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INERTIAL NAVIGATION SYSTEM STANDARDIZED SOFTWARE DEVELOPMENT

FINAL TECHNICAL REPORT

Volume IV of IV

PROGRAM LISTINGS

June 1976

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Inertial Navigation
Computer Algorithms
Computation Errors

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Section 1 of Volume IV contains the listings of the variable precision form of the numerical simulator program, VUMSIM. In this version all the "flight code" (i.e., simulated navigation computer operations) is performed in a user-specified floating point format, providing the capability of simulating a reduced computer word length. Appropriate library subroutines, for the specified word length, are automatically incorporated (for sine-cosine, square root, and arc tangent). The special routines called are those with names starting with the letter V. The remaining "flight code"

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20. Abstract (continued)

is modified to call the variable precision routines. The "ideal" IMU simulator portion of the program is unchanged from NUMSIM.

Section 2 contains the listings of the numerical simulator proper, NUMSIM, as described in Volume III, without the variable precision option.

Both NUMSIM and VUMSIM accept instantaneous values of specific force in the local vertical wander azimuth frame from PROFGEN at the trajectory sample rate and output the integrals of specific force in the simulated IMU frame to the "flight code" at the appropriate attitue of navigation rate. Subsequent modifications to NUMSIM/VUMSIM, to accept integrals of specific force in the appropriate IMU frame directly from PROFGEN are described in the addendum.

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INERTIAL NAVIGATION SYSTEM STANDARDIZED SOFTWARE DEVELOPMENT

FINAL TECHNICAL REPORT

VOLUME IV

Program Listings

June 1976

Approved: W. G. Denhard
W. G. Denhard

The Charles Stark Draper Laboratory, Inc.
Cambridge, Massachusetts 02139

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PREFACE

~~ACKNOWLEDGEMENT~~

This four-volume report was prepared under USAF Contract F33615-75-C-1149 by Charles Stark Draper Laboratory, Inc., Cambridge, Massachusetts, in accordance with Section 4 of the contract. The monitoring Air Force project engineer is Captain E. Harrington (RWA-2), Air Force Avionics Laboratory, ~~Dayton~~ Wright-Patterson AF Base, Ohio.

The Draper Laboratory Program Manager for this task is Dr. George T. Schmidt and the Lead Engineer is Arthur Ciccolo. The coordinator of this report is Janusz Sciegienny and the authors are Janusz Sciegienny, Roy Nurse, Peter Kampion and John Wexler.

The authors express their appreciation to Mr. W. Shephard, Mr. D. Kaiser and Mr. Stan Musick of the Air Force Avionics Laboratory for their assistance during the course of this contract.

PROGRAM LISTING

~~VOLUME IV~~

~~1.0 PROGRAM LISTING~~

~~1.1 Introduction~~

This ~~section~~ volume contains the program listing for the two versions (one with, and one without, variable precision) as available for the CYBER 74.

Note that all '$'s in variable names had to be replaced ~~by~~ by '9's.

~~1.2~~ Version with Variable Precision (VUMSIM) — pg 2

~~1.3~~ Version without Variable Precision (NUMSIM) — pg

```
      PROGRAM VUMSIM(INPUT,OUTPUT,TAPE5=INPUT,TAPE6,TAPE20,TAPE30)
C     EXECUTIVE ROUTINE -- CALLS THE APPROPRIATE SUBROUTINES DEPENDENT
C          ON THE IMU STABILIZATION SELECTED AND THE SYSTEM
C          PARAMETERS SPECIFIED.
C
      IMPLICIT REAL(A-H,L-Z)
      COMMON /CONTRL/ DELTC,    DTIME,    PLTIME,   PSTIME,
     1    IPREV,    INIT,     ISTOP,    ICHGYL,   ICHGVP
      COMMON /INPUTS/ AQUANT,   IQUANT,   VQUANT,   START,
     1    STOP,     PLOTIM,   PRNT,     QSTOP,    CV01,
     2    CV02,     CV03,     TOLJCK,   HSDTIM,   HSPING,
     2    ITRNAV,   ITRATT,   INCOR,    IMUTYP,   ICYLTP,
     3    TPC(30),  IOPHLP,   SSX0,     SSY0,     SSZ0,
     4    PSMAX,    DPSMAX,   ITRFIL
      COMMON /TRUDAT/ PLSIG(3),  DV3P(3),   CTAUP(6),   W11(7),
     1    SCPTP(3),  C2P4543,3),  CBMIS(3,3),  XMECSO(3),  C1B30(3,3),
     2    C1032P(3,3),  C2P86T(3,3),  ARSCTD(3)
      COMMON /MAV/    C0B92P(3,3),V92P(3),    DV92P(3),   DW2(3),
     1    C2BM0(3,3),  A(3,3),     B(3,3),   THTEPT(3),  THTEDO(3),
     2    THTCDP(3),   WXV(3),     G92T(3),  W,          ALPHA,
     3    SALF,     CALF,     DELT,     FTA(3),   VOMP,
     4    LAT,      LONG,     V92(3),   FILATT(3,3),DELTA,
     5    XSAVE,    XCALF,    X2P92P(3,3),HV92P(3),   DW2P(3),
     6    S2PHI,    V92PHI,   XV92P(3),  XH,       DELH,
     7    C8910(3,3),  C8P90(3,3),  DHA,      C895(3,3),   DV592P(3),
     8    DDX ,     DDY ,     DDZ ,     D2P95(4),   DELTP(3),
     9    GAINS(3,10),IGAINP(3)
      COMMON /OUTPUT/ TITLE(20),  BLAT9T,   BLON9T,   BALF9T,
     1    BLAT,     BLONG,    BALF,     BETA9T(3),  BETA(3),
     2    V92T(3),  DH,       DV(3),    BETA2(3),   BLAT,
     3    BLONG,    BALF,
     4    IPAGE,    IPLIM,    IPRINT
      COMMON /UNVERSL/ PI,      HPI,      PS,       PS1,
     1    EE,       ESQ,      ESQP1,    HESQ1,    RADEQ,
     2    RESQ
      COMMON /TRAJIN/ TIME,     LAT9T,    LONG9T,   ALF9T,
     1    HH,       FTA9T(3),  VBT(3),   SFPT(3),  DELTS,
     2    TIMEO,    LONGO,    SLAT9T,   CLAT9T,   SALF9T,
     3    CALF9T
C
C     COMMON FOR PRECISION VARYING
      COMMON /SQRPTH/SQPPTH /SINPTH/SINPTH /COSPTH/COSPTH /ATNPTH/
     1  ATNPTH /PRECIS/ FRACTL,EXPOL /VPPTH/ ROUND
      INTEGER SQRPTH,SINPTH,COSPTH,ATNPTH,FRACTL,EXPOL,ROUND
C
      INTEGER LLMECH,RESTAR,TURN,MODE,IPATH,NSEG
      COMMON /PROFGS/ DTO(50),FPRO(50),HEAD(50),HMAX(50),HMIN(50),
     1 MODE(50),NPATH(50),PACC(50),PITCH(50),PSTAR(50),PSPLNT(50),
     2 TACC(50),TURN(50),POLRAT,TSTART,VEO,PHIPO,
     3 PWITCH,ALFAO,LATO,LONG,ALTO,IPRNT,IPLTE,IPLOT,
     4 IPROG,NPSEG,LLMECH
      NAMELIST /OUTPARM/ AQUARE,ROUNDI,VQUANT,START,STOP,PLOTIM,PRNT,
     A          PSTOP,TOLJCK,HSPTIM,HSPING,SSY0,SSY0,SSZ0,
     1          ITRNAV,ITRATT,INCOR,IMUTYP,ICYLTP,IPC,IOPHLP,
     2          CV01,CV02,CV03,SSX0,SSY0,SSZ0,DELTC,IPRINT,
     3          SQRPTH,SINPTH,COSPTH,ATNPTH,FRACTL,EXPOL,ROUND
```

```
                C
                C  ...NAMELIST PARAMETERS FROM PROFGEN RUN                                  000670
                C                                                                           000680
                C                                                                           000690
                C                                                                           000700
                      REWIND 20                                                             000710
                      READ(20) TODAY,CLOCK                                                  000720
                      READ(20) IPROF,NSEGT,LLMECH,TSTART,VTO,PHEADO,PPITCH,                 000730
                     1   ALFAO,LATO,LONO,ALTO,IPRNT,IPLTF,IPLOT,POLPAT                    000740
                      READ(20) NSEGLNT,RESTAR,TURN,NPATH,PACC,TACC,HEAD,                    000750
                     1   PITCH,DTO,MODE,ERROR,HMAX,HMIN                                   000760
                      WRITE(6,699) IPROF,NSEGT,LLMECH,TSTART,VTO,PHEADO,PPITCH,             000770
                     1   ALFAO,LATO,LONO,ALTO,IPRNT,IPLTF,IPLOT,POLPAT                    000780
                  699 FORMAT("1PROFGEN PARAMETERS ARE:"/I2,"IPROF:",T10,I11,I22,            000790
                     1 "NSEGT:",T30,I11,T42,"LLMECH:",T50,I11,T62,"TSTART:",T70,            000800
                     2 G11.5,I82,"VTO:",T90,G11.5,T102,"PHEADO:",T110,G11.5/                000810
                     3 I2,"PPITCH:",T10,G11.5,T22,"ALFAO:",T30,G11.5,T42,"LATO:",           000820
                     4 T50,G11.5,T62,"LONO:",T70,G11.5,T82,"ALTO:",T90,G11.5,               000830
                     5 T102,"IPRNT:",T110,I11/I2,"IPLTF:",T10,I11,T22,"IPLOT:",             000840
                     6 T30,I11,T42,"POLPAT:",T50,G11.5//)                                   000850
                      WRITE(6,698) (I,NSEGLNT(I),RESTAR(I),TURN(I),NPATH(I),PACC(I),        000860
                     1 TACC(I),HEAD(I),PITCH(I),DTO(I),MODE(I),ERROR(I),HMAX(I),           000870
                     2 HMIN(I),I=1,NSEGT)                                                   000880
                  698 FORMAT(" PARAMETERS FOR PROFILE NO.",I3,":"/I2,"NSEGLNT:",            000890
                     1 I10,G11.5,T32,"RESTAR:",T30,T11,T42,"TURN:",T50,I11,T62,"NPATH:",    000900
                     2 T70,I11,T82,"PACC:",T90,G11.5,T102,"TACC:",T110,G11.5,               000910
                     3 /I2,"HEAD:",T10,G11.5,T22,"PITCH:",T30,G11.5,T42,"DTO:",             000920
                     4 T50,G11.5,T62,"MODE:",T70,I11,T82,"ERROR:",T90,G11.5,                000930
                     5 T102,"HMAX:",T110,G11.5/I2,"HMIN:",T10,G11.5//)                      000940
                C                                                                           000950
                C                                                                           000960
                      READ(5,5) (ITITLE(I),I=1,20)                                          000970
                    5 FORMAT (20A4)                                                         000980
                      WRITE(6,900 ) (ITITLE(I),I=1,20),IPAGE                                000990
                 9000 FORMAT ("1",2X,"IDEAL INS SIMULATOR",10X,20A4,1X,"PAGE ",I3//,        001000
                     1       10X,"I N I T I A L I Z A T I O N   P A R A M E T E R S "/)     001010
                      IPAGE = IPAGE + 1                                                     001020
                      READ (5,SIMPAR)                                                       001030
                      WRITE(6,697) CVD1,CVD2,CVD3,AQUANT,VQUANT,TQUANT,START,STOP,          001040
                     1 PLOTIM,PRNT,RSTRT,INCOR,TOLJPK,IFPLTM,(IPC(I),I=1,30)                001050
                  697 FORMAT(" VERTICAL DAMPING:",T10,"CVD1:",T36,G11.5,                    001060
                     1 T48,"SEC**-1,",T60,"CVD2:",T66,G11.5,T78,"SEC**-2,",                 001070
                     2 T90,"CVD3:",T98,G11.5,T110,"SEC**-3"/                                001080
                     3 " QUANTIZATION PARAMETERS:",T30,"AQUANT:",T40,G11.5,T52,"RAD",        001090
                     4 T60,"VQUANT:",T82,"FT/SEC",T78,G11.5,T91,"TQUANT:",T112,"RAD",       001100
                     4 T103,G11.5/                                                          001110
                     5 " TIMESISECS, EXCEPT INCOR):",T30,"START:",T40,G11.5,T60,            001120
                     5 "STOP:",T70,G11.5,                                                   001130
                     6 T90,"PLOTIM:",T100,G11.5/T30,"PRNT:",T40,G11.5,T60,"RSTRT:",         001140
                     7 T70,G11.5,T90,"INCOR:",T100,I11/" TOLERANCES:",T70,"TOLJPK:",        001150
                     8 T40,G11.5,T52,"FT/SEC",T60,"IFPLTM:",T70,I11/" IPC:",                001160
                     9 T30,15(I3,","),I3/T30,14(I3,","),I3)                                 001170
                      IF (IMUTYP .EQ. 1) WRITE(6,696) IOPNLP                                001180
                  696 FORMAT(" LOCAL LEVEL PLATFORM MISALIGNMENTS, IOPNLP:",T11)            001190
                      IF (IMUTYP .EQ. 2) WRITE(6,695) SSX0,SSYJ,SSZ0                        001200
                  695 FORMAT(" SPACE STABLE PLATFORM INITIAL ORIENTATION AS",                001210
                     1 " EULER ANGLES(RADIANS)",T70,"SSX0:",T80,G11.5,T100,"SSY0:",         001220
                     2 T110,G11.5/T70,"SSZ0:",T81,G11.5)
```

```
      IF (IMUTYP .EQ. 3) WRITE(6,694) HSOTIM,HSOINC                     001240
  694 FORMAT(" HIGH SPEED STRAPDOWN NORMALIZATIONS WILL START",         001250
     1 " AT TIME ",G11.5," AND HAPPEN EVERY ",G11.5," SECONDS")         001260
      IF (IPC(25) .NE. 0) WRITE(6,693) PSMAX,DRSMAX,((GAINS(I,J),       001270
     1 J=1,3),J=1,10)                                                   001280
  693 FORMAT(" ATTITUDE FILTER TOLERANCES, PSMAX= ",G11.5,              001290
     1 " DRSMAX= ",G11.5," FIXED GAINS(COLUMNWISE)="/                   001300
     2 4(3(1X,G11.5),5X,3(1X,G11.5),5X,"(1X,G11.5)/) )                  001310
      CALL VPINIT                                                       001320
      WRITE(6,692) SQRPIH,SINPIH,COSPIH,ATNPIH,EXPOL,FRACTL,ROUND       001330
  692 FORMAT(" THIS VERSION HAS VARIABLE PRECISION, SQRPIH=",I2,        001340
     1 " SINPIH=",I2," COSPIH=",I2," ATNPIH=",I2/I45,"EXPOL=",I2,       001350
     2 " FRACTL=",I2," ROUND=",I2)                                      001360
      GO TO (991,992,993),IMUTYP                                        001370
  991 CALL LLINIT                                                       001380
      GO TO 420                                                         001390
  992 CALL SSINIT                                                       001400
      GO TO 420                                                         001410
  993 CALL SDINIT                                                       001420
      GO TO 420                                                         001430
    1 CONTINUE                                                          001440
      GO TO (10,100,200),IMUTYP                                         001450
C                                                                       001460
C        THIS LOOP PERFORMS INPUT, IMU MODELING, AND ATTITUDE           001470
C          CALCULATIONS WHEN LOCAL-LEVEL, WANDER-AZIMUTH (LLWA)         001480
C          PLATFORM STABILIZATION IS SELECTED                           001490
C                                                                       001500
   10 DO 30 I=1,IIPNAV                                                  001510
      DO 25 J=1,IIPATT                                                  001520
   11 CALL INREC                                                        001530
      IF (ISTOP .EQ. 10) GO TO 505                                      001540
      IF (TIME .GT. STOP) GO TO 520                                     001550
      CALL LLINTG                                                       001560
      IF (TIME .NE. TPREV .OR. ISTOP .NE. 0) GO TO 20                   001570
      DO 19 K=1,3                                                       001580
   19 SFXTP(K)=SFXT(K)                                                  001590
      GO TO 11                                                          001600
   20 TPREV=TIME                                                        001610
   25 CALL CMINTG                                                       001620
      CALL LLATUD                                                       001630
      CALL LLATT                                                        001640
      IF (I .EQ. IIPNAV) CALL INRNAV                                    001650
      CALL ATUDE                                                        001660
      IF (MOD(I,IIPFIL) .EQ. 0) CALL ATTFIL                             001670
C     FILTER THE ATTITUDE DATA IF IT IS TIME                            001680
   30 CONTINUE                                                          001690
      GO TO 400                                                         001700
C                                                                       001710
C        THIS LOOP PERFORMS INPUT, IMU MODELING, AND ATTITUDE           001720
C          CALCULATIONS WHEN SPACE STABLE PLATFORM STABILIZATION IS      001730
C          SELECTED                                                     001740
C                                                                       001750
  100 DO 130 I=1,IIPNAV                                                 001760
      DO 125 J=1,IIPATT                                                 001770
  101 CALL INREC                                                        001780
      IF (ISTOP .EQ. 10) GO TO 505                                      001790
      IF (TIME .GT. STOP) GO TO 520                                     001800
```

```
                      CALL SSINTG                                                 001810
                      IF (TIME .NE. TPREV .OR. ISTOP .NE. 0) GO TO 120            001820
                      DO 119 K=1,3                                                001830
  175                 119 SESTP(K)=SEST(K)                                        001840
                      GO TO 101                                                   001850
                  120 TPREV=TIME                                                  001860
                  125 CALL CMINTG                                                 001870
                      CALL SSATUD                                                 001880
  180                 IF (I .EQ. ITRNAV) CALL SSTERM                              001890
                      IF (I .EQ. ITRNAV) CALL INRNAV                              001900
                      CALL SSATT                                                  001910
                      CALL ATUDE                                                  001920
                      IF (MOD(I,ITRFIL) .EQ. 0) CALL ATTFIL                       001930
  185             C   FILTER THE ATTITUDE DATA IF IT IS TIME                      001940
                  130 CONTINUE                                                    001950
                      GO TO 400                                                   001960
                C                                                                 001970
                C         THIS LOOP PERFORMS INPUT, IMU MODELING, ATTITUDE, AND   001980
  190           C         VELOCITY SUMMING CALCULATIONS WHEN STRAP-DOWN INU      001990
                C         STABILIZATION IS SELECTED                               002000
                C                                                                 002010
                  200 DO 230 I=1,ITRNAV                                           002020
                      DO 225 J=1,ITRATT                                           002030
  195             201 CALL INREC                                                  002040
                      IF (ISTOP .EQ. 10) GO TO 505                                002050
                      IF (TIME .GT. STOP) GO TO 520                               002060
                      CALL SDINTG                                                 002070
                      IF (TIME .NE. TPREV .OR. ISTOP .NE. 0) GO TO 220            002080
  200                 DO 219 K=1,3                                                002090
                  219 SESTP(K)=SEST(K)                                            002100
                      GO TO 201                                                   002110
                  220 TPREV=TIME                                                  002120
                  225 CALL CMINTG                                                 002130
  205                 CALL SDATUD                                                 002140
                      CALL HSINTG                                                 002150
                      IF (I .EQ. ITRNAV) CALL HSINT2                              002160
                      IF (I .EQ. ITRNAV) CALL INRNAV                              002170
                      CALL ATUDE                                                  002180
  210                 IF (MOD(I,ITRFIL) .EQ. 0) CALL ATTFIL                       002190
                C     FILTER THE ATTITUDE DATA IF IT IS TIME                      002200
                  230 CONTINUE                                                    002210
                C                                                                 002220
                C         THIS PATH IS COMMON TO ALL CONFIGURATIONS -- PERFORMS    002230
  215           C         CONTROL AND OUTPUT FUNCTIONS                            002240
                C                                                                 002250
                  400 CONTINUE                                                    002260
                  420 IF (TIME .LT. PTIME .AND. TIME .LT. PLTIME) GO TO 500       002270
                      CALL OUTUNI                                                 002280
  220                 IF (TIME .LT. PTIME) GO TO 440                            002290
                      CALL PRINTR                                                 002300
                      PTIME = TIME + PRNT                                         002310
                      IF (TIME .LT. PLTIME) GO TO 500                             002320
                  440 CALL PLTAPE                                                 002330
  225                 PLTIME = TIME + PLOTTM                                      002340
                  500 IF (ISTOP .LT. IERLIM) GO TO 1                              002350
                  505 WRITE(6,510) ISTOP,IERLTH                                   002360
                  510 FORMAT (/2X,"***** SIMULATION TERMINATED: ERROR SEVERITY OF " 002370
```

```
                1       ,I2,": ERROR LIMIT IS ",I2)                              002380
  230           STOP                                                             002390
                520 WRITE(6,521) TIME,STOP                                       002400
                521 FORMAT (/2X,"****** PRESENT TRAJECTORY TIME OF ",G14.8,      002410
                1       " EXCEEDS REQUESTED STOP TIME OF ",G14.8,                002420
                2       "; SIMULATION TERMINATED")                               002430
  235           STOP                                                             002440
                END                                                              002450
```

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

```
  124   I               AN IF STATEMENT MAY BE MORE EFFICIENT THAN A 2 OR 3 BRANCH COMPUTED GO TO STATEMENT.
  136   I               AN IF STATEMENT MAY BE MORE EFFICIENT THAN A 2 OR 3 BRANCH COMPUTED GO TO STATEMENT.
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
12256 VUMSIM

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	1217	ALFAC	REAL		PROFGE
3	ALFGT	REAL		TRAJIN	75	ALPHA	REAL		NAV
1222	ALTO	REAL		PROFGE	0	AQUANT	REAL		INPUTS
100	APESID	REAL	ARRAY	IMUDAT	0	ATMPTH	INTEGER		ATMPTH
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALFGT	REAL		TRAJIN	22	CLATGT	REAL		TRAJIN
13562	CLOCK	REAL			0	COSPTH	INTEGER		COSPTH
11	CV01	REAL		INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL		INPUTS	165	C0900	REAL	ARRAY	NAV
0	C0902P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C0915	REAL	ARRAY	NAV	45	C1000	REAL	ARRAY	IMUDAT
56	C1092P	REAL	ARRAY	IMUDAT	20	C2P95	REAL	ARRAY	IMUDAT
67	C2P95T	REAL	ARRAY	IMUDAT	31	C9415	REAL	ARRAY	IMUDAT
22	C9740	REAL	ARRAY	NAV	54	DALF	REAL		OUTPUT
153	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
47	DETA	REAL	ARRAY	OUTPUT	43	DH	REAL		OUTPUT
52	DLAT	REAL		OUTPUT	53	DLONG	REAL		OUTPUT
66	DRSMAX	REAL		INPUTS	0	DTO	REAL	ARRAY	PROFGE
44	DV	REAL	ARRAY	OUTPUT	211	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNVSL	6	EFRAC	REAL		UNVSL
62	ERROR	REAL	ARRAY	PROFGE	5	ESQ	REAL		UNVSL
101	ETA	REAL	ARRAY	NAV	6	ETA0S	REAL	ARRAY	IMUDAT
5	ETAGT	REAL	ARRAY	TRAJIN	1	EXPOL	INTEGER		PRINTS
112	FILATT	REAL	ARRAY	NAV	0	FRACTL	INTEGER		PRINTS
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	H0	REAL		TRAJIN
144	HEAD	REAL	ARRAY	PROFGE	226	HMAX	REAL	ARRAY	PROFGE
117	HPTN	REAL	ARRAY	PROFGE	1	HPT	REAL		UNVSL

VARIABLES SN TYPE RELOCATION

15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	13563	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
22	IERLIM	INTEGER		INPUTS	263	IGATNP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	INCOR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPHLP	INTEGER		INPUTS
66	IPAGE	INTEGER		OUTPUT	23	IPC	INTEGER	ARRAY	INPUTS
56	IPLIM	INTEGER		OUTPUT	1225	IPLOT	INTEGER		PROTGE
67	IPPINT	INTEGER		OUTPUT	1223	IPPNT	INTEGER		PROTGE
1226	IPROB	INTEGER		PROTGE	1224	IRITE	INTEGER		PROTGE
6	ISTOP	INTEGER		CONTRL	0	ITITLE	INTEGER	ARRAY	OUTPUT
17	ITRATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	13564	J	INTEGER		
13565	K	INTEGER			105	LAT	REAL		NAV
1220	LATO	REAL		PROTGE	1	LATOT	REAL		TRAJIN
1230	LLMECH	INTEGER		PROTGE	106	LONG	REAL		NAV
20	LONGO	REAL		TRAJIN	2	LONGOT	REAL		TRAJIN
1221	LONO	REAL		PROTGE	372	MODE	INTEGER	ARRAY	PROTGE
454	NPATH	INTEGER	ARRAY	PROTGE	1227	NSEGT	INTEGER		PROTGE
31	OALF	REAL		OUTPUT	26	OALFOT	REAL		OUTPUT
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	35	OETA	REAL	ARRAY	OUTPUT
32	OETAOT	REAL	ARRAY	OUTPUT	222	OETLTR	REAL	ARRAY	NAV
176	OHO	REAL		NAV	27	OLAT	REAL		OUTPUT
24	OLATOT	REAL		OUTPUT	30	OLONG	REAL		OUTPUT
25	OLONOT	REAL		OUTPUT	0	OTIME	REAL		CONTRL
142	OV92P	REAL	ARRAY	NAV	535	PAGE	REAL	ARRAY	PROTGE
1215	PPEADO	REAL		PROTGE	0	PI	REAL		UNVRSL
620	PITCH	REAL	ARRAY	PROTGE	5	PLOTTM	REAL		INPUTS
2	PLTIME	REAL		CONTRL	1216	PPITCH	REAL		PROTGE
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	10	PAOPER	REAL		UNVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESO	REAL		UNVRSL
202	RESTAB	INTEGER	ARRAY	PROTGE	17	RHO	REAL	ARRAY	NAV
1212	ROLRAT	REAL		PROTGE	4	ROUND	INTEGER		VPPTH
3	RRC	REAL		UNVRSL	65	RSMAX	REAL		INPUTS
9	RSTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS
2	RT	REAL		UNVRSL	76	SALF	REAL		NAV
23	SALFOT	REAL		TRAJIN	764	SEGLNT	REAL	ARRAY	PROTGE
17	SFOT	REAL	ARRAY	TRAJIN	13	SFOTP	REAL	ARRAY	IMUDAT
0	SINPTH	INTEGER		SINPTH	21	SLATOT	REAL		TRAJIN
0	SQRPTH	INTEGER		SQRPTH	62	SSXO	REAL		INPUTS
63	SSYO	REAL		INPUTS	64	SSZO	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	1046	TACC	REAL	ARRAY	PROTGE
63	THTCOR	REAL	ARRAY	NAV	55	THTERT	REAL	ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
12	TIMEO	REAL		TRAJIN	13561	TODAY	REAL		
13	TOLJRK	REAL		INPUTS	4	TRREV	REAL		CONTRL
1	TOUANT	REAL		INPUTS	42	TRESID	REAL	ARRAY	IMUDAT
1213	TSTART	REAL		PROTGE	1	TURN	INTEGER	ARRAY	PROTGE
194	VOMO	REAL		NAV	2	VOUANT	REAL		INPUTS
1214	V10	REAL		PROTGE	10	V9T	REAL	ARRAY	TRAJIN
137	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
40	V9ST	REAL	ARRAY	OUTPUT	7	WERT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
126	XCALF	REAL		NAV	152	XH	REAL		NAV

VARIABLES SN TYPE RELOCATION

124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XCP92P	REAL	ARRAY	NAV

FILE NAMES MODE

0	INPUT		2041	OUTPUT		6143	TAPE20	UNFMT	10204 TAPE30
0	TAPE5	MIXED	4102	TAPE6	FMT				

EXTERNALS TYPE ARGS

ATTFIL	0	ATUDF	0
CMINTG	0	HSINTG	0
HSINT2	0	INDEC	0
TURNAV	0	LLATT	0
LLATUD	0	LLINTT	0
LLINTG	0	OUTUNI	0
PLTAPE	0	PRINT2	0
SDATUD	0	SDINIT	0
SDINTG	0	SSATT	0
SSATUD	0	SSINIT	0
SSINTG	0	SSTERM	0
VPINIT	0		

INLINE FUNCTIONS TYPE ARGS

MOD INTEGER 2 INTRIN

NAMELISTS

SIMPAP

STATEMENT LABELS

12400	1		13210	5	FMT		12410	10	
12412	11		0	19			12433	20	
3	25		0	30			12457	100	
12461	101		0	119			12502	120	
0	125		0	130			12531	200	
12533	201		0	219			12554	220	
0	225		0	230			12603	400	
12603	420		12617	440			12622	500	
12625	505		13524	510	FMT		12639	520	
13543	521	FMT	13477	602	FMT		13446	603	FMT
13424	604	FMT	13376	605	FMT		13361	606	FMT
13362	607	FMT	13137	608	FMT		13044	609	FMT
12372	991		12374	992			12376	993	
13217	9000	FMT							

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES			
12274		* I	77 77	328		EXT REFS		
12411	30	* I	142 160	468		EXT REFS	EXITS	NOT INNER
12412	25	* J	143 153	278		EXT REFS	EXITS	NOT INNER
12426	19	K	149 150	48	INSTACK			
12460	130	* I	167 186	518		EXT REFS	EXITS	NOT INNER
12461	125	* J	168 178	278		EXT REFS	EXITS	NOT INNER
12475	119	K	174 175	48	INSTACK			
12532	230	* I	193 212	518		EXT REFS	EXITS	NOT INNER
12533	225	* J	194 204	278		EXT REFS	EXITS	NOT INNER
12547	219	K	200 201	48	INSTACK			

COMMON BLOCKS	LENGTH
CONTRL	9
INPUTS	56
IMUDAT	67
DAV	152
OUTPUT	48
UNVRSL	10
TRAJIN	21
SUBPTH	1
STHPTH	1
COSPTH	1
ATHPTH	1
PRECIS	2
VPPTH	1
PROPGE	655

STATISTICS

PROGRAM LENGTH	13209	720
BUFFER LENGTH	122462	5246
CM LABELED COMMON LENGTH	28519	1065

```
      BLOCK DATA
      IMPLICIT REAL(A-H),REAL(L-Z)
C
C
C
      COMMON /CONTRL/ DTIME,    PTIME,    PLTIME,   RSTIME,
     1    IPREV,    INIT,     ISTOP,    ICNCYL,   ICNCYP
      COMMON /IMUDAT/ RESID(3), DV3P(3),  ET49P(4), WT(3),
     1    SF9TP(3),  C2P95(3,3), C9MIS(3,3), IPESID(3), C1P92P(3,3),
     2    C1P92T(3,3), C2P95T(3,3), ARESID(3)
      COMMON /INPUTS/ AQUANT,   FQUANT,   VQUANT,   START,
     1    STOP,     PLOTIM,   DENT,     PSTRT,    CV01,
     2    CV02,     CV03,     TOLJPK,   HSDTIM,   HSDINC,
     2    ITRMAV,   ITRATT,   INCOP,    IMUTYP,   IERLIM,
     3    IPC(70),  IOPNLP,   GSXE,     GSYO,     GSZO,
     4    PLMAX,    DRSMAX,   IRCFIL
      COMMON /MAV/    C0P92P(3,3),V92P(3),  DV32P(3),  RH0(7),
     1    C9PH0(3,3), A(3,3),   B(3,3),   IHTERT(3), IHTRQ(3),
     2    IHTCOR(3), HXV(3),   G92P(3),   H,        ALPH1,
     3    SALF,     CALF,     DELT,     ETA(3),   V01P,
     4    LAT,      LONG,     V92(3),   FILATT(3,3),DELTA,
     5    XSALF,    XCALF,    XD92P(3,3),DV92P(3),  DV32P(3),
     6    S2PHI,    XS2PHI,   XV32P(3),  XH,       DELH,
     7    CC910(3,3), C0P90(3,3), D43,      C095(3,3),  DV592P(3),
     8    DDX ,     DDY ,     DDZ ,     D2P95(4),  DELTP(3),
     9    GAINS(3,10),IGAINP(3)
      COMMON /OUTPUT/ TITLE(20), OLATGT,   OLONGT,   OALGT,
     1    OLAT,     OLONG,    OALF,     OCTAGT(3), OETA(3),
     2    V92T(3),  DH,       DV(3),    DETA(3),   DLAT,
     3    DLONG,    DALF,
     4    IPAGE,    IPLIM,    IPRINT
      COMMON /PGPAV/  GLHSC,    GPCNT,    GPS2,     GPS4,
     1    GPH,      GPH2,     GPHS2
      COMMON /TRAJIN/ TIME,     LATGT,    LONGGT,   ALFGT,
     1    H9,       ETART(3), V9T(3),   SF9T(3),  DELTS,
     2    IIMCO,    LONGO,    GLATGT,   CLATGT,   SALFGT,
     3    CALFGT
      COMMON /UNIVRSL/ PI,      HPI,      RI,       RPI,
     1    EE,       ESQ,      ERPQ,     WEGT,     GRAVED,
     2    RESQ
C
C
C     VARIABLE PRECISION BLOCKS
      COMMON /SQRTH/SQRTH /SINRTH/SINRTH /COSRTH/COSRTH /ATNRTH/
     1 ATNRTH /PRECIS/ EPSILL,EXPOL /VRRTH/ ROUND
      INTEGER SQRTH,SINRTH,COSRTH,ATNRTH,EPSILL,EXPOL,ROUND
      DIMENSION PRDAT(21)
      DIMENSION DATIMU(67)
      DIMENSION NAVCOM(149)
      DIMENSION OUTDAT(25)
C
      EQUIVALENCE (DATIMU(1),RESID(1))
      EQUIVALENCE (NAVCOM(1),C0P92P(1,1))
      EQUIVALENCE (PRDAT(1),TIME)
      EQUIVALENCE (OUTDAT(1),OLATGT)
C
C
```

```
C  CONTROL DATA                                                          00030040
C                                                                        00030050
      DATA DTIME/-1.E6      /,RTIME   /-1.E6    /,PLTTMF   /1.E6     /  00030060
     1   ,RSTIME  /1.E6     /,INTT    /0        /,ICMCYL   /1        /  00030070
     1   ,ISTOP   /0        /,ICMCYP  /1        /,IPREV/1.E6/           00030080
C                                                                        00030090
C                                                                        00030100
C                                                                        00030110
C  IMU DATA                                                              00030120
C                                                                        00030130
C                                                                        00030140
      DATA DATIMU/25*0.,1.0,3*0.,1.0,3*0.,1.0,33*0./                     00030150
C                                                                        00030160
C                                                                        00030170
C  INPUT DATA                                                            00030180
C                                                                        00030190
C                                                                        00030200
      DATA AQUANT/0.E0      /,TQUANT  /0.E0     /,VQUANT   /0.E0     /  00030210
     1   ,START   /-1.E6    /,STOP    /1.E6     /,PLOTTM   /1.E6     /  00030220
     1   ,PRNT    /1.E6      /,RSTRT   /1.E6     /,CVD1     /6.E-2    /  00030230
     2   ,CVD2    /1.62E-3   /,CVD3    /1.62E-5  /                       00030240
     2   ,IIGNAV  /0         /,ITRAIL  /0        /,INCOR    /100      /  00030250
     3   ,TERLIM  /5         /,IPC     /3*3      /                      00030260
     3   ,QSMAX/2.E-3/,      DRSMAX/.02E0/,      ITRFIL/32/             00030270
     4   ,IMUTYP  /1         /, IOPNLP   /0      /,                     00030280
     5   IOLJRK,HSOLIM,HSOINC,SSX0,SSY0,SSZ0/3*1.E6,3*0./               00030290
C                                                                        00030300
C                                                                        00030310
C  NAVIGATION EQUATION DATA                                              00030320
C                                                                        00030330
C                                                                        00030340
      DATA NAVCOM/125*0.E0,1.E0,23*0.E0/                                 00030350
      DATA IGAINP/1,1,1/                                                 00030360
      DATA GAINS/1.0E0,0.0E0,0.0E0,      .999997E0,32.0572?E0,1.657520E0,00030370
     1  .999997E0,47.852980E0,1010.2152E0,    .956990E0,34.291964E0,    00030380
     2  525.95033E0,    .795909E0,16.51126E0,137.15806E0,                00030390
     3  .673359E0,9.733766E0,57.  .44335E0,    .543539E0,5.407999E0,     00030400
     3  21.417501E0,    .465173E0,3.60900850,                           00030410
     4  10.938422E0,    .3778625E0,2.1?13846?,4.5?6174E0,               00030420
     5  .332072E0,1.540656E0,2.614120E0 /                               00030430
C                                                                        00030440
C                                                                        00030450
C  OUTPUT DATA                                                           00030460
C                                                                        00030470
C                                                                        00030480
      DATA ITITLE/20*4H    /                                           00030490
      DATA OUTDAT/25*0.0E0/                                            00030500
      DATA IPAGE /1        /,IPLIM  /47      /,IPRINT  /5/             00030510
C                                                                        00030520
C                                                                        00030530
C  GRAVITY MODEL DATA                                                    00030540
C                                                                        00030550
C                                                                        00030560
      DATA GLHSC  /1.63E-8      /,GRGMT    /32.0877057E0  /            00030570
     1   ,GPS2    /0.1693908?E0 /,GPS4     /7.52810E-4    /            00030580
     2   ,GPH     /9.6227E-8    /,GRH2     /6.8512E-15    /            00030590
     3   ,GPHS2   /?.4189E-10   /
```

```
      C                                                                 003600
      C                                                                 003610
      C  UNIVERSAL CONSTANTS                                            003620
      C                                                                 003630
      C                                                                 003640
      DATA PI    /3.141592653589 /,HPI     /1.570796326794 /           003650
     1     ,PR0   /2.002564067  /,PRD     /4.778826358E-9/             003660
     2     ,EE    /3.352779454E-3/,ESQ     /6.694317774E-3/            003670
     3     ,EERRO /1.6022350BE-10/,WERT    /7.292115147E-5/            003680
     4     ,RADPER/1.745329251994E-2/,PESQ /2.0785557126E7 /           003690
      C                                                                 003700
      C                                                                 003710
      C  TRAJECTORY INPUT DATA                                          003720
      C                                                                 003730
      C                                                                 003740
      DATA PRDAT/21*0.0/                                                003750
      C                                                                 003760
      C  DEFAULT PRECISION VALUES                                       003770
      DATA SQRPTH,ATNPTH,COSPTH,SINPTH/4*4/,ROUND,EXPOL,FRACTL/1,0,4*/  003780
      END                                                               003790
```

SYMBOLIC REFERENCE MAP (R=1)

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALFDT	REAL		TRAJTN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
100	APESID	REAL	ARRAY	IMUDAT	0	ATNPTH	INTEGER		ATNPTH
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALF9T	REAL		TRAJTN	32	CLATDT	REAL		TRAJTN
0	COSPTH	INTEGER		COSPTH	11	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	55	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C9P90	REAL	ARRAY	NAV
54	DALF	REAL		OUTPUT	0	DATIMU	REAL	ARRAY	IMUDAT
153	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJTN
47	DETA	REAL	ARRAY	OUTPUT	43	DH	REAL		OUTPUT
52	DLAT	REAL		OUTPUT	53	DLONG	REAL		OUTPUT
66	DPSMAX	REAL		INPUTS	64	DV	REAL	ARRAY	OUTPUT
210	DV592P	REAL	ARRAY	NAV	3	DV3P	REAL	ARRAY	IMUDAT
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNVRSL
6	EERRO	REAL		UNVRSL	5	ESQ	REAL		UNVRSL
101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
5	ETA9T	REAL	ARRAY	TRAJTN	1	EXPOL	INTEGER		PRCCTS
112	FILATT	REAL	ARRAY	NAV	0	FRACTL	INTEGER		PRCCTS
225	GAINS	REAL	ARRAY	NAV	0	GL45D	REAL		PGRAV
1	GNCNT	REAL		PGRAV	4	GP4	REAL		PGRAV
6	GPHS2	REAL		PGRAV	5	GPH2	REAL		PGRAV
2	GR02	REAL		PGRAV	3	GR34	REAL		PGRAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV

VARIABLES	SN	TYPE		RELOCATION
4	HP	REAL		TRAJIN
15	HSOINC	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV
10	ICMCYP	INTEGER		CONTRL
263	IGAINP	INTEGER	ARRAY	NAV
22	INCOR	INTEGER		INPUTS
61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS
57	IPPINT	INTEGER		OUTPUT
0	ITITLE	INTEGER	ARRAY	OUTPUT
67	ITRFIL	INTEGER		INPUTS
105	LAT	REAL		NAV
106	LONG	REAL		NAV
2	LONGDT	REAL		TRAJIN
31	OALF	REAL		OUTPUT
213	ODX	REAL		NAV
215	OD7	REAL		NAV
32	OETADT	REAL	ARRAY	OUTPUT
176	OHB	REAL		NAV
24	OLATDT	REAL		OUTPUT
25	OLONDT	REAL		OUTPUT
24	OUTDAT	REAL	ARRAY	OUTPUT
0	OT	REAL		UNVRSL
2	PLTIME	REAL		CONTRL
6	PONT	REAL		INPUTS
216	Q2005	REAL	ARRAY	NAV
0	RESID	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV
1	RRD	REAL		UNVRSL
1	RSTIME	REAL		CONTRL
2	RU	REAL		UNVRSL
23	SALFDT	REAL		TRAJIN
15	SF9TP	REAL	ARRAY	IMUDAT
21	SLATDT	REAL		TRAJIN
62	SSX0	REAL		INPUTS
64	SSZ0	REAL		INPUTS
4	STOP	REAL		INPUTS
67	TPTCOR	REAL	ARRAY	NAV
66	THJTPO	REAL	ARRAY	NAV
17	TIMED	REAL		TRAJIN
4	TPPFV	REAL		CONTRL
42	TPESID	REAL	ARRAY	IMUDAT
2	VQUANT	REAL		INPUTS
107	V92	REAL	ARRAY	NAV
40	V92T	REAL	ARRAY	OUTPUT
12	WT	REAL	ARRAY	IMUDAT
125	XCALF	REAL		NAV
124	XSALF	REAL		NAV
147	XV92P	REAL	ARRAY	NAV
1	HPT	REAL		UNVRSL
14	HSOTIM	REAL		INPUTS
7	ICMCYL	INTEGER		CONTRL
22	IERLIM	INTEGER		INPUTS
21	IMUTYP	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL
55	IPAGE	INTEGER		OUTPUT
56	IPLIN	INTEGER		OUTPUT
6	ISTOP	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS
1	LATDT	REAL		TRAJIN
20	LONGD	REAL		TRAJIN
0	NAVCOM	REAL	ARRAY	NAV
26	OALFDT	REAL		OUTPUT
214	ODY	REAL		NAV
36	OETA	REAL	ARRAY	OUTPUT
222	OFILT2	REAL	ARRAY	NAV
27	OLAT	REAL		OUTPUT
33	OLONG	REAL		OUTPUT
0	OTIME	REAL		CONTRL
142	OV92P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS
0	PRDAT	REAL	ARRAY	TRAJIN
1	PTIME	REAL		CONTRL
10	RADDER	REAL		UNVRSL
11	RESD	REAL		UNVRSL
0	SOUND	INTEGER		VPPTH
65	RSMAX	REAL		INPUTS
7	RSTRT	REAL		INPUTS
76	SALF	REAL		NAV
13	SFDT	REAL	ARRAY	TRAJIN
0	STHPTH	INTEGER		STHPTH
0	SXRPTH	INTEGER		SXRPTH
63	SSY0	REAL		INPUTS
3	START	REAL		INPUTS
145	S2PHI	REAL		NAV
55	THTEDT	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN
13	TOLJRK	REAL		INPUTS
1	TQUANT	REAL		INPUTS
104	VDMD	REAL		NAV
10	VDT	REAL	ARRAY	TRAJIN
11	V92P	REAL	ARRAY	NAV
7	WEDT	REAL		UNVRSL
66	WXV	REAL	ARRAY	NAV
152	XH	REAL		NAV
146	XS2PHI	REAL		NAV
126	XOP92P	REAL	ARRAY	NAV

COMMON BLOCKS	LENGTH
CONTRL	9
IMUDAT	67
INPUTS	56
NAV	182
OUTPUT	48
PGRAV	7

COMMON BLOCKS	LENGTH
TRAJIN	21
UNVPSL	10
SQPPTH	1
SINPTH	1
COSPTH	1
ATNPTH	1
PRECIS	2
VPPTH	1

STATISTICS

PROGRAM LENGTH	03	0
CM LABELED COMMON LENGTH	6270	407

