ( 6,370 ) VWTHKIN,LUNITS
READ ( 5,'(A)') ANSWER
IF ( ANSWER(1:4).NE.' ') THEN
READ ( ANSWER(1:12),260,ERR=350 ) VWTHKIN
END IF
END IF
360 FORMAT (/IX,'VESSEL WALL THICKNESS (' ,A ,') = > ',$)
370 FORMAT (/IX,'VESSEL WALL THICKNESS <CR> = ',F10.5,'(',A,') > ',$)
IF(IBATCOM.EQ.1) WRITE(13,* ) VWTHKIN
C
IF ( CTYPE.NE.1 ) THEN
C
Determine the shield stand-off distance.
C
380 IF ( IC.EQ.1 ) THEN
390 IF (CTYPE.EQ.3) THEN
WRITE ( 6,371 )LUNITS
ELSE
WRITE ( 6,400 )LUNITS
END IF
READ ( 5,* ,ERR=380 ) STANDIN
ELSE

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
    READ ( ANSWER(1:12), 260, ERR=390 ) STANDIN
  END IF

371  FORMAT ( /IX, 'TOTAL BUMPER SPACING (',A,') = > ',$)
380  FORMAT ( /IX, 'SHIELD STAND-OFF (',A,') = > ',$)
381  FORMAT ( /IX, 'TOTAL BUMPER SPACING <CR> = ',
           'F10.5,(',A,') > ',$)
410  FORMAT ( /IX, 'SHIELD STAND-OFF <CR> = ',F10.5,(',A,') > ',$)

C

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

C

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(1:4).EQ. ' ' ) ANSWER='Y'
  IF (IBATCOM.EQ.I) THEN
    WRITE (13, ' (A) ' ) ANSWER
    RETURN
  END IF
  IF (ANSWER(1:1) .EQ. 'Y' .OR. ANSWER(1:1).EQ.'y' ) THEN
    MLI=. TRUE.
  ELSE
    MLI=. FALSE.
  END IF
END IF

C

THE FOLLOWING SECTIONS WERE EXTRACTED FROM ABOVE IF-BLOCK
C FOR MAC COMPATIBILITY. - N.ELFER
C
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
   READ ( 5, '(A)',ERR=643 ) ANSWER
   IF (ANSWER(1:1).EQ.'?') THEN


6
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
600 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

THE ABOVE SECTION WAS DONE BY BJORKMAN & CO. (WP-01).

THE ABOVE SECTION WAS REPEATED FOR MAC COMPATABILITY
1XX WAS CHANGED TO 6XX (600 STAYED THE SAME) - N.ELFER
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

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
icase = maximum number of shield cases

INTEGER*4 ICASE
PARAMETER (ICASE=3)

CHARACTER*30 OFILE1, OFILE2, MATFILE
CHARACTER*80 ANSWER
CHARACTER*12 UNITS, SMATRL(ICASE,2)
REAL*4 RTABLE(70,90,ICASE), WILKMULT
C WAS 50 - MAC
REAL*4 SAVTK(ICASE,3), SHDEN(ICASE), VWDEN(ICASE)
REAL*4 BHCARD(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 Common Block for PEN_4 Subroutine of BUMPERII

CHARACTER SHAPE*3
LOGICAL PENNON, SHATER
INTEGER MAXK(10), PRMAT, PRMATI, TARMAT(10), TMATSP(10), PLATE,
1 BIN, NBIN, I
REAL RF(10), RC(10), NF, J, MR, MPROJ, LASTSP, LRM, FMASS(10),
1 DIAM, VI, VR, VILEM, VRLEM, EPSIL, GAMMA, VI1, PI, THETA, SUMSP,
1 A, B, D, R, X, Y, TOVERD, RH, PLATEM, FTHETA, ALIMAS, VC, DELJ, DELJ2,
1 P, EFFP, PET, PGRADY, THETAI, AVGMAS, RP, FI, VF, THICK(10), SPACE(9),
1 THICK1(10), PDENSE(3), PXSTRN(3), PSONDV(3), FRTUFF(3),
1 VIX, MFMAX, MPROJX, DENSE(10)
DOUBLE PRECISION INTACT, HOAREA, SUMPR(10), NR, PCR, LAMBDAM, SIGSQ,
1 SIGMA, AS, AC, THETAR

HVIS BUMPERII Suggestions - page 10
To: Greg Olsen NASA-MSFC ED52  
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Date: May 19, 1992  

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Subject: BUMPERII compatibility 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,Nr,Pk,P1)

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

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

SUBROUTINE Binomi(kl,NrBIN,Pk,PcrBIN)

where "kl" 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 "kl" 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 LAMBDABIN 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

Pk 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.
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.

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HVIS BUMPERII Suggestions - page 13
Subroutine INPUT_G  File BUMPERII.FOR  Line 1220

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

> ^

BUMPERII.FOR:INPUT_G line 1443:
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//'.'

> ^

BUMPERII.FOR:DTHREAT_SUB line 1651:
SYNTAX FYI #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)

> ^

BUMPERII.FOR:NDTHREAT line 2098:
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, EL, 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, EL, 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 WKITEAREA File BUMPERII.FOR Line 3454
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDummy
Hypervelocity Impact Study - BUMPERII Suggestions

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 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 4088

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

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

> 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

HVIS BUMPERII Suggestions - page 16
Hypervelocity Impact Study - BUMPERII Suggestions

FORTRAN-lint Rev 2.83
18-May-92 16:37:29 Page 5

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

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
******************************************************************************
Subroutine HEADER_R File BUMPERII.FOR Line 5669

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
******************************************************************************
Subroutine INPUT_R File BUMPERII.FOR Line 5840

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
******************************************************************************
Subroutine INPUT_R_MATRL File BUMPERII.FOR Line 6026

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

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, DLJ, EL, H, CHRDUMMY

Subroutine INPUT_R_CONFIG  File BUMPERII.FOR Line 6148

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

Subroutine SPINPUT_R  File BUMPERII.FOR Line 6204

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

Subroutine DPINPUT_R  File BUMPERII.FOR Line 6330

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

Subroutine INPUT_R_GETPENTAB  File BUMPERII.FOR Line 6449

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

> 143 PENTABOLD=PENTABFILE//'.'

SYNTAX WARNING #54- branch to label 148 from outside do loop.

>146 CONTINUE

SYNTAX WARNING #54- branch to label 146 from outside do loop.

Subroutine INPUT_R_WILK  File BUMPERII.FOR Line 6522

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

Subroutine MWINPUT_R  File BUMPERII.FOR Line 6630

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

Subroutine MWINPUT  File BUMPERII.FOR Line 6693

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLJ, EL, H, CHRDUMMY
Subroutine INPUT_R_VW  File BUMPERII.FOR  Line 6788
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INPUT_R_SHIELD  File BUMPERII.FOR  Line 6923
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, 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, DLU, EL, H, CHRDUMMY

Subroutine INPUT_R_MLI  File BUMPERII.FOR  Line 7143
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INPUT_R_VARS  File BUMPERII.FOR  Line 7187
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine SETMETRICS  File BUMPERII.FOR  Line 7336
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine INPUT_R_OUT  File BUMPERII.FOR  Line 7369
USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY

Subroutine DOUBLE  File BUMPERII.FOR  Line 7590
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:  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, DLU, 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, DLU, EL, H, CHRDUMMY

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

HVIS BUMPERII Suggestions - page 19
Subroutine COURPAL 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), RECIPSQRT2PI (Line 8752)

USAGE FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, NH, 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
Hypervelocity Impact Study - BUMPERII Suggestions

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: DIA1 (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, LNFAC

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- 1"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, THETAI

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)

BUMPERII.FOR:COUNTR line 9855:
INTERFACE FYI #121- common block /COUNT/ member names differ (compared to initial use in routine PENK).

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
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, TSO0
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)
Hypervelocity Impact Study - BUMPERII Suggestions

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 SETDIAM  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

> GFIL=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

> RFIL=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  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H
File BUMPERII.FOR  Line 13784
*******************************************************************************
Subroutine FLUX  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
File BUMPERII.FOR  Line 13947
*******************************************************************************
Subroutine FLUX20001  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
File BUMPERII.FOR  Line 13970
*******************************************************************************
Subroutine FLUX791  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
File BUMPERII.FOR  Line 14065
*******************************************************************************
Function DEBFLUX  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, PDF
File BUMPERII.FOR  Line 14125
*******************************************************************************
Subroutine SOLKEAD  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, LUXMON, LUXYR
File BUMPERII.FOR  Line 14262
*******************************************************************************
Subroutine FILL  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
File BUMPERII.FOR  Line 14355
*******************************************************************************
Subroutine FORMATOUT  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
File BUMPERII.FOR  Line 14425
*******************************************************************************
Subroutine SUPER  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY
File BUMPERII.FOR  Line 14653
*******************************************************************************
Subroutine PATRES  Usage FYI #128- local variables declared but unused: WORKSPACE, TCA, CHECKWKSP, DLU, EL, H, CHRDUMMY, IFL
File BUMPERII.FOR  Line 14804
*******************************************************************************
SYNTAX FYI #138- unused labels: 60
*******************************************************************************
SYNTAX FYI #138- unused labels: 70
*******************************************************************************

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.

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

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 CRESOUT

File BUMPERII.FOR Line 16712

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

Subroutine CRESPONSE

File BUMPERII.FOR Line 16859

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

Subroutine LASTOUT_C

File BUMPERII.FOR Line 17163

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

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/LAMBDAS, /ALL1/SIGSQ, /ALL1/SIGMA, /ALL1/VDIST, /ALL1/RHO, /ALL1/DENSE1, /ALL1/YSTRN1, /ALL1/SOUNDV, /ALL2/PIDC, /ALL2/IPID1, /ALL2/PRANGE, /ALL2/NPIDR, /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: REAL FUNCTION PRV(VV) (REAL*4 VV) and VV was substituted for VR in PRV. 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

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