```
      SUBROUTINE INREC                                                  003800
C                                                                       003810
C     INREC -- TRAJECTORY INPUT ROUTINE                                 003820
C                                                                       003830
      IMPLICIT REAL(A-H),REAL(L-Z)                                      003840
      COMMON /CONTRL/ DTIME,      PTIME,      PLTIME,     RSTIME,       003850
     1      IOPEV,      INIT,       ISTOP,      ICMCYL,     ICMCYP      003860
      COMMON /INPUTS/ AQUANT,     TQUANT,     VQUANT,     STAPT,        003870
     1      STOP,       PLOTIM,     PONT,       QSTRT,      CVQ1,       003880
     2      CVQ2,       CVQ3,       IOLJCK,     HSOTIM,     HSCINC,     003890
     2      ITPMAV,     ITRATT,     INCOR,      INUTYP,     IERLIM,     003900
     3      IPC(30),    IOPNLP,     SSX0,       SSY0,       SSZ0,       003910
     4      RSMAX,      QRSMAX,     ITRFIL                              003920
      COMMON /NAV/    COP92P(3,3),V92P(3),    QV92P(3),   PH0(3),       003930
     1      C0PH0(3,3), A(3,3),     B(3,3),     THTEQT(3),  THTIQ0(3),  003940
     2      IHICQ2(3),  HXV(3),     G92P(3),    H,          ALPHA,      003950
     3      SALF,       CALF,       QCLT,       ETA(3),     VOME,       003960
     4      LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,      003970
     5      XSALF,      YCALF,      XQP92P(3,3),HV92P(3),   QV92P(3),   003980
     6      S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,       003990
     7      C0910(3,3), C0P90(3,3), OH0,        C095(3,3),  QV592P(3),  004000
     8      QQX,        QQY,        QQZ,        Q2895(4),   QFILIR(3),  004010
     9      GAINS(3,10),TGAINP(3)                                       004020
      COMMON /TRAJIN/ TIME,       LAT9T,      LONG9T,     ALF9T,        004030
     1      H9,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,      004040
     2      TIME0,      LONG0,      SLAT9T,     CLAT9T,     SALF9T,     004050
     3      CALF9T                                                      004060
C                                                                       004070
      DIMENSION PRDAT(14),PPD(14)                                       004080
      EQUIVALENCE (PRD,TIM)                                             004090
      EQUIVALENCE (PPDAT,TIME)                                          004100
C                                                                       004110
C                                                                       004120
      IF (INIT .NE. 0) GO TO 201                                        004130
C                                                                       004140
C           INITIALIZATION PATH                                         004150
C                                                                       004160
    4 READ(20) (PRDAT(I),I=1,14)                                        004170
      IF (EOF(20) .NE. 0) GO TO 300                                     004180
      IF (TIME .LT. START) GO TO 4                                      004190
C                                                                       004200
C           READ SECOND RECORD TO GET TRAJECTORY SAMPLE PERIOD          004210
C                                                                       004220
      READ(20) (PRD(I),I=1,14)                                          004230
      IF (EOF(20) .NE. 0) GO TO 300                                     004240
      DELTS = TIM - TIME +1.E-9                                         004250
      TIMP1=1./DELTS                                                    004260
      DELIS=1./TIMP1                                                    004270
C                                                                       004280
C           ENSURE ATTITUDE CYCLE PERIOD IS MULTIPLE OF TRAJECTORY      004290
C            SAMPLE PERIOD                                              004300
C                                                                       004310
      IF (ITPATT .LE. 0) GO TO 60                                       004320
      DELTA = 1./ITPATT                                                 004330
      ITPATT = DELTA/DELTS                                              004340
      IF (ITPATT .LT. 1) GO TO 50                                       004350
      IF (ITPATT*DELTS .EQ. DELTA) GO TO 70                             004360
```

```
                50  WRITE(6,55) DELTA,DELTS                                          004370
                55 FORMAT (/2X,"***** TIMING ERROR:  DESIRED ATUD PERIOD IS ",G16.10,004380
     60         1       " SEC:  TRAJECTORY SAMPLE PERIOD IS ",G16.10/,9X,            004390
                2       "MUST BE EVEN MULTIPLES       ERROR LEVEL 5"/)               004400
                ISTOP = 5                                                           004410
                60 DELTA = DELTS                                                    004420
                ITRATT = 1                                                          004430
     65         C                                                                   004440
                C          ENSURE NAVIGATION CYCLE PERIOD IS MULTIPLE OF ATTITUDE   004450
                C          CYCLE PERIOD                                             004460
                C                                                                   004470
                70 IF (ITRNAV .LE. 0) GO TO 30                                      004480
     70         DELT = 1./ITRNAV                                                    004490
                IITRNAV = DELT/DELTA                                                004500
                IF (ITRNAV .LT. 1) GO TO 20                                         004510
                IF (ITRNAV*DELTA .EQ. DELT) GO TO 40                                004520
                20 WRITE(6,25) DELT,DELTA                                           004530
     75         25 FORMAT (/2X,"***** TIMING ERROR:  DESIRED NAV PERIOD IS ",G16.10, 004540
                1       " SEC:  DESIRED ATTITUDE PERIOD IS ",G16.10/,9X,            004550
                2       "MUST BE EVEN MULTIPLES       ERROR LEVEL 5"/)              004560
                ISTOP = 5                                                           004570
                30 DELT = DELTA                                                     004580
     80         ITRNAV = 1                                                          004590
                40 ITMP1 = 1./DELTS                                                 004600
                ITMP2 = 1./DELTA                                                    004610
                ITMP3 = 1./DELT                                                     004620
                ITMP4 = ITRNAV*ITRATT                                               004630
     85         IF (IPG(25) .EQ. 0) GO TO 430                                       004640
                IF (ITRFIL .LE. 0) GO TO 400                                        004650
                TEMP=1./ITRFIL                                                      004660
                ITRFIL=TEMP/DELTA                                                   004670
                IF (ITRFIL .LT. 1) GO TO 420                                        004680
     90         IF (ITRFIL*DELTA .EQ. TEMP .AND. MOD(ITRNAV,ITRFIL) .EQ. 0)         004690
                1   GO TO 430                                                       004700
                420 WRITE(6,421)                                                    004710
                421 FORMAT (/2X,"***** TIMING ERROR: EITHER ITRFIL IS NOT AN "      004720
                1 ,"INTEGRAL NUMBER OF ATTITUDE CYCLES, OR",/25X,"ITRNAV ",         004730
     95         2 "IS NOT AN INTEGRAL MULTIPLE OF ITRATT    ERROR LEVEL 5"//)       004740
                ISTOP=5                                                             004750
                400 TEMP=DELTA                                                      004760
                ITRFIL=1                                                            004770
                430 CONTINUE                                                        004780
    100         WRITE(6,110) ITMP1,DELTS                                            004790
                WRITE(6,115) ITMP2,DELTA,ITRATT                                     004800
                WRITE(6,120) ITMP3,DELT,ITMP4,ITRNAV                                004810
                IF (IPG(25) .EQ. 0) GO TO 250                                       004820
                ITMP5=1./TEMP                                                       004830
    105         WRITE(6,567) ITMP5,TEMP                                             004840
                567 FORMAT("   FILTER CYCLE RATE",7X,I3," CPS  FILTER PERIOD"       004850
                1 ,6X,F11.8," SEC")                                                 004860
                GO TO 250                                                           004870
                110 FORMAT (2X,"TIMING PARAMETERS"/,3X,"TRAJECTORY SAMPLE RATE  ",  004880
    110         1       I3," CPS  TRAJECTORY PERIOD  ",F11.8," SEC")                004890
                115 FORMAT (3X,"ATTITUDE CYCLE RATE     ",I3," CPS  ",              004900
                1       "ATTITUDE PERIOD    ",F11.8," SEC  TRAJ SAMP/ATT CYCLE ",   004910
                2       I3)                                                         004920
                120 FORMAT (3X,"NAV CYCLE RATE",10X,I3," CPS  NAV PERIOD",9X,F11.8,  004930
```

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                1       " SEC  TRAJ SAMP/NAV CYCLE ",I3," ATT CYCLE/",          004940
               2       "NAV CYCLE ",I3).                                        004950
      C                                                                         004960
      C                                                                         004970
      C     NORMAL PATH                                                       004980
      C                                                                         004990
  200 CONTINUE                                                                  005000
      IF (INIT .NE. 1) GO TO 245                                                005010
      DO 240 I=1,14                                                             005020
  240 PROAT(I) = PRO(I)                                                         005030
      INIT = 2                                                                  005040
      GO TO 250                                                                 005050
  245 READ(20) (PROAT(I),I=1,14)                                                005060
      IF (EOF(20) .NE. 0) GO TO 300                                             005070
  250 SLAT9T= SIN(LAT9T)                                                        005080
      CLAT9T = COS(LAT9T)                                                       005090
      SALF9T= SIN(ALF9T)                                                        005100
      CALF9T= COS(ALF9T)                                                        005110
      RETURN                                                                    005120
      C                                                                         005130
      C     TAPE ERROR HANDLING                                               005140
      C                                                                         005150
  300 TSTOP = 10                                                                005160
      WRITE (6,301)                                                             005170
  301 FORMAT (/2X,"****** INPUT TAPE READ ERROR?  ERROR LEVEL 10"/)             005180
      RETURN                                                                    005190
      END                                                                       005200
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 INPEC

VARIABLES SN TYPE RELOCATION

33	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALF9T	REAL		TRAJIN	22	CLAT9T	REAL		TRAJIN
10	CVD1	REAL		INPUTS	11	CVD2	REAL		INPUTS
12	CVD3	REAL		INPUTS	165	C0P90	REAL	ARRAY	NAV
0	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C995	REAL	ARRAY	NAV	22	C9240	REAL	ARRAY	NAV
153	DELH	REAL		NAV	180	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DRSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	101	ETA	REAL	ARRAY	NAV
5	ETA9T	REAL	ARRAY	TRAJIN	112	ETLATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G02P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	H2	REAL		TRAJIN
15	HSDINC	REAL		INPUTS	14	HSDTTM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	446	I	INTEGER		
7	ICNCVL	INTEGER		CONTRL	19	ICNCV2	INTEGER		CONTRL
22	IJPLIN	INTEGER		INPUTS	261	IGAIND	INTEGER	ARRAY	NAV

VARIABLES SN TYPE RELOCATION

21	IMUTYP	INTEGER		INPUTS	29	INCOR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IORNLR	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOR	INTEGER		CONTRL
447	ITMP1	INTEGER			450	ITMP2	INTEGER		
451	ITMP3	INTEGER			452	ITMP4	INTEGER		
454	ITMP5	INTEGER			17	ITRAIT	INTEGER		INPUTS
67	ITPFIL	INTEGER		INPUTS	16	ITRNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LATOT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGO	REAL		TRAJIN
2	LONGOT	REAL		TRAJIN	213	OOX	REAL		NAV
214	OOY	REAL		NAV	215	OOZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OPT	REAL		NAV
0	OTIME	REAL		CONTRL	142	OV92P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
455	PRO	REAL	ARRAY		3	PSDAT	REAL	ARRAY	TRAJIN
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	17	RHO	REAL	ARRAY	NAV
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
7	RSTOT	REAL		INPUTS	76	SALF	REAL		NAV
23	SALFOT	REAL		TRAJIN	13	SFOT	REAL	ARRAY	TRAJIN
21	SLATOT	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	453	TEMP	REAL		
53	THTCOF	REAL	ARRAY	NAV	55	THTERT	REAL	ARRAY	NAV
60	THTTRO	REAL	ARRAY	NAV	456	TTH	REAL		
0	TIME	REAL		TRAJIN	17	TIMEO	REAL		TRAJIN
17	TOLJRK	REAL		INPUTS	4	TOSEV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	104	VOMP	REAL		NAV
2	VQUANT	REAL		INPUTS	10	VOT	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XOP92P	REAL	ARRAY	NAV					

FILE NAMES MODE

TAPE20 UNFMT TAPE6 FMT

EXTERNALS TYPE ARGS

COS	REAL	1	LIBRARY	FOF	REAL	1	
SIN	REAL	1	LIBRARY				

INLINE FUNCTIONS TYPE ARGS

MOD INTEGER 2 INTRIN

STATEMENT LABELS

3	4		64	20		252	25		FMT
67	30		72	40		42	50		
224	55	FMT	45	60		50	70		
257	110	FMT	373	115	FMT	407	120		FMT
146	200		0	240		157	245		
164	250		175	300		414	301		FMT
127	400		124	420		276	421		FMT
132	436		347	567	FMT				

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
151	240	I	123 124	40	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
INPUTS	56
NAV	182
TRAJIN	21

STATISTICS

PROGRAM LENGTH	4730	315
CM LABELED COMMON LENGTH	4148	269

```
      SUBROUTINE OUTUNI                                                 005210
C                                                                       005220
C     CONVERTS TRAJECTORY AND SIMULATOR DATA FROM INTERNAL UNITS        005230
C     TO EXTERNAL UNITS (DEGREES, FEET, SECONDS).                       005240
C                                                                       005250
      IMPLICIT REAL(A-H,L-Z)                                            005260
      COMMON /NAV/     C0P92P(3,3),V92P(3),     DV92P(3),    PHD(3),    005270
     1    C9RHO(3,3),  A(3,3),     B(3,3),     THTE9T(3),   THTTE0(3),  005280
     2    THTC0P(3),   HXV(3),     G92P(3),    H,           ALPHA,      005290
     3    SALF,        CALF,       DELT,       ETA(3),      VDHF,       005300
     4    LAT,         LONG,       V92(3),     DELATT(3,3),DELTA,      005310
     5    XSALF,       XCALF,      X0P92P(3,3),HV92P(3),    DV92P(3),   005320
     6    S2PHI,       XS2PHI,     XV92P(3),   XH,          DELH,       005330
     7    C0910(3,3),  C0P90(3,3), DHJ,        C005(3,3),   DV92P2P(3), 005340
     8    D0X ,        D0Y ,       D0Z ,       D2P95(4),    DELTP(3),   005350
     9    GAINS(3,10),IGAIND(3)                                          005360
      COMMON /OUTPUT/  TITLE(20),  OLAT9T,     OLON9T,     OALF9T,     005370
     1    OLAT,        OLONG,      OALF,       DETA9T(3),   DETA(3),    005380
     2    V92T(3),     DH,         DV(3),      DETA(3),     OLAT,       005390
     3    OLONG,       OALF,                                            005400
     4    IPAGE,       IPLIN,      IP2INT                               005410
      COMMON /UNV2SL/  PI,         HPI,        P0,          REP,        005420
     1    EF,          ESQ,        EE2M6,      WE9T,        RADPER,     005430
     2    PESQ                                                          005440
      COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,      ALF9T,      005450
     1    HR,          ETA9T(3),   V9T(3),     SF9T(3),     DELTS,      005460
     2    TIMER,       LONG0,      SLAT9T,     CLAT9T,      SALF9T,     005470
     3    CALF9T                                                        005480
C                                                                       005490
C     CONVERT ANGLES TO DEGREES                                         005500
C                                                                       005510
      OLAT9T = LAT9T/RADPER                                             005520
      OLON9T = LONG9T/RADPER                                            005530
      OALF9T = -ALF9T/RADPER                                            005540
      OLAT = LAT/RADPER                                                 005550
      OLONG = LONG/RADPER                                               005560
      OALF = ALPHA/RADPER                                               005570
      ETA9T(3) = ETA9T(3) - ALF9T                                       005580
      DO 10 I=1,3                                                       005590
      DETA9T(I) = ETA9T(I)/RADPER                                       005600
      DETA(I) = ETA(I)/RADPER                                           005610
   10 CONTINUE                                                          005620
C                                                                       005630
C     FIND DIFFERENCES BETWEEN TRAJECTORY AND SIMULATOR                 005640
C                                                                       005650
      V92T(1) = V9T(3)                                                  005660
      V92T(2) = -SALF9T*V9T(1) - CALF9T*V9T(2)                          005670
      V92T(3) = CALF9T*V9T(1) - SALF9T*V9T(2)                           005680
      DH = HR - H                                                       005690
      OLAT = OLAT9T - OLAT                                              005700
      OLONG = OLON9T - OLONG                                            005710
      OALF = OALF9T - OALF                                              005720
      DO 50 I=1,3                                                       005730
      DV(I) = V92T(I) - V92(I)                                          005740
      DETA(I) = DETA9T(I) - DETA(I)                                     005750
   50 CONTINUE                                                          005760
      RETURN                                                            005770
```

END 005700

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 OUTUNI

VARIABLES SN TYPE RELOCATION

33	A	REAL	ARRAY	NAV	3	ALFSQ	REAL		TRAJIN
75	ALPHA	REAL		NAV	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFSQ	REAL		TRAJIN
22	CLATSQ	REAL		TRAJIN	155	COSSQ	REAL	ARRAY	NAV
0	COSSQP	REAL	ARRAY	NAV	154	COSTH	REAL	ARRAY	NAV
177	COS	REAL	ARRAY	NAV	22	CSRHC	REAL	ARRAY	NAV
54	DALF	REAL		OUTPUT	153	DELH	REAL		NAV
100	DELT	REAL		NAV	123	DELTA	REAL		NAV
16	DELTS	REAL		TRAJIN	47	DETA	REAL	ARRAY	OUTPUT
43	DH	REAL		OUTPUT	52	DLAT	REAL		OUTPUT
57	DLONG	REAL		OUTPUT	44	DV	REAL	ARRAY	OUTPUT
210	DV52P	REAL	ARRAY	NAV	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNVRSL	6	ERRSP	REAL		UNVRSL
5	ESQ	REAL		UNVRSL	101	ETA	REAL	ARRAY	NAV
5	ETASQ	REAL	ARRAY	TRAJIN	112	FILATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	GRAD	REAL	ARRAY	NAV
74	H	REAL		NAV	4	H	REAL		TRAJIN
1	HPI	REAL		UNVRSL	137	HV92P	REAL	ARRAY	NAV
63	I	INTEGER			263	IGAINP	INTEGER	ARRAY	NAV
56	IPAGE	INTEGER		OUTPUT	56	IPLIM	INTEGER		OUTPUT
57	IPPINT	INTEGER		OUTPUT	0	ITITLE	INTEGER	ARRAY	OUTPUT
105	LAT	REAL		NAV	1	LATSQ	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGS	REAL		TRAJIN
2	LONGSQ	REAL		TRAJIN	31	OALF	REAL		OUTPUT
26	OALFSQ	REAL		OUTPUT	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
35	OETA	REAL	ARRAY	OUTPUT	32	OETASQ	REAL	ARRAY	OUTPUT
222	OFILTP	REAL	ARRAY	NAV	176	OHD	REAL		NAV
27	OLAT	REAL		OUTPUT	24	OLATSQ	REAL		OUTPUT
30	OLONG	REAL		OUTPUT	29	OLONSQ	REAL		OUTPUT
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVRSL
216	OZP95	REAL	ARRAY	NAV	19	RADDER	REAL		UNVRSL
11	RESD	REAL		UNVRSL	17	RHO	REAL	ARRAY	NAV
3	RRC	REAL		UNVRSL	2	RR	REAL		UNVRSL
75	SALF	REAL		NAV	23	SALFSQ	REAL		TRAJIN
13	SF9F	REAL	ARRAY	TRAJIN	21	SLATSQ	REAL		TRAJIN
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	60	THTTOT	REAL	ARRAY	NAV
3	TIME	REAL		TRAJIN	17	TIMES	REAL		TRAJIN
104	VCMP	REAL		NAV	10	VGT	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
40	V92T	REAL	ARRAY	OUTPUT	7	VFGT	REAL		UNVRSL
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XCALF	REAL		NAV
146	XC2P4I	REAL		NAV	147	XV92P	REAL	ARRAY	NAV

VARIABLES SN TYPE RELOCATION
126 XDP92P REAL ARRAY NAV

STATEMENT LABELS
0 10 0 50

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
21	10	I	39 42	108	OPT
53	50	I	53 56	108	OPT

COMMON BLOCKS	LENGTH
NAV	182
OUTPUT	48
UNVPSL	10
TRAJIN	21

STATISTICS
PROGRAM LENGTH 643 52
CM LABELED COMMON LENGTH 4059 261

22

```
      SUBROUTINE PRINT2                                                 005790
C                                                                       005800
C     PRINTER OUTPUT SUBROUTINE                                         005810
C                                                                       005820
      IMPLICIT REAL(A-H,L-Z)                                            005830
      COMMON /CONTRL/ DTIME,     PTIME,     PLTIME,    PSTIME,         005840
     1     TPREV,     INIT,      ISTOP,     ICMCYL,    ICMCYP          005850
      COMMON /NAV/    CBP92P(3,3),V92P(3),  DV92P(3),  PHD(3),         005860
     1     CBRHO(3,3), A(3,3),    B(3,3),    THTERT(3), THTPD(3),      005870
     2     THICOR(3),  WXV(3),    C92P(3),   H,         ALPHA,          005880
     3     SALF,       CALF,      DELT,      ETA(3),    VOMF,           005890
     4     LAT,        LONG,      V92(3),    ETLATT(3,3),DELTA,         005900
     5     XSALF,      XCALF,     XBP92P(3,3),HV92P(3),  DV92P(3),      005910
     6     S2PHI,      XS2PHI,    XV92P(3),  XH,        DELH,           005920
     7     C0910(3,3), CBP90(3,3), DHD,      C005(3,3), DV592P(3),      005930
     8     DDX,        DDY,       DDZ,       D2P95(4),  DELTIF(3),      005940
     9     GAINS(3,10),IGAINP(3)                                        005950
      COMMON /OUTPUT/ ITITLE(20), OLAT9T,    OLONGT,    OALF9T,         005960
     1     OLAT,       OLONG,     OALF,      DETA9T(3), DETA(3),        005970
     2     V92T(3),    DH,        DV(3),     DETA(3),   DLAT,           005980
     3     DLONG,      DALF,                                            005990
     4     IPAGE,      IPLIM,     IPRINT                                006000
      COMMON /TRAJIN/ TIME,      LAT9T,     LONG9T,    ALF9T,          006010
     1     HD,         ETA9T(3),  V9T(3),    SF9T(3),   DELTS,          006020
     2     TIMED,      LONGD,     SLAT9T,    CLAT9T,    SALF9T,         006030
     3     CALF9T                                                       006040
      COMMON /INPUTS/ AQUANT,    TQUANT,    VQUANT,    STAPT,          006050
     1     STOP,       PLOTIM,    PRNT,      PSTRT,     CVJ1,           006060
     2     CVD2,       CVD3,      TOLJPK,    HSOTIM,    HSCINC,         006070
     2     ITRMAV,     ITRATT,    INCOP,     IMUTYP,    IFRLIM,         006080
     3     IPC(30),    IOPNLP,    SSXD,      SSYD,      SSZD,           006090
     4     DRSMAX,     DRSMAX,    ITRFIL                                006100
      COMMON /UKVRSL/ PI,        HPI,       RD,        RRD,            006110
     1     EE,         ESQ,       EEP2D,     HERT,      RADPER,         006120
     2     PESQ                                                         006130
C                                                                       006140
      IF (INIT .NE. 0) GO TO 1900                                       006150
      IPRINT = 100                                                      006160
C                                                                       006170
C     PERIODIC PRINTOUT                                                 006180
C                                                                       006190
 1900 CONTINUE                                                          006200
      IF (IPRINT .LT. IPLIM) GO TO 1910                                 006210
      WRITE(6,9100) (ITITLE(I),I=1,20),IPAGE                            006220
      IPRINT = 5                                                        006230
      IPAGE = IPAGE + 1                                                 006240
 1910 WRITE(6,9105) TIME                                                006250
      WRITE(6,9110) DLAT9T,DLAT,DLAT                                    006260
      WRITE(6,9115) DLONG9T,DLONG,DLONG                                 006270
      WRITE(6,9120) DALF9T,DALF,DALF                                    006280
      WRITE(6,9125) HD,H,DH                                             006290
      WRITE(6,9130) V92T(1),V92(1),DV(1)                                006300
      WRITE(6,9135) V92T(2),V92(2),DV(2)                                006310
      WRITE(6,9140) V92T(3),V92(3),DV(3)                                006320
      WRITE(6,9145) DETA9T(1),DETA(1),DETA(1)                           006330
      WRITE(6,9150) DETA9T(2),DETA(2),DETA(2)                           006340
      WRITE(6,9155) DETA9T(3),DETA(3),DETA(3)                           006350
```

```
                      IPRINT = IPRINT + 12                                          006360
                      IF (IPC(25) .EQ. 0) GO TO 2000                                006370
     60               DO 1950 I=1,3                                                 006380
                      DO 1950 J=1,3                                                 006390
                 1950 A(I,J)=FILATT(I,J)/RADPER                                     006400
                      WRITE(6,9160) ((A(I,J),I=1,3),TGAIN*(J),J=1,3)                006410
                      IPRINT=IPRINT+5                                               006420
     65          9100 FORMAT ("1",2X,"IDEAL INS SIMULATOR",10X,20A4,1X,"PAGE ",I3//,14X,006430
                     1      "TRAJECTORY",12X,"SIMULATOR",12X,"DIFFERENCE"/)        006440
                 9105 FORMAT (2X,"TIME          ",G19.12)                          006450
                 9110 FORMAT (2X,"LATITTUDE  ",3(G18.12,3X))                       006460
                 9115 FORMAT (2X,"LONGITUDE  ",3(G18.12,3X))                       006470
     70          9120 FORMAT (2X,"ALPHA      ",3(G18.12,3X))                       006480
                 9125 FORMAT (2X,"ALTITUDE   ",3(G18.12,3X))                       006490
                 9130 FORMAT (2X,"VX (UP)    ",3(G18.12,3X))                       006500
                 9135 FORMAT (2X,"VY (EAST)  ",3(G18.12,3X))                       006510
                 9140 FORMAT (2X,"VZ (NORTH) ",3(G18.12,3X))                       006520
     75          9145 FORMAT (2X,"ROLL       ",3(G18.12,3X))                       006530
                 9150 FORMAT (2X,"PITCH      ",3(G18.12,3X))                       006540
                 9155 FORMAT (2X,"YAW        ",3(G18.12,3X))//)                    006550
                 9160 FORMAT(2X,"FLTRD ATTUD",8X,"ANGLE",16X,"RATE",17X,           006560
                     1  "ACCEL",7X,"PTP"/2X,"ROLL       ",3(G18.12,3X),I3/       006570
     80              2  2X,"PITCH      ",3(G18.12,3X),I3                          006580
                     3  /2X,"YAW        ",3(G18.12,3X),I3 / )                     006590
                 2000 RETURN                                                       006600
                      END                                                          006610
```

T=25 3/

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 PRINTP

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALFGT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	ADUANT	REAL		INPUTS
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALFGT	REAL		TRAJIN	22	CLATGT	REAL		TRAJIN
10	CV01	REAL		INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL		INPUTS	165	C0P92	REAL	ARRAY	NAV
0	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C095	REAL	ARRAY	NAV	22	C0RH0	REAL	ARRAY	NAV
54	DALF	REAL		OUTPUT	153	DELH	REAL		NAV
109	DFLT	REAL		NAV	123	DELTA	REAL		NAV
16	DELTS	REAL		TRAJIN	47	DETA	REAL	ARRAY	OUTPUT
43	DH	REAL		OUTPUT	52	DLAT	REAL		OUTPUT
53	DLONG	REAL		OUTPUT	66	DPSMAX	REAL		INPUTS
44	DV	REAL	ARRAY	OUTPUT	210	DV092P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNVRSL
6	EERR0	REAL		UNVRSL	5	ESQ	REAL		UNVRSL
101	ETA	REAL	ARRAY	NAV	5	ETAGT	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HH	REAL		TRAJIN	1	HPT	REAL		UNVRSL

VARIABLES SN TYPE RELOCATION

15	HSOTHC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	345	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
22	IFRLIM	INTEGER		INPUTS	253	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	IUCOR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPHLP	INTEGER		INPUTS
55	IPAGE	INTEGER		OUTPUT	23	IPC	INTEGER	ARRAY	INPUTS
56	IPLIM	INTEGER		OUTPUT	57	IPRINT	INTEGER		OUTPUT
6	ISTOP	INTEGER		CONTRL	0	ITITLE	INTEGER	ARRAY	OUTPUT
17	ITRAJT	INTEGER		INPUTS	57	ITREFL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	346	J	INTEGER		
105	LAT	REAL		NAV	1	LATGT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGD	REAL		TRAJIN
2	LONGGT	REAL		TRAJIN	31	OALF	REAL		OUTPUT
25	OALFGT	REAL		OUTPUT	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
35	OETA	REAL	ARRAY	OUTPUT	32	OETAGT	REAL	ARRAY	OUTPUT
222	OFILTR	REAL	ARRAY	NAV	176	OHB	REAL		NAV
27	OLAT	REAL		OUTPUT	24	OLATGT	REAL		OUTPUT
30	OLONG	REAL		OUTPUT	25	OLONGT	REAL		OUTPUT
0	OTIME	REAL		CONTRL	142	OV02P	REAL	ARRAY	NAV
0	PI	REAL		UNVRSL	5	PLOTIN	REAL		INPUTS
2	PLTIME	REAL		CONTRL	6	PRNT	REAL		INPUTS
1	PTIME	REAL		CONTRL	216	Q2PP5	REAL	ARRAY	NAV
10	RADPER	REAL		UNVRSL	11	RESO	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	RPQ	REAL		UNVRSL
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
2	RSTPT	REAL		INPUTS	2	RX	REAL		UNVRSL
76	SALF	REAL		NAV	23	SALFGT	REAL		TRAJIN
13	SFGT	REAL	ARRAY	TRAJIN	21	SLATGT	REAL		TRAJIN
62	SSX0	REAL		INPUTS	63	SSY0	REAL		INPUTS
64	SSZ0	REAL		INPUTS	3	START	REAL		INPUTS
4	STOP	REAL		INPUTS	145	S2PHI	REAL		NAV
67	THTCOR	REAL	ARRAY	NAV	55	THTERT	REAL	ARRAY	NAV
60	THTTRO	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
12	TIMEO	REAL		TRAJIN	13	TOLJPK	REAL		INPUTS
4	TPOFV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
104	VOHP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	40	V92T	REAL	ARRAY	OUTPUT
7	WEPT	REAL		UNVRSL	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XV092P	REAL	ARRAY	NAV

FILE NAMES MODE

TAPE6 FMT

STATEMENT LABELS

4	1900		13	1910		0	1950		
104	2000		222	9100	FMT	236	9105	FMT	
242	9110	FMT	247	9115	FMT	254	9120	FMT	
261	9125	FMT	266	9130	FMT	273	9135	FMT	
301	9140	FMT	305	9145	FMT	312	9150	FMT	
317	9155	FMT	324	9160	FMT				

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
45	1950	*	I	60 62	120	NOT INNER
46	1950		J	61 62	68	INSTACK
61		*	J	63 63	209	EXT REFS NOT INNER
62		*	I	63 63	118	EXT REFS

COMMON BLOCKS	LENGTH
CONTRL	9
NAV	182
OUTPUT	48
TRAJIN	21
INPUTS	56
UNVRSL	10

STATISTICS

PROGRAM LENGTH	3478	231
CM LABELED COMMON LENGTH	5063	326

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SUBROUTINE PLTAPE     74/74   OPT=0 TRACE          FTN 4.5+2406    05/25/76. 17.12.47      PAGE    1

      1                 SUBROUTINE PLTAPE                                                   006620
                      C                                                                     006630
                      C           SUBROUTINE TO CREATE A PLOT TAPE.  RECORD FORMAT IS GIVEN 006640
                      C           BELOW:                                                    006650
      5               C                                                                     006660
                      C                     TIME (SEC)                                      006670
                      C                     LATITUDE (DEG)                                  006680
                      C                     LONGITUDE (DEG)                                 006690
                      C                     HANDER ANGLE (DEG)                              006700
     10               C                     ALTITUDE (FT)                                   006710
                      C                     UP VELOCITY (FT/SEC)                            006720
                      C                     EAST VELOCITY (FT/SEC)                          006730
                      C                     NORTH VELOCITY (FT/SEC)                         006740
                      C                     ROLL ANGLE (DEG)                                006750
     15               C                     PITCH ANGLE (DEG)                               006760
                      C                     YAW ANGLE (DEG)                                 006770
                      C                                                                     006780
                      C                     ALL ITEMS ARE DOUBLE PRECISION.                 006790
                      C                                                                     006800
     20               C                                                                     006810
                            IMPLICIT REAL(A-H,L-Z)                                          006820
                            COMMON /CONTRL/  DTIME,      PTIME,      PLTIME,     RSTIME,    006830
                           1      TPREV,     INIT,       ISTOP,      ICMCYL,     ICMCYP     006840
                            COMMON /OUTPUT/  ITITLE(20), OLAT9T,     OLONGT,     OALF9T,    006850
     25                     1      OLAT,      OLONG,      OALF,       DETA9T(3),  DETA(3),   006860
                            2      V92I(3),   DH,         DV(3),      DETA(3),    DLAT,      006870
                            3      DLONG,     DALF,                                          006880
                            4      IPAGE,     IPLIN,      IPRINT                             006890
                            COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALF9T,     006900
     30                     1      H0,        ETA9I(3),   V9I(3),     SF9I(3),    DELIS,     006910
                            2      TIME0,     LONG0,      SLAT9T,     CLAT9T,     SALF9T,    006920
                            3      CALF9T                                                     006930
                      C                                                                     006940
                      C           INITIAL PASS WRITES TITLE AS FIRST RECORD                 006950
     35               C                                                                     006960
                            IF (INIT .NE. 0) GO TO 10                                       006970
                            WRITE(30) (ITITLE(I),I=1,20)                                    006980
                           10 WRITE(30) TIME,DLAT,DLONG,DALF,DH,(DV(I),I=1,3),              006990
                           1            (DETA(I),I=1,3)                                    007000
     40                     RETURN                                                         007010
                           90 ISTOP = 10                                                    007020
                            WRITE(6,91)                                                     007030
                           91 FORMAT (/2X,"****** PLOT TAPE WRITE ERROR:  ERROR LEVEL 10"/) 007040
                            RETURN                                                          007050
     45                     END                                                            007060

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1  PLTAPE
```

VARIABLES	SN	TYPE		RELOCATION		SN	TYPE		RELOCATION
	3	ALFQT	REAL	TRAJIN		24	CALFQT	REAL	TRAJIN
	22	CLATQT	REAL	TRAJIN		54	DALF	REAL	OUTPUT
	16	DELTS	REAL	TRAJIN		47	DETA	REAL ARRAY	OUTPUT
	43	DH	REAL	OUTPUT		52	DLAT	REAL	OUTPUT
	53	DLONG	REAL	OUTPUT		44	DV	REAL ARRAY	OUTPUT
	5	ETAQT	REAL ARRAY	TRAJIN		4	HR	REAL	TRAJIN
	42	I	INTEGER			7	ICMCYL	INTEGER	CONTRL
	10	ICMCYP	INTEGER	CONTRL		5	INIT	INTEGER	CONTRL
	55	IPAGE	INTEGER	OUTPUT		56	IPLIM	INTEGER	OUTPUT
	57	IPPINT	INTEGER	OUTPUT		6	ISTOP	INTEGER	CONTRL
	0	ITITLE	INTEGER ARRAY	OUTPUT		1	LATQT	REAL	TRAJIN
	20	LONGG	REAL	TRAJIN		2	LONGQT	REAL	TRAJIN
	31	OALF	REAL	OUTPUT		26	OALFQT	REAL	OUTPUT
	35	OETA	REAL ARRAY	OUTPUT		32	OETAQT	REAL ARRAY	OUTPUT
	27	OLAT	REAL	OUTPUT		24	OLATQT	REAL	OUTPUT
	30	OLONG	REAL	OUTPUT		25	OLONQT	REAL	OUTPUT
	0	OTIME	REAL	CONTRL		2	PLTIME	REAL	CONTRL
	1	PTIME	REAL	CONTRL		3	PSTIME	REAL	CONTRL
	23	SALFQT	REAL	TRAJIN		13	SEQT	REAL ARRAY	TRAJIN
	21	SLATQT	REAL	TRAJIN		0	TIME	REAL	TRAJIN
	17	TIMED	REAL	TRAJIN		4	TPREV	REAL	CONTRL
	10	VQT	REAL ARRAY	TRAJIN		40	VQZT	REAL ARRAY	OUTPUT

FILE NAMES MODE

TAPE30	UNFMT	TAPE6	FMT

STATEMENT LABELS

5	10	0	92	INACTIVE	33	91	FMT		

COMMON BLOCKS LENGTH

CONTRL	9
OUTPUT	48
TRAJIN	21

STATISTICS

PROGRAM LENGTH	430	35
CM LABELED COMMON LENGTH	1168	78

```
      SUBROUTINE DOUT(J)                                                0037070
C                                                                       0037080
C     OUTPUTS VARIOUS DATA ITEMS ON REQUEST                             0037090
C                                                                       0037100
      IMPLICIT REAL(A-H,L-Z)                                            0037110
      COMMON /CONTRL/ DTIME,     PTIME,     PLTIME,    RSTIME,         0037120
     1    IPREV,     INIT,      ISTOP,     ICMCYL,    ICMCYP          0037130
      COMMON /INDCAT/ RESID(3),  DV0P(3),   DTA0P(4),  WT(3),          0037140
     1    SE0TP(3),  C2P95(3,3), C0MTS(3,3), TRESID(3), C1092(3,3),   0037150
     2    C1092B(3,3), C2P95T(3,3), ARESID(3)                          0037160
      COMMON /INPUTS/ AQUANT,    TQUANT,    VQUANT,    START,          0037170
     1    STOP,      PLOTIM,    P2NT,      RSTRT,     CV01,           0037180
     2    CV02,      CV03,      TOLJPK,    HSDTIM,    HSDTNC,         0037190
     2    ITRMAV,    ITRATT,    INCOR,     IMUTYP,    IERLIM,         0037200
     3    ISC(30),   IOPNLP,    SGX0,      SSY0,      SSZ0,           0037210
     4    RSMAX,     DRCMAX,    ITRFIL                                0037220
      COMMON /MAV/    C0P32P(3,3),V92P(3),  DV92P(3),  RP0(3),        0037230
     1    C0PHD(3,3), A(3,3),    B(3,3),    THTERT(3), IMTTPO(3),    0037240
     2    THTCOR(3), WXV(3),     G32P(3),   H,         ALPHA,          0037250
     3    SALF,      CALF,       DELT,      ETA(3),    VDMP,           0037260
     4    LAT,       LONG,       V92(3),    FILATT(3,3),DELTA,         0037270
     5    XSALF,     XCALF,      X0P92P(3,3),HV92P(3),  DV92P(3),       0037280
     6    S2PHI,     XS2PHT,     XV92P(3),  XH,        DELH,           0037290
     7    C0910(3,3), C0P30(3,3), C4B,       C095(3,3),  DVS92P(3),  0037300
     8    ODX ,      ODY ,       ODZ ,      D2P95(4),  DFILTP(3),      0037310
     9    GAINS(3,10),IGAINP(3)                                        0037320
      COMMON /OUTPUT/ ITITLE(20), OLAT9T,    OLON9T,    OALF9T,       0037330
     1    OLAT,      OLONG,      OALF,      DETA9T(3), DETA(3),        0037340
     2    V92T(3),   OH,         DV(3),     DETA(3),   OLAT,          0037350
     3    OLONG,     OALF,                                             0037360
     4    IPAGE,     IPLIM,      IPRINT                                0037370
      COMMON /PGRAV/  GLHSC,     G2CNT,     GRS2,      GRS4,           0037380
     1    G2H,       G2H2,       G2HS2                                 0037390
      COMMON /IGAJIN/ TIME,      LAT9T,     LONG9T,    ALF9T,          0037400
     1    HB,        ETA9T(3),   V9T(3),    SE9T(3),   DELTS,          0037410
     2    TIMEO,     LONGO,      SLAT9T,    CLAT9T,    SALF9T,         0037420
     3    CALF9T                                                       0037430
      COMMON /UNVRSL/ PI,        HPI,       PO,        RRO,            0037440
     1    EE,        ESQ,        EE2PO,     WERT,      RADPER,         0037450
     2    RESO                                                         0037460
      DIMENSION TP2ARR(3,3)                                            0037470
C                                                                       0037480
C                                                                       0037490
C                                                                       0037500
      IF (IPRINT .LE. 57) GO TO 99                                      0037510
      WRITE(6,900) IPAGE                                                0037520
  900 FORMAT ("1",30X,"IDEAL INS SIMULATOR",61X,"PAGE ",I3//,14X,       0037530
     1    "TRAJECTORY",12X,"SIMULATOR",12X,"DIFFERENCE"/)               0037540
      IPAGE = IPAGE + 1                                                 0037550
      IPRINT = 5                                                        0037560
   99 GO TO (1,2,3,4,5,6,6,8,9,10,11,12,13,14,15,16,17,18,19,20,        0037570
     .    21,22,23,24,25,26,27,28,29,30),J                             0037580
      WRITE(6,100) J                                                    0037590
  100 FORMAT (5X,"** UNEXPECTED PRINT PARAM = ",I10," NO ACTION"/)      0037600
      GO TO 810                                                         0037610
    1 WRITE(6,110) (WT(I),I=1,3)                                        0037620
  110 FORMAT (5X,"** WT=IMU    ",(3(2X,G16.10))/)                       0037630
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I=30

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                      GO TO 810                                                  007640
                    2 WRITE(6,120) (ETA9P(I),I=1,4)                              007650
   60               120 FORMAT (5X,"** ETA9P     ",(4(2X,G16.10))/)              007660
                      GO TO 809                                                  007670
                    3 WRITE(6,130) (DV92P(I),I=1,3)                              007680
                    130 FORMAT (5X,"** DV92P     ",(3(2X,G16.10))/)              007690
                      GO TO 810                                                  007700
   65               4 WRITE(6,140) (V92P(I),I=1,3)                               007710
                    140 FORMAT (5X,"** V92P      ",(3(2X,G16.10))/)              007720
                      GO TO 810                                                  007730
                    5 WRITE(6,150) (PHO(I),I=1,3)                                007741
                    150 FORMAT (5X,"** PHO       ",(3(2X,G16.10))/)              007750
   70               GO TO 810                                                    007760
                    6 WRITE(6,160) ((C0P92P(K,I),I=1,3),K=1,3)                   007770
                    160 FORMAT (18X,(3(2X,G16.10))/,5X,"** C0P92P    ",(3(2X,G16.10))/,007780
                     .      18X,(3(2X,G16.10))/)                                007790
                      GO TO 809                                                  007800
   75               8 WRITE(6,180) (THTERT(I),I=1,3)                             007810
                    180 FORMAT (5X,"** THTERT    ",(3(2X,G16.10))/)              007820
                      GO TO 810                                                  007830
                    9 WRITE(6,190) (THTIRO(I),I=1,3)                             007840
                    190 FORMAT (5X,"** THTIRO    ",(3(2X,G16.10))/)              007850
   80               GO TO 810                                                    007860
                   10 WRITE(6,200) (WXV(I),I=1,3)                               007870
                    200 FORMAT (5X,"** WXV       ",(3(2X,G16.10))/)              007880
                      GO TO 810                                                  007890
                   11 WRITE(6,210) VOMP                                         007900
   85              210 FORMAT (5X,"** VOMP      ",2X,G16.10/)                   007910
                      GO TO 810                                                  007920
                   12 WRITE(6,220) (G92P(I),I=1,3)                              007930
                    220 FORMAT (5X,"** G92P      ",(3(2X,G16.10))/)              007940
                      GO TO 810                                                  007950
   90               13 WRITE (6,230) A(1,2),A(2,3),A(3,1)                        007960
                    230 FORMAT (5X,"** MISALIGN  ",(3(2X,G16.10))/)              007970
                      GO TO 810                                                  007980
                   14 WRITE(6,240) ((C1092P(K,I),I=1,3),K=1,3)                   007990
                    240 FORMAT (18X,(3(2X,G16.10))/,5X,"** C1092P    ",(3(2X,G16.10))/,008000
   95               .      18X,(3(2X,G16.10))/)                                 008010
                      GO TO 808                                                  008020
                   15 WRITE(6,250) ((C2P95 (K,I),I=1,3),K=1,3)                   008030
                    250 FORMAT (18X,(3(2X,G16.10))/,5X,"** C2P95     ",(3(2X,G16.10))/,008040
                     .      18X,(3(2X,G16.10))/)                                008050
  100               GO TO 808                                                  008060
                   16 WRITE(6,260) ((C095  (K,I),I=1,3),K=1,3)                   008070
                    260 FORMAT (18X,(3(2X,G16.10))/,5X,"** C095      ",(3(2X,G16.10))/,008080
                     .      18X,(3(2X,G16.10))/)                                008090
                      GO TO 808                                                  008100
  105               17 WRITE(6,270) TIME                                        008110
                    270 FORMAT(5X,"** TIME       ",2X,G16.10/)                   008120
                      GO TO 810                                                  008130
                   18 CALL MIN(TMPA9R,C2P95,C2P95T)                             008140
                      TMPA9R(3,1)=-TMPA9R(3,1)                                  008150
  110                 WRITE(6,280) TMPA9R(3,2),TMPA9R(3,1),TMPA9R(2,1)         008160
                    280 FORMAT(5X,"** ENG ANGLES",3(2X,G16.10)/)                 008170
                      GO TO 810                                                  008180
                   19 WRITE(6,290) (D2P95(I),I=1,4)                             008190
                    290 FORMAT (5X,"** D2P95     ",(4(2X,G16.10))/)              008200
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      115                GO TO 809                                                    000210
                     807 IPRINT = IPRINT + 1                                        000220
                     808 IPRINT = IPRINT + 1                                        000230
                     809 IPRINT = IPRINT + 1                                        000240
                     810 IPRINT = IPRINT + 2                                        000250
      120            20 CONTINUE                                                    000260
                     21 CONTINUE                                                    000270
                     22 CONTINUE                                                    000280
                     23 CONTINUE                                                    000290
                     24 CONTINUE                                                    000300
      125            25 CONTINUE                                                    000310
                     26 CONTINUE                                                    000320
                     27 CONTINUE                                                    000330
                     28 CONTINUE                                                    000340
                     29 CONTINUE                                                    000350
      130            30 CONTINUE                                                    000360
                        RETURN                                                      000370
                     END                                                            000380
```

CAPD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

53 I THERE IS NO PATH TO THIS STATEMENT.

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
2 DOUT

VARIABLES	SN	TYPE	RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALFGT	REAL	TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL	INPUTS
100	APESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY NAV
77	CALF	REAL		NAV	24	CALFGT	REAL	TRAJIN
22	CLATGT	REAL		TRAJIN	10	CVD1	REAL	INPUTS
11	CVD2	REAL		INPUTS	12	CVD3	REAL	INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C9PH0	REAL	ARRAY NAV
54	DALF	REAL		OUTPUT	153	DELH	REAL	NAV
100	DELT	REAL		NAV	123	DELTA	REAL	NAV
16	DELTS	REAL		TRAJIN	47	DETA	REAL	ARRAY OUTPUT
43	DH	REAL		OUTPUT	52	DLAT	REAL	OUTPUT
57	DLONG	REAL		OUTPUT	56	DPSMAX	REAL	INPUTS
44	DV	REAL	ARRAY	OUTPUT	210	DV592P	REAL	ARRAY NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY NAV
4	EF	REAL		UNVRSL	6	EFPSC	REAL	UNVRSL
5	ETA	REAL		UNVRSL	101	ETA	REAL	ARRAY NAV
7	ETA9P	REAL	ARRAY	IMUDAT	5	ETAGT	REAL	ARRAY TRAJIN

VARIABLES	SN	TYPE		RELOCATION					
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
0	GLHSG	REAL		PGRAV	1	GPOUT	REAL		PGRAV
4	GPH	REAL		PGRAV	6	GPHS2	REAL		PGRAV
5	GPH2	REAL		PGRAV	2	GPS2	REAL		PGRAV
3	GPS4	REAL		PGRAV	71	G32P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HB	REAL		TRAJIN
1	HPI	REAL		UNVRSL	15	HSOINC	REAL		INPUTS
14	HSOTIM	REAL		INPUTS	137	HV32P	REAL	ARRAY	NAV
604	I	INTEGER			7	ICMCYL	INTEGER		CONTRL
10	ICMCYP	INTEGER		CONTRL	22	IPLIM	INTEGER		INPUTS
263	IRAINP	INTEGER	ARRAY	NAV	21	INUTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	5	INTT	INTEGER		CONTRL
61	IOPNLP	INTEGER		INPUTS	55	IPAGE	INTEGER		OUTPUT
23	IPC	INTEGER	ARRAY	INPUTS	56	IPLIN	INTEGER		OUTPUT
57	IPRINT	INTEGER		OUTPUT	6	ISTOP	INTEGER		CONTRL
0	ITITLE	INTEGER	ARRAY	OUTPUT	17	ITRATT	INTEGER		INPUTS
67	ITPFIL	INTEGER		INPUTS	16	ITPNAV	INTEGER		INPUTS
0	J	INTEGER		F.P.	605	K	INTEGER		
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONG0	REAL		TRAJIN
2	LONG9T	REAL		TRAJIN	31	OALF	REAL		OUTPUT
26	OALF9T	REAL		OUTPUT	213	ODY	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
35	OETA	REAL	ARRAY	OUTPUT	33	OETA9T	REAL	ARRAY	OUTPUT
222	OFILTR	REAL	ARRAY	NAV	176	OH1	REAL		NAV
27	OLAT	REAL		OUTPUT	24	OLAT9T	REAL		OUTPUT
30	OLONG	REAL		OUTPUT	25	OLON9T	REAL		OUTPUT
0	OTIME	REAL		CONTRL	142	OV32P	REAL	ARRAY	NAV
0	PI	REAL		UNVRSL	5	PLOTIM	REAL		INPUTS
2	PLTIME	REAL		CONTRL	6	PONT	REAL		INPUTS
1	PTIME	REAL		CONTRL	216	Q2P05	REAL	ARRAY	NAV
10	RADPER	REAL		UNVRSL	0	RESID	REAL	ARRAY	INUDAT
11	RESO	REAL		UNVRSL	17	RHO	REAL	ARRAY	NAV
3	RR0	REAL		UNVRSL	65	RSMAX	REAL		INPUTS
3	RSTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS
2	R0	REAL		UNVRSL	76	SALF	REAL		NAV
23	SALF9T	REAL		TRAJIN	13	SF0T	REAL	ARRAY	TRAJIN
15	SF0TP	REAL	ARRAY	INUDAT	21	SLAT9T	REAL		TRAJIN
62	SSX0	REAL		INPUTS	63	SSY0	REAL		INPUTS
64	SS70	REAL		INPUTS	1	START	REAL		INPUTS
4	STOP	REAL		INPUTS	145	S2PHI	REAL		NAV
53	THTCOR	REAL	ARRAY	NAV	55	THTCRT	REAL	ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
17	TIMEO	REAL		TRAJIN	606	TMPARR	REAL	ARRAY	
13	TOLJRK	REAL		INPUTS	4	TPREV	REAL		CONTRL
1	TOUANT	REAL		INPUTS	42	TRESID	REAL	ARRAY	INUDAT
104	VDMP	REAL		NAV	2	VOUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	43	V9T	REAL	ARRAY	OUTPUT
7	WEPT	REAL		UNVRSL	12	WT	REAL	ARRAY	INUDAT
56	WXV	REAL	ARRAY	NAV	125	XOALF	REAL		NAV
152	XR	REAL		NAV	124	YOALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XTP92P	REAL	ARRAY	NAV					

FILE NAMES MODE
TAPE6 FMT

EXTERNALS TYPE ARGS
YTM 3

STATEMENT LABELS

62	1		65	2		70	3	
73	4		76	5		101	6	
122	8		125	9		130	10	
133	11		136	12		141	13	
144	14		165	15		226	16	
227	17		232	18		240	19	
253	20		253	21		253	22	
253	23		253	24		253	25	
253	26		253	27		253	28	
253	29		253	30		14	99	
103	100	FMT	316	110	FMT	327	120	FMT
348	130	FMT	351	140	FMT	362	150	FMT
375	160	FMT	411	180	FMT	422	190	FMT
433	200	FMT	444	210	FMT	455	220	FMT
470	230	FMT	503	240	FMT	521	250	FMT
537	260	FMT	553	270	FMT	566	280	FMT
577	290	FMT	0	807	INACTIVE	245	808	
247	809		251	810		264	900	FMT

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES	
104		*	K	71 71	148	EXT REFS	NOT INNER
105		*	I	71 71	118	EXT REFS	
147		*	K	93 93	148	EXT REFS	NOT INNER
150		*	I	93 93	118	EXT REFS	
170		*	K	97 97	148	EXT REFS	NOT INNER
171		*	I	97 97	118	EXT REFS	
211		*	K	101 101	148	EXT REFS	NOT INNER
212		*	I	101 101	118	EXT REFS	

COMMON BLOCKS LENGTH

CONTPL	9
IMUDAT	67
INPUTS	56
NAV	182
OUTPUT	48
PGRAV	7
TRAJIN	21
UNVRSL	10

STATISTICS

PROGRAM LENGTH	6178	399
CM LABELED COMMON LENGTH	6208	400

```
      SUBROUTINE CMINTG                                                 000700
C                                                                       000400
C     THIS SUBROUTINE PERFORMS THE SUMMATION OF THE SIMULATED           000410
C     ACCELEROMETER DATA, AFTER IT HAS BEEN TRANSFORMED TO THE          000420
C     PLATFORM FRAME                                                    000430
C                                                                       000440
      IMPLICIT REAL(A-H,L-Z)                                            000450
      COMMON /CONTRL/ DTIMC,      PTIME,      PLTIME,     RSTIME,       000460
     1     IPRFV,     INIT,       ISTOP,      ICMCYL,     ICMCYP        000470
      COMMON /IMUDAT/ RESID(3),   DV3P(3),    FTA3P(4),   MT(3),        000480
     1     SF3TP(3),  C2P95(3,3), C3MIS(3,3), TRESID(3),  C1093(3,3),   000490
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                           000500
      COMMON /INPUTS/ AQUANT,     TQUANT,     VQUANT,     START,        000510
     1     STOP,      PLOTIM,     PRNT,       PSIRT,      CVD1,         000520
     2     CVD2,      CVD3,       TOLJRK,     HSOTIM,     HSCING,       000530
     2     IIRNAV,    IIRAII,     INCOR,      IMUTYP,     IC2LIM,       000540
     3     IPC(30),   IOPNLP,     SSX0,       SSY0,       SSZ0,         000550
     4     PSMAX,     OMSMAX,     ITREIL                                000560
      COMMON /NAV/    C0P92P(3,3),V32P(3),    DV32P(3),   RH0(3),       000570
     1     C32HO(3,3), A(3,3),     B(3,3),     THTERT(3),  THTTP0(3),    000580
     2     THTCOR(3),  HXV(3),     G32P(3),    H,          ALPHA,        000590
     3     SALE,       CALE,       DELT,       ETA(3),     VDIF,         000600
     4     LAT,        LONG,       V32(3),     FILATT(3,3),DELTA,        000610
     5     XSALF,      XCALF,      X0P32P(3,3),HV32P(3),   DV32P(3),     000620
     6     S2PHI,      XS2PHI,     XV32P(3),   XH,         DELH,         000630
     7     C0918(3,3), C0P93(3,3), OMO,        C095(3,3),  DV592P(3),    000640
     8     OMX ,       OMY ,       OMZ ,       92P95(4),   DELTP(3),     000650
     9     GAINS(3,10),IGAINP(3)                                         000660
      COMMON /UNVRSL/ PI,         HPI,        R0,         RE0,          000670
     1     EE,        ESQ,        ERRRO,      HERT,       RADREQ,       000680
     2     RESQ                                                         000690
      COMMON /TRAJINZ/ TIME,      LAT9T,      LONG9T,     ALF9T,        000700
     1     H9,        ETA9T(3),   V9T(3),     SF9T(3),    DELTS,        000710
     2     TIME0,     LONG0,      SLAT9T,     CLAT9T,     SALF9T,       000720
     3     CALF9T                                                       000730
C                                                                       000740
C     TEMPORARY (??) PATCH FOR DISCONTINUITIES IN PROGENMS ACCE         000750
C                                                                       000760
      DO 55 I=1,3                                                       000770
      IF ( ABS(DELTS*(SF3TP(I)-SF9T(I))) .LE. TOLJRK) GO TO 55          000780
      SF9TP(I)=SF9T(I)                                                  000790
      WRITE(6,6001) I,TIME                                              000800
 6001 FORMAT(" CMINTG: DISCONTINUITY DETECTED ALONG AXIS",I2,           000810
     1" COMPONENT OF LINEAR ACCELERATION AT TIME = ",F12.5," SEC."/     000820
     2" DISCONTINUITY ASSUMED AT BEGINNING OF CYCLE")                   000830
   55 CONTINUE                                                          000840
      IF (MOD(ICMCYL,2) .NE. 1) GO TO 63                                000850
C                                                                       000860
C     SIMPSONS RULE IF NUMBER OF INTERVALS IS EVEN                      000870
C                                                                       000880
      DO 170 I=1,3                                                      000890
      IF (ICMCYP .EQ. 1) GO TO 167                                      000900
      IF (ICMCYP .EQ. ICMCYL) GO TO 166                                 000910
      IF (MOD(ICMCYP,2) .EQ. 0) GO TO 165                               000920
      DV9P(I)=DV9P(I)+2.*SF9T(I)                                        000930
      GO TO 170                                                         000940
  166 DV9P(I)=(DV9P(I)+SF9T(I)/2.0)*ICMCYL/(1*ICMCYL-2)                 000950
```

34 1135 Continue numbers

```
                  GO TO 170                                                     000960
              167 DV9P(I)=SF9IP(I)+2.*SF9T(I)                                   000970
     60           GO TO 170                                                     000980
              165 DV9P(I)=DV9P(I)+4.*SF9T(I)                                    000990
              170 SF9TP(I)=SF9T(I)                                              001000
                  GO TO 100                                                     001010
                  C                                                             001020
     65           C TRAPEZOIDAL RULE IF NUMBER OF INTERVALS IS ODD              001030
                  C                                                             001040
                  63 DO 60 I=1,3                                                001050
                     DV9P(I) = DV9P(I) + ((SF9T(I) + SF9TP(I))/2.0)*DELTS       001060
              60  SF9TP(I) = SF9T(I)                                           001070
     70           C            QUANTIZE THE VELOCITY OUTPUTS                    001080
                  C                                                             001090
                  C                                                             001100
                  C                                                             001110
                  100 ICMCYP=ICMCYP+1                                           001120
     75           IF (ICMCYP .LE. ICMCYL) RETURN                               001130
                  ICMCYP=1                                                      001140
                  DO 64 I=1,3                                                   001150
                     DV9P(I) = DV9P(I) + RESID(I)                               001160
              64  RESID(I) = DV9P(I)                                           001170
     80           CALL QNTIZ(DV9P(1),VQUANT)                                   001180
                  DO 66 I=1,3                                                   001190
              66  RESID(I) = RESID(I) - DV9P(I)                                001200
              70  RETURN                                                       001210
                  END                                                           001220
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1	CMINTG

VARIABLES

SN	TYPE		RELOCATION		SN	TYPE		RELOCATION
33	A	REAL ARRAY	NAV		3	ALF9T	REAL	TRAJIN
75	ALPHA	REAL	NAV		0	AQUANT	REAL	INPUTS
100	ARESID	REAL ARRAY	IMUDAT		44	B	REAL ARRAY	NAV
77	CALF	REAL	NAV		24	CALF9T	REAL	TRAJIN
22	CLAT9T	REAL	TRAJIN		10	CV01	REAL	INPUTS
11	CV02	REAL	INPUTS		12	CV03	REAL	INPUTS
165	C0P90	REAL ARRAY	NAV		0	C0P92P	REAL ARRAY	NAV
154	C0910	REAL ARRAY	NAV		177	C095	REAL ARRAY	NAV
45	C1090	REAL ARRAY	IMUDAT		56	C1092P	REAL ARRAY	IMUDAT
20	C2P95	REAL ARRAY	IMUDAT		67	C2P95T	REAL ARRAY	IMUDAT
71	C9MIS	REAL ARRAY	IMUDAT		22	C9PH0	REAL ARRAY	NAV
153	DELH	REAL	NAV		100	DELT	REAL	NAV
123	DELTA	REAL	NAV		16	DELTS	REAL	TRAJIN
66	DPSMAX	REAL	INPUTS		210	DV902P	REAL ARRAY	NAV
7	DV9P	REAL ARRAY	IMUDAT		14	DV92P	REAL ARRAY	NAV
4	EE	REAL	UNVPSL		6	EE2PI	REAL	UNVPSL
5	ESQ	REAL	UNVPSL		101	ETA	REAL ARRAY	NAV
6	ETA9P	REAL ARRAY	IMUDAT		5	ETA9T	REAL ARRAY	TRAJIN
112	FILATT	REAL ARRAY	NAV		225	GAINS	REAL ARRAY	NAV

SUBROUTINE SMINTS . 74/74 OPT=0 TRACE FTN 4.5+R436 05/25/76 17.12.47 PAGE 3

VARIABLES	SN	TYPE		RELOCATION						
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV	
4	HB	REAL		TRAJIN	1	HDI	REAL		UNIVRSL	
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS	
137	HV92P	REAL	ARRAY	NAV	152	I	INTEGER			
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL	
22	IEPLIM	INTEGER		INPUTS	253	IGAIND	INTEGER	ARRAY	NAV	
21	IMUTYP	INTEGER		INPUTS	23	INCOS	INTEGER		INPUTS	
5	INIT	INTEGER		CONTRL	61	IOPULP	INTEGER		INPUTS	
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL	
17	ITPART	INTEGER		INPUTS	67	ITRTIL	INTEGER		INPUTS	
16	ITRNAV	INTEGER		INPUTS	135	LAT	REAL		NAV	
1	LATGT	REAL		TRAJIN	135	LONG	REAL		NAV	
20	LONGD	REAL		TRAJIN	2	LONGGT	REAL		TRAJIN	
213	MDY	REAL		NAV	214	MDY	REAL		NAV	
215	MDZ	REAL		NAV	222	OFILTR	REAL	ARRAY	NAV	
175	OMB	REAL		NAV	0	OTIME	REAL		CONTRL	
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNIVRSL	
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL	
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL	
216	Q2P95	REAL	ARRAY	NAV	10	RADDEG	REAL		UNIVRSL	
3	RESID	REAL	ARRAY	TMUMAT	11	RESO	REAL		UNIVRSL	
17	RHO	REAL	ARRAY	NAV	3	R30	REAL		UNIVRSL	
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL	
7	RSTRT	REAL		INPUTS	2	RZ	REAL		UNIVRSL	
26	SALF	REAL		NAV	23	SALFGT	REAL		TRAJIN	
17	SFGT	REAL	ARRAY	TRAJIN	15	SFSTR	REAL	ARRAY	TMUMAT	
21	SLATGT	REAL		TRAJIN	62	SSX0	REAL		INPUTS	
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS	
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS	
145	S2PHI	REAL		NAV	63	THTGGP	REAL	ARRAY	NAV	
66	THTFRT	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV	
0	TIME	REAL		TRAJIN	17	TIMTB	REAL		TRAJIN	
13	TOLJPK	REAL		INPUTS	4	TOPEV	REAL		CONTRL	
1	TQUANT	REAL		INPUTS	42	TRESID	REAL	ARRAY	TMUMAT	
104	VOMP	REAL		NAV	2	VQUANT	REAL		INPUTS	
10	V9T	REAL	ARRAY	TRAJIN	147	V92	REAL	ARRAY	NAV	
11	V92P	REAL	ARRAY	NAV	7	WEGT	REAL		UNIVRSL	
12	WT	REAL	ARRAY	TMUMAT	65	WXV	REAL	ARRAY	NAV	
125	XCALF	REAL		NAV	152	XH	REAL		NAV	
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV	
147	XV92P	REAL	ARRAY	NAV	126	XW92P	REAL	ARRAY	NAV	

FILE NAMES MODE

TAPE6 F4T

EXTERNALS TYPE ARGS

ORTTZ 2

INLINE FUNCTIONS TYPE ARGS

ABS REAL 1 INTRIN MOD INTEGER 2 INTRIN

STATEMENT LABELS

14	60	0	60	57	63		
3	66	0	66	0	70	INACTIVE	
71	105	47	105	74	107		
62	127	62	127	125	5211	EXIT	

LOOPS	LABEL		INDEX	FROM	TO	LENGTH	PROPERTIES
							EXT REFS
3	55	*	I	39	46	148	
22	170		I	51	62	348	OPT
69	60		I	67	69	118	OPT
77	54		I	77	79	58	INSTACK
110	66		I	81	82	40	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
INDAT	67
INPUTS	56
NAV	142
UNVRSL	10
TRAJIN	21

STATISTICS

PROGRAM LENGTH	1538	107
CM LABELED COMMON LENGTH	5310	345

```
      SUBROUTINE TORCOR(A0P92P,AV92P)                                   000230
      IMPLICIT REAL(A-H,L-Z)                                            000240
      DIMENSION A0P92P(3,3),AV92P(3)                                    000250
      COMMON /INPLIS/  AQUANT,     TQUANT,     VQUANT,     START,       000260
     1    STOP,       PLOTIM,     PRNT,       PSTRT,      CV01,        000270
     2    CV02,       CV03,       TOLJCK,     HSOTIM,       SOINC,     000280
     2    ITRNAV,     ITPATT,     INCOP,      TIUTYP,     ISPLTM,      000290
     3    IPC(30),    IOPNLP,     SSX0,       SSY0,       SSZ0,        000300
     4    RSMAX,      ORSMAX,     ITRFTL                                000310
      COMMON /NAV/     C0P92P(3,3),V92P(3),    DV92P(3),   ZR0(3),      000320
     1    C0PH0(3,3), A(3,3),     B(3,3),     THTERT(3),  THTTRC(3),   000330
     2    THTC0P(3),  HXV(3),     G92P(3),    H,          ALPHA,       000340
     3    SALF,       CALF,       DELT,       ETA(7),     V0MP,        000350
     4    LAT,        LONG,       V92(3),     ETLATT(3,3),DELTA,       000360
     5    XSALF,      XCALF,      X0P92P(3,3),HV32P(3),   DV32P(3),    000370
     6    S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,        000380
     7    C0910(3,3), C0P90(3,3), OHB,        C095(3,3),    DV592P(3), 000390
     8    DDX,        DDY,        DDZ,        02995(4),   DELTP(3),    000400
     9    GAINS(3,10),IGAINP(3)                                        000410
      COMMON /UNVRSL/  PI,         HPI,        PV,         RR),         000420
     1    EF,         ESQ,        SERRD,      HERT,       RADDEG,      000430
     2    RLSQ                                                         000440
C                                                                       000450
C     TORQ -- GENERATE EARTH ANGLE TORQUING ANGLES                      000460
C                                                                       000470
      DO 590 I=1,3                                                      000480
      THTERT(I)=VP(VP(A0P92P(3,I)*HE3T)*DELT)                           000490
  590 THTTRC(I)=VP(THTERT(I)+VP(PHO(I)*DELT))                           000500
      IF (IPC(8) .EQ. 0) GO TO 620                                      000510
      CALL DOUT(8)                                                      000520
  620 CONTINUE                                                          000530
      IF (IPC(9) .EQ. 0) GO TO 700                                      000540
      CALL DOUT(9)                                                      000550
  700 CONTINUE                                                          000560
C                                                                       000570
C     CORLS -- SENSED ACCELERATION DUE TO ANGULAR VELOCITIES            000580
C                                                                       000590
      DO 710 I=1,3                                                      000600
      THTCOR(I) = VP(THTCRT(I) + THTTRC(I))                             000610
  710 A(I,I) = 0.                                                       000620
      A(2,1) = -THTCOR(3)                                               000630
      A(3,1) = THTCOR(2)                                                000640
      A(3,2) = -THTCOR(1)                                               000650
      A(1,2) = THTCOR(3)                                                000660
      A(1,3) = -THTCOR(2)                                               000670
      A(2,3) = THTCOR(1)                                                000680
      CALL VMATVC(HXV,A,AV92P)                                          000690
      IF (IPC(10) .EQ. 0) GO TO 800                                     000700
      CALL DOUT(10)                                                     000710
  800 RETURN                                                            000720
      END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 TORCOP

VARIABLES	SN	TYPE	RELOCATION					
33	A	REAL	ARRAY	NAV	75	ALPHA	REAL	NAV
0	AQUANT	REAL		INPUTS	0	AV92P	REAL ARRAY	F.P.
1	ARP92P	REAL	ARRAY	F.P.	44	B	REAL ARRAY	NAV
72	CALF	REAL		NAV	10	CV01	REAL	INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL	INPUTS
165	C2P9J	REAL	ARRAY	NAV	0	C2P92P	REAL ARRAY	NAV
154	C2910	REAL	ARRAY	NAV	177	C295	REAL ARRAY	NAV
22	C92HO	REAL	ARRAY	NAV	153	DELH	REAL	NAV
190	DELT	REAL		NAV	123	DELTA	REAL	NAV
66	JRSMAX	REAL		INPUTS	213	DV592P	REAL ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL	UNIVRSL
6	EERRJ	REAL		UNIVRSL	5	ECO	REAL	UNIVRSL
111	ETA	REAL	ARRAY	NAV	112	FILATT	REAL ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL ARRAY	NAV
74	H	REAL		NAV	1	HPI	REAL	UNIVRSL
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL	INPUTS
137	HV92P	REAL	ARRAY	NAV	136	I	INTEGER	
22	ICRLIM	INTEGER		INPUTS	253	IGAINP	INTEGER ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	IMODP	INTEGER	INPUTS
61	IOPNLP	INTEGER		INPUTS	23	IPC	INTEGER ARRAY	INPUTS
17	ITPATT	INTEGER		INPUTS	67	ITPFIL	INTEGER	INPUTS
16	ITPNAV	INTEGER		INPUTS	105	LAT	REAL	NAV
106	LONG	REAL		NAV	213	ODX	REAL	NAV
214	ODY	REAL		NAV	215	ODZ	REAL	NAV
222	OFILTR	REAL	ARRAY	NAV	176	OMI	REAL	NAV
142	OV92P	REAL	ARRAY	NAV	3	PI	REAL	UNIVRSL
5	PLOTIM	REAL		INPUTS	6	PRNT	REAL	INPUTS
216	Q2P95	REAL	ARRAY	NAV	10	RADPER	REAL	UNIVRSL
11	RESQ	REAL		UNIVRSL	17	RHO	REAL ARRAY	NAV
3	RRR	REAL		UNIVRSL	65	RSMAX	REAL	INPUTS
7	RSTRT	REAL		INPUTS	2	RR	REAL	UNIVRSL
76	SALF	REAL		NAV	62	SSX0	REAL	INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL	INPUTS
3	STARI	REAL		INPUTS	4	STOP	REAL	INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL ARRAY	NAV
55	THTEPT	REAL	ARRAY	NAV	60	THTTRQ	REAL ARRAY	NAV
17	TOLJ2K	REAL		INPUTS	1	TQUANT	REAL	INPUTS
104	VDOP	REAL		NAV	2	VQUANT	REAL	INPUTS
137	V92	REAL	ARRAY	NAV	11	V92P	REAL ARRAY	NAV
7	WEDT	REAL		UNIVRSL	66	WXV	REAL ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL	NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL	NAV
147	XV92P	REAL	ARRAY	NAV	135	XDP92P	REAL ARRAY	NAV

EXTERNALS	TYPE	ARGS		
DOUT		1	VMATVC	3
VP	REAL	1		

STATEMENT LABELS

45 620 50 702

SUBROUTINE TOSCOP 74/74 OPT=0 TRACE FTN 4.5+P406 05/25/76 17.12.47 PAGE 3

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
16	580	*	I	26 28	240	EXT REFS
51	710	*	I	38 40	118	EXT REFS

COMMON BLOCKS	LENGTH
INPUTS	56
NAV	182
UNVRSL	10

STATISTICS

PROGRAM LENGTH	1338	91
CM LABELED COMMON LENGTH	3708	248

```
      SUBROUTINE INPNAV                                                 000740
C                                                                       000750
C     THIS SUBROUTINE REPRESENTS THOSE CALCULATIONS THAT WOULD BE       000760
C        PERFORMED BY AN AIRBORN AVIONICS COMPUTER                      000770
C                                                                       000780
      IMPLICIT REAL(A-H),REAL(L-Z)                                      000790
      COMMON /CONTRL/  ATTME,       PTIME,      PLTIME,     RSTIME,     000800
     1     TPREV,      INIT,       ISTOP,      ICMCYL,     ICMCYP      000810
      COMMON /IMUDAT/  RESID(3),    DV9P(3),    ETA9P(4),   HT(3),      000820
     1     SF9IP(3),   C2P95(3,3), C9MIS(3,3), TRESID(3),  C1090(3,3), 000830
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                           000840
      COMMON /INPUTS/  AQUANT,      TQUANT,     VQUANT,     START,      000850
     1     STOP,       PLOTIM,     PRNT,       RSTRT,      CV01,       000860
     2     CV02,       CV03,       TOLJPK,     HSOTIM,     HSCINC,     000870
     2     ITPNAV,     ITPATT,     INCOP,      IMUTYP,     IERLIM,     000880
     3     IPC(30),    IOPNLP,     SSX0,       SSY0,       SSZ0,       000890
     4     RSMAX,      DRSMAX,     ITREIL                              000900
      COMMON /NAV/     C0P92P(3,3),V92P(3),    DV12P(3),   PHO(3),     000910
     1     C9RHO(3,3), A(3,3),     B(3,3),     THTE9T(3),  THTI90(3),  000920
     2    THTCOR(3),   NXV(3),     G92P(3),    H,          ALPHA,      000930
     3     SALF,       CALF,       DELT,       ETA(3),     VOME,       000940
     4     LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,      000950
     5     XSALF,      XCALF,      X0P92P(3,3),HV92P(3),   DV32P(3),   000960
     6     S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,       000970
     7     C0910(3,3), C0P90(3,3), PHO,        CC95(3,3),  DV592P(3),  000980
     8     ODX   ,     ODY   ,     ODZ   ,     Q2P95(4),   DFILTP(3),  000990
     9     GAINS(3,10),IGAINP(3)                                       001000
      COMMON /PGRAV/   GLHGC,      GRCNT,      GPS2,       GPS4,       001010
     1     GRH,        GPH2,       GPHS2                               001020
      COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALE9T,      001030
     1     HR,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,      001040
     2    TIMED,       LONGD,      SLAT9T,     CLAT9T,     SALF9T,     001050
     3     CALF9T                                                      001060
      COMMON /UNVRSL/  PI,         HPI,        R3,         RPD,        001070
     1     EF,         ESQ,        EERRO,      NERT,       RADPER,     001080
     2    RESQ                                                         001090
C                                                                       001100
C        TRANSFORM VELOCITY INCREMENTS TO LLWA: ZERO THE VELOCITY       001110
C        SUM FROM THE PLATFORM                                          001120
C                                                                       001130
  100 DO 110 I=1,3                                                      001140
      DV92P(I) = V9(DV9P(I))                                            001150
  110 DV9P(I) = 0.0                                                     001160
      IF (IPC(3) .EQ. 0) GO TO 300                                      001170
      CALL DOUT(3)                                                      001180
C                                                                       001190
C     VLCTY -- VELOCITY UPDATE SUBROUTINE                               001200
C                                                                       001210
  300 CONTINUE                                                          001220
  305 DO 310 I=1,3                                                      001230
      DV92P(I)=V92P(I)                                                  001240
      V92P(I) = VP(VP(VP(V92P(I) + HXV(I)) + VP(G92P(I)*DELT)) + DV92P(I)001250
     A))                                                                001260
  310 CONTINUE                                                          001270
      V92P(1) = VP(V92P(1) + VP((  VP(VOMP + VP(GVC2*DELH)) ) * DELT))  001280
C                                                                       001290
```

```
      C     AVERAGE OLD AND NEW V92P TO OBTAIN INTERPOLATE VALUES, HV92P          010700
      C     ALSO EXTRAPOLATE NEW V92P TO OBTAIN XV92P                             010310
      C                                                                           010320
   60       IF (IPC(29) .EQ. 0) GO TO 320                                         010330
            DO 315 I=1,3                                                          010340
            XV92P(I)=VP(VP(1.5*V92P(I))-VP(0.5*OV92P(I)))                         010350
  315       HV92P(I)=VP(0.5*VP((OV92P(I)+V92P(I))))                               010360
  320       CONTINUE                                                            010370
   65       IF (IPC(4) .EQ. 0) GO TO 400                                          010380
            CALL DOUT(4)                                                        010390
      C                                                                         010400
      C     ARATE -- ANGULAR RATES SUBROUTINE                                   010410
      C                                                                         010420
   70   400 CONTINUE                                                           010430
      C                                                                         010440
        410 IF (IPC(33) .NE. 0) GO TO 420                                       010450
            OCM32S = VP(COP92P(3,2)**2)                                         010460
            OCM33S = VP(COP92P(3,3)**2)                                         010470
   75       CORR = VP(VF(VP(2.0*EFP20)*COP92P(3,2))*COP92P(3,3))                010480
            ONEM = VP(1.0 - VP(4*RR0))                                          010490
            RHO(2) = VP(VP(VP(-V92P(3) *RR0)*VP((ONEM-VP(EF*(VP(VP(1.-VP(3.*OC010500
           A*33S))-OCM32S))))))-VP(V92P(2)*CORR))                               010510
            RHO(1)=VP(VP(VP(V92P(2)*RR0)*VP(ONEM-VP(EF*VP(VP(1.-VP(3.*         010520
   80       A  OCM32S))-OCM33S)))) +VP(V92P(3)*CORR ))                          010530
            GO TO 430                                                           010540
        420 CONTINUE                                                            010550
            IF (IPC(29) .EQ. 0) GO TO 422                                       010560
            CALL ANGVL2(HV92P,XSALF,XCALF,XS2PHI,XH)                            010570
   85       GO TO 430                                                           010580
        422 CONTINUE                                                            010590
            CALL ANGVL2(V92P,SALF,CALF,S2PHI,H)                                 010600
        430 CONTINUE                                                            010610
            IF (IPC(5) .EQ. 0) GO TO 490                                        010620
   90       CALL DOUT(5)                                                        010630
        490 CONTINUE                                                            010640
      C                                                                         010650
      C     OCM UPDATE IS FIRST OR SECOND ORDER                                 010660
      C                                                                         010670
   95       CALL OCMUPD(C9PHO,0.,E0,VP(RHO(2)*DELT),VP(RHO(3)*DELT),IPC(28),    010680
           1 0.E0,A(1,1),A(1,2),A(1,3))                                         010690
            CALL VMM(A,COP92P,C9PHO)                                            010700
            DO 520 I=1,3                                                        010710
            DO 520 J=1,3                                                        010720
  100       COP92P(I,J) = VP(COP92P(I,J) + A(I,J))                              010730
            IF (IPC(29) .EQ. 0) GO TO 520                                       010740
            XOP92P(I,J)=VP(COP92P(I,J)+VP(0.5*A(I,J)))                          010750
        520 CONTINUE                                                            010760
      C                                                                         010770
  105 C     ORTHONORMALIZE IF OTIME .GE. TIME                                   010780
      C                                                                         010790
            IF (IPC(6) .EQ. 0) GO TO 522                                        010800
            CALL DOUT(6)                                                        010810
        522 CONTINUE                                                            010820
  110       IF (TIME .LT. OTIME) GO TO 550                                      010830
            OTIME = VP(TIME + VP(INCO9*DELT))                                   010840
            CALL ORTHO(COP92P)                                                  010850
```

```
                      550 CONTINUE                                                  010880
                      600 IF (IPC(29) .NE. 0) GO TO 805                             010890
                          CALL TORCOR(C0P92P,V92P)                                  010900
                     C                                                              010910
                     C    VDAMP -- VERTICAL DAMPING                                 010920
                     C                                                              010930
                      805 CONTINUE                                                  010940
                      810 IF (IPC(29) .NE. 1) GO TO 815                             010950
                          H = VP(H + VP(VP((DV92P(1)+VP(CVD1*DELH)))*DELT))         010960
                          DELH = VP(HB - H)                                         010970
                          GO TO 820                                                 010980
                      815 H = VP(H + VP(VP((HV92P(1)+VP(CVD1*DELH)))*DELT ))        010990
                          XH=VP(H+VP(VP(V92P(1)*DELT)*0.5))                         011000
                          XH3=VP(VP(1.5*HB)-VP(0.5*DHB))                            011010
                          DELH=VP(XHB-XH)                                           011020
                          DHB=HB                                                    011030
                      820 CONTINUE                                                  011040
                          VDMP = VP(VDMP + VP(VP(CVD3*DELH)*DELT))                  011050
                          IF (IPC(11) .EQ. 0) GO TO 900                             011060
                          CALL DOUT(11)                                             011070
                      900 CONTINUE                                                  011080
                          IF (IPC(29) .EQ. 0) GO TO 1600                            011090
                          CALL GRAV(X0P92P,XS2PHI,XH)                               011100
                          IF (IPC(12) .NE. 0) CALL DOUT(12)                         011110
                          CALL POSVEL                                               011120
                          CALL ANGVL2(XV92P,XSALF,XCALF,XS2PHI,XH)                  011130
                          CALL TORCOR(X0P92P,XV92P)                                 011140
                          RETURN                                                    011150
                     1600 CALL GRAV(C0P92P,S2PHI,H)                                 011160
                          IF (IPC(12) .NE. 0) CALL DOUT(12)                         011170
                          CALL POSVEL                                               011180
                          RETURN                                                    011190
                          END                                                       011200
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 INRNAV

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
100	ARESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJIN
22	CLAT9T	REAL		TRAJIN	656	CORR	REAL		
10	CVD1	REAL		INPUTS	11	CVD2	REAL		INPUTS
12	CVD3	REAL		INPUTS	155	C0P90	REAL	ARRAY	NAV
6	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C1095	REAL	ARRAY	NAV	45	C1099	REAL	ARRAY	IMUDAT
56	C1P92P	REAL	ARRAY	IMUDAT	23	C2095	REAL	ARRAY	IMUDAT
67	C2P95T	REAL	ARRAY	IMUDAT	31	C9415	REAL	ARRAY	IMUDAT
22	CHORD	REAL	ARRAY	NAV	664	DM32S	REAL		
[illegible]	[illegible]	REAL			153	DELH	REAL		NAV

VARIABLES SN TYPE RELOCATION

665	DCM33S	REAL			153	DELH	REAL		NAV
199	DELT	REAL		NAV	123	DELTA	REAL		NAV
16	DELTS	REAL		TRAJIN	66	DPSMAX	REAL		INPUTS
210	DV592P	REAL	ARRAY	NAV	3	DV9P	REAL	ARRAY	IMUDAT
14	DV92P	REAL	ARRAY	NAV	4	EF	REAL		UNVRSL
6	EFRR0	REAL		UNVRSL	5	ESQ	REAL		UNVRSL
101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
5	ETA9T	REAL	ARRAY	TRAJIN	112	FILATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	0	GL4SC	REAL		PGRAV
1	GPCNT	REAL		PGRAV	4	GPH	REAL		PGRAV
6	GPHS2	REAL		PGRAV	5	GPH2	REAL		PGRAV
2	GPS2	REAL		PGRAV	3	GPS4	REAL		PGRAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HB	REAL		TRAJIN	1	HPT	REAL		UNVRSL
15	HSDTNC	REAL		INPUTS	14	HSDTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	663	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
22	ILRLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	INCOR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	INPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS	67	ITPFTL	INTEGER		INPUTS
16	ITPNAV	INTEGER		INPUTS	670	J	INTEGER		
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONG0	REAL		TRAJIN
2	LONG9T	REAL		TRAJIN	213	MMX	REAL		NAV
214	MMY	REAL		NAV	215	MMZ	REAL		NAV
222	OFILTP	REAL	ARRAY	NAV	176	OHP	REAL		NAV
667	ONEM	REAL			0	OTIME	REAL		CONTRL
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVRSL
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	13	RADDEG	REAL		UNVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESQ	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	RR1	REAL		UNVRSL
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
7	RSTRT	REAL		INPUTS	2	R0	REAL		UNVRSL
76	SALF	REAL		NAV	23	SALF9T	REAL		TRAJIN
13	SF9T	REAL	ARRAY	TRAJIN	15	SF9TP	REAL	ARRAY	IMUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
56	THTCRT	REAL	ARRAY	NAV	58	THTTRQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEQ	REAL		TRAJIN
13	TOLJPK	REAL		INPUTS	4	TPREV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRESTQ	REAL	ARRAY	IMUDAT
134	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WCRT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
671	XHB	REAL			124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XPP92P	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS		
ANGVL2		5	DCMUPD	9
DOUT		1	GRAV	3
ORTHO		1	POSVEL	9
TORCOR		2	VMM	3
VP	REAL	1		

STATEMENT LABELS

0	100	INACTIVE	0	110	15	300	
0	305	INACTIVE	0	310	0	315	
112	320		115	400	0	410	INACTIVE
243	420		247	422	251	430	
254	490		323	520	333	522	
351	550		0	600	INACTIVE	354	805
0	810	INACTIVE	377	815		447	820
464	900		500	1600			

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
3	110	* I	41 43	100	EXT. REFS
16	310	* I	50 54	260	EXT. REFS
63	315	* I	61 63	278	EXT REFS
273	520	* I	98 -103	358	EXT REFS NOT INNER
274	520	* J	99 103	328	EXT REFS

COMMON BLOCKS	LENGTH
CONTRL	9
IMUDAT	67
INPUTS	56
NAV	182
POSAV	7
TRAJIN	21
UNIVRSL	10

STATISTICS

PROGRAM LENGTH	6720	442
CM LABELED COMMON LENGTH	5400	352

```
      SUBROUTINE POSVEL                                                 011210
C                                                                       011220
C     ROUTINE TO CALCULATE THE AIRCRAFT POSITION AND VELOCITY           011230
C     IN THE LVN FRAME (2 SPACE? DEN ANES).  POSITION CONSISTS OF       011240
C     LATITUDE, LONGITUDE, AND WANDER ANGLE.                            011250
C                                                                       011260
C                                                                       011270
      IMPLICIT REAL(A-H,L-Z)                                            011280
      COMMON /TRAJIN/  TIME,       LAT9I,      LONG9I,     ALF9I,       011290
     1     H3,         EI69I(3),   V9I(3),     SF9I(3),    DELTS,       011300
     2     TIMEO,      LONGO,      SLAT9I,     CLAT9I,     SALF9I,      011310
     3     CALF9I                                                       011320
      COMMON /NAV/     C9P92P(3,3),V92P(3),    DV92P(3),   PH9(3),      011330
     1     C9PHD(3,3), A(3,3),     B(3,3),     THTC9I(3),  THTI9O(3),   011340
     2     THTC9P(3),  WXV(3),     G92P(3),    H,          ALPHA,       011350
     3     SALF,       CALF,       DELT,       ETA(3),     V9MP,        011360
     4     LAT,        LONG,       V92(3),     EILATI(3,3),DELTA,       011370
     5     XSALF,      XCALF,      X0P92P(3,3),HV92P(3),   DV92P(3),    011380
     6     S?PHI,      XC?PHI,     XV92P(3),   XH,         DELH,        011390
     7     C0910(3,3), C0P90(3,3), PH3,        C035(3,3),  DV592P(3),   011400
     8     OOX ,       OOY ,       OOZ ,       O2P95(4),   DELTP(3),    011410
     9     GAIUS(3,10),IGAINP(3)                                        011420
C                                                                       011430
C     FIND THE POSITION ANGLES.                                         011440
C                                                                       011450
      TEMP = VSQRT(VP(VP(C0P92P(1,1)**2)+VP(C0P92P(2,1)**2)))           011460
      LAT = VATAN2(C0P92P(3,1),TEMP)                                    011470
      OALPHA=0.                                                         011480
      OALPHA=ALPHA                                                      011490
      IF (TEMP .EQ. 0.) GO TO 1200                                      011500
      LONG = VATAN2(C0P92P(2,1),C0P92P(1,1))                            011510
      LONG = VP(LONG + LONGO)                                           011520
      ALPHA = VATAN2(-C0P92P(3,2),C0P92P(3,3))                          011530
      OALPHA=VP(VP((ALPHA-OALPHA))/2.)                                  011540
C                                                                       011550
C     CONVERT VELOCITIES TO LVN FRAME                                   011560
C                                                                       011570
 1200 SALF = VSIN(ALPHA)                                                011580
      CALF = VCOS(ALPHA)                                                011590
      XSALF=VP(SALF*VP(CALF*VP(OALPHA*CALF)))                           011600
      YCALF=VP(CALF-VP(OALPHA*SALF))                                    011610
      V92(1) = V92P(1)                                                  011620
      V92(2) = VP(VP(CALF*V92P(2)) + VP(SALF*V92P(3)))                  011630
      V92(3) = VP(VP(-SALF*V92P(2)) + VP(CALF*V92P(3)))                 011640
      RETURN                                                            011650
      END                                                               011660
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 POSVEL

SUBROUTINE POSVEL 74/74 OPT=0 TRACE FTN 4.5+2436 05/25/76 17.12.47 PAGE 2

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJTN
75	ALPHA	REAL		NAV	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJTN
22	CLAT9T	REAL		TRAJTN	165	C0P95	REAL	ARRAY	NAV
0	C0P92P	REAL	ARRAY	NAV	164	C0P10	REAL	ARRAY	NAV
177	C095	REAL	ARRAY	NAV	22	C0RH0	REAL	ARRAY	NAV
156	DALPHA	REAL			153	DELH	REAL		NAV
100	DELT	REAL		NAV	123	DELT9	REAL		NAV
16	DELTS	REAL		TRAJTN	210	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	101	ETA	REAL	ARRAY	NAV
5	ET49T	REAL	ARRAY	TRAJTN	112	FILAT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HR	REAL		TRAJTN
137	HV92P	REAL	ARRAY	NAV	263	IGAINR	INTEGER	ARRAY	NAV
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONG0	REAL		TRAJTN
2	LONG9T	REAL		TRAJTN	157	OALPHA	REAL		
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILTR	REAL	ARRAY	NAV
176	OHD	REAL		NAV	142	OV92P	REAL	ARRAY	NAV
216	Q2P95	REAL	ARRAY	NAV	17	RHO	REAL	ARRAY	NAV
76	SALF	REAL		NAV	23	SALF9T	REAL		TRAJTN
13	SF9T	REAL	ARRAY	TRAJTN	21	SLAT9T	REAL		TRAJTN
145	S2PHI	REAL		NAV	155	TEMP	REAL		
63	THTC0P	REAL	ARRAY	NAV	56	THTF0T	REAL	ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	3	TIME	REAL		TRAJTN
17	TIME0	REAL		TRAJTN	104	V0MP	REAL		NAV
13	V9T	REAL	ARRAY	TRAJTN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XJP92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS			
VATAN2	REAL	2	VCOS	REAL	1
VP	REAL	1	VSIN	REAL	1
VSQRT	REAL	1			

STATEMENT LABELS

45 1200

COMMON BLOCKS	LENGTH
TRAJTN	21
NAV	182

STATISTICS

PROGRAM LENGTH	1608	112
CM LABELED COMMON LENGTH	3139	203

```
      SUBROUTINE GRAV(A0P92P,AS2PHI,AH)                                 011670
C                                                                       011680
C     THIS SUBROUTINE COMPUTES THE COMPONENTS OF GRAVITYIN THE LLHA     011690
C     FRAME. THESE RESULTS ARE RETURNED IN G92P(1) THRU (3). ALSO       011700
C     COMPUTED IS SINE(PHI)**2. THIS IS RETURNED THRU THE               011710
C     ARGUMENT LIST. THESE CALCULATIONS DUPLICATE THOSE OF THE          011720
C     FLIGHT PROFILE GENERATOR                                          011730
C                                                                       011740
      IMPLICIT REAL(A-H,L-Z)                                            011750
      COMMON /NAV/   C0P92P(3,3),V92P(3),   DV92P(3),   PHI(3),         011760
     1     CBRHO(3,3), A(3,3),     B(3,3),    THTEPT(3),  THTTPO(3),    011770
     2     THTCOP(3),  WXV(3),     G92P(3),   H,          ALPHA,         011780
     3     SALF,       CALF,       DELT,      CTA(3),     V0MP,          011790
     4     LAT,        LONG,       V92(3),    FILATT(3,3),DELTA,         011800
     5     XSALF,      XCALF,      X0P92P(3,3),HV92P(3),   DV92P(3),      011810
     6     S2PHI,      XS2PHI,     XV92P(3),  XH,         DELH,          011820
     7     C0910(3,3), C0P90(3,3), DH3,       C095(3,3),  DV592P(3),     011830
     8     CDX ,       DDY ,       DD7 ,      92P95(4),   DFILTP(3),     011840
     9     GAINS(3,10),IGAINP(3)                                        011850
      COMMON /PGRAV/   GLHSC,      GPCNT,     GPS2,      GPS4,          011860
     1     GRH,        GRH2,       GRHS2                                011870
      DIMENSION A0P92P(3,3)                                             011880
      AS2PHI= VP(A0P92P(3,1)**2)                                        011890
      COEF = VP(VP(-GLHSC*AH)*A0P92P(3,1))                              011900
      G92P(1) = VP(-VP(VP((GPCNT +VP(GPS2*AS2PHI)))+VP(GPS4*VP(AS2PHI**2011910
     A))) * VP((1. - VP(VP(VP(GPH -                                     011920
     1     VP(GRHS2*AS2PHI))*AH)-VP(GPH2*VP(AH**2))))))                 011930
      G92P(2) = VP(-COEF*A0P92P(3,2))                                   011940
      G92P(3) = VP(COEF*A0P92P(3,3))                                    011950
      RETURN                                                            011960
      END                                                               011970
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 GRAV

VARIABLES	SN	TYPE		RELOCATION					
37	A	REAL	ARRAY	NAV	0	AH	REAL		F.P.
75	ALPHA	REAL		NAV	0	AS2PHI	REAL		F.P.
0	A0P92P	REAL	ARRAY	F.P.	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	163	COEF	REAL		
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
22	CBRHO	REAL	ARRAY	NAV	151	DELH	REAL		NAV
193	DELT	REAL		NAV	123	DELTA	REAL		NAV
219	DV592P	REAL	ARRAY	NAV	14	DV92P	REAL	ARRAY	NAV
101	FTA	REAL	ARRAY	NAV	112	FILATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	0	GLHSC	REAL		PGRAV
1	GPCNT	REAL		PGRAV	4	GPH	REAL		PGRAV
6	GPHS2	REAL		PGRAV	5	GPH2	REAL		PGRAV
2	GPS2	REAL		PGRAV	3	GPS4	REAL		PGRAV

71 G92P REAL ARRAY MAV 74 H REAL MAV

SUBROUTINE GRAV 74/74 OPT=0 TRACE FTN 4.5+P436 05/25/76 17.12.47 PAGE 2

VARIABLES	SN	TYPE		RELOCATION				
137	HV92P	REAL	ARRAY	MAV	213	IGAINP	INTEGER	SPRAY	MAV
185	LAT	REAL		MAV	185	LONG	REAL		MAV
213	ODX	REAL		MAV	214	ODY	REAL		MAV
215	ODZ	REAL		MAV	222	OFILTR	REAL	ARRAY	MAV
176	OHB	REAL		MAV	142	OV32P	REAL	ARRAY	MAV
216	O2P95	REAL	ARRAY	MAV	17	OVD	REAL	ARRAY	MAV
76	SALF	REAL		MAV	145	S2PHI	REAL		MAV
62	THTCOP	REAL	ARRAY	MAV	55	THTFPT	REAL	SPRAY	MAV
68	THTTPO	REAL	ARRAY	MAV	104	V3HP	REAL		MAV
107	V92	REAL	ARRAY	MAV	11	V92P	REAL	SPRAY	MAV
66	VXV	REAL	ARRAY	MAV	135	XFILF	REAL		MAV
152	XH	REAL		MAV	124	YSILF	REAL		MAV
144	XS2PHI	REAL		MAV	147	XV-2P	REAL	ADJAY	MAV
125	XC92P	REAL	ARRAY	MAV					

EXTERNALS	TYPE	ARGS
VP	REAL	1

COMMON BLOCKS	LENGTH
MAV	152
PGRAV	7

STATISTICS		
PROGRAM LENGTH	1648	116
CM LABELED COMMON LENGTH	2759	189

```
SUBROUTINE ANGVL2    74/74   OPT=0 TRACE                    FTN 4.5+P406    05/25/76  17.12.47        PAGE  1

      1                SUBROUTINE ANGVL2 (VLCTY,ASALF,ACALF,AS2PHI,AH)                          011900
                       C                                                                        011910
                       C     THIS SUBROUTINE COMPUTES THE ANGULAR VELOCITY OF THE PLATFORM       012000
                       C     FRAME WITH RESPECT TO THE ROTATING EARTH. THIS ANGULAR VELOCITY     012010
      5                C     IS CAUSED BY THE MOTION OF THE PLATFORM WITH RESPECT TO THE EARTH.  012020
                       C     THE RESULTS ARE RETURNED IN PHO(1) THRU (3).                       012030
                       C                                                                        012040
                       IMPLICIT REAL(A-H,L-Z)                                                   012050
                       COMMON /NAV/     CORD2P(3,3),V32P(3),     DV92P(3),     RHO(3),         012060
     10                1     C4PHO(3,3),     A(3,3),     B(3,3),     THETPT(3),     THTTPO(3),  012070
                       2     THTCOP(3),     WXV(3),     G92P(3),     H,          ALPHA,         012080
                       3     SALF,     CALF,     DELT,     SF4(3),     VPHS,                   012090
                       4     LAT,     LONG,     V92(3),     FILAPT(3,3),DELTA,                 012100
                       5     XSALF,     XCALF,     XCORD2P(3,3),HV92P(3),     DV92P(3),       012110
     15                6     S2PHI,     XS2PHI,     XV32P(3),     XH,          DELH,          012120
                       7     C0910(3,3),     C0920(3,3),     DUB,     C095(3,3),     DV592P(3),  012130
                       8     DDX   ,     DDY   ,     DDZ   ,     D2P95(4),     DFILTP(3),      012140
                       9     GAINS(2,10),IGAINP(3)                                              012150
                       COMMON /UNVRSL/  PI,          HPI,          PO,          R3,             012160
     20                1     EE,     CSQ,     EER2O,     HERT,     RTDPER,                     012170
                       2     PESQ                                                               012180
                       DIMENSION VLCTY(3)                                                       012190
                       VF=VP(VP(ACALF*VLCTY(2))+VP(ASALF*VLCTY(3)))                             012200
                       VN=VP(VP(-ASALF*VLCTY(2))+VP(ACALF*VLCTY(3)))                            012210
     25                TMP1=VP(1.0/(VP(1.0-VP(ESQ*AS2PHI))))                                    012220
                       TMP2=VSQRT(TMP1)                                                         012230
                       RP=R3*(AH+VP(R3*TMP2))                                                   012240
                       RM=VP(AH+VP(VP(1.-ESQ*TMP1)*TMP2))                                       012250
                       WE=VP(-VN/RM)                                                            012260
     30                WN=VP(VF/RP)                                                             012270
                       RHO(2)=VP(VP(WE*ACALF)-VP(WN*ASALF))                                     012280
                       RHO(3)=VP(VP(WE*ASALF)+VP(WN*ACALF))                                     012290
                       RETURN                                                                   012300
                       END                                                                      012310

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
     7  ANGVL2

VARIABLES     SN  TYPE            RELOCATION
     53  AH          REAL        ARRAY       NAV          0  ACALF       REAL                F.P.
      0  ASALF       REAL                    F.P.        75  ALPHA       REAL                NAV
     44  B           REAL        ARRAY       NAV          0  AS2PHI      REAL                F.P.
    155  C0P90       REAL        ARRAY       NAV         77  CALF        REAL                NAV
    154  C0910       REAL        ARRAY       NAV        177  C095        REAL        ARRAY   NAV
     22  C4PHO       REAL        ARRAY       NAV        153  DELH        REAL                NAV
    101  DELT        REAL                    NAV        125  DELTA       REAL                NAV
    210  DV592P      REAL        ARRAY       NAV         14  DV92P       REAL        ARRAY   NAV
      6  EE          REAL                    UNVRSL       6  EER2O       REAL                UNVRSL
      5  ESQ         REAL                    UNVRSL     111  G92P        REAL        ARRAY   NAV
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112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV

SUBROUTINE ANGVL2 74/74 OPT=0 TRACE FTN 4.5+R406 05/25/79 17.12.47 PAGE 2

VARIABLES SN TYPE RELOCATION

71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
1	HPI	REAL		UNVRSL	137	HV92P	REAL	ARRAY	NAV
263	IGAINP	INTEGER	ARRAY	NAV	105	LAT	REAL		NAV
106	LONG	REAL		NAV	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFILTP	REAL	ARRAY	NAV	175	OH3	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVRSL
216	P2P95	REAL	ARRAY	NAV	10	PAPER	REAL		UNVRSL
11	RESO	REAL		UNVRSL	17	PH3	REAL	ARRAY	NAV
161	RR	REAL			161	RP	REAL		
3	SPP	REAL		UNVRSL	2	RS	REAL		UNVRSL
76	SALF	REAL		NAV	145	S2PHI	REAL		NAV
63	THICOP	REAL	ARRAY	NAV	95	THTEST	REAL	ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	156	TH91	REAL		
157	TMP2	REAL			184	V94P	REAL		NAV
154	VE	REAL			1	VLCITY	REAL	ARRAY	F.P.
155	VN	REAL			107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	162	WC	REAL		
7	WFRT	REAL		UNVRSL	153	WH	REAL		
66	WV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	YCALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV32P	REAL	ARRAY	NAV
126	XOP92P	REAL	ARRAY	NAV					

EXTERNALS TYPE ARGS

VP	REAL	1		VSQRT	REAL	1	

COMMON BLOCKS LENGTH

NAV	192
UNVRSL	10

STATISTICS

PROGRAM LENGTH	1640	116
CM LABELED COMMON LENGTH	3000	192

```
      SUBROUTINE ATUDE                                                  012720
C                                                                       012730
C     THIS ROUTINE CALCULATES THE THREE ATTITUDE ANGLES FROM            012740
C     THE BODY (S SPACE) TO LVN (2 SPACE) TRANSFORMATION                012750
C     MATRIX.  THIS ROUTINE IS USED IN ALL IMU CONFIGURATIONS.          012760
C                                                                       012770
      IMPLICIT REAL(A-H,L-Z)                                            012780
      COMMON /INPUTS/ AQUANT,    TQUANT,    VQUANT,    START,          012790
     1    STOP,     PLOTIM,    PRNT,      PSTRT,     CVD1,           012800
     2    CVD2,     CVD3,      TOLJPK,    HSOTIM,    HSCINC,         012810
     2    ITRNAV,   ITRATT,    INCOP,     IMUTYP,    IFILIM,         012820
     3    IPC(30),  IOPNLF,    SSX0,      SSY0,      SSZ0,           012830
     4    PSMAX,    OPSMAX,    ITREIL                                 012840
      COMMON /IMUDAT/ PESID(3), DV3P(3),   DT49P(4),  WT(7),          012850
     1    SF9TP(3), C2P95(3,3), C9MIS(3,3), TPESID(3), C1090(3,3),    012860
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                        012870
      COMMON /NAV/    C9P92P(3,3),V92P(3),   DV92P(3),  RH0(3),       012880
     1    C9RHO(3,3), A(3,3),    B(3,3),    THTERT(3), THTIPC(3),    012890
     2    THTC0P(3),  WXV(3),    G92P(3),   H,         ALPHA,          012900
     3    SALF,       CALF,      DELT,      ETA(3),    V3X0,           012910
     4    LAT,        LONG,      V93(3),    ETLATT(3,3),DELTA,         012920
     5    XSALE,      XCALE,     X0P92P(3,3),HV92P(3),  DV92P(3),       012930
     6    S2PHI,      XS2PHI,    XV92P(3),  XH,        DELH,           012940
     7    C0910(3,3), CCP90(3,3), DHB,      C095(3,3),  DV592P(3),    012950
     8    ODX ,       ODY ,      ODZ ,      D2P95(4),  DELTR(3),       012960
     9    GAINS(3,10),TGAINP(3)                                       012970
      DIMENSION X(3,3)                                                  012980
      EQUIVALENCE (X,C2P95)                                             012990
      ETA(1)=VATAN2(-X(1,2),X(1,1))                                     013000
      ETA(2)=VATAN2(X(1,3),VSQRT(VP(VP(X(2,3)**2)+VP(X(3,3)**2))))      013010
      ETA(3)=VP(VATAN2(X(2,3),X(3,3))+ALPHA)                            013020
      RETURN                                                            013030
      END                                                               013040
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 ATUDE

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
0	AQUANT	REAL		INPUTS	100	ARESID	REAL	ARRAY	IMUDAT
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
10	CVD1	REAL		INPUTS	11	CVD2	REAL		INPUTS
12	CVD3	REAL		INPUTS	166	C1090	REAL	ARRAY	NAV
0	CCP92P	REAL	ARRAY	NAV	154	CCP90	REAL	ARRAY	NAV
177	C095	REAL	ARRAY	NAV	45	C1092P	REAL	ARRAY	IMUDAT
56	C1092P	REAL	ARRAY	IMUDAT	20	C2P95	REAL	ARRAY	IMUDAT
67	C2P95T	REAL	ARRAY	IMUDAT	31	C9MIS	REAL	ARRAY	IMUDAT
22	C9RHO	REAL	ARRAY	NAV	153	DELH	REAL		NAV
130	DELT	REAL		NAV	123	DELTA	REAL		NAV
52	DHB	REAL		INPUTS	211	DV592P	REAL	10014	NAV

3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL		

VARIABLES SN TYPE RELOCATION

101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	22	IERLIM	INTEGER		INPUTS
263	IGAINP	INTEGER	ARRAY	NAV	21	INUTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	61	IOPNL2	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	ITPATT	INTEGER		INPUTS
67	ITPFIL	INTEGER		INPUTS	16	ITRNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	106	LONG	REAL		NAV
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILTR	REAL	ARRAY	NAV
176	OBM	REAL		NAV	142	OV92P	REAL	ARRAY	NAV
	SOTIM	REAL		INPUTS	5	PPUT	REAL		INPUTS
217	R2P95	REAL	ARRAY	NAV	1	PRGID	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	55	PSMAX	REAL		INPUTS
7	RSTRT	REAL		INPUTS	76	SALF	REAL		NAV
	SF9IP	REAL	ARRAY	IMUDAT	62	SGX0	REAL		INPUTS
64	SSY0	REAL		INPUTS	66	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
55	THTFRT	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV
13	TOLJRK	REAL		INPUTS	1	TQUANT	REAL		INPUTS
42	TPESID	REAL	ARRAY	IMUDAT	104	V9MP	REAL		NAV
2	VQUANT	REAL		INPUTS	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	12	WT	REAL	ARRAY	IMUDAT
66	WXV	REAL	ARRAY	NAV	20	X	REAL	ARRAY	IMUDAT
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XX9P2P	REAL	ARRAY	NAV

EXTERNALS TYPE ARGS

VATAN2	REAL	2	VP	REAL	1
VSQRT	REAL	1			

COMMON BLOCKS LENGTH

INPUTS	66
IMUDAT	67
NAV	182

STATISTICS

PROGRAM LENGTH	618	49
CM LABELED COMMON LENGTH	4618	305

```
      SUBROUTINE ININIT                                                 012650
C                                                                       012660
C     THIS ROUTINE PERFORMS MUCH OF THE INITIALIZATION OF THE           012670
C     NAV SIMULATOR. THE REST IS PERFORMED BY THE EXEC AND INREC.       012680
C                                                                       012690
      IMPLICIT REAL(A-H),REAL(L-Z)                                      012700
      COMMON /CONTRL/  DTIME,      PTIME,      PLTIME,     RSTIME,      012710
     1     TPREV,      INIT,       ISTOP,      ICMCYL,     ICMCY2       012720
      COMMON /IMUDAT/  RESID(3),   DV2P(3),    FTA2P(4),   NT(3),       012730
     1     SENIP(3),   C2P95(3,3), C94IC(3,3), IRESID(3),  C1092(3,3),  012740
     2    C1092P(3,3), C2P95T(3,3), A2ESID(3)                           012750
      COMMON /INPUTS/  AQUANT,     TQUANT,     VQUANT,     START,       012760
     1     STOP,       PLOTIM,     PRNT,       PSTRT,      CV21,        012770
     2     CVD2,       CVD3,       TOLJPK,     HSOTIM,      HSOTNG,     012780
     2     ITPNAV,     IIRATT,     INCOP,      TMUTYP,     TIPLIM,      012790
     3     IPC(30),    IOPNLP,     SSXB,       SSYB,       SSZB,        012800
     4     RSMAX,      DRSMAX,     ITRFIL                               012810
      COMMON /NAV/     C2P92P(3,3),V92P(3),    DV32P(3),   PPO(3),      012820
     1     C2PH0(3,3), A(3,3),     T(3,3),     THTEPT(3),  THTIPO(3),   012830
     2    THTG2P(3),   WXV(3),     G32P(3),    H,          ALPHA,       012840
     3     SALF,       CALF,       DELT,       FTA(3),     V2MP,        012850
     4     LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,       012860
     5     XSALF,      XCALF,      X2P92P(3,3),HV92P(3),   DV92P(3),    012870
     6     S2PHI,      XS2PHI,     XV92P(3),   XH,         DELP,        012880
     7     C0910(3,3), C2P90(3,3), D43,        C295(3,3),   DV592P(3),  012890
     8     DDX,        DDY,        DDZ,        D2P95(4),   DFILTP(3),   012900
     9     GAINS(2,10),IGAINP(3)                                        012910
      COMMON /PGRAV/   GLHSQ,      GRCNT,      GPS2,       GPS4,        012920
     1     GRH,        GPH2,       GPYS2                                012930
      COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALF9T,       012940
     1     HR,         FTA9T(3),   V9T(3),     SE9T(3),    DELTS,       012950
     2     TIMEG,      LONGG,      SLAT9T,     CLAT9T,     SALF9T,      012960
     3     CALF9T                                                       012970
      COMMON /UNVRSL/  PI,         HPI,        R0,         R2D,         012980
     1     EF,         ESQ,        ERRR0,      HERT,       RADPER,      012990
     2     RSSQ                                                         013000
      LONGG = VP(LONG9T)                                                013010
      TIMEG = TIME                                                      013020
      LAT = VP(LAT9T)                                                   013030
      LONG = LONGG                                                      013040
      ALPHA = VP(-ALF9T)                                                013050
      SALF =VSIN(ALPHA)                                                 013060
      CALF =VCOS(ALPHA)                                                 013070
      V92P(1) = VP(V9T(2))                                              013080
      V92P(2) = VP(-V9T(2))                                             013090
      V92P(3) = VP(V9T(1))                                              013100
C                                                                       013110
C     INITIALIZE THE DCM.                                               013120
C                                                                       013130
      CALL VRTZYX(C2P92P,0.E0,1.E0,SLAT9T,CLAT9T,-SALF9T,CALF9T)        013140
      IF (IPC(6) .EQ. 0) GO TO 522                                      013150
      CALL DOUT(6)                                                      013160
  522 CONTINUE                                                          013170
      PPO(1) = 0.                                                       013180
      G2PHT=VP(C2P92P(3,1)**2)                                          013190
      D = VP(D43)                                                       013200
```

```
                    OMG=VP(H**2)                                                  01 3210

SUBROUTINE ININII    74/74   OPT=0 TRACE          FTN 4.5+R406    05/25/76 17.12.47    PAGE  2

                    IF (IPC(30) .NE. 0) GO TO 410                                 01 3220
                    DCM32S = VP(C0P92P(3,2)**2)                                   01 3230
          60        DCM33S = VP(C0P92P(3,3)**2)                                   01 3240
                    CORR = VP(VE(VP(2.0*ERR0)*C0P922(3,2))*C0P92P(3,3))           01 3250
                    ONEM = VP(1.0 - VP(H*RR0))                                    01 3260
                    RHO(2) = VP(VP(VP(-V92P(3)*RR0)*VP((ONEM+VP(EE*VP(VP((1.-VP(3.*DCM01 3270
                   A33S)))-DCM32S)))))-VP(V92P(2)*C922))                          01 3280
          65        RHO(3)=VP(VP(VP(V92P(2)*RR0)*VP(ONEM-VP(EE*VP(VP(1.-VP(3.*   01 3290
                    A  DCM32S))-DCM33S)))) +VP(V92P(3)*C0PP ))                    01 3300
                    GO TO 450                                                     01 3310
                410 IF (IPC(29) .EQ. 0) CALL ANGVL2(V92P,SALF,CALF,S2PHI,H)       01 3320
                450 IF (IPC(29) .EQ. 0) GO TO 500                                 01 3330
          70        XS2PHI=S2PHI                                                  01 3340
                    XH=H                                                          01 3350
                    HV92P(1)=V92P(1)                                              01 3360
                    HV92P(2)=V92P(2)                                              01 3370
                    HV92P(3)=V92P(3)                                              01 3380
          75        XCALF=CALF                                                    01 3390
                    XSALF=SALF                                                    01 3400
                    XV92P(1)=V92P(1)                                              01 3410
                    XV92P(2)=V92P(2)                                              01 3420
                    XV92P(3)=V92P(3)                                              01 3430
          80        IF (IPC(30) .NE. 0) CALL ANGVL2(HV92P,XSALF,XCALF,XS2PHI,XH)  01 3440
                    IF (IPC(5) .NE. 0) CALL DOUT(5)                               01 3450
                  C                                                               01 3460
                  C     DCM UPDATE IS FIRST OR SECOND ORDER                       01 3470
                  C                                                               01 3480
          85        CALL DCMUPD(C0PHO,VP(RHO(1)*DELT),VP(RHO(2)*DELT),VP(RHO(3)*DELT),01 3490
                    ATPC(29),                                                     01 3500
                    1 0.E0,A(1,1),A(1,2),A(1,3))                                  01 3510
                    CALL VMM(A,C0P92P,C0PHO)                                      01 3520
                    DO 520 I=1,3                                                  01 3530
          90        DO 520 J=1,3                                                  01 3540
                    X0P92P(I,J)=VP(C0P92P(I,J)+VP(0.5*A(I,J)))                    01 3550
                520 CONTINUE                                                      01 3560
                    IF (TIME .LT. OTIME) GO TO 550                                01 3570
                    OTIME = VP(TIME + VP(INC0P*DELT))                             01 3580
          95        CALL OPTHO(C0P92P)                                            01 3590
                    IF (IPC(7) .EQ. 0) GO TO 550                                  01 3600
                    CALL DOUT(7)                                                  01 3610
                550 CONTINUE                                                      01 3620
                    CALL GPAV(X0P92P,XS2PHI,XH)                                   01 3630
         100        IF (IPC(12) .NE. 0) CALL DOUT(12)                             01 3640
                    CALL POSVEL                                                   01 3650
                    CALL ANGVL2(XV92P,XSALF,XCALF,XS2PHI,XH)                      01 3660
                    CALL TOPCOP(X0P92P,XV92P)                                     01 3670
                    INIT=1                                                        01 3680
         105        RETURN                                                        01 3690
                600 IF (IPC(5) .NE. 0) CALL DOUT(5)                               01 3700
                    CALL TOPCOP(C0P92P,V92P)                                      01 3710
                    C0PHO(2,1) = VP(PHO(3)*DELT)                                  01 3720
                    C0PHO(3,1) = VP(-PHO(2)*DELT )                                01 3730
         110        C0PHO(3,2) = VP(PHO(1)*DELT)                                  01 3740
                    C0PHO(1,2) = VP(-PHO(3)*DELT)                                 01 3750
                    C0PHO(1,3) = VP(PHO(2)*DELT)                                  01 3760
```

```
                CALL GRAV(C0P92P,S2PHI,H)                                01 17 80



      SUBROUTINE ININIT     74/74   OPT=0 TRACE          FTN 4.5+P406    05/25/76. 17.12.47        PAGE     3

  115           IF (IPC(12) .NE. 0) CALL DOUT(12)                        01 37 90
                CALL POSVEL                                              01 38 00
                INIT=1                                                   01 38 10
                RETURN                                                   01 38 20
                END                                                      01 38 30


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1  ININIT

VARIABLES    SN  TYPE              RELOCATION
    33  A          REAL      ARRAY     NAV          3  ALF9T      REAL              TRAJTN
    75  ALPHA      REAL                NAV          0  AQUANT     REAL              INPUTS
   100  ARESIG     REAL      ARRAY     IMUDAT      44  B          REAL      ARRAY   NAV
    77  CALF       REAL                NAV         24  CALF9T     REAL              TRAJTN
    22  CLAT3T     REAL                TRAJTN     565  COSP       REAL
    10  CV01       REAL                INPUTS      11  CV02       REAL              INPUTS
    12  CV03       REAL                INPUTS     155  C0P90      REAL      ARRAY   NAV
     8  DCP92P     REAL      ARRAY     NAV        154  C0910      REAL      ARRAY   NAV
   177  C095       REAL      ARRAY     NAV         45  C1390      REAL      ARRAY   IMUDAT
    56  C1P92P     REAL      ARRAY     IMUDAT      20  C2P95      REAL      ARRAY   IMUDAT
    67  C2P95T     REAL      ARRAY     IMUDAT      31  C9MTS      REAL      ARRAY   IMUDAT
    22  C9PH0      REAL      ARRAY     NAV        563  DCM32S     REAL
   564  DCM33S     REAL                           153  DELH       REAL              NAV
   100  DELT       REAL                NAV        123  DELTA      REAL              NAV
    16  DLLTS      REAL                TRAJTN      66  DPSMAX     REAL              INPUTS
   210  DV592P     REAL      ARRAY     NAV          3  DV9P       REAL      ARRAY   IMUDAT
    14  DV92P      REAL      ARRAY     NAV          4  EE         REAL              UNVPSL
     6  EEP90      REAL                UNVPSL       5  ESQ        REAL              UNVPSL
   101  ETA        REAL      ARRAY     NAV          6  ETA9P      REAL      ARRAY   IMUDAT
     5  ETA9T      REAL      ARRAY     TRAJTN     112  ETLATT     REAL      ARRAY   NAV
   225  GAINS      REAL      ARRAY     NAV          0  GLHSC      REAL              PGRAV
     1  GPCNT      REAL                PGRAV        4  GPH        REAL              PGRAV
     6  GPHS2      REAL                PGRAV        5  GPH2       REAL              PGRAV
     2  GPS2       REAL                PGRAV        3  GPS4       REAL              PGRAV
    71  G92P       REAL      ARRAY     NAV         74  H          REAL              NAV
     4  HB         REAL                TRAJTN       1  HPI        REAL              UNVPSL
    15  HSOINC     REAL                INPUTS      14  HSOTTM     REAL              INPUTS
   137  HV92P      REAL      ARRAY     NAV        567  I          INTEGER
     7  ICMCYL     INTEGER             CONTRL      19  ICMCYP     INTEGER           CONTRL
    22  IFPLIM     INTEGER             INPUTS     263  IGAINP     INTEGER   ARRAY   NAV
    21  IMUTYP     INTEGER             INPUTS      28  IMUSP      INTEGER           INPUTS
     5  INIT       INTEGER             CONTRL      51  IOPNLP     INTEGER           INPUTS
    23  IPC        INTEGER   ARRAY     INPUTS       6  ISTOP      INTEGER           CONTRL
    17  ITMATT     INTEGER             INPUTS      67  ITREIL     INTEGER           INPUTS
    16  ITRNAV     INTEGER             INPUTS     570  J          INTEGER
   135  LAT        REAL                NAV          1  LAT9T      REAL              TRAJTN
   136  LONG       REAL                NAV         23  LONGO      REAL              TRAJTN
     2  LONG9T     REAL                TRAJTN      213  MAX        REAL              NAV
   214  MDX        REAL                NAV         215  MDZ        REAL              NAV
   222  MFLT2      REAL      ARRAY     NAV         175  MU2        REAL              NAV
```

566	ONEM	REAL			0	OTIME	REAL		CONTRL

VARIABLES SN TYPE RELOCATION

142	OV92P	REAL	ARRAY	NAV	3	PI	REAL		UNIVRSL
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	11	RADPER	REAL		UNIVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESO	REAL		UNIVRSL
17	RHO	REAL	ARRAY	NAV	3	RO1	REAL		UNIVRSL
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
7	RSTRT	REAL		INPUTS	2	RU	REAL		UNIVRSL
76	SALF	REAL		NAV	23	SALF9T	REAL		TRAJIN
13	SF9T	REAL	ARRAY	TRAJIN	15	SF9TP	REAL	ARRAY	IMUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
7	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
55	THTRT	REAL	ARRAY	NAV	60	THTTRO	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEO	REAL		TRAJIN
13	TOLJRK	REAL		INPUTS	4	TRREV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRESID	REAL	ARRAY	IMUDAT
104	VDHP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WE2T	REAL		UNIVRSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XWP92P	REAL	ARRAY	NAV

EXTERNALS TYPE ARGS

ANGVL2		5	DCOUBD		9
DOUT		1	GRAV		3
ORTHO		1	POSVEL		0
TORCOR		2	VCOS	REAL	1
VMM		3	VP	REAL	1
VRTZYX		7	VSIN	REAL	1

STATEMENT LABELS

177	410	202	450		0	520	
40	522	316	550		332	600	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
254	520	* I	89 92	240	EXT REFS NOT INNER
255	520	* J	90 92	200	EXT REFS

COMMON BLOCKS LENGTH

CONTRL	9
IMUDAT	67
INPUTS	56
NAV	192
PCRAV	7
TRAJIN	21
UNIVRSL	10

STATISTICS

PROGRAM LENGTH	5718	377
CM LABELED COMMON LENGTH	5400	352

```
      SUBROUTINE ATTFIL                                                 013840
C                                                                       013850
C     THIS ROUTINE IS A MULTIPLE FIXED GAIN FILTER THAT IS APPLIED      013860
C     TO THE ATTITUDE DATA, ATTITUDE AND ITS FIRST AND SECOND           013870
C     DERIVATIVES ARE THE STATE VARIABLES                               013880
C                                                                       013890
      IMPLICIT REAL(A-H,L-Z)                                            013900
      COMMON /INPUTS/ AQUANT,   TQUANT,   VQUANT,   START,   013910
     1    STOP,     PLOTIM,   PRNT,     PSTPT,    CV01,    013920
     2    CV02,     CV03,     TOLJPK,   HSOTIM,   HSCIPC,  013930
     2    ITRNAV,   ITRATT,   INCOP,    IMUTYP,   IERLIM,  013940
     3    IPC(30),  IOPNLP,   SSXO,     SSYO,     SSZO,    013950
     4    RSMAX,    ORSMAX,   ITRFIL                       013960
      COMMON /NAV/  C0P92P(3,3),V92P(3),   RV92P(3),  PHO(3),   013970
     1    C9PHO(3,3), A(3,3),   B(3,3),   THTEPT(3), THTTPC(3),  013980
     2    THTCO2(3),  WXV(3),   G92P(3),  H,        ALPHA,     013990
     3    SALF,     CALF,     DELT,     STA(3),   VPHF,      014000
     4    LAT,      LONG,     V92(3),   FILATT(3,3),DELTA,   014010
     5    XSALF,    XCALF,    X0P92P(3,3),HV92P(3),  OV92P(3),  014020
     6    S2PHI,    XS2PHI,   XV92P(3),  XH,       DELH,      014030
     7    CC910(3,3), C0P90(3,3), OHB,    C095(3,3),  OVE92P(3),  014040
     8    ODX,      ODY,      ODZ,      Q2P95(4),  OFILTP(3),  014050
     9    GAINS(3,10),IGAINP(3)                              014060
      DIMENSION FILTP(3)                                                014070
C     FILTR ARE FILTER RESIDUALS                                        014080
      IF (IPC(25) .EQ. 0) RETURN                                        014090
C     IF FILTER NOT ACTIVATED, RETURN                                   014100
      DT=VP(ITRFIL*DELTA)                                               014110
      DTSQ2=VP(VP(DT*DT)*.5 )                                           014120
C                                                                       014130
C     EXTRAPOLATE NEW STATE VECTOR, FIND THIS CYCLES RESIDUALS          014140
C     SELECT GAINS AND UPDATE STATE VECTOR, THE STATE VECTOR            014150
C     HERE IS THE ATTITUDE AND ITS FIRST AND SECOND DERIVATIVE.         014160
C                                                                       014170
      DO 900 J=1,3                                                      014180
C     LOOP OVER ROLL PITCH AND YAW                                      014190
      A(1,J)=VP(VP(FILATT(1,J)+VP(FILATT(2,J)*DT))+VP(FILATT(3,J)*DTSQ2) 014200
     A)                                                                 014210
      A(2,J)=VP(FILATT(2,J)+VP(FILATT(3,J)*DT))                         014220
      A(3,J)=FILATT(3,J)                                                014230
C     A IS NOW EXTRAPOLATED STATE VECTOR                                014240
      FILTP(J)=VP(STA(J)-A(1,J) )                                       014250
C     RESIDUALS                                                         014260
      IF ( ABS(FILTP(J)) .GE. RSMAX) GO TO 300                          014270
C     IF RESIDUALS ARE TOO BIG, WANT TO MOVE GAINS POINTER LEFT         014280
C     WHICH IMPLIES LESS RELIANCE ON PREVIOUS VALUES                    014290
C     OF THE STATE VECTOR                                               014300
      IF ( ABS(VP(OFILTP(J)-FILTP(J))) .GE. ORSMAX) GO TO 300           014310
C     IF CHANGE OF RESIDUALS TOO BIG, MOVE GAIN POINTER LEFT            014320
C     ELSE MOVE GAIN POINTER RIGHT                                      014330
      K=IGAINP(J)+1                                                     014340
      IF (K .GT. 11) K=10                                               014350
      GO TO 400                                                         014360
  300 K=IGAINP(J)-1                                                     014370
      IF (K .GT. 1) GO TO 400                                           014380
```

```
                    K=1                                                                 014430


      SUBROUTINE ATTFIL     74/74   OPT=0 TRACE          FTN 4.5+2406     05/05/76  17.12.47        PAGE     2


                    A(3,J)=0.                                                           014410
                C   DISCARD FIRST AND SECOND DERIVATIVES                                 014420
     60           400 IGAINP(J)=K                                                       014430
                    OFILTR(J)=FILTR(J)                                                  014440
                    DO 900 I=1,3                                                        014450
                900 FILATT(I,J)=VR(A(I,J)+VR(GAINS(I,K)*FILTR(J)))                      014460
                C   UPDATE STATE VECTOR                                               014470
     65             RETURN                                                           014480
                    END                                                              014490
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 ATTFIL

VARIABLES

SN.	TYPE		RELOCATION	SN.				
33	A	REAL	ARRAY NAV	75	ALPHA	REAL		NAV
0	AQUANT	REAL	INPUTS	44	B	REAL	ARRAY	NAV
77	CALF	REAL	NAV	10	CVD1	REAL		INPUTS
11	CVD2	REAL	INPUTS	12	CVD3	REAL		INPUTS
165	C0P90	REAL	ARRAY NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0913	REAL	ARRAY NAV	177	C995	REAL	ARRAY	NAV
22	C9PH0	REAL	ARRAY NAV	153	DELH	REAL		NAV
197	DELT	REAL	NAV	123	DELTA	REAL		NAV
56	DPSMAX	REAL	PUTS	172	DT	REAL		
173	DTS02	REAL		210	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY NAV	101	ETA	REAL	ARRAY	NAV
112	FILATT	REAL	ARRAY NAV	177	FILTR	REAL	ARRAY	
225	GAINS	REAL	ARRAY NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL	NAV	15	HSOINC	REAL		INPUTS
14	HSOTIM	REAL	INPUTS	137	HV92P	REAL	ARRAY	NAV
176	I	INTEGER		22	IESLIM	INTEGER		INPUTS
261	IGAINP	INTEGER	ARRAY NAV	21	INUTYP	INTEGER		INPUTS
20	INCOP	INTEGER	INPUTS	61	IOPNLP	INTEGER		INPUTS
21	IPC	INTEGER	ARRAY INPUTS	17	ITRATT	INTEGER		INPUTS
67	ITREIL	INTEGER	INPUTS	16	ITRNAV	INTEGER		INPUTS
174	J	INTEGER		175	K	INTEGER		
105	LAT	REAL	NAV	106	LONG	REAL		NAV
213	ODX	REAL	NAV	214	ODY	REAL		NAV
215	ODZ	REAL	NAV	222	OFILTR	REAL	ARRAY	NAV
176	OHR	REAL	NAV	142	OV92P	REAL	ARRAY	NAV
5	PLOTIM	REAL	INPUTS	6	PONT	REAL		INPUTS
216	Q2P95	REAL	ARRAY NAV	17	RHO	REAL	ARRAY	NAV
65	RSMAX	REAL	INPUTS	7	RSTRT	REAL		INPUTS
76	SALF	REAL	NAV	62	SSX0	REAL		INPUTS
63	SSY0	REAL	INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL	INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL	NAV	63	THTCOR	REAL	ARRAY	NAV
56	THTEPT	REAL	ARRAY NAV	60	THTTRO	REAL	ARRAY	NAV
13	TOLJRK	REAL	INPUTS	1	TQUANT	REAL		INPUTS
194	V0SP	REAL	NAV	2	VQUANT	REAL		INPUTS
107	[illegible]	REAL	ARRAY NAV	11	[illegible]	REAL	ARRAY	NAV

```
    66  WXV        REAL        ARRAY    NAV              125  XSCALF     REAL                 NAV

      SUBROUTINE ATTFIL     74/74   OPT=0 TRACE                    FTN 4.5+R906     05/25/76 17.12.47        PAGE     3

  VARIABLES     SN  TYPE          RELOCATION
    152  XH          REAL                NAV              124  XSCALF     REAL                 NAV
    145  XS2PHI      REAL                NAV              147  XV92P      REAL        ARRAY    NAV
    136  XBP92P      REAL        ARRAY   NAV

  EXTERNALS          TYPE   ARGS
       VP            REAL   1

  INLINE FUNCTIONS   TYPE   ARGS
       ABS           REAL   1   INTRIN

  STATEMENT LABELS
    112  300                                          124  400                                  0  900

  LOOPS  LABEL    INDEX          FROM-TO    LENGTH   PROPERTIES
     29  900     * J             35 63       1338    EXT REFS  NOT INNER
    131  900     * I             62 63        208    EXT REFS

  COMMON BLOCKS   LENGTH
       INPUTS        56
       NAV          142

  STATISTICS
    PROGRAM LENGTH              2028     130
    CM LABELED COMMON LENGTH    3569     238
```

```
SUBROUTINE ORTHO      74/74   OPT=0 TRACE                    FTN 4.5+R40E    05/25/76  17.12.47       PAGE     1

      1                 SUBROUTINE ORTHO(ARRAY)                                          014500
                        C                                                                014510
                        C     THIS ROUTINE ORTHONORMALIZES IS INPUT                      014520
                        C                                                                014530
      5                 IMPLICIT REAL(A-H),REAL(L-Z)                                     014540
                        DIMENSION ARRAY(3,3),A(3,3),B(3,3)                               014550
                        CALL VMTM(A,ARRAY,ARRAY)                                         014560
                        DO 525 I=1,3                                                     014570
                    525 A(I,I) = VP(A(I,I) - 1.0)                                        014580
     10                 CALL VMM(3,ARRAY,A)                                              014590
                        DO 530 I=1,3                                                     014600
                        DO 530 J=1,3                                                     014610
                    530 ARRAY(I,J) = VP(ARRAY(I,J) - VP(0.5*B(I,J)))                     014620
                        RETURN                                                           014630
     15                 END                                                              014640


        SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
     3  ORTHO

VARIABLES    SN  TYPE          RELOCATION
   103  A        REAL      ARRAY                   0  ARRAY     REAL      ARRAY     F.P.
   114  B        REAL      ARRAY                 101  I         INTEGER
   102  J        INTEGER

EXTERNALS          TYPE   ARGS
     VMM                  3                        VMTM                3
     VP           REAL    1

STATEMENT LABELS
     0  525                                  0  530

LOOPS  LABEL     INDEX      FROM-TO    LENGTH   PROPERTIES
    21  525      * I          8 9        118    EXT REFS
    35  530      * I         11 13       238    EXT REFS  NOT INNER
    34  530      * J         12 13       208    EXT REFS

STATISTICS
  PROGRAM LENGTH              1303       89
```

```
      SUBROUTINE DCMUPD(DCM,DX,DY,DZ,IORDM1,DIAG,DDX,DDY,DDZ)
      IMPLICIT REAL(A-H,L-Z)
C
C     THIS ROUTINE CONSTRUCTS A DCM UPDATE MATRIX. THE INPUTS
C     ARE THE ROTATIONS (ASSUMED TO BE INCREMENTAL ROTATIONS
C     IN NO PARTICULAR ORDER), THE ROTATIONS FROM
C     THE PREVIOUS CYCLE, THE ORDER OF THE ROTATION MINUS 1
C     (THAT IS 0 MEANS FIRST ORDER, 1 MEANS SECOND ORDER,
C     ANYTHING ELSE MEANS THIRD ORDER), AND THE VALUE(PRESUMABLY
C     EITHER 0. OR 1.) THAT THE DIAGONAL ENTRIES WILL HAVE FOR ZERO
C     ROTATION(THIS ALLOWS ONE TO GET EITHER A MATRIX THAT REPRESENTS
C     THE AMOUNT THAT THE OLD DCM IS BEING CHANGED, OR TO GET A MATRIX
C     THAT, WHEN MULTIPLIED BY THE OLD DCM, YIELDS THE NEW DCM).
C     THE ROUTINE ALSO SAVES THE NEW ROTATIONS AS THE OLD ROTATIONS FOR
C     USE DURING THE NEXT CYCLE.
C
      DIMENSION DCM(3,3)
C
C     FORM FIRST ORDER TERMS
C
  500 DCM(2,1) = DZ
      DCM(3,1) = -DY
      DCM(3,2) = DX
      DCM(1,2) = -DZ
      DCM(1,3) = DY
      DCM(2,3) = -DX
      DCM(1,1) = DIAG
      DCM(2,2) = DIAG
      DCM(3,3) = DIAG
C
C     FORM AND ADD SECOND ORDER DCM UPDATE TERMS IF IORDM1 .NE. 0
C
      IF (IORDM1 .EQ. 0) GO TO 510
      S1=VP(DX**2)
      S2=VP(DY**2)
      S3=VP(DZ**2)
      DCM(1,1)=VP(DCM(1,1)-VP(0.5*VP((S2+S3))))
      DCM(2,2)=VP(DCM(2,2)-VP(0.5*VP((S3+S1))))
      DCM(3,3)=VP(DCM(3,3)-VP(0.5*VP((S1+S2))))
      T1=VP(.5*VP(DX*DY))
      T2=VP(.5*VP(DY*DZ))
      T3=VP(.5*VP(DZ*DX))
      DCM(2,1)=VP(DCM(2,1)+T1)
      DCM(1,2)=VP(DCM(1,2)+T1)
      DCM(2,3)=VP(DCM(2,3)+T2)
      DCM(3,2)=VP(DCM(3,2)+T2)
      DCM(1,3)=VP(DCM(1,3)+T3)
      DCM(3,1)=VP(DCM(3,1)+T3)
C
C     FORM AND ADD THIRD ORDER TERMS IF IORDM1 .GT. 1
C
      IF (IORDM1 .EQ. 1) GO TO 510
      T2=0.
      T3=0.
      T1=0.
      SCL=VP(.166666666666666667*VP((S1+VP(S2+S3))))
```

```
                DCM(2,1)=VP(DCM(2,1)-VP(VP(SCL*DZ)+T3))                                 015211


 SUBROUTINE DCMUPD     74/74   OPT=0 TRACE                    FTN 4.5+R406    05/25/76 17.12.47       PAGE     2

                DCM(1,2)=VP(DCM(1,2)+VP(VP(SCL*DZ)-T3))                                 015220
                DCM(3,1)=VP(DCM(3,1)+VP(VP(SCL*DY)-T2))                                 015230
      60        DCM(1,3)=VP(DCM(1,3)-VP(VP(SCL*DY)+T2))                                 015240
                DCM(2,3)=VP(DCM(2,3)+VP(VP(SCL*DX)-T1))                                 015250
                DCM(3,2)=VP(DCM(3,2)-VP(VP(SCL*DX)+T1))                                 015260
            510 DDX=DX                                                                  015270
                DDY=DY                                                                  015280
      65        DDZ=DZ                                                                  015290
                RETURN                                                                  015300
                END                                                                     015310


CARD NR. SEVERITY  DETAILS    DIAGNOSIS OF PROBLEM
      56    I                 CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.

1-64

        SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
     3  DCMUPD

VARIABLES    SN  TYPE            RELOCATION
     0  DCM        REAL    ARRAY   F.P.          3  DTAG       REAL              F.P.
     0  DX         REAL            F.P.          3  DY         REAL              F.P.
     0  DZ         REAL            F.P.          3  IO2OM1     INTEGER           F.P.
     0  DDX        REAL            F.P.          3  DDY        REAL              F.P.
     0  DDZ        REAL            F.P.        351  SCL        REAL
   342  S1         REAL                        343  S2         REAL
   344  S3         REAL                        345  T1         REAL
   346  T2         REAL                        347  T3         REAL

EXTERNALS          TYPE   ARGS
     VP            REAL     1

STATEMENT LABELS
     0  500        INACTIVE                    320  510

STATISTICS
  PROGRAM LENGTH              3510     233
```

```
SUBROUTINE QNTIZ      74/74   OPT=0 TRACE          FTN 4.5+396    05/25/76 17.12.47      PAGE     1

      1               SUBROUTINE QNTIZ(ARRAY,UNIT)                                    015722
                      C                                                               015730
                      C     THIS SUBROUTINE PERFORMS THE QUANTITIZATION FUNCTION.     015740
                      C     IT CAUSES ITS INPUTS TO BE TRUNCATED TO THE NEAREST INTEGRAL  015750
      5               C     MULTIPLE OF A UNIT.                                       015760
                      C     A UNIT OF ZERO IS INTERPRETED TO MEAN NO QUANTITIZATION.  015770
                      C                                                               015780
                            IMPLICIT REAL(A-H,L-Z)                                    015790
                            DIMENSION ARRAY(3)                                        015800
     10                     IF (UNIT .EQ. 0.) RETURN                                 015810
                            DO 10 I=1,3                                               015820
                         10 ARRAY(I)=UNIT*FLOAT(INT(ARRAY(I)/UNIT) )                  015830
                            RETURN                                                    015840
                            END                                                       015850


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  QNTIZ

VARIABLES     SN  TYPE          RELOCATION
    0  ARRAY      REAL          ARRAY   F.P.        26  I         INTEGER
    0  UNIT       REAL                  F.P.

INLINE FUNCTIONS   TYPE   ARGS
       FLOAT       REAL     1  INTRIN          INT       INTEGER    1  INTRIN

STATEMENT LABELS
    0  10

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   20  10       I           11 12       59      INSTACK

STATISTICS
  PROGRAM LENGTH              330      27
```

```
SUBROUTINE MATVEC      74/74   OPT=0 TRACE                    FTN 4.5+P406    05/25/76  17.12.47        PAGE      1

      1                    SUBROUTINE MATVEC(D,B,C)                                          015460
                     C     SUBROUTINE TO MULTIPLY A VECTOR BY A MATRIX                       015470
                     C                                                                       015480
                     C     FORM IS:                                                          015490
      5              C                                                                       015500
                     C           D = B*C                                                     015510
                     C                                                                       015520
                     C                 D = 1X3 VECTOR                                        015530
                     C                 B = 3X3 MATRIX                                        015540
     10              C                 C = 1X3 VECTOR                                        015550
                     C                                                                       015560
                     C                                                                       015570
                           IMPLICIT REAL(A-H,L-Z)                                            015580
                           DIMENSION A(3),B(3,3),C(3),D(3)                                   015590
     15                    DO 21 I=1,3                                                       015600
                           A(I) = 0.0                                                        015610
                           DO 20 J=1,3                                                       015620
                        20 A(I) = A(I) + B(I,J)*C(J)                                         015630
                           DO 22 I=1,3                                                       015640
     20                 22 D(I) = A(I)                                                       015650
                           RETURN                                                            015660
                           END                                                               015670
```

1-66

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 MATVEC

VARIABLES	SN	TYPE	PELOCATION					
42	A	REAL	ARRAY		0	B	REAL	ARRAY	F.P.
0	C	REAL	ARRAY	F.P.	0	D	REAL	ARRAY	F.P.
40	I	INTEGER			41	J	INTEGER		

STATEMENT LABELS
0 20 0 22

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
16	20	* I	15 18	148	NOT INNER
21	20	J	17 18	78	INSTACK
33	22	I	19 20	48	INSTACK

STATISTICS
PROGRAM LENGTH 538 43

```
      1                SUBROUTINE MTM(DD,BB,CC)                                  015640
                     C                                                           015660
                     C                                                           015700
                     C                                                           015710
      5              C     SUBROUTINE TO MULTIPLY A MATRIX BY A TRANSPOSED MATRIX015720
                     C                                                           015730
                     C     FORM IS:                                              015740
                     C                                                           015750
                     C          DD = BB*CC                                       015760
     10              C                                                           015770
                     C                    BB = MATRIX TO BE TRANSPOSED BEFORE MULTIPLYING015780
                     C                                                           015790
                     C                                                           015800
                     C                                                           015810
     15              C                                                           015820
                           IMPLICIT REAL(A-H,L-Z)                                015830
                           DIMENSION AA(3,3),BB(3,3),CC(3,3),DD(3,3)             015840
                           DO 12 I=1,3                                           015850
                           DO 10 J=1,3                                           015860
                           AA(I,J) = 0.0                                         015870
     20                    DO 10 K=1,3                                           015880
                        10 AA(I,J) = AA(I,J) + BB(K,I)*CC(K,J)                   015890
                           DO 12 I=1,3                                           015900
                           DO 12 J=1,3                                           015910
                        12 DD(I,J) = AA(I,J)                                     015920
     25                    RETURN                                                015930
                           END                                                   015940
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
0 MTM

VARIABLES	SN	TYPE	RELOCATION					
56	AA	REAL	ARRAY		0	BB	REAL	ARRAY F.P.
0	CC	REAL	ARRAY F.P.		0	DD	REAL	ARRAY F.P.
57	I	INTEGER			58	J	INTEGER	
59	K	INTEGER						

STATEMENT LABELS
0 10 0 12

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
15	10	*	I	17 21	229	NOT INNER
17	10	*	J	19 21	179	NOT INNER
21	10		K	20 21	103	OPT
41	12	*	I	22 24	117	NOT INNER
42	12		J	23 24	69	INSTACK

STATISTICS
PROGRAM LENGTH 758 61

```
SUBROUTINE MM          74/74   OPT=0 TRACE                    FTN 4.5+R405    05/25/76  17.12.47        PAGE     1

      1                SUBROUTINE MM(D,B,C)                                                    015940
                       IMPLICIT REAL(A-H,L-Z)                                                  015950
                       DIMENSION A(3,3),B(3,3),C(3,3),D(3,3)                                   015960
                       DO 12 I=1,3                                                             015970
      5                DO 10 J=1,3                                                             015980
                       A(I,J) = 0.0                                                            015990
                       DO 10 K=1,3                                                             016000
                    10 A(I,J) = A(I,J) + B(I,K)*C(K,J)                                         016011
                       DO 12 I=1,3                                                             016020
     10                DO 12 J=1,3                                                             016030
                    12 D(I,J) = A(I,J)                                                         016040
                       RETURN                                                                  016050
                       END                                                                     016060


          SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  MM

VARIABLES    SN  TYPE                RELOCATION
    56  A        REAL      ARRAY                    3  B        REAL      ARRAY     F.P.
     3  C        REAL      ARRAY     F.P.           0  D        REAL      ARRAY     F.P.
    53  I        INTEGER                            54  J        INTEGER
    55  K        INTEGER

STATEMENT LABELS
     0  10                                    0  12

LOOPS  LABEL    INDEX     FROM-TO    LENGTH     PROPERTIES
    16  12    * I          4  8        228      NOT INNER
    17  10    * J          5  8        178      NOT INNER
    23  10      K          7  8        108      OPT
    41  12    * I          9 11        110      NOT INNER
    42  12      J         10 11         68      INSTACK

STATISTICS
  PROGRAM LENGTH                  758      61
```

```
      1                 SUBROUTINE ROTXYZ(ARRAY,SZ,CZ,SY,CY,SX,CX)                    016070
                C                                                                    016080
                C     THIS ROUTINE FORMS THE ROTATION MATRIX THAT ACTS ON AN X-Y-Z    016090
                C     COLUMN VECTOR AS SPECIFIED BY THREE EULER ROTATIONS. FIRST     016100
      5         C     ROTATION IS MINUS Z DEGREES ABOUT Z, THEN MINUS Y ABOUT Y,      016110
                C     THEN X DEGREES ABOUT X. THE INPUTS ARE THE SINES AND COSINES OF 016120
                C     Z,Y, AND X DEGREES. THE RESULT IS STORED IN ARRAY.             016130
                C                                                                    016140
                      IMPLICIT REAL(A-H,L-Z)                                         016150
     10               DIMENSION ARRAY(3,3)                                           016160
                      SYCZ = SY*CZ                                                   016170
                      SYSZ = SY*SZ                                                   016180
                      ARRAY(1,1) = CY*CZ                                             016190
                      ARRAY(2,1) = CX*SZ - SX*SYCZ                                   016200
     15               ARRAY(3,1) = -SY*SZ - CX*SYCZ                                  016210
                      ARRAY(2,2) = CX*CZ + SX*SYSZ                                   016220
                      ARRAY(3,2) = -SX*CZ + CX*SYSZ                                  016230
                      ARRAY(1,3) = SY                                                016240
                      ARRAY(2,3) = SX*CY                                             016250
     20               ARRAY(3,3) = CX*CY                                             016260
                      RETURN                                                         016270
                      END                                                            016280
```

insert this card

ARRAY(1,2) = -CY*SZ

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 ROTXYZ

VARIABLES	SN	TYPE	RELOCATION				
0	ARRAY	REAL	ARRAY	F.P.	0	CX	REAL	F.P.
0	CY	REAL		F.P.	0	CZ	REAL	F.P.
0	SX	REAL		F.P.	0	SY	REAL	F.P.
46	SYCZ	REAL			47	SYSZ	REAL	
0	SZ	REAL		F.P.				

STATISTICS
PROGRAM LENGTH 508 40

```
      1              SUBROUTINE MATRAN(B,A)                                    016290
                     IMPLICIT REAL(A-H),REAL(L-Z)                              016300
                C                                                              016310
                C     TRANSPOSE 3X3 MATRIX, A, AND RETURN AS B                 016320
      5         C                                                              016330
                     DIMENSION A(3,3),B(3,3)                                   016340
                     B(1,1)=A(1,1)                                             016350
                     B(2,1)=A(1,2)                                             016360
                     B(3,1)=A(1,3)                                             016370
     10              B(1,2)=A(2,1)                                             016380
                     B(2,2)=A(2,2)                                             016390
                     B(3,2)=A(2,3)                                             016400
                     B(1,3)=A(3,1)                                             016410
                     B(2,3)=A(3,2)                                             016420
     15              B(3,3)=A(3,3)                                             016430
                     RETURN                                                    016440
                     END                                                       016450
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
2 MATRAN

VARIABLES SN TYPE RELOCATION
2 A REAL ARRAY F.P. 2 B REAL ARRAY F.P.

STATISTICS
PROGRAM LENGTH 279 23

```
      1              SUBROUTINE ROTZYX(ARRAY,SZ,CZ,SY,CY,SX,CX)                 016660
                    C                                                          016670
                    C     THIS ROUTINE FORMS THE ROTATION MATRIX THAT ACTS ON AN X-Y-Z      016680
                    C     VECTOR. THE ROTATION IS SPECIFIED BY THREE EULER ANGLES. FIRST    016690
      5             C     ROTATION IS ABOUT X, NEXT ABOUT Y, THEN ABOUT Z. THE INPUTS       016700
                    C     ARE THE SINES AND COSINES OF THE ROTATIONS ANGLES. THE OUTPUT IS  016710
                    C     IN ARRAY                                                 016720
                    C                                                          016730
                          IMPLICIT REAL(A-H,L-Z)                               016740
     10                   DIMENSION ARRAY(3,3)                                 016750
                          SYSX=SY*SX                                           016760
                          SYCX=SY*CX                                           016770
                          ARRAY(1,1)=CY*CZ                                     016780
                          ARRAY(2,1)=-SZ*CY                                    016790
     15                   ARRAY(3,1)=SY                                        016800
                          ARRAY(1,2)=SYSX*CZ+SZ*CX                             016810
                          ARRAY(2,2)=-SYSX*SZ+CZ*CX                            016820
                          ARRAY(3,2)=-CY*SX                                    016830
                          ARRAY(1,3)=-CZ*SYCX+SZ*SX                            016840
     20                   ARRAY(2,3)=SZ*SYCX+SX*CZ                             016850
                          ARRAY(3,3)=CY*CX                                     016860
                          RETURN                                               016870
                          END                                                  016880
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 ROTZYX

VARIABLES	SN	TYPE		RELOCATION					
0	ARRAY	REAL	ARRAY	F.P.	0	CX	REAL		F.P.
0	CY	REAL		F.P.	0	CZ	REAL		F.P.
0	SX	REAL		F.P.	0	SY	REAL		F.P.
52	SYCX	REAL			51	SYSX	REAL		
0	SZ	REAL		F.P.					

STATISTICS
PROGRAM LENGTH 530 43

```
SUBROUTINE VMATVC     74/74   OPT=0 TRACE                    FTN 4.5+R436    05/25/76  17.12.47       PAGE     1

      1                SUBROUTINE VMATVC(D,B,C)                                          016690
                     C  SUBROUTINE TO MULTIPLY A VECTOR BY A MATRIX                     016700
                     C                                                                  016710
                     C  FORM IS:                                                        016720
      5              C                                                                  016730
                     C      D = B*C                                                     016740
                     C                                                                  016750
                     C                  D = 1X3 VECTOR                                  016760
                     C                  B = 3X3 MATRIX                                  016770
     10              C                  C = 1X3 VECTOR                                  016780
                     C                                                                  016790
                     C                                                                  016800
                          IMPLICIT REAL(A-H,L-Z)                                        016810
                          DIMENSION A(3),B(3,3),C(3),D(3)                               016820
     15                   DO 20 I=1,3                                                  016830
                          A(I) = 0.0                                                    016840
                          DO 20 J=1,3                                                   016850
                       20 A(I) = VP(A(I),VP(B(I,J)*C(J)))                               016860
                          DO 22 I=1,3                                                   016870
     20                22 D(I) = A(I)                                                  016880
                          RETURN                                                        016890
                          END                                                           016900
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 VMATVC

VARIABLES	SN	TYPE			RELOCATION				
57	A	REAL	ARRAY		0	B	REAL	ARRAY	F.P.
3	C	REAL	ARRAY	F.P.	0	D	REAL	ARRAY	F.P.
55	I	INTEGER			56	J	INTEGER		

EXTERNALS	TYPE	ARGS
VP	REAL	1

STATEMENT LABELS

0 20 0 22

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES	
16	20	*	I	15 18	238	EXT REFS	NOT INNER
21	20	*	J	17 18	168	EXT REFS	
42	22		I	19 20	48	INSTACK	

STATISTICS

PROGRAM LENGTH 208 56

```
SUBROUTINE VMTM      74/74   OPT=0 TRACE                    FTN 4.5+348    05/25/76  17.12.47       PAGE     1

      1               SUBROUTINE VMTM(BB,AA,CC)                                          016910
                      C                                                                  016920
                      C                                                                  016930
                      C                                                                  016940
      5               C     SUBROUTINE TO MULTIPLY A MATRIX BY A TRANSPOSED MATRIX       016950
                      C                                                                  016960
                      C     FORM IS:                                                     016970
                      C                                                                  016980
                      C          BB = BB*CC                                              016990
     10               C                                                                  017000
                      C                    BB = MATRIX TO BE TRANSPOSED BEFORE MULTIPLYING 017010
                      C                                                                  017020
                      C                                                                  017030
                      C                                                                  017040
     15               C                                                                  017050
                      C     IMPLICIT REAL(A-H,L-Z)                                       017060
                      C     DIMENSION AA(3,3),BB(3,3),CC(3,3),DD(3,3)                    017070
                      C     DO 13 I=1,3                                                  017080
                      C     DO 10 J=1,3                                                  017090
                      C     AA(I,J) = 0.0                                                017100
     20               C     DO 10 K=1,3                                                  017110
                      C  10 AA(I,J) = VP(AA(I,J) + VP(BB(K,I)*CC(K,J)))                  017120
                      C     DO 12 I=1,3                                                  017130
                      C     DO 12 J=1,3                                                  017140
                      C  12 BB(I,J) = AA(I,J)                                            017150
     25               C     RETURN                                                       017160
                      C     END                                                          017170

1-73

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  VMTM

VARIABLES     SN  TYPE          RELOCATION
   76  AA        REAL    ARRAY                    0  BB        REAL      ARRAY     F.P.
    0  CC        REAL    ARRAY     F.P.           0  DD        REAL      ARRAY     F.P.
   73  I         INTEGER                          74  J         INTEGER
   75  K         INTEGER

EXTERNALS         TYPE   ARGS
    VP            REAL      1

STATEMENT LABELS
    9  10                                  0  12

LOOPS  LABEL    INDEX     FROM-TO    LENGTH     PROPERTIES
   16  10    * I           17 21        348              EXT REFS  NOT INNER
   17  10    * J           18 21        319              EXT REFS  NOT INNER
   21  10    * K           20 21        220              EXT REFS
   63  12    * I           22 24        113              NOT INNER
   64  12      J           23 24         58     INSTACK
```

SUBROUTINE VMIM 74/74 OPT=0 TRACE

STATISTICS
PROGRAM LENGTH 1158 77

```
      1                SUBROUTINE VMM(D,B,C)                                  017170
                       IMPLICIT REAL(A-H,L-Z)                                 017180
                       DIMENSION A(3,3),B(3,3),C(3,3),D(3,3)                  017190
                       DO 10 I=1,3                                            017200
      5                DO 10 J=1,3                                            017210
                       A(I,J) = 0.0                                           017220
                       DO 10 K=1,3                                            017230
                    10 A(I,J) = VP(A(I,J) + VP(B(I,K)*C(K,J)))                017240
                       DO 12 I=1,3                                            017250
     10                DO 12 J=1,3                                            017260
                    12 D(I,J) = A(I,J)                                        017270
                       RETURN                                                 017280
                       END                                                    017290
                                                                              017300
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 VMM

VARIABLES	SN	TYPE	RELOCATION						
75	A	REAL	ARRAY		0	B	REAL	ARRAY	F.P.
0	C	REAL	ARRAY	F.P.	0	D	REAL	ARRAY	F.P.
73	I	INTEGER			74	J	INTEGER		
75	K	INTEGER							

EXTERNALS	TYPE	ARGS
VP	REAL	1

STATEMENT LABELS

0 10 0 12

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
16	10	* I	4 8	348	EXT REFS NOT INNER
17	10	* J	5 8	310	EXT REFS NOT INNER
23	10	* K	7 8	220	EXT REFS
53	12	* I	9 11	110	NOT INNER
54	12	J	10 11	68	INSTACK

STATISTICS

PROGRAM LENGTH 1150 77

```
      1              SUBROUTINE VRTZYX(ARRAY,SZ,CZ,SY,CY,SX,CX)                        017530
                     C                                                                 017540
                     C     THIS ROUTINE FORMS THE ROTATION MATRIX THAT ACTS ON AN X-Y-Z 017550
                     C     VECTOR. THE ROTATION IS SPECIFIED BY THREE EULER ANGLES. FIRST 017560
      5              C     ROTATION IS ABOUT X, NEXT ABOUT Y, THEN ABOUT Z. THE INPUTS 017570
                     C     ARE THE SINES AND COSINES OF THE ROTAIONS ANGLES. THE OUTPUT IS 017580
                     C     IN ARRAY                                                    017590
                     C                                                                 017600
                           IMPLICIT REAL(A-H,L-Z)                                      017610
     10              DIMENSION ARRAY(3,3)                                              017620
                     SYSX=VP(SY*SX)                                                    017630
                     SYCX=VP(SY*CX)                                                    017640
                     ARRAY(1,1)=VP(CY*CZ)                                              017650
                     ARRAY(2,1)=-VP(SZ*CY)                                             017660
     15              ARRAY(3,1)=SY                                                     017670
                     ARRAY(1,2)=VP(VP(SYSX*CZ)+VP(SZ*CX))                              017680
                     ARRAY(2,2)=VP(VP(-SYSX*SZ)+VP(CZ*CX))                             017690
                     ARRAY(3,2)=-VP(CY*SX)                                             017700
                     ARRAY(1,3)=VP(VP(-CZ*SYCX)+VP(SZ*SX))                             017710
     20              ARRAY(2,3)=VP(VP(SZ*SYCX)+VP(SX*CZ))                              017720
                     ARRAY(3,3)=VP(CY*CX)                                              017730
                     RETURN                                                            017740
                     END                                                               017750
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1 VRTZYX

VARIABLES	SN	TYPE	RELOCATION					
0	ARRAY	REAL ARRAY	F.P.	0	CX	REAL	F.P.	
0	CY	REAL	F.P.	0	CZ	REAL	F.P.	
0	SX	REAL	F.P.	0	SY	REAL	F.P.	
145	SYCX	REAL		144	SYSX	REAL		
0	SZ	REAL	F.P					

EXTERNALS	TYPE	ARGS
VP	REAL	1

STATISTICS
  PROGRAM LENGTH 1460 102

```
      1                 SUBROUTINE VPTXYZ(ARRAY,SZ,CZ,SY,CY,SX,CX)                        017300
                      C                                                                  017310
                      C     THIS ROUTINE FORMS THE ROTATION MATRIX THAT ACTS ON AN X-Y-Z  017320
                      C     COLUMN VECTOR AS SPECIFIED BY THREE EULER ROTATIONS. FIRST    017330
      5               C     ROTATION IS MINUS Z DEGREES ABOUT Z, THEN MINUS Y ABOUT Y,    017340
                      C     THEN X DEGREES ABOUT X. THE INPUTS ARE THE SINES AND COSINES OF 017350
                      C     Z,Y, AND X DEGREES. THE RESULT IS STORED IN ARRAY.           017360
                      C                                                                  017370
                            IMPLICIT REAL(A-H,L-Z)                                       017380
     10                     DIMENSION ARRAY(3,3)                                        017390
                            SYCZ = VP(SY*CZ)                                            017400
                            SYSZ = VP(SY*SZ)                                            017410
                            ARRAY(1,1) = VP(CY*CZ)                                      017420
                            ARRAY(2,1) = VP(VP(CX*SZ) - VP(SX*SYCZ))                    017430
     15                     ARRAY(3,1) = VP(VP(-SX*SZ) - VP(CX*SYCZ))                   017440
                            ARRAY(1,2) = -VP(CY*SZ)                                     017450
                            ARRAY(2,2) = VP(VP(CX*CZ) + VP(SX*SYSZ))                    017460
                            ARRAY(3,2) =VP( VP(-SX*CZ) + VP(CX*SYSZ))                   017470
                            ARRAY(1,3) = SY                                             017480
     20                     ARRAY(2,3) = VP(SX*CY)                                      017490
                            ARRAY(3,3) = VP(CX*CY)                                      017500
                            RETURN                                                      017510
                            END                                                         017520
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 VPTXYZ

VARIABLES	SN	TYPE	RELOCATION					
0	ARRAY	REAL	ARRAY	F.P.	0	CX	REAL	F.P.
0	CY	REAL		F.P.	0	CZ	REAL	F.P.
0	SX	REAL		F.P.	0	SY	REAL	F.P.
140	SYCZ	REAL			141	SYSZ	REAL	
0	SZ	REAL		F.P.				

EXTERNALS	TYPE	ARGS
V	REAL	1

STATISTICS
PROGRAM LENGTH 1428 98

```
      SUBROUTINE SSATUD                                                 017760
C                                                                       017770
C     THIS ROUTINE GENERATES THAT GIMBAL ANGLES THAT WOULD BE GENRATED  017780
C     BY A PERFECT SPACE STABLE IMU. THE ANGLES ARE ROTATIONS           017790
C     ABOUT Z,X,Y, AND Z (IN THAT ORDER) FROM THE BODY TO               017800
C     TOWARDS THE IMU                                                   017810
C                                                                       017820
      IMPLICIT REAL(A-H),REAL(L-Z)                                      017830
      COMMON /IMUDAT/  RESID(3),    DV3P(3),     ETA9P(4),    WT(3),    017840
     1    SF9I(3),    C2P95(3,3), C9MIS(3,3), TRESID(3), C1099(3,3),   017850
     2   C1092P(3,3), C2P95T(3,3), ARCSTD(3)                            017860
      COMMON /NAV/     C09P92P(3,3),V92P(3),     DV92P(3),    PHD(3),   017870
     1    C99H0(3,3)  A(3,3),      B(3,3),      THT29T(3),   THTIPG(3),  017880
     2    THTG0P(3),  HXV(3),      G92P(3),     H,           ALPHA,      017890
     3    SALF,       CALF,        DELT,        ETA(3),      V0MS,       017900
     4    LAT,        LONG,        V92(3),      FILATT(3,3),DELTA,       017910
     5    XSALF,      XCALF,       X0P92P(3,3),HV92P(3),     DV32P(3),   017920
     6    S2PHI,      XS2PHI,      XV92P(3),    XN,          DELH,       017930
     7    CC910(3,3), C0P99(3,3),  DH8,         C095(3,3),   DVS92P(3),  017940
     8    DDX  ,      DDY  ,       DDZ  ,       Q2P95(4),    DFILTP(3),  017950
     9    GAINS(3,10),IGAIMP(3)                                          017960
      COMMON /UNIVRSL/ PI,         HPI,         RG,          R2G,        017970
     1    EE,         FSQ,         EERRG,       WE9T,        DADPLP,     017980
     2    RESQ                                                           017990
      COMMON /TRAJIN/  TIME,       LAT9T,       LONG9T,      ALE9T,      018000
     1    HB,         ETA9T(3),    V9T(3),      SF9T(3),     DELTS,      018010
     2    TIMEO,      LONGG,       SLAT9T,      CLAT9T,      SALE9T,     018020
     3    CALE9T                                                         018030
      COMMON /INPUTS/  AQUANT,     TQUANT,      VQUANT,      STAGT,      018040
     1    STOP,       PLOTIM,      PRNT,        PSTRT,       CVD1,       018050
     2    CVD2,       CVD3,        TOLJAK,      HSDTIM,      HSDTMG,     018060
     2    TERMAV,     TIPATT,      TACOP,       IMUTYP,      IFPLIM,     018070
     3    IPC(30),    IOPNLP,      SSX0,        SSY0,        SSZ0,       018080
     4    PSMAX,      DRSMAX,      ITREIL                                 018090
      EQUIVALENCE (TH1,ETA9P(1)), (TH2,ETA9P(2)), (TH3,ETA9P(3)),       018100
     1   (TH4,ETA9P(4))                                                 018110
      CALL ROTXYZ(C2P95, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),   018120
     1   COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                  018130
      CALL MM(A,C1092P,C2P95)                                           018140
      OTH2=TH4                                                          018150
      OTH1=TH1                                                          018160
      TEMP= SQRT(1.0E0-A(3,3)**2)                                       018170
      IF (TEMP .EQ. 0.E0) GO TO 5                                       018180
      TH2= ATAN2(A(3,1),-A(3,2))                                        018190
      TH3= ATAN2(TEMP,A(3,3))                                           018200
      TH1= ATAN2(A(1,3),A(2,3))                                         018210
    5 DTH2=TH2-OTH2                                                     018220
      DTH1=TH1-OTH1                                                     018230
      IF (DTH2 .GT. HPI .AND. DTH1 .GT. HPI) GO TO 1                    018240
      GO TO 2                                                           018250
    1 TH2=TH2+PI                                                        018260
      TH3=-TH3                                                          018270
      TH1=TH1+PI                                                        018280
    2 CONTINUE                                                          018290
      TH1=TH1-.5*HPI                                                    018300
      CALL SETZ(ETA9P,AGIMPT)                                           018310
```

```
                ETA9P(2)=0.                                                    013330
                IF (IPC(2) .NE. 9) CALL DOUT(2)                                013340
      60        RETURN                                                         013350
                END                                                            013360
```

SYMBOLIC REFERENCE MAP (9=1)

ENTRY POINTS
1 SSATUD

VARIABLES	SN	TYPE	RELOCATION						
33	A	REAL	ARRAY	NAV	3	ALFRT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUAPT	REAL		INPUTS
109	APESID	REAL	ARRAY	INUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFRT	REAL		TRAJIN
22	CLATRT	REAL		TRAJIN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	C1P90	REAL	ARRAY	NAV	0	C2P92P	REAL	ARRAY	NAV
154	C1910	REAL	ARRAY	NAV	177	C1P6	REAL	ARRAY	NAV
45	C1990	REAL	ARRAY	INUDAT	56	C1992P	REAL	ARRAY	INUDAT
20	C2P95	REAL	ARRAY	INUDAT	67	C2P95T	REAL	ARRAY	INUDAT
31	C9MIS	REAL	ARRAY	INUDAT	22	C9PN9	REAL	ARRAY	NAV
153	DELH	REAL		NAV	154	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELT	REAL		TRAJIN
66	DPSMAX	REAL		INPUTS	164	DTH1	REAL		
163	DTH2	REAL			210	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	INUDAT	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNVPSI	6	EFRPO	REAL		UNVPSL
5	ESQ	REAL		UNVPSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	INUDAT	5	ETA9T	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HR	REAL		TRAJIN	1	HRT	REAL		UNVPSL
15	HSCINC	REAL		INPUTS	14	HSDTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	22	IFPLIM	INTEGER		INPUTS
257	IGAINP	INTEGER	ARRAY	NAV	21	INUTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	ITRATT	INTEGER		INPUTS
67	ITRFIL	INTEGER		INPUTS	16	ITRNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LATRT	REAL		TRAJIN
106	LONG	REAL		NAV	2	LONGR	REAL		TRAJIN
2	LONGRT	REAL		TRAJIN	213	ODV	REAL		NAV
214	ODV	REAL		NAV	215	ODZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OUT	REAL		NAV
161	OTH1	REAL			160	OTH2	REAL		
192	PV92P	REAL	ARRAY	NAV	1	PI	REAL		UNVPSL
5	PLOTIM	REAL		INPUTS	6	PONT	REAL		INPUTS
216	Q2P95	REAL	ARRAY	NAV	11	RADDEG	REAL		UNVPSL
1	RESID	REAL	ARRAY	INUDAT	11	RESQ	REAL		UNVPSL
47	RHO	REAL	ARRAY	NAV	3	RHO	REAL		UNVPSL
65	RSMAX	REAL		INPUTS	2	RSTRT	REAL		INPUTS
[illegible]		[illegible]		UNVPSL	[illegible]	SALF	REAL		NAV

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      24  SALF9T     REAL                    TRAJIN          13  SF3T       REAL        ARRAY     TRAJIN


 SUBROUTINE SSATUD    74/74   OPT=0 TRACE                    FTN 4.5+R406      05/25/76  17.12.47      PAGE    7

 VARIABLES     SN  TYPE            RELOCATION
     15  SF9TP      REAL       ARRAY    INUDAT          21  SLATOT     REAL                 TRAJIN
     62  SSXO       REAL                INPUTS          63  SSYO       REAL                 INPUTS
     64  SSZO       REAL                INPUTS           3  START      REAL                 INPUTS
      4  STOP       REAL                INPUTS         145  S2PHI      REAL                 NAV
    162  TEMP       REAL                                63  THTCOP     REAL       ARRAY     NAV
     55  THTERT     REAL       ARRAY    NAV             68  THTTRD     REAL       ARRAY     NAV
      6  TH1        REAL                INUDAT           7  TH2        REAL                 INUDAT
     10  TH3        REAL                INUDAT          11  TH4        REAL                 INUDAT
      8  TIME       REAL                TRAJIN          17  TTRED      REAL                 TRAJIN
     13  TOLJPK     REAL                INPUTS           1  TOUANT     REAL                 INPUTS
     42  TRESTD     REAL       ARRAY    INUDAT         104  V0MP       REAL                 NAV
      2  VOUANT     REAL                INPUTS          10  V0T        REAL       ARRAY     TRAJTN
    107  V92        REAL       ARRAY    NAV             11  V92P       REAL       ARRAY     NAV
      7  WERT       REAL                UNVPSL          12  WT         REAL       ARRAY     INUDAT
     66  WXV        REAL       ARRAY    NAV            125  YCALE      REAL                 NAV
    152  X4         REAL                NAV            124  XSALE      REAL                 NAV
    146  XS2PHT     REAL                NAV            147  XV92P      REAL       ARRAY     NAV
    126  XGP92P     REAL       ARRAY    NAV

 EXTERNALS          TYPE    ARGS
            ATAN2   REAL    2 LIBRARY                   COS        REAL       1 LIBRARY
            DOUT            4                           M4                    3
            ONTIZ           2                           ROTYYZ                7
            SIN     REAL    1 LIBRARY                   SQRT       REAL       1 LIBRARY

 STATEMENT LABELS
     63  1                                   70  2                                        93  5

 COMMON BLOCKS    LENGTH
        INUDAT       67
        NAV         192
        UNVPSL       10
        TRAJIN       21
        INPUTS       56

 STATISTICS
   PROGRAM LENGTH                1058      117
   CM LABELED COMMON LENGTH      5203      336

1-80
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```
      SUBROUTINE SSINIG                                                 018370
C                                                                       018380
C     THIS ROUTINE TRANSFORMS THE VELOCITY INCREMENTS FROM              018390
C     THE HANDLP AZIMUTH FRAME TO THE SPACE STABLE FRAME                018400
C                                                                       018410
      IMPLICIT REAL(A-H),REAL(L-Z)                                      018420
      COMMON /INPUTS/  AQUANT,      TQUANT,      VQUANT,      START,    018430
     1     STOP,       PLOTIM,      PRNT,        PSTPT,       CV01,     018440
     2     CV02,       CV03,        TOLJPK,      HSOTIM,      HSOINC,   018450
     2     ITRMAX,     ITRATT,      INCOR,       IMOTYP,      IFILIM,   018460
     3     IPC(30),    IOPHLP,      SSX0,        SSY0,        SSZ0,     018470
     4     PSMAX,      OPSMAX,      IFROIL                              018480
      COMMON /IMUDAT/  RESID(3),    DV1P(3),     CTAOP(4),    WT(3),    018490
     1     SFSTP(3),   C2P95(3,3),  C9MIS(3,3),  TRESID(3),   C1092(3,3),018500
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                            018510
      COMMON /NAVX/    C0P32P(3,3),V222(3),     DV92P(3),    PP0(7),   018520
     1     CBRH0(3,3), A(3,3),      P(3,3),      THTEST(3),   THITP0(3),018530
     2     THTC0P(3),  WXV(3),      G92P(3),     H,           ALPHA,    018540
     3     SALF,       CALF,        DELT,        ETA(3),      V94P,     018550
     4     LAT,        LONG,        V92(3),      FILATT(3,3), DELTA,    018560
     5     XSALF,      XCALF,       V0P92P(3,3),HV92P(3),     DV120(3), 018570
     6     S2PHI,      XS2PHI,      VV120(3),    XH,          DELH,     018580
     7     C0910(3,3), C0P90(3,3),  G93,         C095(3,3),   DV592P(3),018590
     8     ODX   ,     ODY   ,      ODZ   ,      D2P95(4),    DELTP(3), 018600
     9     GAINS(3,10),IGAINP(3)                                        018610
      COMMON /TRAJIN/  TIML,        LAT9T,       LONG9T,      ALF9T,    018620
     1     H1,         ETA9T(3),    V9T(3),      SF9T(3),     DELTS,    018630
     2     TIMC0,      LONG0,       SLAT9T,      CLAT9T,      SALF9T,   018640
     3     CALF9T                                                       018650
      COMMON /UNVRSL/  PI,          HPI,         PC,          PPO,      018660
     1     FF,         FSQ,         EE220,       WORT,        RADREP,   018670
     2     EESQ                                                         018680
      DIMENSION TEMP(3)                                                 018690
      TEMP(1)=-LONG9T*LONG0-WE9T*(TIME TIME0)                           018700
      CALL ROTZYX(4, SIN(TEMP(1)), COS(TEMP(1)),SLAT9T,CLAT9T,          018710
     1 -SALF9T,CALF9T)                                                  018720
      TEMP(1)=SF9T(3)                                                   018730
      TEMP(2)=-SF9T(2)                                                  018740
      TEMP(3)=SF9T(1)                                                   018750
      CALL AM(C1092P,C1090,A)                                           018760
      IF (IPC(14) .NE. 1) CALL DOUT(14)                                 018770
      CALL MATVEC(SF9T,C1092P,TEMP)                                     018780
      RETURN                                                            018790
      END                                                               018800
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 SSINIG

VARIABLES	SN	TYPE	RELOCATION				
** 1		REAL	ARRAY	NAV		ALF9T	REAL

75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS

VARIABLES SN TYPE RELOCATION

190	APESTO	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJIN
22	CLAT9T	REAL		TRAJIN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	CCP90	REAL	ARRAY	NAV	0	CCP92P	REAL	ARRAY	NAV
154	CG910	REAL	ARRAY	NAV	177	C935	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY	IMUDAT
21	C2P05	REAL	ARRAY	IMUDAT	67	C2295T	REAL	ARRAY	IMUDAT
31	C9NES	REAL	ARRAY	IMUDAT	22	C9PH9	REAL	ARRAY	NAV
153	DELH	REAL		NAV	100	DELT	REAL		NAV
121	DELTA	REAL		NAV	15	DELTS	REAL		TRAJIN
6	DPSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNV2SL	6	EFRP0	REAL		UNV2SL
5	ESO	REAL		UNV2SL	101	ET4	REAL	ARRAY	NAV
6	ET49P	REAL	ARRAY	IMUDAT	5	ET49T	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HB	REAL		TRAJIN	1	HPT	REAL		UNV2SL
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	22	IFLTIM	INTEGER		INPUTS
263	IGAINP	INTEGER	ARRAY	NAV	21	INUTYP	INTEGER		INPUTS
29	INCOP	INTEGER		INPUTS	61	IOONLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	IPATT	INTEGER		INPUTS
67	ITRFIL	INTEGER		INPUTS	16	ITYNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJIN
116	LONG	REAL		NAV	20	LONG0	REAL		TRAJIN
2	LONG9T	REAL		TRAJIN	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFILT	REAL	ARRAY	NAV	176	OH9	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNV2SL
5	PLOTIM	REAL		INPUTS	6	PUNT	REAL		INPUTS
216	Q2P05	REAL	ARRAY	NAV	10	RADPER	REAL		UNV2SL
8	RESID	REAL	ARRAY	IMUDAT	11	RESQ	REAL		UNV2SL
17	RHO	REAL	ARRAY	NAV	3	RPO	REAL		UNV2SL
65	RSMAX	REAL		INPUTS	7	RSTRT	REAL		INPUTS
2	SP	REAL		UNV2SL	76	SALF	REAL		NAV
23	SALF9T	REAL		TRAJIN	13	SF9T	REAL	ARRAY	TRAJIN
15	SF9TP	REAL	ARRAY	IMUDAT	21	SLAT9T	REAL		TRAJIN
62	SSX0	REAL		INPUTS	64	SSY0	REAL		INPUTS
64	SSZ0	REAL		INPUTS	3	START	REAL		INPUTS
4	STOP	REAL		INPUTS	145	S2PHI	REAL		NAV
63	TEMP	REAL	ARRAY		63	THTCO2	REAL	ARRAY	NAV
59	THTERT	REAL	ARRAY	NAV	60	THTTPQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEO	REAL		TRAJIN
13	TOLJRK	REAL		INPUTS	1	TQUANT	REAL		INPUTS
42	TPESIO	REAL	ARRAY	IMUDAT	104	V0MP	REAL		NAV
2	VQUANT	REAL		INPUTS	10	VRT	REAL	ARRAY	TRAJIN
197	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
7	VERT	REAL		UNV2SL	12	VT	REAL	ARRAY	IMUDAT
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2_9T	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XDP92P	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS				
COS	REAL	1	LIBRARY	DOUT		1
MATVEC		3		MM		3
POTZYX		7		SIN	REAL	1 LIBRARY

COMMON BLOCKS	LENGTH
INPUTS	56
IMUDAT	67
NAV	182
TRAJIN	21
UNIVSL	10

STATISTICS

PROGRAM LENGTH	661	54
CM LABELED COMMON LENGTH	5203	326

```
      SUBROUTINE SSINIT                                                 018810
C                                                                       018820
C     THIS ROUTINE PERFORMS THE INITIALIZATION FOR THE SPACE STABLE     018830
C     CASE.ALL INITIALIZATION OF THE NAV EQUATIONS(EXCEPT FOR SSTERM)   018840
C     IS PERFORMED BY THE COMMON SUBROUTINE ININIT.                     018850
C                                                                       018860
      IMPLICIT REAL(A-H),REAL(L-Z)                                      018870
      COMMON /CONTRL/ QTIME,      PTIME,      PLTIME,     RSTIME,       018880
     1    IOPEV,      INIT,       ISTOP,      ICMCYL,     ICMCYP        018890
      COMMON /IMUCAL/ RESID(3),   DV3P(3),    FIASP(4),   WI(3),        018900
     1    SF9TP(3),   C2P95(3,3), COMIS(3,3), IRESID(3),  C1)90(3,3),   018910
     2    C1092P(3,3), C2P95T(3,3), APESID(3)                           018920
      COMMON /INPUTS/ AQUANT,     TQUANT,     VQUANT,     START,        018930
     1    STOP,       PLOTIM,     PRNT,       RSTRT,      CV01,         018940
     2    CV12,       CV03,       TOLJPK,     HSOTIM,      HSOINC-      018950
     2    ITRNAV,     ITRAIT,     INCON,      IMUTYP,     IERLIM,       018960
     3    IPC(30),    TOPHLP,     SSX0,       SSY0,       SSZ0,         018970
     4    RSMAX,      DRSMAX,     ITPFIL                                018980
      COMMON /NAV/    C0P92P(3,3),V32P(3),    DV92P(3),   PH3(3),       018990
     1    CV2H0(3,3), A(3,3),     B(3,3),     THTE2T(3),  THTT2C(3),    019000
     2    THTC02(3),  WXV(3),     G02P(3),    H,          ALPHA,        019010
     3    SALE,       CALE,       DELT,       ETA(3),     VOMP,         019020
     4    LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,        019030
     5    XSALE,      XCALE,      X0P92P(3,3),HV92P(3),   DV92P(3),     019040
     6    S2PHI,      XS2PHI,     XV92P(3),   YH,         DELH,         019050
     7    C0915(3,3), C0P90(3,3), OH3,        C035(3,3),  DV592P(3),    019060
     8    ODX   ,     ODY   ,     ODZ   ,     D2P95(4),   DELTS(3),     019070
     9    GAINS(3,10),IGAINP(3)                                         019080
      COMMON /TRAJTM/ TIME,       LAT9T,      LONG9T,     ALE9T,        019090
     1    H0,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,        019100
     2    TIME0,      LONG0,      SLAT9T,     CLAT9T,     SALE9T,       019110
     3    CALE9T                                                        019120
      CALL ROTZYX(C0919, SIN(SSZ0), COS(SSZ0), SIN(SSY0), COS(SSY0),    019130
     1    SIN(SSX0), COS(SSX0))                                         019140
      DO 4 I=1,3                                                        019150
      DO 4 J=1,3                                                        019160
    4 C0910(I,J)=VP(C0910(I,J))                                         019170
      CALL MATPAN(C1090,C0910)                                          019180
      CALL ROTZYX(C0P90,0.E0,1.E0,0.E0,1.E0,0.E0,1.E0)                  019190
      CALL INREC                                                        019200
      ICMCYL=ITRNAV*ITRAIT                                              019210
      CALL VRTZYX(C0P92P,0.E0,1.E0,SLAT9T,CLAT9T,-SALE9T,CALE9T)        019220
      TIME0=TIME                                                        019230
      LONG0=VP(LONG9T)                                                  019240
      CALL SSINTG                                                       019250
      DO 5 I=1,3                                                        019260
    5 SF9TP(I)=VP(SF9T(I))                                              019270
      WRITE(6,6)                                                        019280
    6 FORMAT(2X,"IMU STABILIZATION IS SPACE STABLE"/)                   019290
      CALL SSATUP                                                       019300
C     NAV SIMULATOR INIT                                                019310
      CALL SSATT                                                        019320
      CALL ININIT                                                       019330
      CALL ATUDE                                                        019340
      IF (IPC(25) .EQ. 0) GO TO 888                                     019350
```

```
                FILATT(1,1)=VP(ETA(1))                                  019370

SUBROUTINE SSINIT   74/74  OPT=2 TRACE          FTN 4.5+P406   05/25/76  17.12.47   PAGE   2

                FILATT(1,2)=VP(ETA(2))                                  019380
                FILATT(1,3)=VP(ETA(3))                                  019390
     60       888 RETURN                                                019400
                END                                                     019410


 SYMBOLIC REFERENCE MAP (P=1)

ENTRY POINTS
    1  SSINIT

VARIABLES     SN  TYPE            RELOCATION
    53  A         REAL    ARRAY   NAV          3  ALFGT     REAL              TRAJIN
    75  ALPHA     REAL            NAV          0  AQUANT    REAL              INPUTS
   130  APFSTD    REAL    ARRAY   INUDAT      44  B         REAL    ARRAY     NAV
    77  CALF      REAL            NAV         24  CALFGT    REAL              TRAJIN
    22  CLATGT    REAL            TRAJIN      10  CV01      REAL              INPUTS
    11  CV02      REAL            INPUTS      12  CV03      REAL              INPUTS
   155  C0P90     REAL    ARRAY   NAV          0  C0P92P    REAL    ARRAY     NAV
   154  C0910     REAL    ARRAY   NAV        177  C0135     REAL    ARRAY     NAV
    45  C1090     REAL    ARRAY   INUDAT      56  C1092P    REAL    ARRAY     INUDAT
    28  C2P95     REAL    ARRAY   INUDAT      67  C2P95T    REAL    ARRAY     INUDAT
    31  C9MIS     REAL    ARRAY   INUDAT      22  C9PHC     REAL    ARRAY     NAV
   157  DELH      REAL            NAV        101  DELT      REAL              NAV
   123  DELTA     REAL            NAV         16  DELTS     REAL              TRAJIN
    66  DPSMAX    REAL            INPUTS     210  DV590P    REAL    ARRAY     NAV
     *  DV9P      REAL    ARRAY   IN  T       14  DV32P     REAL    ARRAY     NAV
   101  ETA       REAL    ARRAY   NA           6  ETA9P     REAL    ARRAY     INUDAT
     5  ETA9T     REAL    ARRAY   TRAJIN      112  FILATT    REAL    ARRAY     NAV
   225  GAINS     REAL    ARRAY   NAV         71  G9ZP      REAL    ARRAY     NAV
    74  H         REAL            NAV          4  HR        REAL              TRAJIN
    15  HSOINC    REAL            INPUTS      14  HSOTTM    REAL              INPUTS
   177  HV92P     REAL    ARRAY   NAV        216  I         INTEGER
     7  ICYCYL    INTEGER         CONTRL      13  IGYCYP    INTEGER           CONTRL
    27  IFPLTM    INTEGER         INPUTS     253  IGATHP    INTEGER ARRAY     NAV
    21  INITYP    INTEGER         INPUTS      23  INCOF     INTEGER           INPUTS
     5  INTT      INTEGER         CONTRL      61  IOPHLP    INTEGER           INPUTS
    23  IPC       INTEGER ARRAY   INPUTS       6  ISTOF     INTEGER           CONTRL
    17  ITPATT    INTEGER         INPUTS      67  ITRFTL    INTEGER           INPUTS
    16  ITPNAV    INTEGER         INPUTS     217  J         INTEGER
   105  LAT       REAL            NAV          1  LATGT     REAL              TRAJIN
   106  LONG      REAL            NAV         29  LONGT     REAL              TRAJIN
     2  LONGGT    REAL            TRAJIN     213  OOX       REAL              NAV
   214  OOY       REAL            NAV        215  OOZ       REAL              NAV
   222  OFILTR    REAL    ARRAY   NAV        176  OHP       REAL              NAV
     1  OTIMC     REAL            CONTRL     142  OVIEP     REAL    ARRAY     NAV
     *  PLOTTM    REAL            INPUTS       *  PLTIME    REAL              CONTRL
     5  PRNT      REAL            INPUTS       1  PTIME     REAL              CONTRL
   216  QUPOS     REAL    ARRAY   NAV          0  RESTR     REAL    ARRAY     INUDAT
    17  RHO       REAL    ARRAY   NAV         65  RLMAX     REAL              INPUTS
     *  RSTIME    REAL            CONTRL       /  RSTRT     REAL              INPUTS
    75  SALF      REAL            NAV         26  SALFGT    REAL              TRAJIN
    17  SLAT      REAL    ARRAY   TRAJIN      11  SLON      REAL    ARRAY     CONTRL
```

```
      SUBROUTINE SSTERM                                                 019420
C                                                                       019430
C     THIS ROUTINE TRANSF  MS THE VELOCITY INCREMENTS FROM THE IMU      019440
C     THAT IS, SPACE STABLE FRAME, TO THE COMP FRAME.                   019450
C                                                                       019460
      IMPLICIT REAL(A-H),REAL(L-Z)                                      019470
      COMMON /IMUCAT/ PESID(3),    DV9P(3),     FTA9P(4),    HT(3),     019480
     1    SF9IP(3),    C2P95(3,3), C9MIS(3,3), TRESID(3), C1099(3,3),  019490
     2    C1992P(3,3), C2P95T(3,3), ARESID(3)                           019500
      COMMON /NAV/    C9P92P(3,3),V92P(3),     DV92P(3),    PHO(3),    019510
     1    C9MH0(3,3), A(3,3),      B(3,3),     THTE9I(3),   THTI90(3), 019520
     2    INTC0P(3),  WXV(3),      S92P(3),    H,           ALPHA,     019530
     3    SALF,       CALF,        DELT,       FTA(3),      V9ME,      019540
     4    LAT,        LONG,        V92(3),     FILATT(3,3), DELTA,     019550
     5    XSALF,      XCALF,       X9992P(3,3),WV92P(3),    DV92P(3),  019560
     6    S2PHI,      XS2PHI,      XV92P(3),   XH,          DCLH,      019570
     7    C091 (3,3), C9P90(3,3),  DH3,        C995(3,3),   DV592P(3), 019580
     8    DDX,        DDY,         DDZ,        Q2P95(4),    DFILT2(3), 019590
     9    GAINS(3,10),IGAINP(3)                                         019600
      COMMON /INPLIS/ AQUANT,      IQUANT,     VQUANT,      STAPT,     019610
     1    STOP,       PLOTIM,      PRNT,       PSTPT,       CVD1,      019620
     2    CVD2,       CVD3,        TOLJCK,     HSOTIM,      HSCINC,    019630
     2    ITRMAV,     ITRATT,      INCOR,      IMUTYP,      IERLIM,    019640
     3    IPC(30),    IOPNLP,      SSX3,       SSY3,        SSZ3,      019650
     4    PSMAX,      DPSMAX,      ITRFIL                              019660
      COMMON /UNVRSL/ PI,          HPI,        ,            2P0,       019670
     1    EF,         ESQ,         EERP        , RT,        RADDEG,    019680
     2    DESQ                                                          019690
      COMMON /TRAJIN/ TIME,        LAT9T,      LONG9T,      ALF9T,     019700
     1    HB,         ETA9T(3),    V9T(3),     SF9T(3),     DELTS,     019710
     2    TIMF0,      LONG0,       GLAT9T,     GLAI9T,      SALF9T,    019720
     3    CALF9T                                                        019730
      DIMENSION TEMP(3),TEMP2(3)                                        019740
      CALL VMAIVC(TEMP,C091C,DV9P)                                      019750
      HST=VP(HFRT)*(TIME-TIMF0-DELT*.5)                                 019760
      C0P90(1,1)=VCOS(HST)                                              019770
      C0P90(2,2)=C0P90(1,1)                                             019780
      C0290(1,2)=VSIN(HST)                                              019790
      C0P90(2,1)=-C0P90(1,2)                                            019800
      CALL VMAIVC(TEMP2,C0P90,TEMP)                                     019810
      IF (IPC(29) .NE. 0) GO TO 520                                     019820
      CALL VMUL(A,C0P92P,C0PH0)                                         019830
      DO 510 I=1,3                                                      019840
      DO 510 J=1,3                                                      019850
  510 A(J,I)=VP(C0P92P(I,J)+VP(.5*A(I,J)))                              019860
      GO TO 530                                                         019870
  520 CALL MATRAN(0,X0P92P)                                             019880
  530 CALL VMAIVC(DV9P,3,TEMP2)                                         019890
      RETURN                                                            019900
      END                                                               019910
```

SUBROUTINE SSTERM 74/74 OPT=0 TRACE FTN 4.5+R406 05/25/76 17.12.47 PAGE 2

ENTRY POINTS
1 SSTERM

VARIABLES SN TYPE RELOCATION

33	A	REAL	ARRAY	NAV	3	ALFDT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
100	ASESIO	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	74	CALFDT	REAL		TRAJIN
22	CLATDT	REAL		TRAJIN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	CDP30	REAL	ARRAY	NAV	0	CDP32P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C9PHD	REAL	ARRAY	NAV
153	DELH	REAL		NAV	104	DELT	REAL		NAV
123	DELTA	REAL		NAV	15	DELTS	REAL		TRAJIN
66	DPSMAX	REAL		INPUTS	210	DV392P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EE	REAL		UNVRSL	6	EE22	REAL		UNVRSL
5	ESO	REAL		UNVRSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	IMUDAT	5	ETADT	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HB	RE		TRAJIN	1	HPT	REAL		UNVRSL
15	HSOTMC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	123	I	INTEGER		
22	IEPLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	INUTYP	INTEGER		INPUTS	20	INCOF	INTEGER		INPUTS
61	IOPNLP	INTEGER		INPUTS	23	IPC	INTEGER	ARRAY	INPUTS
17	ITPATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	121	J	INTEGER		
105	LAT	REAL		NAV	1	LATDT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGD	REAL		TRAJIN
2	LONGDT	REAL		TRAJIN	214	OBX	REAL		NAV
214	OBY	REAL		NAV	215	OBZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OHB	REAL		NAV
142	OV32P	REAL	ARRAY	NAV	9	PI	REAL		UNVRSL
5	PLOTIM	REAL		INPUTS	6	PONT	REAL		INPUTS
216	Q2P95	REAL	ARRAY	NAV	10	RADPER	REAL		UNVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESO	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	8	RPJ	REAL		UNVRSL
65	RSMAX	REAL		INPUTS	7	RSTRT	REAL		INPUTS
2	RU	REAL		UNVRSL	76	SALF	REAL		NAV
23	SALFDT	REAL		TRAJIN	13	SFDT	REAL	ARRAY	TRAJIN
15	SF9TP	REAL	ARRAY	IMUDAT	21	SLATDT	REAL		TRAJIN
62	SSXO	REAL		INPUTS	63	SSYO	REAL		INPUTS
64	SSZO	REAL		INPUTS	8	START	REAL		INPUTS
4	STOP	REAL		INPUTS	146	STPHT	REAL		NAV
122	TEMP	REAL	ARRAY		135	TEMP2	REAL	ARRAY	
63	THTCOR	REAL	ARRAY	NAV	55	THTERT	REAL	ARRAY	NAV
69	THTIPO	REAL	ARRAY	NAV	1	TIME	REAL		TRAJIN
17	TIMEO	REAL		TRAJIN	13	TOLJPK	REAL		INPUTS
1	TQUANT	REAL		INPUTS	43	TRSCID	REAL	ARRAY	IMUDAT
104	VEMR	REAL		NAV	2	VQUANT	REAL		INPUTS
12	VRT	REAL	ARRAY	TRAJIN	127	VV2	REAL	ARRAY	NAV
11	W	REAL	ARRAY	NAV	2	WT	REAL		UNVRSL

```
 21  SLAT9I     REAL                 TRAJIN      62  SSX0       REAL                 INPUTS


 SUBROUTINE SSINIT     74/74   OPT=0 TRACE                    FTN 4.5+R406    05/25/75  17.12.47       PAGE    7

 VARIABLES     SN  TYPE      RELOCATION
    63  SSY0       REAL                 INPUTS      64  SSZ0       REAL                 INPUTS
     3  START      REAL                 INPUTS       4  STOP       REAL                 INPUTS
   145  S2PHI      REAL                 NAV         63  THTCOR     REAL       ARRAY     NAV
    55  THTERT     REAL       ARRAY     NAV         60  THTTRU     REAL       ARRAY     NAV
     0  TIME       REAL                 TRAJIN      17  TIMEO      REAL                 TRAJIN
    13  TOLJRK     REAL                 INPUTS       4  TPREV      REAL                 CNTRL
     1  TQUANT     REAL                 INPUTS      42  TRGSTO     REAL       ARRAY     IMUDAT
   104  V0M2       REAL                 NAV          2  VQUANT     REAL                 INPUTS
    10  V9T        REAL       ARRAY     TRAJIN     107  V92        REAL       ARRAY     NAV
    11  V92P       REAL       ARRAY     NAV         12  WT         REAL       ARRAY     IMUDAT
    66  WXV        REAL       ARRAY     NAV        125  XCALF      REAL                 NAV
   152  XH         REAL                 NAV        124  XSALF      REAL                 NAV
   146  XS2PHI     REAL                 NAV        147  XV92P      REAL       ARRAY     NAV
   126  XVP02P     REAL       ARRAY     NAV

 FILE NAMES      MODE
      TAPE6      FMT

 EXTERNALS          TYPE   ARGS
      ATUDE                 0                      COS        REAL       1 LIBRARY
      ININIT                0                      INREC                 0
      MATRAN                2                      POTZYX                7
      SIN        REAL       1 LIBRARY              SSATT                 3
      SSATUD                0                      SSINTG                3
      VP         REAL       1                      VRTZYX                7

 STATEMENT LABELS
    0  4                                    0  5                                206  6       FMT
  112  988

 LOOPS  LABEL    INDEX      FROM-TO    LENGTH     PROPERTIES
    31  4       * I          35 37        159     EXT REFS  NOT INNER
    32  4       * J          36 37        128     EXT REFS
    66  5       * I          46 47         58     EXT REFS

 COMMON BLOCKS   LENGTH
      CONTRL          9
      IMUDAT         67
      INPUTS         56
      NAV           182
      TRAJIN         21

 STATISTICS
   PROGRAM LENGTH              2208      144
   CM LABELED COMMON LENGTH    5179      435
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  117  WRT        REAL                                  12  WT         REAL        ARRAY     IMUDAT

 SUBROUTINE SSTEP4     74/74   OPT=0 TRACE                    FTN 4.5+P406     05/25/76  17.12.47       PAGE    3

 VARIABLES     SN  TYPE          RELOCATION
    66  WXV        REAL      ARRAY    NAV          125  YCALF      REAL                  NAV
   152  XH         REAL               NAV          124  XSALF      REAL                  NAV
   146  XS2PHT     REAL               NAV          147  YV02P      REAL        ARRAY     NAV
   126  XUP92P     REAL      ARRAY    NAV

 EXTERNALS          TYPE  ARGS                     VCOS       REAL        1
        MATRAN              2                     VMM                    3
        VMATVC              3                     VSTN       REAL        1
        VP         REAL     1

 STATEMENT LABELS
     0  510                                  54  520                                  56  530

 LOOPS  LABEL     INDEX     FROM-TO    LENGTH     PROPERTIES
    30  510    * I           43 45        238     EXT REFS  NOT INNER
    31  510    * J           44 45        209     EXT REFS

 COMMON BLOCKS    LENGTH
        IMUDAT       67
        NAV         182
        INPUTS       56
        UNVPSL       10
        TRAJIN       21

 STATISTICS
   PROGRAM LENGTH              1308       88
   CM LABELED COMMON LENGTH    5200      336
```

```
      SUBROUTINE SSATT                                                  C13920
C                                                                       J13930
C     THIS ROUTINE CONSTRUCTS THE TRANSFORMATION FROM THE BODY(S)       C13940
C     FRAME TO THE LLHA(2P) FRAME                                       C13950
C                                                                       J13960
      IMPLICIT REAL(A-H,L-Z)                                            C13970
      COMMON /IMUDAT/  RESID(3),   DV3P(3),    ETA9P(4),   WT(3),       J13980
     1     SF9IP(3),   C2P95(3,3), C9MIS(3,3), IRCSID(3), C189P(3,3),  C13990
     2    C1)92P(3,3), C2P95T(3,3), AKESID(7)                           C14000
      COMMON /UBMZ/    C0P92P(3,3),V92P(3),    DV32P(3),   RHO(3),      C14010
     1     C9PN0(3,3), A(3,3),      B(3,7),    INF92T(3),  INTTPO(3),   C14020
     2     INTC03(3),  WXV(3),      G92P(7),   K,          ALPHA,       C14030
     3     SALF,       CALF,        DELT,      STA(3),     VOMP,        C14040
     4     LAT,        LONG,        V92(3),    FILATT(3,3),DELTA,       C14050
     5     XSALF,      XCALF,       V0P92P(3,3),HV92P(3),  DV32P(3),    C14060
     6     S2PHI,      XS2PHI,      XV32P(3),  XH,         DELH,        C14070
     7     C0910(3,3), C0P90(3,3),  DW3,       C095(3,3),  DV502P(3),   C14080
     8     ODX ,       ODY ,        ODZ ,      C2P95(4),   OFILTP(7),   C14090
     9     GAINS(3,10),IGAINP(3)                                        C14100
      COMMON /UNIVRSL/ PI,          HPI,       PP,         PPI,         C14110
     1     EE,         ESQ,         EER2C,     WEPI,       R1??EP,      C14120
     2     RESQ                                                         C14130
      CALL VMTM(A,C0P92P,C0P90)                                         C14140
C     A IS NOW C2P90                                                    C14150
      CALL V4M(A,A,C0910)                                               C14160
C     A IS NOW C2P910                                                   C14170
      ETA9P(1)=VP(ETA9P(1)+VP(.5*HPI))                                  C14180
      C1=VCOS(ETA9P(1))                                                 C14190
      S1=VSIN(ETA9P(1))                                                 C14200
      C3=VCOS(ETA9P(3))                                                 C14210
      S3=VSIN(ETA9P(3))                                                 C14220
      C4=VCOS(ETA9P(4))                                                 C14230
      S4=VSIN(ETA9P(4))                                                 C14240
      S1S4=VP(S1*S4)                                                    C14250
      S1C3=VP(S1*C3)                                                    C14260
      S3S4=VP(S3*S4)                                                    C14270
      C1C4=VP(C1*C4)                                                    C14280
      B(1,1)=VP(C1C4-VP(S1C3*S4))                                       C14290
      B(2,1 =VP(VF(-S1*C4)-VP(C1*VP(C3*S4)))                            C14300
      B(3,1)=S3S4                                                       C14310
      B(1,2)=VP(VF(C1*S4)+VP(S1C3*C4))                                  C14320
      B(2,2)=VP(-S1S4+VP(C1C4*C3))                                      C14330
      B(3,2)=VP(-S3*C4)                                                 C14340
      B(1,3)=VP(S1*S3)                                                  C14350
      B(2,3)=VP(C1*S3)                                                  C14360
      B(3,3)=C3                                                         C14370
      CALL VPM(C2P95,A,B)                                               C14380
      RETURN                                                            C14390
      END                                                               C14400
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 SSATT

VARIABLES	SN	TYPE	RELOCATION						
32	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
100	ARESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	155	C0P90	REAL	ARRAY	NAV
0	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C095	REAL	ARRAY	NAV	205	C1	REAL		
216	C1C4	REAL			45	C1290	REAL	ARRAY	IMUDAT
56	C1C92P	REAL	ARRAY	IMUDAT	20	C2P0F	REAL	ARRAY	IMUDAT
67	C2P95T	REAL	ARRAY	IMUDAT	207	C3	REAL		
211	C4	REAL			31	C94TS	REAL	ARRAY	IMUDAT
22	C9PH0	REAL	ARRAY	NAV	153	DELH	REAL		NAV
109	DELT	REAL		NAV	123	DELTA	REAL		NAV
210	DV592P	REAL	ARRAY	NAV	3	DV3P	REAL	ARRAY	IMUDAT
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNVRSL
6	EEPRJ	REAL		UNVRSL	5	ESO	REAL		UNVRSL
101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
1	HPI	REAL		UNVRSL	137	HV32P	REAL	ARRAY	NAV
263	IGAINP	INTEGER	ARRAY	NAV	105	LAT	REAL		NAV
106	LONG	REAL		NAV	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFILTP	REAL	ARRAY	NAV	176	OM3	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVRSL
216	Q2P95	REAL	ARRAY	NAV	13	RADPER	REAL		UNVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESQ	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	RP4	REAL		UNVRSL
2	RG	REAL		UNVRSL	75	SALF	REAL		NAV
15	SF9TP	REAL	ARRAY	IMUDAT	206	S1	REAL		
214	S1C3	REAL			213	S1S4	REAL		
145	S2PHI	REAL		NAV	210	S3	REAL		
215	S3S4	REAL			212	S4	REAL		
63	THTCOP	REAL	ARRAY	NAV	55	THTERT	REAL	ARRAY	NAV
62	THTTPO	REAL	ARRAY	NAV	42	TPESTO	REAL	ARRAY	IMUDAT
104	V0MP	REAL		NAV	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WEPT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	150	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	Y0P92P	REAL	ARRAY	NAV

EXTERNALS TYPE ARGS

VCOS	REAL	1	VMM		3
VMTH		3	VP	REAL	1
VSIN	REAL	1			

COMMON BLOCKS LENGTH

IMUDAT	67
NAV	192
UNVRSL	10

STATISTICS

PROGRAM LENGTH	2179	143
BLANK COMMON LENGTH	4330	263

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      SUBROUTINE LLINTG                                                 020410
C                                                                       020420
C     SUBROUTINE TO COMPUTE MISALIGNMENTS BETWEEN ACTUAL AND            020430
C     IDEAL LLWA PLATFORM FRAMES. TRANSFORM TRAJECTORY SPECIFIC         020440
C     FORCE TO ACTUAL PLATFORM FRAME, AND INTEGRATE SPECIFIC            020450
C     FORCE.  DELTA-VELOCITIES ARE COMPUTED IN THE LLWA                 020460
C     PLATFORM FRAME (UEN AXES).                                        020470
C                                                                       020480
      IMPLICIT REAL(A-H,L-Z)                                            020490
      COMMON /CONTRL/ QTIME,     DTIME,     PLTIME,    RSTIME,         020500
     1    TPREV,     INIT,      TSTOP,     ICNGVL,    ICNGVP          020510
      COMMON /INUCAT/ RESID(3),  DV2P(3),   ETA9P(4),  WT(3),          020520
     1    SF9TP(3),  C2P95(3,3), C9MIS(3,3), TPSID(3), C1092P(3,3),    020530
     2  C1092P(3,3), C2P95T(3,3), APESID(3)                            020540
      COMMON /INPUTS/ AQUANT,    TQUANT,    VQUANT,    STAPI,          020550
     1    STOP,      PLOTIN,    PRNT,      PSTPI,     CVD1,           020560
     2    CVD2,      CVD3,      TOLJPK,    HSOTTP,    HSOTMC,         020570
     2    IITRNAV,   IITRAT,    INGOR,     IMUTYP,    IERLIM,         020580
     3    IPC(30),   IOPNLP,    SSX5,      SSY9,      SF79,           020590
     4    DSMAX,     DHSMAX,    IIRFIL                                020600
      COMMON /NAV/    C0P92P(3,3),V92P(3),    DV92P(3),  RH9(3),      020610
     1    C92H9(3,3), A(3,3),    B(3,3),    THTERT(3), THTIP0(3),    020620
     2    THTCOP(3), WXV(3),     G92P(3),   H,         ALPHA,          020630
     3    SALF,      CALF,       DELT,      ETA(3),    V9MS,           020640
     4    LAT,       LONG,       V92(3),    PILATT(3,3),DELTA,         020650
     5    XSALF,     XCALF,      X0P92P(3,3),HV92P(3),  DV32P(3),      020660
     6    S2PHI,     XS2PHI,     XV92P(3),  VH,        DELH,           020670
     7    C9910(3,3), C2P90(3,3), DH3,       C005(3,3), DV592P(3),    020680
     8    ODX  ,     ODY  ,      ODZ  ,     02P95(4),  DELTP(3),      020690
     9    GAINS(3,10),IGAINP(3)                                        020700
      COMMON /UNVRSL/ PI,        HPI,       R0,        R50,            020710
     1    EE,        ESQ,        EERR0,     WERT,      RADDEG,         020720
     2    RESQ                                                         020730
      COMMON /TRAJIN/ TIME,      LAT9T,     LONG9T,    ALF9T,          020740
     1    H9,        ETA9T(3),   V9T(3),    SF9T(3),   DELTS,          020750
     2    TIME0,     LONG0,      SLAT9T,    CLAT9T,    SALF9T,         020760
     3    CALF9T                                                       020770
      DIMENSION TMP(3)                                                  020780
      EQUIVALENCE (TMP(1),Q(1))                                         020790
C                                                                       020800
   10 IF (IOPNLP .NE. 0) GO TO 50                                       020810
C                                                                       020820
C         TRANSFORM TRAJECTORY VELOCITIES TO LVN FRAME(UEN)             020830
C                                                                       020840
      VN = CALF9T*V9T(1) - SALF9T*V9T(2)                                020850
      VE = -SALF9T*V9T(1) - CALF9T*V9T(2)                               020860
C                                                                       020870
C     COMPUTE RADII OF CURVATURE                                        020880
C                                                                       020890
      TMP1 = 1.0/(1.0 - ESQ*SLAT9T**2)                                  020900
      TMP2 = SQRT(TMP1)                                                 020910
      RP = R0 + R50*TMP2                                                020920
      RM = R0 + RESQ*TMP1*TMP2                                          020930
C                                                                       020940
C         COMPUTE TOTAL VEHICLE ANGULAR RATES                           020950
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                WT(1) = WERT*SLAT9T                                                 020070

      SUBROUTINE LLINTG     74/74   OPT=0 IPAGE                FTN 4.5+P406    05/25/75  17.13.47       PAGE     2

                WTE = -VN/RM                                                        020080
                WTN = VE/RP + WERT*CLAT9T                                           020090
     60         C                                                                   021000
                C          TRANSFORM TO LLWA FRAME (WEN) AND THEN TO ACTUAL PLATFORM 021010
                C          FRAME                                                    021020
                C                                                                   021030
                WT(2) = WTE*CALF9T + WTN*SALF9T                                     021040
     65         WT(3) = -WTE*SALF9T + WTN*CALF9T                                    021050
                IF (IPC(1) .EQ. 0) GO TO 15                                         021060
                CALL DOUT(1)                                                        021070
             15 CALL MATVEC(WT,C9MIS,WT)                                            021080
                C                                                                   021090
     70         C          UPDATE THE MISALIGNMENT MATRIX                           021100
                C                                                                   021110
                DO 17 I=1,3                                                         021120
                THTTRQ(I)=THTIRQ(I)+TRESID(I)                                       021130
             17 TMP(I)=THTTRQ(I)                                                    021140
     75         CALL QNTIZ(THTIRQ,TQUANT)                                           021150
                DO 19 I=1,3                                                         021160
             19 TRESID(I)=TMP(I)-THTTRQ(I)                                          021170
                A(2,3) = (THTTRQ(1)/DELT - WT(1))*DELTS                             021180
                A(3,2) = -A(2,3)                                                    021190
     80         A(1,1) = (THTTRQ(2)/DELT - WT(2))*DELTS                             021200
                A(1,3) = -A(3,1)                                                    021210
                A(1,2) = (THTTRQ(3)/DELT - WT(3))*DELTS                             021220
                A(2,1) = -A(1,2)                                                    021230
                IF (IPC(13) .EQ. 0) GO TO 20                                        021240
     85         CALL DOUT(13)                                                       021250
             20 DO 30 I=1,3                                                         021260
             30 A(I,I) = 1.0                                                        021270
                CALL MM(C9MIS,A,C9MIS)                                              021280
                C                                                                   021290
     90         C          TRANSFORM SPECIFIC FORCE TO ACTUAL LLWA PLATFORM FRAME   021300
                C          AND INTEGRATE                                            021310
                C                                                                   021320
             50 TMP(1) = SF9T(3)                                                    021330
                TMP(2) = -SF9T(2)                                                   021340
     95         TMP(3) = SF9T(1)                                                    021350
                CALL MATVEC(SF9T,C9MIS,TMP)                                         021360
                RETURN                                                              021370
                END                                                                 021380

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1  LLINTG

VARIABLES     SN  TYPE          RELOCATION
   33  A         REAL      ARRAY     NAV          3  ALF9T     REAL                TRAJTN
   75  ALPHA     REAL                NAV          0  AQUANT    REAL                INPUTS
  112  TRESID    REAL      ARRAY     IMUDAT      44  B         REAL      ARRAY     NAV
   77  CALF      REAL                NAV          6  CALF9T    REAL                TRAJTN


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                WT(1) = WERT*SLAT9T                                     020970

SUBROUTINE LLINIG     74/74   OPT=0 TRACE          FTN 4.5+R406   05/25/76  17.12.47       PAGE     2

                WTE = -VN/PM                                            021080
                WTN = VE/RP + WERT*CLAT9T                               021090
     60         C                                                       021100
                C          TRANSFORM TO LLWA FRAME (VEW) AND THEN TO ACTUAL PLATFORM    021110
                C          FRAME                                        021120
                C                                                       021130
                WT(2) = WTE*CALF9T + WTN*SALF9T                         021140
     65         WT(3) = -WTE*SALF9T + WTN*CALF9T                        021150
                IF (IPC(1) .EQ. 0) GO TO 15                             021160
                CALL DOUT(1)                                            021170
             15 CALL MATVEC(WT,C9MIS,WT)                                021180
                C                                                       021190
     70         C          UPDATE THE MISALIGNMENT MATRIX               021200
                C                                                       021210
                DO 17 I=1,3                                             021220
                THETRQ(I)=THETPQ(I)+TRESID(I)                           021230
             17 TMP(I)=THETRQ(I)                                        021240
     75         CALL QNTIZ(THETRQ,TQUANT)                               021250
                DO 19 I=1,3                                             021260
             19 TRESID(I)=TMP(I)-THETPQ(I)                              021270
                A(2,3) = (THETPQ(1)/DELT - WT(1))*DELTS                 021280
                A(3,2) = -A(2,3)                                        021290
     80         A(3,1) = (THETPQ(2)/DELT - WT(2))*DELTS                 021300
                A(1,3) = -A(3,1)                                        021310
                A(1,2) = (THETPQ(3)/DELT - WT(3))*DELTS                 021320
                A(2,1) = -A(1,2)                                        021330
                IF (IPC(13) .EQ. 0) GO TO 20                            021340
     85         CALL DOUT(13)                                           021350
             20 DO 30 I=1,3                                             021360
             30 A(I,I) = 1.0                                            021370
                CALL MM(C9MIS,A,C9MIS)                                  021380
                C                                                       021390
     90         C          TRANSFORM SPECIFIC FORCE TO ACTUAL LLWA PLATFORM FRAME   021400
                C          AND INTEGRATE                                021410
                C                                                       021420
             50 TMP(1) = SF9T(3)                                        021430
                TMP(2) = -SF9T(2)                                       021440
     95         TMP(3) = SF9T(1)                                        021450
                CALL MATVEC(SF9T,C9MIS,TMP)                             021460
                RETURN                                                  021470
                END                                                     021480
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1 LLINIG

VARIABLES SN TYPE RELOCATION

33	A	REAL	ARRAY	NAV	3	ALF9T	REAL			TRAJTN
75	ALPHA	REAL		NAV	1	AQUANT	REAL			INPUTS
111	ARESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV	
77	CALF	REAL		NAV	2	CALF9T	REAL			TRAJTN

VARIABLES SM TYPE RELOCATION

11	CVD2	REAL		INPUTS	12	CVD3	REAL		INPUTS
169	CDP93	REAL	ARRAY	NAV	3	C1892P	REAL	ARRAY	NAV
154	CD919	REAL	ARRAY	NAV	177	CV95	REAL	ARRAY	NAV
45	C1891	REAL	ARRAY	INVDAT	56	C1892P	REAL	ARRAY	INVDAT
23	CDP95	REAL	ARRAY	INVDAT	67	CD295T	REAL	ARRAY	INVDAT
31	CDMIS	REAL	ARRAY	INVDAT	22	CDINC	REAL	ARRAY	NAV
161	DELH	REAL		NAV	111	DELT	REAL		NAV
124	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DESMAX	REAL		INPUTS	210	DVS92P	REAL	ARRAY	NAV
1	DV9P	REAL	ARRAY	INVDAT	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNIVSL	5	EF2P	REAL		UNIVSL
5	EPS	REAL		UNIVSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	INVDAT	6	ETAPT	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINC	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
5	HB	REAL		TRAJIN	1	HDI	REAL		UNIVSL
15	HSDINC	REAL		INPUTS	14	HSDTIM	REAL		INPUTS
177	HV92P	REAL	ARRAY	NAV	171	I	INTEGER		
7	ICHCYL	INTEGER		CONTRL	13	ICNCYP	INTEGER		CONTRL
22	ICPLIM	INTEGER		INPUTS	263	IGSIAP	INTEGER	ARRAY	NAV
21	INDTYP	INTEGER		INPUTS	23	INSOR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPHLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITCATT	INTEGER		INPUTS	67	ITPFIL	INTEGER		INPUTS
16	ITPNAV	INTEGER		INPUTS	135	LAT	REAL		NAV
1	LATGT	REAL		TRAJIN	136	LONG	REAL		NAV
28	LONGG	REAL		TRAJIN	2	LONGGT	REAL		TRAJIN
213	QDX	REAL		NAV	214	QDY	REAL		NAV
215	QDZ	REAL		NAV	222	QELTP	REAL	ARRAY	NAV
176	QHD	REAL		NAV	0	QTIME	REAL		CONTRL
142	QV92P	REAL	ARRAY	NAV	3	R1	REAL		UNIVSL
5	RLGTIM	REAL		INPUTS	2	RLTIMC	REAL		CONTRL
6	RNNT	REAL		INPUTS	1	RTIMC	REAL		CONTRL
216	S2P95	REAL	ARRAY	NAV	11	S9DSF2	REAL		UNIVSL
2	SFSID	REAL	ARRAY	INVDAT	11	SGSD	REAL		UNIVSL
1	SHD	REAL	ARRAY	NAV	166	SK	REAL		
166	SP	REAL			1	SR1	REAL		UNIVSL
65	RSMAX	REAL		INPUTS	3	SSTIME	REAL		CONTRL
7	RSTRT	REAL		INPUTS	2	T1	REAL		UNIVSL
76	SALF	REAL		NAV	24	SALFGT	REAL		TRAJIN
13	SFGT	REAL	ARRAY	TRAJIN	15	SFSIP	REAL	ARRAY	INVDAT
21	SLATGT	REAL		TRAJIN	62	SSVE	REAL		INPUTS
63	SSVO	REAL		INPUTS	64	SSZO	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
55	THTERI	REAL	ARRAY	NAV	58	THTRO	REAL	ARRAY	NAV
0	TIMF	REAL		TRAJIN	17	TIMFO	REAL		TRAJIN
44	TMP	REAL	ARRAY	NAV	162	TMP1	REAL		
164	TMP2	REAL			11	TPLJPK	REAL		INPUTS
4	TRFW	REAL		CONTRL	1	TSTART	REAL		INPUTS
42	TRSID	REAL	ARRAY	INVDAT	134	V0MP	REAL		NAV
161	VF	REAL			151	VH	REAL		
9	VINERT	REAL		INPUTS	13	V9T	REAL	ARRAY	TRAJIN
177	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
7	WFT	REAL		UNIVSL	12	WT	REAL	ARRAY	INVDAT

VARIABLES	SN	TYPE		RELOCATION					
152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV32P	REAL	ARRAY	NAV
126	XOP92P	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS			
QOUT		1	MATVEC	3	
QN		3	ONIT7	2	
SQRT	REAL	1 LIBRARY			

STATEMENT LABELS

0	10	INACTIVE	50	15	0	17	
0	19		112	20	0	30	
121	50						

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
51	17	I	72 74	69	INSTACK
64	19	I	76 77	58	INSTACK
113	30	I	86 87	48	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
INUMAT	67
INPUTS	56
NAV	192
UNVRSL	10
TRAJIN	21

STATISTICS

PROGRAM LENGTH	1713	121
CM LABELED COMMON LENGTH	5313	345

```
      SUBROUTINE LLATUD                                                 021390
C                                                                       021400
C     SUBROUTINE TO COMPUTE THE GIMBAL ANGLES WHICH WOULD BE            021410
C     GENERATED BY THE ACTUAL LLNA IMU.  FOUR GIMBAL ANGLES ARE         021420
C     GENERATED TO SIMULATED INNER ROLL, OUTER ROLL, PITCH, AND         021430
C     YAW.  HOWEVER, THE INNER ROLL ANGLE IS ALWAYS ZERO.               021440
C     GENERATED BY THE ACTUAL LLNA IMU.                                 021450
C                                                                       021460
C     ETA9P(1) -- OUTER ROLL                                            021470
C     ETA9P(2) -- PITCH                                                 021480
C     ETA9P(3) -- INNER ROLL (ALWAYS ZERO)                              021490
C     ETA9P(4) -- YAW                                                   021500
C                                                                       021510
      IMPLICIT REAL(A-H,L-Z)                                            021520
      COMMON /COM1RL/  DTIME,      RTIME,      PLTIME,     RSTIME,      021530
     1     IPREV,      INIT,       ISTOP,      ICMCYL,     ICMCYP       021540
      COMMON /IMUCAT/  RESID(3),   DV9P(3),    ETA9P(4),   HT(3),       021550
     1     SF9TP(3),   C2P95(3,3), C9MIS(3,3), TRESID(3),  C1T90(3,3),  021560
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                            021570
      COMMON /INPUTS/  AQUANT,     TQUANT,     VQUANT,     START,       021580
     1     STOP,       RLOLIM,     P2PI,       RSTRT,      CV01,        021590
     2     CV02,       CV03,       TOLJPK,     HSDTIM,      HSCTMC,     021600
     2    ITRMAV,     ITRATT,     INCOR,      IMUTYP,     IESLIM,      021610
     3     IPC(30),    IOPNLP,     SSX0,       SSY0,       SSZ0,        021620
     4     RSMAX,      DRSMAX,     ITSETL                               021630
      COMMON /NAV/     C0P92P(3,3),V92P(3),    DV92P(3),   PHO(3),      021640
     1     C9P90(3,3), A(3,3),     B(3,3),     THTEST(3),  THTIPC(3),   021650
     2    THTCOR(3),  WXV(3),     G92P(3),    H,          ALPHA,       021660
     3     SALF,       CALF,       DELT,       ETA(3),     VPHO,        021670
     4     LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,       021680
     5     XSALF,      XCALF,      X0992P(3,3),HV92P(3),   DV92P(3),    021690
     6     S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,        021700
     7    C091O(3,3), C0P90(3,3), OMB,        C295(3,3),  DV592P(3),   021710
     8     DDX ,       DDY ,       DDZ ,       C2P95(4),   DELTP(3),    021720
     9     GAINS(3,10),IGAINP(3)                                        021730
      COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALF9T,       021740
     1     HP,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,       021750
     2    TIMCO,      LONGI,      SLAT9T,     CLAT9T,     SALF9T,      021760
     3     CALF9T                                                       021770
C                                                                       021780
      CALL ROTXYZ(C2P95, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),   021790
     1  COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                   021800
      CALL MM(C2P95,C9MIS,C2P95)                                        021810
C                                                                       021820
C          EXTRACT THE GIMBAL ANGLES                                    021830
C                                                                       021840
      ETA9P(1) =  ATAN2(-C2P95(1,2),C2P95(1,1))                         021850
      TEMP= SQRT(C2P95(1,3)**2+C2P95(3,3)**2)                           021860
      ETA9P(2)= ATAN2(C2P95(1,3),TEMP)                                  021870
      ETA9P(3) =  ATAN2(C2P95(                    3,3))                 021880
      CALL UNITIZ(ETA9P(1),A0                                           021890
      ETA9P(4) = ETA9P(1)                                               021900
      ETA9P(1) = 0.0                                                    021910
      IF (IPC(2) .EQ. 0) GO    20                                       021920
      CALL POUT(2)                                                      021930
```

END

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 LLATUD

VARIABLES SN TYPE RELOCATION

77	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJTN
75	ALPHA	REAL		NAV	9	AQUANT	REAL		INPUTS
109	APESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJTN
22	CLAT9T	REAL		TRAJIN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
155	C0P90	REAL	ARRAY	NAV	9	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	57	C2P96T	REAL	ARRAY	IMUDAT
71	C90IS	REAL	ARRAY	IMUDAT	22	C93H0	REAL	ARRAY	NAV
153	DELH	REAL		NAV	101	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DNSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
3	DV3P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
101	ETA	REAL	ARRAY	NAV	5	ETA9P	REAL	ARRAY	IMUDAT
5	ETA9T	REAL	ARRAY	TRAJIN	112	ETLATT	REAL	ARRAY	NAV
225	G0INS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HR	REAL		TRAJIN
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	7	ICHCKL	INTEGER		CONTPL
10	ICMGVP	INTEGER		CONTPL	22	IEPLIN	INTEGER		INPUTS
263	IGAINP	INTEGER	ARRAY	NAV	21	IMUTYP	INTEGER		INPUTS
24	INCOR	INTEGER		INPUTS	5	INIT	INTEGER		CONTPL
61	IOPNLP	INTEGER		INPUTS	23	IPC	INTEGER	ARRAY	INPUTS
6	ISTOP	INTEGER		CONTPL	17	IVRATT	INTEGER		INPUTS
67	ITRFIL	INTEGER		INPUTS	15	IVRNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONG9	REAL		TRAJIN
2	LONG9T	REAL		TRAJIN	213	OBX	REAL		NAV
214	OBY	REAL		NAV	215	OBZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OMB	REAL		NAV
0	OTIME	REAL		CONTPL	142	OV92P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTPL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTPL
216	Q2P95	REAL	ARRAY	NAV	0	RESTP	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	65	RSMAX	REAL		INPUTS
3	RSTIME	REAL		CONTPL	7	RSTPT	REAL		INPUTS
76	SALF	REAL		NAV	23	SALF9T	REAL		TRAJTN
13	SF9T	REAL	ARRAY	TRAJIN	15	SF9TP	REAL	ARRAY	IMUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
4	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	[illegible]	REAL		NAV	174	TIMP	REAL		

86-T

VARIABLES	SN	TYPE		RELOCATION					
60	FUTTPQ	REAL	ARRAY	NAV	9	TIME	REAL		TRAJTN
17	TIMED	REAL		TRAJTN	13	TOLJRK	REAL		INPUTS
4	TPPFV	REAL		CONTPL	1	TOUANT	REAL		INPUTS
42	TPESID	REAL	ARRAY	IMUDAT	104	V042	REAL		NAV
2	VQUANT	REAL		INPUTS	19	V9T	REAL	ARRAY	TRAJTN
102	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
126	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	YS2PHT	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XDP92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS				
ATAN2	REAL	2	LIBRARY	COS	REAL	1 LIBRARY
DOUT		1		MM		3
QUTI7		2		RDTXY2		7
SIN	REAL	1	LIBRARY	SQRT	REAL	1 LIBRARY

STATEMENT LABELS
55 20

COMMON BLOCKS	LENGTH
CONTPL	3
IMUDAT	67
INPUTS	56
NAV	142
TRAJTN	21

STATISTICS
PROGRAM LENGTH 1359 93
CM LABELED COMMON LENGTH 5178 315

```
      SUBROUTINE LLATT                                                  022197
C                                                                       022198
C     THIS ROUTINE CONSTRUCTS THE BODY TO LVN TRANSFORMATION            022199
C     MATRIX FOR USE IN DERIVING THE ATTITUDE ANGLES.  THE              022200
C     MATRIX IS FORMED FROM THE 4 GIMBAL ANGLES CALCULATED IN           022210
C     ROUTINE "LLATUD".                                                 022220
C                                                                       022230
C     H -- OUTER ROLL                                                   022240
C     X -- PITCH                                                        022250
C     Y -- INNER ROLL                                                   022260
C     Z -- YAW                                                          022270
C                                                                       022280
      IMPLICIT REAL(A-H,L-Z)                                            022290
      COMMON /INPUTS/ AQUANT,  IQUANT,  VQUANT,  START,               022300
     1     STOP,    PLOTIM,  PRNT,   PSTRT,   CV01,                   022310
     2     CV02,    CV03,    TOLJCK,  HSOTIM,  HSCING,                022320
     2     ITRNAV,  TTRAIT,  INCOR,   IMUTYP,  TESLIP,                022330
     3     IPC(20),  IOPHLP,  SSX0,    SSY0,    SSZ0,                 022340
     4     RSMAX,   DPSMAX,  ITREF                                    022350
      COMMON /IMUCAT/ RESID(3),  DV3P(3),  ETA3P(4),  WT(3),          022360
     1     SF3TP(3),  C2P95(3,3), C94TS(3,3), TRESID(3), C1093(3,3),  022370
     2     C1093P(3,3), C2P95T(3,3), ARESID(3)                        022380
      COMMON /NAV/  C0P92P(3,3),V92P(3),   DV92P(3),   PHD(3),        022390
     1     C0PHD(3,3), A(3,3),    B(3,3),    THTERT(3),  THTTPD(3),  022400
     2     THTCOP(3),  WXV(3),    G92P(3),   H,          ALPHA,       022410
     3     SALE,    CALF,    DELT,    ETA(3),    VPHS,               022420
     4     LAT,     LONG,    V92(3),    FILATT(3,3),DELTA,           022430
     5     XSALE,   XCALF,   X0P92P(3,3),HV92P(3),   DV92P(3),       022440
     6     S2PHI,   XS2PHI,  XV92P(3),  XH,       DELH,             022450
     7     C091C(3,3), C0P90(3,3), DH3,     C095(3,3),  DV592P(3),  022460
     8     DDX ,    DDY ,    DDZ ,    D2P95(4),  DELTP(3),           022470
     9     GAINS(3,10),IGAINP(5)                                      022480
      EQUIVALENCE (H,ETA9P(1)),(X,ETA9P(2)),(Y,ETA9P(3)),(Z,ETA9P(4)) 022490
C                                                                       022500
      CALL VRTXYZ(A,VSIN(Y),VCOS(Y),0.E0,1.E0,VSIN(Z),VCOS(Z))          022310
      CALL VRTXYZ(B,VSIN(H),VCOS(H),VSIN(X),VCOS(X),0.E0,1.E0)          022320
      CALL V4M(C2P95,A,B)                                               022330
      RETURN                                                            022340
      END                                                               022350
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 LLATT

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
0	AQUANT	REAL		INPUTS	100	ARESID	REAL	ARRAY	IMUMAT
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
10	CV01	REAL		INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL		INPUTS	166	C2P95	REAL	ARRAY	NAV
0	C2P95T	REAL	ARRAY	NAV	154	C1093	REAL	ARRAY	NAV

VARIABLES	SN.	TYPE		RELOCATION					
	56	C1C92P	REAL	ARRAY	INUDAT	20	C2P95	REAL	ARRAY	INUDAT
	67	C2P95I	REAL	ARRAY	INUDAT	31	C9MIS	REAL	ARRAY	INUDAT
	22	C9PHO	REAL	ARRAY	NAV	153	DELH	REAL		NAV
	100	DELT	REAL		NAV	123	DELTA	REAL		NAV
	66	DFSMAX	REAL		INPUTS	210	DV52P	REAL	ARRAY	NAV
	3	DV9P	REAL	ARRAY	INUDAT	14	DV92P	REAL	ARRAY	NAV
	101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	INUDAT
	112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
	71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
	15	HSDINC	REAL		INPUTS	14	HSDTIM	REAL		INPUTS
	137	HV32P	REAL	ARRAY	NAV	22	ICRLIM	INTEGER		INPUTS
	263	IGAINP	INTEGER	ARRAY	NAV	21	INUTYP	INTEGER		INPUTS
	20	INDOR	INTEGER		INPUTS	61	IOPHLP	INTEGER		INPUTS
	23	IPC	INTEGER	ARRAY	INPUTS	17	ITRATT	INTEGER		INPUTS
	67	ITPFIL	INTEGER		INPUTS	16	ITRNAV	INTEGER		INPUTS
	105	LAT	REAL		NAV	106	LONG	REAL		NAV
	213	ODX	REAL		NAV	214	ODY	REAL		NAV
	215	ODZ	REAL		NAV	223	OFILTR	REAL	ARRAY	NAV
	176	OMB	REAL		NAV	142	OV92P	REAL	ARRAY	NAV
	5	PLOTIN	REAL		INPUTS	6	PRNT	REAL		INPUTS
	216	Q2P95	REAL	ARRAY	NAV	0	RESID	REAL	ARRAY	INUDAT
	17	RHO	REAL	ARRAY	NAV	65	RSMAX	REAL		INPUTS
	7	RSTRT	REAL		INPUTS	76	SALF	REAL		NAV
	15	SF9IP	REAL	ARRAY	INUDAT	62	SSXO	REAL		INPUTS
	63	SSYO	REAL		INPUTS	64	SSZO	REAL		INPUTS
	3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
	145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
	55	THTCRT	REAL	ARRAY	NAV	60	THTTRO	REAL	ARRAY	NAV
	17	TOLJ2K	REAL		INPUTS	1	TQUANT	REAL		INPUTS
	42	TRESID	REAL	ARRAY	INUDAT	104	V2MP	REAL		NAV
	2	VQUANT	REAL		INPUTS	107	V92	REAL	ARRAY	NAV
	11	V92P	REAL	ARRAY	NAV	6	W	REAL		INUDAT
	12	WT	REAL	ARRAY	INUDAT	66	WXV	REAL	ARRAY	NAV
	7	X	REAL		INUDAT	125	XCALF	REAL		NAV
	152	XH	REAL		NAV	124	YSALF	REAL		NAV
	146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
	126	XDP92P	REAL	ARRAY	NAV	13	Y	REAL		INUDAT
	11	Z	REAL		INUDAT					

EXTERNALS	TYPE	ARGS			
VCOS	REAL	1	VMM		3
VRTXYZ		7	VSIN	REAL	1

COMMON BLOCKS	LENGTH
INPUTS	56
INUDAT	67
NAV	192

STATISTICS

PROGRAM LENGTH	1060	70
CM LABELED COMMON LENGTH	4610	305

```
      SUBROUTINE LLINIT     74/74   OPT=0 TRACE                FTN 4.5+P406    05/25/76  17.12.47        PAGE     1


      1                 SUBROUTINE LLINIT                                                                   022360
                        C                                                                                   022370
                        C     THIS SUBROUTINE PERFORMS THE INITIALIZATION OF BOTH                           022380
                        C     THE LL IMU SIMULATOR AND THE NAV SIMULATOR(FOR THE LL CASE)                   022390
      5                 C     IT MAKES USE OF THE COMMON SUBROUTINE FOR NAV SIMULATOR INIT                  022400
                        C                                                                                   022410
                              IMPLICIT REAL(A-H),REAL(L-Z)                                                  022420
                              COMMON /CONTRL/  DTIME,       PTIME,       PLTIME,       PSTIME,            022430
                             1     IPREV,       INIT,        ISTOP,       ICMCYL,       ICMCYP             022440
     10                       COMMON /IMUDAT/  RESID(3),    DV0P(3),     ETA0P(4),     HI(3),             022450
                             1     SF0IP(3),    C2P06(3,3),  C0MIS(3,3),  TRESID(3),    C1000(3,3),        022460
                             2     C1002P(3,3), C2P05(3,3),  ARCSTO(3)                                    022470
                              COMMON /INPUTS/  AQUANT,      TQUANT,      VQUANT,      START,             022480
                             1     STOP,        PLOTIM,      PRNT,        PSTPT,       CV01,              022490
     15                      2     CV02,        CV03,        TOLJPK,      HSOTIM,      HSOINC,            022500
                             2     ITRNAV,      ITRATT,      INCOR,       IMUTYP,      ICRLIM,            022510
                             3     IPC(30),     IOPNLP,      SSX0,        SSY0,        SSZ0,              022520
                             4     PSMAX,       QRSMAX,      ITRFTL                                         022530
                              COMMON /NAV/     C0P02P(3,3),V02P(3),     DV02P(3),    PH0(7),            022540
     20                      1     C0PH0(3,3),  A(3,3),      B(3,3),      THTERT(3),   THTIP0(3),         022550
                             2     THYC02(3),   WXV(3),      G02P(7),     H,           ALPHA,             022560
                             3     SALE,        CALE,        DELT,        ETA(3),      VOME,              022570
                             4     LAT,         LONG,        V02(3),      ETLATT(3,3), DELTA,             022580
                             5     XSALE,       XCALE,       X0P02P(3,3), HV02P(3),    DV02P(3),          022590
     25                      6     S2PHI,       XS2PHI,      XV02P(3),    XH,          DELH,              022600
                             7     C0910(3,3),  C0P10(7,3),  QH0,         C095(7,3),   DVE02P(3),         022610
                             8     ODX ,        ODY ,        ODZ ,        C2P05(4),    DELTP(3),          022620
                             9     GAINS(3,10),IGAINP(3)                                                  022630
                              COMMON /PGRAV/   GLHSC,       G2CNT,       G2S2,        G2S4,              022640
     30                      1     GPH,         GPH2,        GPHS2                                       022650
                              COMMON /TRAJIN/  TIME,        LAT0T,       LONG0T,      ALE0T,             022660
                             1     H0,          ETA0T(3),    V0I(3),      SF0T(3),     DELTS,             022670
                             2     TIME0,       LONG0,       SLAT0T,      CLAT0T,      SALE0T,            022680
                             3     CALE0T                                                                 022690
     35                      COMMON /UNVRSL/  PI,          HPI,         R0,          PR0,               022700
                             1     EE,          ES0,         EE2P0,       WE0T,        2A00EE,            022710
                             2     RES0                                                                   022720
                        C                                                                                   022730
                        C     IMU SIMULATOR ( AND SOME NAV SIMULATOR) INIT                                  022740
     40                 C                                                                                   022750
                              CALL INPEC                                                                    022760
                              ICMCYL=ITRNAV*ITRATT                                                          022770
                              SF0IP(1) = VP(SF0T(3))                                                        022780
                              SF0IP(2) = VP(-SF0T(2))                                                       022790
     45                       SF0IP(3) = VP(SF0T(1))                                                       022800
                              WRITE(6,6)                                                                    022810
                            6 FORMAT (2X,"IMU STABILIZATION IS LOCAL LEVEL, WANDER AZIMUTH"/              022820
                              IF (IOPNLP .EQ. 0) GO TO 9                                                    022830
                              WRITE(6,7)                                                                    022840
     50                     7 FORMAT (2X,"PERFECT PLATFORM IS SIMULATED!  NO TORQUING ERRORS"/)            022850
                            9 CALL LLATIO                                                                   022860
                              CALL LLATT                                                                    022870
                        C     NAV SIM INIT                                                                  022880
                              CALL INITT                                                                    022890
     55                       CALL ATUDE                                                                   022900
                              IF (ICMCYL .EQ. 0) GO TO 1 022910
```

```
                FILATT(1,1)=VP(FTA(1))                                  022030
                FILATT(1,2)=VP(FTA(2))                                  022040
     60         FILATT(1,3)=VP(FTA(3))                                  022050
            888 RETURN                                                  022060
                END                                                     022070
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 LLINIT

VARIABLES	SN	TYPE		RELOCATION					
33	4	REAL	ARRAY	NAV	3	ALFRT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
100	ARESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFRT	REAL		TRAJIN
22	CLATRT	REAL		TRAJIN	13	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	3	C0202P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C035	REAL	ARRAY	NAV
45	C1C90	REAL	ARRAY	IMUDAT	56	C1202P	REAL	ARRAY	IMUDAT
24	C2P95	REAL	ARRAY	IMUDAT	67	C2205T	REAL	ARRAY	IMUDAT
31	C9HIS	REAL	ARRAY	IMUDAT	22	C9PH0	REAL	ARRAY	NAV
153	DELH	REAL		NAV	122	DELT	REAL		NAV
123	DELTA	REAL		NAV	15	DELTS	REAL		TRAJIN
66	DESMAX	REAL		INPUTS	210	DV502P	REAL	ARRAY	NAV
3	DV3P	REAL	ARRAY	IMUDAT	14	DV32P	REAL	ARRAY	NAV
4	EF	REAL		UNVRSL	5	EF2R4	REAL		UNVRSL
5	ES0	REAL		UNVRSL	101	ETA	REAL	ARRAY	NAV
6	ETA0P	REAL	ARRAY	IMUDAT	5	ETART	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
0	GLHSC	REAL		PGRAV	1	GPCNT	REAL		PGRAV
4	GPH	REAL		PGRAV	6	GPHS2	REAL		PGRAV
5	GRH2	REAL		PGRAV	2	GPS2	REAL		PGRAV
3	GPS4	REAL		PGRAV	71	G32P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HR	REAL		TRAJIN
1	HPI	REAL		UNVRSL	15	HSGTNG	REAL		INPUTS
14	HSGTIM	REAL		INPUTS	137	HV92P	REAL	ARRAY	NAV
7	ICMCYL	INTEGER		CONTRL	13	ICMCYP	INTEGER		CONTRL
22	IFPLIM	INTEGER		INPUTS	201	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	INCOF	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	51	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITPATT	INTEGER		INPUTS	57	ITRFIL	INTEGER		INPUTS
15	ITPNAV	INTEGER		INPUTS	103	LAT	REAL		NAV
1	LATRT	REAL		TRAJIN	123	LONG	REAL		NAV
20	LONGO	REAL		TRAJIN	2	LONGRT	REAL		TRAJIN
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILTR	REAL	ARRAY	NAV
176	OUT	REAL		NAV	0	OTIME	REAL		CONTRL
142	PV92P	REAL	ARRAY	NAV	3	PI	REAL		UNVRSL
5	PLOTIM	REAL		INPUTS	2	PLTIPS	REAL		CONTRL

6	PKNT	REAL		INPUTS	1	PTIME	REAL		CONTRL

VARIABLES SN TYPE RELOCATION

216	Q2P95	REAL	ARRAY	NAV	10	RADDER	REAL		UNIVSL
9	RESID	REAL	ARRAY	IMUDAT	11	RESQ	REAL		UNIVSL
17	RHO	REAL	ARRAY	NAV	3	RPD	REAL		UNIVSL
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
7	RSTRT	REAL		INPUTS	2	RU	REAL		UNIVSL
76	SALF	REAL		NAV	23	SALFQT	REAL		TRAJIN
13	SFQT	REAL	ARRAY	TRAJIN	15	SFTTP	REAL	ARRAY	IMUDAT
21	SLATQT	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSYU	REAL		INPUTS	64	SSZ0	REAL		INPUTS
2	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
66	THTERT	REAL	ARRAY	NAV	60	THTTPQ	REAL	ARRAY	NAV
8	TIPC	REAL		TRAJIN	17	TTMEQ	REAL		TRAJIN
17	TOLJPK	REAL		INPUTS	4	TPPEV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRESTQ	REAL	ARRAY	IMUDAT
104	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	137	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WEPT	REAL		UNIVSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	125	XVP32P	REAL	ARRAY	NAV

FILE NAMES MODE

TAPE6 FMT

EXTERNALS TYPE ARGS

ATUDE		0	ININIT		0
INDEC		0	LLATT		0
LLATUD		0	VP	REAL	1

STATEMENT LABELS

57	5	FMT	71	7	FMT	22	9		
36	888								

COMMON BLOCKS LENGTH

CONTRL	9
IMUDAT	67
INPUTS	66
NAV	182
PGRAV	7
TRAJIN	21
UNIVSL	10

STATISTICS

PROGRAM LENGTH	1008	64
CM LABELED COMMON LENGTH	5400	352

```
      SUBROUTINE SDATUD                                                 023040
C                                                                       023041
C     THIS SUBROUTINE CALCULATES THE INCREMENTAL GIMBAL ANGLES          023000
C     THAT WOULD BE GENERATED BY A PERFECT STRAPDOWN IMU.               023010
C                                                                       023020
      IMPLICIT REAL(A-H),REAL(L-Z)                                      023030
      COMMON /NAV/     C0P92P(3,3),V92P(3),     DV92P(3),    PH9(3),    023040
     1    C9PH0(3,3), A(3,3),     B(3,3),     THTEPT(3),   THTIPC(3),   023050
     2    THTCOP(3),  WXV(3),     G92P(3),    H,           ALPHA,       023060
     3    SALF,       CALF,       DELT,       CTA(3),      V0MP,        023070
     4    LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,       023080
     5    XSALF,      XCALF,      X0P92P(3,3),HV92P(3),    DV92P(3),    023090
     6    S2PHI,      XS2PHI,     XV92P(3),   XH,          DELH,        023100
     7    C0910(3,3), C0P90(3,3), OH9,        C095(3,3),   DV592P(3),   023110
     8    ODX ,       ODY ,       ODZ ,       D2P95(4),    DFILTR(3),   023120
     9    GAINS(3,10),IGAINC(3)                                          023130
      COMMON /INPUTS/  AQUANT,     TQUANT,     VQUANT,      STAPT,       023140
     1    STOP,       PLOTIM,     P2NT,       RSTRT,       CVD1,        023150
     2    CVD2,       CVD3,       TOLJCK,     HSOTIM,      HSCINC,      023160
     2    ITRMAV,     IIRATT,     INCOP,      IMUTYP,      IC2LIM,      023170
     3    IPC(30),    IOPNLP,     SSX0,       SSY0,        SSZ0,        023180
     4    PSMAX,      DESMAX,     IC2FIL                                 023190
      COMMON /IMUCAT/  PESID(3),   DV3P(3),    ETA9P(4),    XI(3),       023200
     1    SF9TR(3),   C2P95(3,3), C9MIS(3,3), TRTSID(3),   C1090(3,3),  023210
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                            023220
      COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,      ALF9T,       023230
     1    H9,         ETA9T(3),   V9T(3),     SF9T(3),     DELTS,       023240
     2    TIME0,      LONG0,      SLAT9T,     CLAT9T,      SALF9T,      023250
     3    CALF9T                                                         023260
      COMMON /UNIVRSL/ PI,         H9I,        PC,          R90,         023270
     1    CF,         ESQ,        EERR0,      WCPT,        PA90FP,      023280
     2    RESQ                                                           023290
      DIMENSION TMP(3)                                                  023300
      TMP(1)=-LONG9T+LONG0-WEPI*(TIME-TIME0)                            023310
      CALL ROT7YX(4, SIN(TMP(1)), COS(TMP(1)),SLAT9T,CLAT9T,            023320
     1  -SALF9T,CALF9T)                                                 023330
C     A IS C092P                                                        023340
      CALL MM(0,A,C2P95T)                                               023350
C     B IS NEW C095                                                     023360
      CALL MTM(A,C095,B)                                                023370
C     A IS DELTA C095                                                   023380
      DO 15 I=1,3                                                       023390
      DO 15 J=1,3                                                       023400
   15 C095(I,J)=B(I,J)                                                  023410
C     SAVE NEW C095 FOR USE AS NEXT CYCLE'S OLD                         023420
      IF (IPC(16) .NE. 0) CALL DOUT(16)                                 023430
      ETA9P(1)=.5*(A(3,2)-A(2,3))                                       023440
      ETA9P(2)=.5*(A(1,3)-A(3,1))                                       023450
      ETA9P(3)=.5*(A(2,1)-A(1,2))                                       023460
C     ROTATION OF BODY W.R.T. INERTIAL AS SEEN IN BODY                  023470
      STH= SQRT(ETA9P(1)**2+ETA9P(2)**2+ETA9P(3)**2)                    023480
      TH=  ASIN(STH)                                                    023490
      SF=TH/STH                                                         023500
      ETA9P(1)=ETA9P(1)*SF                                              023510
      ETA9P(2)=ETA9P(2)*SF                                              023520
```

```
      DO 775 I=1,3                                                    023540
      ETA9P(I)=ETA9P(I)+ARESID(I)                                     023550
  775 ARESID(I)=ETA9P(I)                                              023560
   60 CALL ONTIZ(ETA9P,AQUANT)                                        023570
      DO 777 I=1,3                                                    023580
  777 ARESID(I)=ARESID(I)-ETA9P(I)                                    023590
      IF (IPC(2).NE. 0) CALL DOUT(2)                                  023600
      RETURN                                                          023610
   65 END                                                             023620
```

SYMBOLIC REFERENCE MAP (P=1)

ENTRY POINTS

1 SDATUD

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALFGT	REAL		TRAJTN
75	ALPHA	REAL		NAV	3	AQUANT	REAL		INPUTS
109	ARESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFGT	REAL		TRAJTN
22	CLATGT	REAL		TRAJTN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C1P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	57	C2P95T	REAL	ARRAY	IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C9PH0	REAL	ARRAY	NAV
153	DELH	REAL		NAV	180	DELT	REAL		NAV
123	DELTA	REAL		NAV	15	DELTS	REAL		TRAJTN
66	DPSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
1	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EE	REAL		UNVPSL	5	EER90	REAL		UNVPSL
5	ESQ	REAL		UNVPSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	IMUDAT	6	ETA9T	REAL	ARRAY	TRAJTN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HB	REAL		TRAJTN	1	HPI	REAL		UNVPSL
15	HSOINC	REAL		INPUTS	16	HSOTTM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	157	I	INTEGER		
22	IFRLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	31	INCOF	INTEGER		INPUTS
61	IOPNLP	INTEGER		INPUTS	23	IPC	INTEGER	ARRAY	INPUTS
17	ITRATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITPNAV	INTEGER		INPUTS	160	J	INTEGER		
105	LAT	REAL		NAV	1	LATGT	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONGO	REAL		TRAJTN
2	LONGGT	REAL		TRAJTN	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
223	OFILTP	REAL	ARRAY	NAV	176	OHB	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	3	PI	REAL		UNVPSL
5	PLOTIM	REAL		INPUTS	6	PONT	REAL		INPUTS
216	R2P95	REAL	ARRAY	NAV	10	RADDEG	REAL		UNVPSL
0	RATIO	REAL	ARRAY	IMUDAT	11	RCSQ	REAL		UNVPSL

17 XHO REAL ARRAY NAV

VARIABLES	SN	TYPE		RELOCATION					
65	PSMAX	REAL		INPUTS	7	PSTRT	REAL		INPUTS
2	RO	REAL		UNVPSL	75	SALF	REAL		NAV
29	SALF9T	REAL		TRAJIN	153	SF	REAL		
13	SF9T	REAL	ARRAY	TRAJIN	15	SF9TP	REAL	ARRAY	IMUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
8	START	REAL		INPUTS	161	STH	REAL		
4	STOP	REAL		INPUTS	145	SXPHI	REAL		NAV
162	TH	REAL			63	THTCOP	REAL	ARRAY	NAV
55	THTCRT	REAL	ARRAY	NAV	61	THTIPO	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEA	REAL		TRAJIN
164	THP	REAL	ARRAY		13	TOLJCK	REAL		INPUTS
1	VQUANT	REAL		INPUTS	42	TRESTO	REAL	ARRAY	IMUDAT
104	VDHP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	117	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WEPT	REAL		UNVPSL
12	WT	REAL	ARRAY	IMUDAT	66	WXW	REAL	ARRAY	NAV
126	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XVP92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS				
ASIN	REAL	1	LIBRARY	COS	REAL	1 LIBRARY
DOUT		1		MM		3
HTM		3		OUTT7		2
ROTZYX		7		SIN	REAL	1 LIBRARY
SORT	REAL	1	LIBRARY			

STATEMENT LABELS

0 15 0 776 0 777

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
25	15	* I	42 44	118	NOT INNER
26	15	J	43 44	69	INSTACK
72	776	I	57 59	69	INSTACK
103	777	I	61 62	48	INSTACK

COMMON BLOCKS	LENGTH
NAV	182
INPUTS	56
IMUDAT	67
TRAJIN	21
UNVPSL	10

STATISTICS

PROGRAM LENGTH	1679	119
CM-LABELED COMMON LENGTH	5200	336

```
      1            SUBROUTINE SOINTG                                                 023630
                   C  THIS ROUTINE IS PART OF THE INU SIMULATOR FOR THE STRAPDOWN    023640
                   C  CASE. IT TRANSFORMS THE SPECIFIC FORCES FROM THE ZP FRAME      023650
                   C  TO THE BODY FRAME.                                             023660
      5            C                                                                 023670
                        IMPLICIT REAL(A-H),REAL(L-Z)                                 023680
                        COMMON /NAV/     C0P92P(3,3),V92P(3),     DV92P(3),     PH0(3),     023690
                   1    C0RH0(3,3),A(3,3),       B(3,3),     THTERT(3),    THTIP0(3),     023700
                   2    THTC0P(3),   WXV(3),     C92P(3),    H,            ALPHA,         023710
     10            3    SALF,        CALF,       DELT,       ETA(3),       V0HP,          023720
                   4    LAT,         LONG,       V92(3),     FILATT(3,3),DELTA,         023730
                   5    XSALF,       XCALF,      X0P92P(3,3),HV92P(3),     DV92P(3),      023740
                   6    S2PHI,       XS2PHI,     XV92P(3),   XH,           DELH,          023750
                   7    C0910(3,3),  C0P30(3,3), 043,        C095(3,3),    DV592P(3),     023760
     15            8    ODX  ,       ODY  ,      ODZ  ,      D2P95(4),     DFILTP(3),     023770
                   9    GAINS(3,10),IGAINP(3)                                        023780
                        COMMON /IMUDAT/  RESID(3),   DV9P(3),     ETA9P(6),     HT(3),     023790
                   1    SF9TP(3),    C2P95(3,3), C0MIS(3,3), IRESID(3),  C1092(3,3),    023800
                   2    C1092P(3,3), C2P95T(3,3), ARESID(3)                          023810
     20            COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,       ALF9T,     023820
                   1    HR,          ETA9T(3),   V9T(3),     SF9T(3),      DELTS,     023830
                   2    TIMED,       LONGD,      SLAT9T,     CLAT9T,       SALF9T,    023840
                   3    CALF9T                                                       023850
                        DIMENSION TMP(3)                                             023860
     25            CALL ROTXYZ(C2P95T, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),   023870
                   1 COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                   023880
                        CALL MATRAN(A,C2P95T)                                        023890
                        TMP(1)=SF9T(2)                                               023900
                        TMP(2)=-SF9T(2)                                              023910
     30                 TMP(3)=SF9T(1)                                               023920
                        CALL MATVEC(SF9T,A,TMP)                                      023930
                        RETURN                                                       023940
                        END                                                          023950
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 SOINTG

VARIABLES SN. TYPE RELOCATION

33	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJIN
79	ALPHA	REAL		NAV	100	ARESID	REAL	ARRAY	IMUDAT
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALF9T	REAL		TRAJIN	22	CLAT9T	REAL		TRAJIN
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
66	C1092	REAL	ARRAY	IMUDAT	55	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	COMIS	REAL	ARRAY	IMUDAT	22	C0RH0	REAL	ARRAY	NAV
153	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
212	DV92P	REAL	ARRAY	NAV	7	DV9P	REAL	ARRAY	TRAJIN

14	DV42P	REAL	ARRAY	NAV	101	FIA	REAL	ARRAY	NAV

SUBROUTINE SOINIG 74/74 OPT=0 TRACE FTN 4.5+R496 05/25/76 17.13.47 PAGE 2

VARIABLES SN TYPE RELOCATION

6	FTA9P	REAL	ARRAY	IMUDAT	5	FTA9T	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HR	REAL		TRAJIN	137	HV32P	REAL	ARRAY	NAV
263	IGAINP	INTEGER	ARRAY	NAV	135	LAT	REAL		NAV
1	LAT9T	REAL		TRAJIN	186	LONG	REAL		NAV
20	LONGO	REAL		TRAJIN	2	LONG9T	REAL		TRAJIN
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILTR	REAL	ARRAY	NAV
176	ONB	REAL		NAV	142	OV32P	REAL	ARRAY	NAV
216	Q2P95	REAL	ARRAY	NAV	9	RESIP	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	76	SALF	REAL		NAV
23	SALF9T	REAL		TRAJIN	13	SFIT	REAL	ARRAY	TRAJIN
15	SF9TP	REAL	ARRAY	IMUDAT	21	SLAT9T	REAL		TRAJIN
145	S2PHI	REAL		NAV	63	THTCOP	REAL	ARRAY	NAV
55	THTERI	REAL	ARRAY	NAV	60	THTTPO	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMO	REAL		TRAJIN
101	TMP	REAL	ARRAY		42	TRESID	REAL	ARRAY	IMUDAT
104	VDMP	REAL		NAV	19	VBT	REAL	ARRAY	TRAJIN
137	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
12	WT	REAL	ARRAY	IMUDAT	66	WXW	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XOP92P	REAL	ARRAY	NAV

EXTERNALS TYPE ARGS

COS	REAL	1 LIBRARY	MATPAN	?
MATVEC		3	POTYYZ	?
SIN	REAL	1 LIBRARY		

COMMON BLOCKS LENGTH

NAV	182
IMUDAT	67
TRAJIN	21

STATISTICS

PROGRAM LENGTH	1040	68
CM LABELED COMMON LENGTH	4168	270

```
      SUBROUTINE SDINIT                                                 023960
C                                                                       023970
C     THIS ROUTINE PERFORMS THE INITIALIZATION OF THE STRAPDOWN         023980
C     CASE. THE NAV EQUATIONS ARE INITIALIZED WITH THE COMMON           023990
C     SUBROUTINE.                                                       024000
C                                                                       024010
      IMPLICIT REAL(A-H),REAL(L-Z)                                      024020
      COMMON /CONTRL/ DTIMC,      PTIME,      PLTIME,     PSTIME,       024030
     1    TPREV,      TNIT,       ISTOP,      ICMCYL,     ICMCYP        024040
      COMMON /IMUDAT/ PCSID(3),   OV9P(3),    ETA9P(4),   WT(3),        024050
     1    SF9TP(3),   C2P95(3,3), COMIS(3,3), TRCSID(3),  C1095(3,3),   024060
     2   C1092P(3,3), C2P95T(3,3), ARESID(3)                            024070
      COMMON /INPUTS/ AQUANT,     TQUANT,     VQUANT,     START,        024080
     1    STOP,       PLOTIM,     PONT,       PSTOT,      CV01,         024090
     2    CV02,       CV03,       TOLJOK,     HSDTIM,     HSDTNC,       024100
     2    ITPNAV,     ITRATT,     INCOP,      IMUTYP,     IFRLIM,       024110
     3    IPC(30),    IOPNLP,     SSX0,       SSYC,       SSZ0,         024120
     4    PSMAX,      D2SMAX,     ITREIL                                024130
      COMMON /NAV/    C0P92P(3,3),V92P(3),    DV92P(3),   RHO(3),       024140
     1    C0PHO(3,3), A(3,3),     R(3,3),     THTF2T(3),  THTIPO(3),    024150
     2    THTC0P(3),  WXV(3),     G92P(3),    W,          ALPHA,        024160
     3    SALF,       CALF,       DELT,       ETA(3),     V0MP,         024170
     4    LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,        024180
     5    XSALF,      XCALF,      X0P92P(3,3),HV92P(3),   DV92P(3),     024190
     6    S2PHI,      XS2PHT,     XV92P(3),   XH,         DELH,         024200
     7    C0910(3,3), C0P90(3,3), OH3,        C095(3,3),  DV592P(3),    024210
     8    DDX   ,     DDY   ,     DDZ   ,     D2P95(4),   DFILTP(3),    024220
     9    GAINS(3,10),IGAINC(3)                                         024230
      COMMON /TRAJIN/ TIME,       LAT9T,      LONG9T,     ALF9T,        024240
     1    H9,         ET49T(3),   V9T(3),     SF9T(3),    DELTS,        024250
     2    TIMEO,      LONGO,      SLAT9T,     CLAT9T,     SALF9T,       024260
     3    CALF9T                                                        024270
C                                                                       024280
      CALL INPEC                                                        024290
      ICMCYL=ITPATT                                                     024300
      CALL ROTZYX(C0P92P,0.E0,1.E0,SLAT9T,CLAT9T,-SALF9T,CALF9T)        024310
      CALL ROTXYZ(C2P95, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),   024320
     1  COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                   024330
      IF (IPC(27) .EQ. 0) GO TO 3                                       024340
C     FOLLOWING CODE INITIALIZES QUATERNION                             024350
      Q2P95(1)=VSQRT(C2P95(1,1)+C2P95(2,2)+C2P95(3,3)+1.E0)*.5          024360
      Q2P95(2)=VP((C2P95(3,2)-C2P95(2,3))/(4.E0*Q2P95(1)))              024370
      Q2P95(3)=VP((C2P95(1,3)-C2P95(3,1))/(4.E0*Q2P95(1)))              024380
      Q2P95(4)=VP((C2P95(2,1)-C2P95(1,2))/(4.E0*Q2P95(1)))              024390
    3 CALL MM(C095,C0P92P,C2P95)                                        024400
      DO 4 I=1,3                                                        024410
      DO 4 J=1,3                                                        024420
      C0P92P(I,J)=VP(C0P92P(I,J))                                       024430
    4 C2P95(I,J)=VP(C2P95(I,J))                                         024440
      CALL SDINIG                                                       024450
      DO 5 I=1,3                                                        024460
    5 SF9TP(I)=VP(SF9T(I))                                              024470
      WRITE(6,6)                                                        024480
    6 FORMAT(" IMU STABILIZATION IS STE   ORN")                         024490
      CALL INPUTT                                                       024500
      CALL ATUDC                                                        024510
```

```
      C     IF ATTITUDE FILTER REQUEST, INIT STATE VECTOR                    024530
            FILATT(1,1)=VP(ETA(1))                                           024540
   60       FILATT(1,2)=VP(ETA(2))                                           024550
            FILATT(1,3)=VP(ETA(3))                                           024560
  888 RETURN                                                                 024570
      END                                                                    024580
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 SOINIT

VARIABLES	SN	TYPE	RELOCATION						
33	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJTN
75	ALPHA	REAL		NAV	3	AQUANT	REAL		INPUTS
101	APFSID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJTN
22	CLAT9T	REAL		TRAJTN	13	CV01	REAL		INPUTS
11	CVD2	REAL		INPUTS	12	CV02	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
71	C9MTS	REAL	ARRAY	IMUDAT	22	C92HC	REAL	ARRAY	NAV
153	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	15	DELTS	REAL		TRAJTN
66	DPSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
7	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
5	ETA9T	REAL	ARRAY	TRAJTN	112	FILATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HR	REAL		TRAJTN
15	HSOINC	REAL		INPUTS	14	HSOTTM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	244	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
22	IERLIM	INTEGER		INPUTS	253	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	INCOR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	245	J	INTEGER		
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONG9	REAL		TRAJTN
2	LONG9T	REAL		TRAJTN	213	00X	REAL		NAV
214	00Y	REAL		NAV	215	00Z	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OM9	REAL		NAV
0	OTIME	REAL		CONTRL	142	OV32P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	R2P95	REAL	ARRAY	NAV	3	RESID	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	55	RSMAX	REAL		INPUTS
7	RTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS

VARIABLES	SN	TYPE		RELOCATION					
17	SF9T	REAL	ARRAY	TRAJIN	15	SF9TP	REAL	ARRAY	INUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
61	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	61	THTCOR	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TTMFC	REAL		TRAJIN
13	TOLJPK	REAL		INPUTS	4	TRSEV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRSTTD	REAL	ARRAY	INUDAT
134	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	12	WT	REAL	ARRAY	INUDAT
66	WXV	REAL	ARRAY	NAV	126	XCALF	REAL		NAV
152	XU	REAL		NAV	134	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV32P	REAL	ARRAY	NAV
126	XOP92P	REAL	ARRAY	NAV					

FILE NAMES MODE
TAPE6 FMT

EXTERNALS	TYPE	ARGS				
ATUDE		0	COS	REAL	1	LIBRARY
DINIT		0	DREG		0	
DM		3	DOTXYZ		7	
ROTZYX		7	SDINTG		0	
SIN	REAL	1 LIBRARY	VP	REAL	1	
VSQRT	REAL	1				

STATEMENT LABELS

71	3	0	4	0 5
233	6 FMT	144	388	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	
74	4	* I	46 49	243	EXT REFS	NOT INNER
75	4	* J	47 49	219	EXT REFS	
122	5	* I	51 52	68	EXT REFS	

COMMON BLOCKS	LENGTH
CONTRL	9
INUDAT	57
INPUTS	56
NAV	182
TRAJIN	21

STATISTICS

PROGRAM LENGTH	2460	166
CM LABELED COMMON LENGTH	5178	335

```
      1              SUBROUTINE HSINTG                                                 024590
                     C                                                                 024600
                     C     THIS ROUTINE IS PART OF THE STRAP DOWN FLIGHT CODE. IT PERFORMS   024610
                     C     THE SUMMATION OF VELOCITY INCREMENTS AT THE ATTITUDE CYCLE RATE.  024620
      5              C                                                                 024630
                           IMPLICIT REAL(A-H),REAL(L-Z)                                024640
                     COMMON /CONTRL/  QTIME,      PTIME,      PLTIME,     PSTIME,      024650
                    1      TPREV,      THTT,       ISTOP,      ICMCYL,     YCMCYP       024660
                     COMMON /INDCAT/  PSIO(3),    OVBP(3),    CTABP(4),   WT(3),       024670
     10              1      SFOIP(3),   C2P95(3,3), C9HIS(2,3), TPCSID(3), C109Z(3,3),  024680
                    2    C109ZP(3,3), C2P95T(3,3), JPCSID(3)                          024690
                     COMMON /INPUTS/  AQUANT,     TQUANT,     VQUANT,     STAGT,       024700
                    1      STOP,       PLOTIM,     PONT,       PSTOT,      CVQ1,        024710
                    2      CVQ2,       CVQ3,       TOLJPK,     HSOTIM,      HSOINC,     024720
     15             2      IIPMAV,     IIPATT,     INCOP,      IMUTYP,     IFPLIM,      024730
                    3      IPC(30),    IOPHLP,     SOXO,       SOYO,       SOZO,        024740
                    4      RSMAX,      OPSMAX,     IIPFIL                               024750
                     COMMON /MAV/     C2P99P(3,3),VQ2P(3),    QVQ2P(3),   AMO(3),      024760
                    1      C9PHO(3,3), A(3,3),     R(3,3),     THTFPT(3),  THTTPO(3),   024770
     20             2      THTCOR(3),  WXV(3),     SQ2P(3),    H,          ALPHA,       024780
                    3      SALF,       CALF,       DELT,       CTA(3),     VDMF,        024790
                    4      LAT,        LONG,       VQZ(3),     FILATT(3,3),DELTA,       024800
                    5      XSALF,      XCALF,      X9P02P(3,3),HVQ2P(3),   QVQ2P(3),    024810
                    6      S2PHI,      XS2PHI,     XVQ2P(3),   XH,         DELH,        024820
     25             7      C0910(3,3), C0P99(3,3), OHO,        C095(3,3),  QVSQ2P(3),   024830
                    8      ODX ,       ODY ,       ODZ ,       Q2P95(4),   DELTP(3),    024840
                    9      GAINS(3,10),TGAINP(3)                                      024850
                     COMMON /TRAJIN/  TIME,       LATQT,      LONGQT,     ALFQT,       024860
                    1      HQ,         FTAQT(3),   VQI(3),     QFQT(3),    DELIS,       024870
     30             2      TIMEQ,      LONGQ,      SLATQT,     CLATQT,     SALFQT,      024880
                    3      CALFQT                                                     024890
                     EQUIVALENCE (Q0,Q2P95(1)),(Q1,Q2P95(2)),(Q2,Q2P95(3)),(Q3,Q2P95(4)024895
                    1  )                                                              024910
                     DIMENSION TMP(3)                                                  024920
     35              CALL MATRAN(A,C2P95)                                              024930
                     C     A IS C592P                                                  024940
                           CALL VMATVC(TMP,A,THTTPO)                                   024950
                     C     TMP IS ANGLE OF INERTIAL W.R.T. COMP COORDINATIZED IN BODY  024960
                           DO 10 I=1,3                                                 024970
     40              10 TMP(I)=VQ(ETAQP(I)-VP(VP(DELTA/DELT)*TPP(I)))                  024980
                     C     TMP IS ROTATION OF COMP W.R.T. BODY IN BODY                  024990
                           IF (IPC(27).EQ. 1) GO TO 900                                025000
                     C     IF QUATERNION UPDATE MODE, BRANCH                           025010
                           CALL DCMUPD(A,TMP(1),TMP(2),TMP(3),IPC(25),1.0E0,ODX  ,ODY  ,025020
     45              1 ODZ  )                                                          025030
                           CALL VMM(3,C2P95,A)                                         025040
                           GO TO 903                                                   025050
                     C                                                                 025060
                     C     THIS IS QUATERION UPDATE,OPTIONAL NORMALIZE, AND DCM FORMATION  025070
     50              C                                                                 025080
                       900 TMP(1)=VP(TMP(1)*.5)                                        025090
                           TMP(2)=VP(TMP(2)*.5)                                        025100
                           TMP(3)=VP(TMP(3)*.5)                                        025110
                           I=1                                                         025120
     55                    IF (IPC(26) .EQ. 0) GO TO 930                             025130
                           [illegible]((VP(VP(IPC(I)*TMP(I))+VP(VP(TMP(2)*TMP(2))+VP(VP(TMP(3)*TMP(3)) [illegible]
```

```
                A)))))*.5 ))                                                    025459
                SO=VP(1.-TSO2)                                                  025460
                IF (II2C(26).EQ. 1) GO TO 830                                   025470
     60         XDTX=0.                                                         025480
                XDTY=0.                                                         025490
                XDTZ=0.                                                         025500
                CON=VP(1.-VP(TSO2*.333333333333333333333))                      025510
                P1=VP(VP(CON*TMP(1))+XDTX)                                      025520
     65         P2=VP(VP(CON*TMP(2))+XDTY)                                      025530
                P3=VP(VP(CON*TMP(3))+XDTZ)                                      025540
          C     WE JUST FINISHED FORMING ROTATION QUATERNION                    025550
                QDX=TMP(1)                                                      025560
                QDY=TMP(2)                                                      025570
     70         QDZ=TMP(3)                                                      025580
                GO TO 840                                                       025590
          C     FORM VECTOR TERMS OF 1ST OR 2ND ORDER DOT QUAT                  025600
      830       P1=TMP(1)                                                       025610
                P2=TMP(2)                                                       025620
     75         P3=TMP(3)                                                       025630
          C     FORM UPDATE QUATERNION AND MULTIPLY                             025641
      840       Q0N=VP(VP(VP(VP(Q0*P0)-VP(Q1*P1))-VP(Q2*P2))-VP(Q3*P3))        025650
                Q1N=VP(VP(VP(VP(P1*Q0)+VP(P0*Q1))+VP(P2*Q3))-VP(P3*Q2))        025660
                Q2N=VP(VP(VP(VP(P2*Q0)-VP(P3*Q1))+VP(P0*Q2))+VP(P1*Q3))        025670
     80         Q3=VP(VP(VP(VP(P3*Q0)+VP(P2*Q1))-VP(P1*Q2))+VP(P0*Q3))         025680
                Q0=Q0N                                                          025690
                Q1=Q1N                                                          025700
                Q2=Q2N                                                          025710
          C     NORMALIZE QUATERNION IF TIME TO DO SO                           025720
     85         IF (TIME .LT. HSOTIM) GO TO 860                                 025730
                HSOTIM=VP(TIME+HSOINC)                                          025740
                COR=VP(1.5E0-VP((VP(VP(VP(VP(Q0*Q0)+VP(Q1*Q1))+VP(Q2*Q2))+VP(Q3*Q3)025750
               A)))*.5 ))                                                       025760
                Q0=VP(COR*Q0)                                                   025770
     90         Q1=VP(Q1*COR)                                                   025780
                Q2=VP(Q2*COR)                                                   025790
                Q3=VP(Q3*COR)                                                   025800
          C     FORM NEW DCM BASED ON QUATERNION                                025810
      860       Q1S=VP(Q1*Q1)                                                   025820
     95         Q2S=VP(Q2*Q2)                                                   025830
                Q3S=VP(Q3*Q3)                                                   025840
                Q01=VP(Q0*Q1)                                                   025850
                Q02=VP(Q0*Q2)                                                   025860
                Q03=VP(Q0*Q3)                                                   025870
    100         Q12=VP(Q1*Q2)                                                   025880
                Q23=VP(Q2*Q3)                                                   025890
                Q31=VP(Q3*Q1)                                                   025900
                B(1,1)=VP(1.-2.*VP(Q2S+Q3S))                                    025910
                B(1,2)=VP(2.*(Q12-Q03))                                         025920
    105         B(1,3)=VP(2.*(Q31+Q02))                                         025930
                B(2,1)=VP(2.*(Q12+Q03))                                         025940
                B(2,2)=VP(1.-2*VP(Q3S+Q1S))                                     025950
                B(2,3)=VP(2.*(Q23-Q01))                                         025960
                B(3,1)=VP(2.*(Q31-Q02))                                         025970
    110         B(3,2)=VP(2.*(Q23+Q01))                                         025980
                B(3,3)=VP(1.-2.*VP(Q1S+Q2S))                                    025990
      900       DO 15 I=1,3                                                     026000
                DO 15 J=1,3                                                     026010
```

```
A11,J)=VP(VP(IME),J)+C2P95(I,J)*DT+.5*DT*DT*A(I,J)                    025720

      SUBROUTINE HSINIG     74/74   OPT=0 TRACE          FTN 4.5+P406    05/15/76  17.17.42       PAGE     3


  115             15 C2P95(I,J)=C(I,J)                                  025730
                     IF (IPC(15) .NE. 0) CALL DOUT(15)                  025740
                C    UPDATE BODY TO COMP FRAME TRANSFORM WITH INCREMENTAL ROTATION  025750
                     IF (TIME .LT. HSOTIM) GO TO 20                     025760
                     HSOTIM=VP(TIME+HSDINC)                             025770
  120                CALL ORTHO(C2P95)                                  025780
                  20 CALL VMATVC(TMP,A,DV9P)                            025790
                     DO 60 I=1,3                                        025800
                  60 DV502P(I)=VP(DV502P(I)+TMP(I))                     025810
                C    DV502P HOLD SUMMATION UNTIL TIME WHEN INRNAV WILL BE CALLED    025820
  125                IF (IPC(17) .NE. 0) CALL DOUT(17)                  025830
                     IF (IPC(19) .NE. 0) CALL DOUT(19)                  025840
                     RETURN                                             025850
                     END                                                025860

CARD NR. SEVERITY  DETAILS    DIAGNOSIS OF PROBLEM

     63    I                  CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.

1-115

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1  HSINIG

VARIABLES     SN  TYPE          RELOCATION
   37  A         REAL      ARRAY   NAV          3  ALFGT     REAL              TRAJIN
   75  ALPHA     REAL              NAV          0  AQUANT    REAL              INPUTS
  100  APESIG    REAL      ARRAY   INUDAT      44  B         REAL      ARRAY   NAV
   77  CALF      REAL              NAV          1  CALFGT    REAL              TRAJIN
   32  CLATGT    REAL              TRAJIN     753  CON       REAL
  762  COP       REAL              INUDAT      10  CV11      REAL              INPUTS
   11  CV02      REAL              INPUTS      12  CV03      REAL              INPUTS
  165  C0P30     REAL      ARRAY   NAV          0  C0P92P    REAL      ARRAY   NAV
  154  C0910     REAL      ARRAY   NAV        177  C0?5      REAL      ARRAY   NAV
   45  C1090     REAL      ARRAY   INUDAT      56  C1092P    REAL      ARRAY   INUDAT
   20  C2P95     REAL      ARRAY   INUDAT      67  C2P95T    REAL      ARRAY   INUDAT
   31  C4HIS     REAL      ARRAY   INUDAT      22  C4PHO     REAL      ARRAY   NAV
  153  DELH      REAL              NAV        103  DELT      REAL              NAV
  123  DELTA     REAL              NAV         16  DELTS     REAL              TRAJIN
   66  DPSMAX    REAL              INPUTS     210  DV502P    REAL      ARRAY   NAV
    3  DV9P      REAL      ARRAY   INUDAT      14  DV92P     REAL      ARRAY   NAV
  101  ETA       REAL      ARRAY   NAV          6  ETAGP     REAL      ARRAY   INUDAT
    6  ETAGT     REAL      ARRAY   TRAJIN     112  ETLATT    REAL      ARRAY   NAV
  225  GAINS     REAL      ARRAY   NAV         71  G92P      REAL      ARRAY   NAV
   74  H         REAL              NAV          4  HR        REAL              TRAJIN
   15  HSOTIC    REAL              INPUTS      14  HSOTIM    REAL              INPUTS
  137  HV92P     REAL      ARRAY   NAV        745  I         INTEGER
    7  ICHCYL    INTEGER           CONTRL      11  IHNCYC    INTEGER           CONTRL
   22  IMCLIM    INTEGER           INPUTS     261  IMATRX    INTEGER   ARRAY   NAV
```

VARIABLES	SN	TYPE		RELOCATION					
5	INIT	INTEGER		CONTRL	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS	67	ITRFTL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	774	J	INTEGER		
125	LAT	REAL		NAV	1	LATGT	REAL		TRAJIN
105	LONG	REAL		NAV	20	LONGG	REAL		TRAJIN
2	LONGGT	REAL		TRAJIN	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	OD2	REAL		NAV
222	OFILTP	REAL	ARRAY	NAV	176	OMG	REAL		NAV
0	OTIME	REAL		CONTRL	142	OV32P	REAL	ARRAY	NAV
6	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
746	P0	REAL			754	P1	REAL		
755	P2	REAL			756	P3	REAL		
216	Q0	REAL		NAV	757	Q0N	REAL		
766	Q01	REAL			767	Q02	REAL		
770	Q0?	REAL			217	Q1	REAL		NAV
760	Q1N	REAL			763	Q1S	REAL		
771	Q12	REAL			223	Q2	REAL		NAV
761	Q2N	REAL			216	Q2295	REAL	ARRAY	NAV
764	Q2S	REAL			772	Q2?	REAL		
221	Q3	REAL		NAV	765	Q3S	REAL		
773	Q31	REAL			0	QESIG	REAL	ARRAY	INPDAT
17	RHO	REAL	ARRAY	NAV	65	RSMAX	REAL		INPUTS
7	RSTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS
76	SALF	REAL		NAV	23	SALFGT	REAL		TRAJIN
13	SFGT	REAL	ARRAY	TRAJIN	15	SFGTP	REAL	ARRAY	INPDAT
21	SLATGT	REAL		TRAJIN	62	SSX2	REAL		INPUTS
63	SSYP	REAL		INPUTS	64	SSZP	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
55	THTGRT	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEP	REAL		TRAJIN
775	TMP	REAL	ARRAY		13	TOLJCK	REAL		INPUTS
4	TRKFV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
62	TRKSID	REAL	ARRAY	INPDAT	747	TSD2	REAL		
104	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
33	VGT	REAL	ARRAY	TRAJIN	107	VG2	REAL	ARRAY	NAV
11	VG2P	REAL	ARRAY	NAV	12	WT	REAL	ARRAY	INPDAT
66	WXV	REAL	ARRAY	NAV	126	XCALF	REAL		NAV
750	XDTX	REAL			751	XDTY	REAL		
752	XDTZ	REAL			152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XW92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS			
DCMUPD		0	DDUT	1	
MAIPAN		2	DPTHO	1	
VUATVC		3	VH4	2	
VP	REAL	1			

STATEMENT LABELS							
0	10	0	15	611	20		
1	60	35	800	153	830		
160	940	417	966	551	960		

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES	
7	10	*	I	39 40	178	EXT REFS	
562	15	*	I	110 115	250	EXT REFS	NOT INNER
563	15	*	J	113 115	218	EXT REFS	
514	50	*	I	122 123	70	EXT REFS	

COMMON BLOCKS	LENGTH
CONTRL	9
IMUDAT	67
INPUTS	56
NAV	182
TRAJIN	21

STATISTICS

PROGRAM LENGTH	10809	512
CM LABELED COMMON LENGTH	5179	335

```
      1            SUBROUTINE HSINT2                                                 025071
                   C                                                                 025080
                   C     THIS ROUTINE EXISTS ONLY TO PUT THE OUTPUT OF HSINTG IN DV90  025090
                   C     FOR USE BY TURNAY AT THE PROPER TIME.                       025100
      5            C                                                                 025110
                       IMPLICIT REAL(A-H),REAL(L-Z)                                  025020
                   COMMON /CONTRL/ QTIME,      PTIME,      PLTIME,     PSTIME,      025030
                  1      IPWEV,      INIT,       ISTOP,      ICMCYL,     ICMCYP     025040
                   COMMON /INPUT1/ PCSID(3),   DV3P(7),    CTAGP(4),   UF(7),       025050
     10           1    GFGTP(3),   G2P35(3,3), G2MIS(7,4), TPESID(3),  G1390(3,3),  025060
                  2    G1092P(3,4), G2295T(3,3), APESID(3)                          025070
                   COMMON /IMPLIS/ AQUANT,     TQUANT,     VQUANT,     STAGT,       025080
                  1      STOP,       PLOTIM,     PRNT,       PSTRT,      CV01,      025090
                  2      CV02,       CV03,       TOLJPK,     HSOTIM,      HSCINC,   025100
     15           2      IIPMAY,     ITPATT,     IUCOP,      IMUTYP,     TCPLTM,    025110
                  3      IPC(30),    IOPHLP,     SCAB,       SSY3,       SSZ3,      025120
                  4      PSMAX,      QPSMEX,     ITRFTL                             025130
                   COMMON /MAY/    C0P92P(3,3),V32P(7),    DV32P(3),   PH3(5),      025140
                  1      C0PH0(3,3), A(3,3),     B(3,3),     THTFPI(3),  THTIPO(3),  025150
     20           2      THTC0P(3),  XXV(3),     G32P(3),    H,          ALPHA,      025160
                  3      SALF,       CALF,       DELT,       FIA(3),     V0MP,       025170
                  4      LAT,        LONG,       V02(3),     FILATT(3,3),DELTS,      025180
                  5      XSALF,      YCALF,      C0P92P(3,3),DV32P(3),   DV32P(3),   025190
                  6      S2PHI,      XS2PHI,     YV32P(3),   YH,         DELM,       025200
     25           7      C0910(3,3), C0P90(3,3), DH3,        C895(3,3),   DVS32P(3), 025110
                  8      DDX ,       DDY ,       DDZ ,       G2P95(4),   DFILTP(3),  025121
                  9      GATAS(3,10),TGATHP(3)                                      025130
                   DO 10 I=1,3                                                       025141
                   DV9P(I)=DV59?P(I)                                                 025150
     30          10 DV532P(I)=0.                                                    025161
                   RETURN                                                            025170
                   END                                                               025180
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 HSINT2

VARIABLES	SN	TYPE	RELOCATION						
33	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
3	AQUANT	REAL		INPUTS	100	APESID	REAL	ARRAY	IMUDAT
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
11	CV01	REAL		INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL		INPUTS	145	C0P90	REAL	ARRAY	NAV
8	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C895	REAL	ARRAY	NAV	45	C1092	REAL	ARRAY	IMUDAT
56	C1P92P	REAL	ARRAY	IMUDAT	21	C2295	REAL	ARRAY	INPUT
67	C2PH51	REAL	ARRAY	IMUDAT	71	C9P1C	REAL	ARRAY	IMUDAT
22	CSHHO	REAL	ARRAY	NAV	153	DELH	REAL		NAV
177	DELT	REAL		NAV	121	DELTA	REAL		NAV
65	DPSMAX	REAL		INPUTS	211	DV532P	REAL	ARRAY	NAV
1	DV9P	REAL	ARRAY	IMUDAT	14	DV32P	REAL	ARRAY	NAV

I-118

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101  ETA        REAL       ARRAY     NAV

SUBROUTINE HSINT2      74/74   OPT=0 TRACE          FTN 4.5+P436     05/25/75  17.17.47      PAGE     2

VARIABLES     SN  TYPE          RELOCATION
  112  FILATT     REAL       ARRAY     NAV          225  GAINS      REAL       ARRAY     NAV
   71  G92P       REAL       ARRAY     NAV           74  H          REAL                 NAV
   15  HSDTHC     REAL                 INPUTS        14  HSDTIM     REAL                 INPUTS
  137  HV92P      REAL       ARRAY     NAV           11  I          INTEGER
    7  ICHCYL     INTEGER              CONTRL        10  ICHCYP     INTEGER              CONTRL
   22  IERLIM     INTEGER              INPUTS       263  IGAINP     INTEGER    ARRAY     NAV
   21  IPUTYP     INTEGER              INPUTS        23  INCOR      INTEGER              INPUTS
    5  IPIT       INTEGER              CONTRL        61  IOPHLP     INTEGER              INPUTS
   23  IPC        INTEGER    ARRAY     INPUTS         6  ISIDF      INTEGER              CONTRL
   17  ITRATI     INTEGER              INPUTS        57  ITAFIL     INTEGER              INPUTS
   16  ITPNAV     INTEGER              INPUTS       105  LAT        REAL                 NAV
  106  LONG       REAL                 NAV          213  ODX        REAL                 NAV
  214  ODY        REAL                 NAV          215  ODZ        REAL                 NAV
  222  OFILTP     REAL       ARRAY     NAV          176  OMB        REAL                 NAV
    0  OTIME      REAL                 CONTRL       142  OV92P      REAL       ARRAY     NAV
    5  PLOTIM     REAL                 INPUTS         2  PLTIME     REAL                 CONTRL
    6  PRNT       REAL                 INPUTS         1  PTIME      REAL                 CONTRL
  216  Q2P95      REAL       ARRAY     NAV            9  RESID      REAL       ARRAY     IMUDAT
   17  RHO        REAL       ARRAY     NAV           65  RSMAX      REAL                 INPUTS
    3  RSTIME     REAL                 CONTRL         7  RSTRT      REAL                 INPUTS
   76  SALF       REAL                 NAV           15  SFRTP      REAL       ARRAY     IMUDAT
   62  SSXD       REAL                 INPUTS        53  SSYD       REAL                 INPUTS
   64  SSZD       REAL                 INPUTS         3  START      REAL                 INPUTS
    4  STOP       REAL                 INPUTS       145  S2PHI      REAL                 NAV
   63  THTCOP     REAL       ARRAY     NAV           55  THTEST     REAL       ARRAY     NAV
   60  THTTRQ     REAL       ARRAY     NAV           13  TOLJPK     REAL                 INPUTS
    4  TPREV      REAL                 CONTRL         1  TQUANT     REAL                 INPUTS
   42  TRESID     REAL       ARRAY     IMUDAT       104  V0HP       REAL                 NAV
    2  VQUANT     REAL                 INPUTS       107  V92        REAL       ARRAY     NAV
   11  V92P       REAL       ARRAY     NAV           12  WT         REAL       ARRAY     IMUDAT
   66  WXV        REAL       ARRAY     NAV          125  XCALF      REAL                 NAV
  152  XH         REAL                 NAV          124  XSALF      REAL                 NAV
  146  XS2PHI     REAL                 NAV          147  XV92P      REAL       ARRAY     NAV
  126  XQP92P     REAL       ARRAY     NAV

STATEMENT LABELS
    9  10

LOOPS  LABEL    INDEX     FROM-TO     LENGTH     PROPERTIES
    3  10       I          29 30         59      INSTACK

COMMON BLOCKS   LENGTH
       CONTRL        9
       IMUDAT       67
       INPUTS       56
       NAV         182

STATISTICS
  PROGRAM LENGTH                 128       10
  CM LABELED COMMON LENGTH      4720      314
```

```
      C                                                                 026100
      C     THESE ROUTINES COMPUTE THE SIN OR COSINE OF THE INPUT ANGLE 026200
      C     ACCORDING TO THE PRECISION SPECIFIED IN SINPTH (OR COSPTH). FOR 026210
      C     A DISCUSSION OF THE ALGORITHMS USED, SEE THE ATTACHED       026220
      C     DOCUMENTATION.                                              026230
      C                                                                 026240
      C     INPUTS:                                                     026250
      C     FOR VSIN(OR FOR VCOS)THE INPUT ANGLE IS PASSED AS PART      026260
      C     OF THE FUNCTION CALL, E.G. "CALL VSIN(ARG)".THIS ARGUMENT   026270
      C     IS AN OCT6600 FLOATING POINT WORD, WITH VALUE EXPRESSED IN  026280
      C     RADIANS.THE SIN ROUTINE SELECTS THE DESIRED EXPANSION BY    026290
      C     EXAMINING THE STORAGE LOCATION SINPTH. LIKEWISE VCOS EXAMINES 026300
      C     COSPTH. EITHER OF THESE IS AN INTEGER VALUE FROM 1 TO 4.    026310
      C                                                                 026320
      C     OUTPUTS:                                                    026330
      C     THE OUTPUT OF EITHER OF THESE ROUTINES IS RETURNED AS THE VALUE 026340
      C     OF THE FUNCTION: THIS VALUE IS AN INTEGER*60 DOUBLEWORD.    026350
      C                                                                 026360
      C     ALGORITHMS:                                                 026370
      C     ALL ARITHMETIC IS DONE AT THE VARIABLE PRECISION SPECIFIED  026380
      C     PREVIOUSLY TO THE "VP" ROUTINE. BOTH THE SINE AND COSINE    026390
      C     ROUTINES REDUCE THE ARGUMENT TO EITHER A SINE OR A COSINE   026400
      C     OF AN ANGLE BETWEEN 0 AND PI/4 RADIANS (0 TO 45 DEGREES).   026410
      C     A COMMON SUBROUTINE IS THEN INVOKED TO COMPUTE THE ACTUAL VALUE. 026420
      C                                                                 026430
            REAL FUNCTION VSIN  (ARG)                                   026440
            COMMON/SINPTH/SINPTH                                        026450
            REAL   ARG,VSINCO                                           026460
            INTEGER Q,SINPTH                                            026470
            Q=0                                                         026480
            IF(ARG .LT. 0.) Q=4                                         026490
            VSIN=VSINCO(ARG,Q,SINPTH)                                   026500
            RETURN                                                      026510
            END                                                         026520
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4 VSIN

VARIABLES	SN	TYPE	RELOCATION				
0 ARG		REAL	F.P.	22	0	INTEGER	
0 SINPTH		INTEGER	SINPTH	21	VSIN	REAL	

EXTERNALS	TYPE	ARGS
VSINCO	REAL	3

COMMON BLOCKS	LENGTH
SINPTH	1

STATISTICS
PROGRAM LENGTH 241 12

```
 CM LABELED COMMON LENGTH        19        1


      FUNCTION VCOS        74/74   OPT=0 TRACE                FTN 4.5+040   09/29/75  17.17.47        PAGE      1

                                                                                                    026630
      1                 REAL FUNCTION VCOS (ARG)                                                    026640
                        COMMON/COSPTH/COSPTH                                                        026650
                        REAL    ARG,VSINCO                                                          026660
                        INTEGER Q,COSPTH                                                            026670
      5                 Q=2                                                                         026680
                        VCOS=VSINCO(ARG,Q,COSPTH)                                                   026690
                        RETURN                                                                      026700
                        END                                                                         026710


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
     4  VCOS

VARIABLES     SN  TYPE            RELOCATION
     0  ARG       REAL                F+2          0  COSPTH    INTEGER             COSPTH
    20  Q         INTEGER                         17  VCOS      REAL

EXTERNALS          TYPE    ARGS
       VSINCO      REAL       3

COMMON BLOCKS    LENGTH
       COSPTH         1

STATISTICS
  PROGRAM LENGTH              213       17
  CM LABELED COMMON LENGTH     13        1
```

```
      1                 REAL FUNCTION VSINCO  (X,O,IPATH)                                 026610
                        INTEGER Q,QQ,Q1,Q2,Q4                                             026620
                        INTEGER ITERMS(8)                                                 026630
                        REAL    COEF(7,8)                                                 026640
      5           C     X40PI IS 4/PI                                                     026650
                        DATA X40PI/1.2732395447351626861450/                              026660
                        DATA COEF/-.356504396-4,.2480013076-2,-.807454132524 -1           026670
                       1  ,.7853981608546D0,0.E0,0.E0,0.E0     ,.308974697E-6            026680
                       2  ,-.766723495496-4,.2480397182533E-2,-.807455120127935-1         026690
     10                3  ,.7853981633033745D0,0.E0,0.E0                                  026700
                       4  ,-.173642880 1E-8,.3133781480485-6,-.3657619127578E-4           026710
                       5  ,.2490394567294D-2,-.807455121880299415-1                       026720
                       6  ,.7853981633974447715D0,0.E0   ,.6877100349E-11                026730
                       7 ,-.1757149202756D-3,.3133616216519845-6,-.3657620415945559E-4    026740
     15                8  ,.2490394571189736117E-2  ,-.8074551213928C530192E-1            026750
                       9 ,.7853981633974483D7014E0                                      026760
                       A  ,-.3187278E-3,.1584968416E-1,-.308424165588E0                  026770
                       1 ,.9999999673AE0,-.E0,1.E0,0.E0  ,.352476152E-5,-.32593650043E-3 026780
                       2  ,.1585432391225E-1,-.3084251348011 E0,.9999999994393E0         026790
     20                3 ,.0,E0,0.E0,    -.2426365092E-7,.3594323677E-5                 026800
                       4  ,-.3259916767495E-3,.1584744419321755E-1                       026810
                       5 ,-.3084251375529547156D0,.99999399993435E0,0.E0                026820
                       6  ,.1130?912637C-9,-.2463945716614E-7,.3590*5912336036E-5       026830
                       7  ,-.3259918866454034001E-3,.1585434424373456?2E-1              026840
     25                8  ,-.3084251375340372298?7E0,.9999999999993999442?E0            026850
                       9  /                                                             026860
                        DATA ITERMS/4,5,6,7,4,5,6,7/                                     026870
                        Z=VP( ABS(X) * VP(X40PI))                                        026880
                C       THE EXPANSIONS ACTUALLY COMPUTE SIN(PI/4*Z) AND COS(PI/4*Z)      026890
     30         C       WHERE 0<= Z <=1.                                                 026900
                        R=AMOD(Z,1.E0)                                                   026910
                C       BREAK Z INTO ITS INTEGER AND FRACTIONAL PARTS                    026920
                        QQ=  INT(Z)                                                      026930
                        QQ=MOD(QQ+Q,8)                                                   026940
     35         C       HALF QUADRANT IN WHICH THE ANGLE FALLS, AFTER ADJUSTMENT FOR THE  026950
                C       SIGN OF THE ARGUMENT AND WHETHER SIN OR COS WAS CALLED           026960
                        Q1=QQ/4                                                          026970
                C       0 TO PI OR PI TO 2*PI                                            026980
                        Q2=MOD(QQ,4)                                                     026990
     40         C       HALF QUADRANT IN ONE OF FIRST TWO QUADRANTS                      027000
                        IF(MOD(Q2,2) .NE. 0) R=VP(1.-R)                                  027010
                C       IF HALF QUADRANT IS 1 OR 3, REFLECT ANGLE IN HALF QUADRANT       027020
                        RSQ=VP(R*R)                                                      027030
                        Q4=1                                                             027040
     45                 IF(Q2 .EQ. 0 .OR. Q2 .EQ. 3) Q4=0                             027050
                C       Q4=0 IMPLIES SINE EXPN(Q2=0,3), =1 IMPLIES COSINE                027060
                        INDEX=IPATH+4*Q4                                                 027070
                C       SELECT PROPER POLYNOMIAL EXPANSION                               027080
                        NTERM=ITERMS(INDEX)                                              027090
     51         C       NUMBER OF TERMS IN EXPANSION                                     027100
                        VSINCO=VP(COEF(1,INDEX))                                         027110
                C       START EVALUATING POLYNOMIAL                                      027120
                        DO 100 J=2,NTERM                                                 027130
                C       EVALUATE REMAINDER OF TERMS                                      027140
     55         100     VSINCO=VP(VP(COEF(J,INDEX))+VP(VSINCO*RSQ))                      027150
                        IF (Q4 .EQ. 1) VSINCO=VP(X40PI*R)                                027160
```

```
C     IF IT HAS A SINE EXPANSION, FINISH POLYNOMIAL                    027177

FUNCTION VSINCO    74/74   OPT=0 TRACE          FTN 4.5+P496    05/25/76  17.13.47    PAGE    2

                IF (Q1 .NE. 3) VSINCO=-VSINCO                            027140
              C IF THIRD OR FOURTH QUADRANT, FLIP SIGN                   027190
      60        RETURN                                                   027200
                END                                                      027210
```

CARD NR.	SEVERITY	DETAILS	DIAGNOSIS OF PROBLEM
6	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
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7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
7	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.

1-123

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    4 VSINCO

VARIABLES	SN	TYPE	RELOCATION					
156	COEF	REAL	ARRAY		143	INDEX	INTEGER	
3	IPATH	INTEGER	F.P.		146	ITERMS	INTEGER	ARRAY
145	J	INTEGER			144	NTERM	INTEGER	
0	Q	INTEGER	F.P.		134	Q0	INTEGER	
135	Q1	INTEGER			136	Q2	INTEGER	
137	Q4	INTEGER			141	R	REAL	
142	RSQ	REAL			133	VSINCO	REAL	
0	X	REAL	F.P.		131	X4QPI	REAL	
140	Z	REAL						

EXTERNALS	TYPE	ARGS
VP	REAL	1

INLINE FUNCTIONS	TYPE	ARGS					
ABS	REAL	1	INTRIN	AMOD	REAL	2	INTRIN
INT	INTEGER	1	INTRIN	MOD	INTEGER	2	INTRIN

STORAGE ALLOCATION.

ADDRESS	LENGTH	BINARY CONTROL CARDS.
2	43	IDENT VP,VP
45		END

BLOCKS	TYPE	ADDRESS	LENGTH
PROGRAM*	LOCAL	0	45
PRECIS	COMMON	0	2
VPPTH	COMMON	0	1

ENTRY POINTS.

VP	2+	VPINIT	34+

```
                IDENT   VP,VP                                                   027220
                ENTRY   VP                                                     027230
                ENTRY   VPINIT                                                 027240
                                                                               027250
*               THIS ROUTINE IMPLEMENTS THE PRECISION VARYING FUNCTION BY      027260
*               ROUNDING AND TRUNCATING ITS INPUT. THE ROUTINE IS CALLED AS    027270
*               A FUNCTION SUBPROGRAM,BY THE FORTRAN CALL *VP(ARG)* WHERE ARG  027280
*               IS THE INPUT TO THIS ROUTINE.                                  027290
*                                                                              027300
*               INPUTS:                                                        027310
*               ARG - A CDC6600 SINGLE PRECISION FLOATING POINT WORD. THE      027320
*               ROUTINE WILL GENERATE ACCURATE RESULTS FOR *PLUS ZERO*, ANY    027330
*               OF THE UNDERFLOW REPRESENTATIONS , AND ANY UNNORMALIZED VALID  027340
*               FLOATING POINT NUMBER.  POSITIVE OVERFLOW, NEGATIVE OVERFLOW   027350
*               POSITIVE INDEFINITE, AND NEGATIVE INDEFINITE INPUTS ARE        027360
*               RETURNED UNCHANGED.                                            027370
*               VPBTH - A COMMON BLOCK CONTAINING ONE FIXED POINT FULLWORD.    027380
*               IT IS FOUND, WHICH, IF ODD, REQUESTS ROUNDING PRIOR TO         027390
*               TRUNCATING. AN EVEN VALUE OF FOUND CAUSES TRUNCATION ONLY.     027400
*               PRECIS - A COMMON BLOCK CONTAINING  TWO FIXED POINT FULLWORDS.  027410
*               THE FIRST IS FRACTL, WHICH  IS THE NUMBER OF BINARY BITS OF    027420
*               FRACTION TO BE KEPT ( THIS ROUTINE , IN ESSENCE, SIMULATES A   027430
*               COMPUTER WITH A BINARY EXPONENT AND FRACTION FLOATING POINT    027440
*               REPRESENTATION). VP EXAMINES THIS VALUE EACH TIME IT IS        027450
*               INVOKED, THEREBY ALLOWING DIFFERENT PRECISIONS TO BE SIMULATED 027460
*               AT EXECUTION TIME. THE SECOND WORD OF THE COMMON BLOCK IS      027470
*               EXPOL, WHICH IS THE NUMBER OF BITS IN THE BINARY EXPONENT. THIS 027480
*               THIS VALUE IS EXAMINED ONLY DURING A CALL TO THE INITIALIZER   027490
*               (WHICH IS INVOKED BY THE FORTRAN SUBROUTINE CALL *CALL VPINIT* 027500
*               ), WHICH SETS THE NUMBER OF BITS IN THE BINARY EXPONENT. THIS  027510
*               VALUE REMAINS UNCHANGED UNTIL THE NEXT (IF ANY) CALL TO        027520
*               VPINIT. IF NO CALLS TO VPINIT ARE MADE, THE DEFAULT VALUE OF 8 027530
*               IS USED.                                                       027540
*                                                                              027550
*               OUTPUTS:                                                       027560
*               IN ACCORDANCE WITH CDC6600 FORTRAN LINKAGE CONVENTIONS, THE    027570
*               RESULT IS RETURNED IN REGISTER X.6. IF A SOFTWARE UNDERFLOW    027580
*               IS DETECTED (THAT IS, WHEN THE EXPONENT IN THE CDC6600         027590
*               REPRESENTATION COULD NOT BE REPRESENTED ON A COMPUTER          027600
*               WITH A BINARY EXPONENT LENGTH AS SET BY THE MOST RECENT        027610
*               CALL TO VPINIT) THE RESULT IS SET TO ZERO. OVERFLOWS ARE       027620
*               HANDLED SIMILARLY.                                             027630
*                                                                              027640
*               ALGORITHMS:                                                    027650
*               TO ROUND THE RESULT TO THE DESIRED PRECISION, WE CONSTRUCT     027660
*               A FLOATING POINT WORD WHOSE EXPONENT IS THE SAME AS THAT OF    027670
*               THE INPUT, AND WHOSE COEFFICIENT HAS A 1 IMMEDIATELY TO        027680
*               THE RIGHT OF THE LEAST SIGNIFICANT BIT OF THE COEFFICIENT      027690
*               TO BE RETAINED. (NO ROUNDING IS DONE IF EITHER VPBTH IS EVEN   027700
*               OR IF THE FRACTL IS 48). THE TRUNCATING IS PERFORMED BY        027710
*               CONSTRUCTING A MASK THAT HAS 1*S IN ONLY THOSE BIT POSITIONS   027720
*               THAT CORRESPOND TO SIGNIFICANT BITS IN THE SIMULATED           027730
*               RESULT. THE EXPONENT IS THEN CHECKED AGAINST RECOMPUTED        027740
*               LIMITS TO DETERMINE IF AN UNDERFLOW OR OVERFLOW CONDITION      027750
*               EXISTS.                                                        027760
*                                                                              027770
```

STATEMENT LABELS
0 100

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
64	100	* J	53 55	200	EXT REFS

STATISTICS
PROGRAM LENGTH 2468 166

```
                0  2620555555555000002 +          VFD       42/0HVP,18/VP,    *TRACE* MODE                          027700

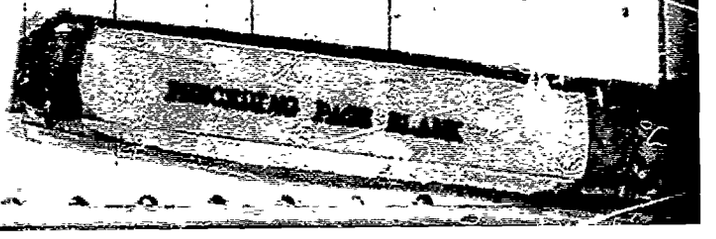
VARIABLE PRECSION EQUITUES                                  COMPASS 3.75551.   05/25/76  17.19.21.      PAGE     3

                1  0000300000000000000          DATA      0                 *TRACE* MODE                          027800
                2  0450400002 +                 VP        EQ        *+1S17  STANDARD FORTRAN LINKAGE MODE          027810
                                                *                           X1 HAS ADDRESS OF ARGUMENT LIST       027820
                                                *                           A1 HAS ADDRESS OF ADC                 027830
                3  53110                        SA1       X1                X1 HAS ARGUMENT                       027840
                        0351000024 +            JR        X1,OUTRANGE       BRANCH IF 'OUT OF RANGE', THAT IS     027850
                                                *                           OVERFLOW OR INDEFINITE.               027860
                4  5120000030 C                 SA2       FRACTL            X2 GETS FRACTION LENGTH               027870
                             7222777717         SX2       X2-48             COMPUTE FRACTION LENGTH OF 48         027880
                5  0322000024 +                 PL        X2,OUTRANGE       BRANCH IF FRACTL >= 48                027890
                             6232000073         SB3       X2*59             B3 GETS FRACTL+11(=NUMBER OF          027900
                                                *                           SIGNIFICANT BITS OF MODE, LESS 1)     027910
                6  5120000026 +                 SA2       BIT0              X2 IS ZERO, EXCEPT FOR SIGN BIT       027920
                             23352              AX3       X2,B3             X3 HAS MASK TO SAVE ONLY FRACTL       027930
                                                *                           +12 MOST SIGNIF. BITS OF MODE         027940
                7  5120000000 C                 SA2       ROUND             GET ROUNDING MODE                     027950
                             20273              LX2       -1                SHIFT LSB TO SIGN BIT                 027960
               10  0322000014 +                 PL        X2,TRUNC          IF BIT ZERO, DON'T ROUND              027970
                             10533              BX5       X3                X5 GETS X3                            027980
                                     21501      AX5       1                 EXTEND B5 ONE MORE BIT                027990
               11  13563                        BX6       X6-X3             X6 NOW IS CLEAR EXCEPT FOR 1 TO       028000
                                                *                           THE RIGHT OF THE LSB OF THE           028010
                                                *                           SIMULATED FRACTION                    028020
                        26641                   UX4       X1,B4             UNPACK X1, X4 GETS COEFFICIENT,       028030
                                                *                           B4 GET EXPONENT                       028040
                        0321000013 +            PL        X1,NORMOK         IF INPUT ZERO, WE ARE DONE WITH       028050
                                                *                           COEFFICIENT OF ROUNDING MODE          028060
               12  14555                        BX5       -X5               COMPLEMENT COEFFICIENT OF MODE        028070
               13  27445           NORMOK       PX4       X5,B4             PACK ROUNDING MODE INTO X4            028080
                             30141              FX1       X4*X1             X1=X1*X4, X1 IS NOW ROUNDED.          028090
               14  11613           TRUNC        BX6       X1*X3             X6 IS NOW TRUNCATED BY USING MASK     028100
                             0321000015 +       PL        X1,CHECKEXPO      IF INPUT ZERO, WE ARE THRU TRUNCING    028110
                                      16663     BX6       -X3*X6            SET LSBS TO 1'S                       028120
                                                *                                                               028130
                                                *  TIME TO CHECK EXPONENT                                       028140
                                                *                                                               028150
               15  26116           CHCKEXPO     UX1       X6,B1             UNPACK X6 INTO X1 AND B1              028160
               16  6120777517                   SB2       -120-48           CHECK EXPONENT AGAINST MINIMUM        028170
                                                *                           VALUE THAT CAN BE SIMULATED AT        028180
                                                *                           THIS EXPONENT LENGTH. THIS            028190
                                                *                           INSTRUCTION IS MODIFIED BY VPINIT     028200
                                                *                           DEFAULT EXPONENT LENGTH IS 8.         028210
               17  0712000025 +                 LT        B1,B2,UNDRFL      IF B1 < B2 WE HAVE UNDERFLOW, BE.     028220
               20  6120000117                   SB2       +127-48           CHECK MAX EXPO (SEE COMMENTS FOR      028230
                                                *                           FOR SETLO+1)                          028240
               21  0621000002 +                 LE        B1,B2,VP          IF B1<=B2, WE ARE OK, RETURN          028250
               22  5110000030 +     OVERFL      SA1       OVER0             PUT POSITIVE OVERFLOW MODE IN X1      028260
                             0326000024 +       PL        X6,OUTRANGE       IF X6 IS ZERO, SKIP NEXT              028270
               23  5110000026 +                 SA1       OVER1             PUT NEGATIVE OVERFLOW MODE IN X1      028280
               24  10611           OUTRANGE     BX6       X1                TRANSFER TO X6                        028290
                        0400000002 +            EQ        VP                RETURN                                028300
               25  13611           UNDRFL       BX6       X1-Y1             CLEAR X6                              028310
                        0400000002 +            EQ        VP                RETURN                                028320
               26  4000000000000000006 BIT0     VFD       1/0,59/0          BIT 0 ONLY IS SET                     028330
               27  6120000000                   SB2       0                 USED TO COMPUTE EXPO LIMIT CHECK      028340
```

```
                                                
```

SYMBOLIC REFERENCE TABLE.

BITS	26	PROGRAM*	3/13	3/54 L	4/01	4/11		
CHCKEXPO	15	PROGRAM*	3/32	3/37 L				
EXPOL	1	PRECIS	4/09	4/29 L				
FRACTL	0	PRECIS	3/38	4/24 L				
MASK	31	PROGRAM*	4/02 L	4/15				
OUTRANGE	24	PROGRAM*	3/06	3/10	3/48	3/50 L		
OVERFL	22	PROGRAM*	3/47 L					
OVERH	26	PROGRAM*	3/49	4/01 D				
OVERP	30	PROGRAM*	3/47	3/57 L				
ROUND	0	VBBTH	3/16	4/31 L				
SETR2	27	PROGRAM*	3/55 L	4/21				
SETHI	20	PROGRAM*	3/44 L	4/25 S				
SETLO	16	PROGRAM*	3/38 L	4/27 S				
TRUNC	14	PROGRAM*	3/18	3/31 L				
UNDERFL	25	PROGRAM*	3/43	3/52 L				
VB	2	PROGRAM*	2/02 F	2/57	3/12 L	3/46	3/51	3/53
VBINIT	34	PROGRAM*	2/03 F	4/13	4/18 L	4/26		
WORDOK	13	PROGRAM*	3/26	3/29 L				



```
      C                                                                 029690
      C     THIS IS THIS SQUARE ROOT SUBROUTINE FOR USE IN CONJUNCTION  029700
      C     WITH THE PRECISION VARYING ROUTINE. IT COMPUTES THE         029710
      C     SQUARE ROOT OF A DOUBLE PRECISION INPUT ARGUMENT BY ONE     029720
      C     OF FOUR ALGORITHMS: THESE PATHS DIFFER IN TERMS OF THE      029730
      C     RESULTANT PRECISION. FOR AN ANALYSIS OF THE ALGORITHMS      029740
      C     SEE THE DOCUMENTED ANALYSIS.                                029750
      C                                                                 029760
      C     IN BROAD TERMS, THE SQUARE ROOT IS COMPUTED AS FOLLOWS:     029770
      C     A. REDUCE THE RANGE BY REEXPRESSING ARG AS NEWARG TIMES     029780
      C     FACTOR SQUARED.                                             029790
      C     B. TAKE AN INITIAL APPROXIMATION TO THE SQUARE ROOT OF      029800
      C     NEWARG BY USING A POLYNOMIAL EXPANSION.                     029810
      C     C. USE ONE OR MORE NEWTON'S ITERATIONS TO REFINE THE RESULT 029820
      C     D. OUPUT THE RESULT AS SQRT(NEWARG)*FACTOR                  029830
      C                                                                 029840
            REAL FUNCTION VSQRT  (ARG)                                  029850
            INTEGER SQRPTH,ITERMS(4)                                    029860
            REAL    NEWARG,COEF(5,4)                                    029870
            COMMON /SQRPTH/SQRPTH                                       029880
            DATA ITERMS/5,3,4,5/                                        029890
      C     NUMBER OF COEFFICIENTS IN THE EXPANSION USED FOR EACH PATH  029900
            DATA COEF/-.323937345025E0,1.062856525 9E0,-1.47586598071E0,1.5462934656E0
           1656E0,.190452179 4E0, -.316322143 E0, 1.052021187E0,-.259276876 E0
           1  ,0.0E0,0.0E0,  .287369824E0,-.825888891E0,1.32 563186E0
           1  ,.217018672E0,0.0E0,    -.323937345025E0,1.062856525 9E0
           1  ,-1.47586598071E0,1.5462934656E0,.190452179 4E0 /
            IF (ARG) 10,20,30                                           030070
     10     VSQRT= SQRT(ARG)                                            030080
      C     NEGATIVE ARG, USE ERROR FACILITY OF SYSTEM                  030090
            RETURN                                                      030095
     20     VSQRT=0.                                                    030100
      C     ZERO ARG                                                    030110
            RETURN                                                      030120
     30     CALL VSQSUP(ARG,NEWARG,FACTOR)                              030130
      C     POSITIVE ARGUMENT, RESCALE IT.                              030140
            IPATH=SQRPTH                                                030150
            IF (IPATH .LE. 0 .OR. IPATH .GT. 4) IPATH=4                 030160
      C     SELECT PATH AS 1,2,3, OR 4                                  030170
            J=ITERMS(IPATH)                                             030180
      C     NUMBER OF TERMS IN INITIAL EXPANSION                        030190
            VSQRT=VP(COEF(1,IPATH))                                     030200
      C     LOOP OVER REMAINING TERMS                                   030210
            DO 100 I=2,J                                                030220
     100    VSQRT=VP(VP(COEF(I,IPATH))+VP(VSQRT*NEWARG))                030230
      C     COMPUTE POLYNOMIAL IN SUCH A WAY AS TO MAXIMIZE SIGNIFICANCE 030240
            IF (IPATH .NE. 1) VSQRT=VP(.5*VP(  VSQRT +                  030250
           1    VP(NEWARG/VSQRT)  )  )                                  030260
      C     IF PATH IS NOT 1, TAKE A NEWTON'S ITERATION                 030270
            X=VP(NEWARG/VSQRT)                                          030280
      C     TEMP RESULT                                                 030290
            VSQRT=VP( FACTOR*VP(  VP(.5*  VP(VSQRT-X)) +X) )            030300
      C     TAKE ANOTHER ITERATION AND THEN RESCALE                     030310
            RETURN                                                      030320
            END                                                         030330
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4 VSORT

VARIABLES	SN	TYPE	RELOCATION				
0	ARG	REAL	F.P.	153	COEF	REAL	ARRAY
142	FACTOR	REAL		145	I	INTEGER	
143	IPATH	INTEGER		147	ITERMS	INTEGER	ARRAY
144	J	INTEGER		141	NUMARG	REAL	
2	SORTH	INTEGER	SORTH	148	VSORT	REAL	
146	X	REAL					

EXTERNALS	TYPE	ARGS				
SORT	REAL	1	LIBRARY	VP	REAL	1
VSORSUB		3				

STATEMENT LABELS
0 10 INACTIVE 13 20 15 30
0 100

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
35	100	* I	44 45	209	EXT REFS

COMMON BLOCKS	LENGTH
SORTH	1

STATISTICS

PROGRAM LENGTH	1779	127
(W LABELED COMMON LENGTH	19	1

STORAGE ALLOCATION.

ADDRESS	LENGTH	BINARY CONTROL CARDS.
2	12	IDENT VSQSUP,VSQSUP
14		END

ENTRY POINTS.

VSQSUP 2#

```
                        IDENT   VSQSUP,VSQSUP                                   029240
                        ENTRY   VSQSUP                                          029250
                        *                                                       029270
                        *  THIS ROUTINE IS USED BY THE SQUARE  ROOT FUNCTION (*VSQRT*)  029280
                        *  TO PERFORM RANGE REDUCTION.  THE GOAL IS TO TRANSFORM AN  029290
                        *  INPUT ARGUMENT (ARG) TO THE FORM NEWARG*FACTOR**2 WHERE   029300
                        *  NEWARG IS BETWEEN .25 AND 1.                           029310
                        *                                                         029320
                        *  THIS ROUTINE IS USED BY THE FORTRAN SUBROUTINE CALL    029330
                        *  *CALL VSQSUP(ARG,NEWARG,FACTOR)*.                      029340
                        *                                                         029350
                        *  INPUTS:                                                029360
                        *  ARG, A CDC6600 STANDARD SINGLE PRECISION FLOATING POINT WORD  029370
                        *  CONTAINS THE ARGUMENT TO BE RANGE-REDUCED. ARG IS ASSUMED > 0.  029380
                        *                                                         029390
                        *  OUTPUTS:                                               029400
                        *  NEWARG, THE RANGE-REDUCED OUTPUT OF WHICH THE SQUARE ROOT  029410
                        *  WILL BE TAKEN. A CDC6600 SINGLE PRECISION FLOATING POINT WORD.  029420
                        *  FACTOR, THE FACTOR TO BE USED TO RESCALE THE RESULT ( OF  029430
                        *  TAKING THE SQUARE ROOT OF NEWARG), BACK TO THE SQUARE ROOT  029440
                        *  OF ARG. A CDC6600 SINGLE PRECISION FLOATING POINT WORD.  029450
                        *                                                         029460
                        *  ALGORITHM.                                             029470
                        *  ARG IS OF THE FORM (2**EXPO)*COEFFICIENT, WHERE COEFFICIENT  029480
                        *  IS A NUMBER BETWEEN 2**47 AND (2**48)-1 (NOTE THAT WE ARE  029490
                        *  ASSUMING THAT ARG IS NORMALIZED). EXPRESS EXPO AS 2*L-M WHERE  029500
                        *  M IS 0 OR 1 AND L IS AN INTEGER. THEN ARG CAN BE EXPRESSED  029510
                        *  AS (2**(2*L+48)) * (2**-M) * FRACTION, WHERE FRACTION  029520
                        *  IS THE COEFFICIENT WITH THE BINARY POINT ASSUMED TO BE AT THE  029530
                        *  IMMEDIATE LEFT OF THE MOST SIGNIFICANT BIT OF COEFFICIENT.  029540
                        *  EXPRESSING THIS AS ( (2**(L-24)*(2**47) )**2  *        029550
                        *  ( (2**(-M-48))*COEFFICIENT ) , WE HAVE REDUCED THE INPUT TO  029560
                        *  THE DESIRED FORM.                                      029570
                        *                                                         029580
  0  2623212325205500002 +        VFD     42/6HVSQSUP,18/VSQSUP  *TRACE* WORD    029590
     0000300003000000000          DATA    3                      *TRACE* WORD    029600
  2  0400400002 +         VSQSUP  EQ      *+1517                 STANDARD FORTRAN LINKAGE WORD  029610
                        *                                       A1 HAS ADDRESS OF ARGUMENT LIST  029630
                        *                                       X1 HAS ADDRESS OF ARG  029670
  3  53210                        SA2     X1                     X2 GETS ARG     029640
        26222                     UX2     X2,B2                  UNPACK X2, X2 GETS COEFFICIENT, B2  029650
                        *                                       GETS EXPONENT   029660
           6110000001             SB1     1                      B1 GETS A 1     029670
  4  0629000005 +                 GE      B2,POSEXPO             IF EXPONENT(IN B2) >=0, SKIP NEXT  029680
           6110000000             SB1     0                      B1 GETS 0       029690
  5  75321                POSEXPO SX3     B2+B1                  SET UP B3 FOR EXTRACTING *L*  029700
        21301                     AX1     1                      RIGHT SHIFT 1 PLACE. X3 NOW HAS L  029710
           6233777750             SB3     X3-23                  B3 NOW HAS L-23 029720
  6  5140300013 +                 SA4     TH047                  X4=2**47        029730
        27734                     PX7     B3,X4                  PACK FACTOR INTO X7  029740
             20301                LX3     1                      2*L             029750
  7  14333                        BX7     -X7                    X7=-2*L         029760
        63332                     SB3     B2+X3                  B3=(2*L-M-2*L)=-M  029770
           6133777717             SB3     B3-48                  B3=-M-48        029780
 10  27632                        PX6     B3,X2                  PACK NEWARG     029790
        58210*0101                SA7     A1+1                   ADDR OF NEWARG  029800
```

```
11  5021000002                  SA2     A1+2            ADDRESS OF FACTOR                       029920
                    53720       SA7     X2              RETURN VALUE OF FACTOR TO CALLER        029930
12  0400300002 +                EQ      VSQSUP          RETURN TO CALLER                        029940
13  0000400000000000000000     IM047    VFD     12/0/,1/=0,47/0/.   2**47                       029950
14                               END                                                             029960
```

474008 CM STORAGE USED 63 STATEMENTS 3 SYMBOLS
MODEL 74 ASSEMBLY 1.206 SECONDS 9 REFERENCES

SYMBOLIC REFERENCE TABLE.

POSEXPO	5	PROGRAM*	2/44	2/46 L		
TABLE	13	PROGRAM*	2/49	3/04 L		
VSQSUP	2	PROGRAM*	2/02 R	2/35	2/37 L	3/03

```
      REAL FUNCTION VATAN2  (YARG,XARG)                                 C20871
C                                                                       C20880
C     THIS IS THE VARIABLE PRECESION ARC-TANGENT ROUTINE                C20890
C     OF TWO ARGUMENTS. IF ONE INTERPRETS THE FIRST                     C20901
C     ARGUMENT AS A Y-COORDINATE AND THE SECOND ARG                     C20911
C     AS AN X-COORDINATE, THEN THE ARCTANGENT VALUE RETURNED            C20920
C     IS THE ANGLE (MEASURED IN A COUNTER CLOCKWISE DIRECTION),         C20931
C     BETWEEN THE X-AXIS AND THE LINE SEGMENT JOINING THE               C20941
C     ORIGIN AND THE POINT(X,Y) IN CARTESIAN COORDINATES.               C20951
C                                                                       C20961
C     INPUTS: YARG AND XARG AS DESCRIBED ABOVE (FLOATING POINT).        C20971
C     VATAN2 SELECTS AN EXPANSION(EXPLAINED BELOW) ON THE BASIS         C20981
C     OF ATNPTH, WHICH IS AVAILABLE IN THE COMMON BLOCK OF              C20991
C     THE SAME NAME.                                                    C21000
C                                                                       C30010
C     OUTPUTS:                                                          C30020
C     VATAN2 RETURNS A FLOATING-POINT QUANTITY, WHICH IS                C30031
C     THE PRINCIPAL VALUE OF THE ARCTANGENT, LOCATED BETWEEN            C30041
C     -PI AND PI (THE VALUE IS EXPRESSED IN RADIANS).                   C30051
C                                                                       C30061
C     ALGORITHMS:                                                       C30071
C     SEE ATTACHED DOCUMENTATION. IN GENERAL, SEVERAL RANGE             C30081
C     REDUCTIONS ARE USED TO REDUCE THE EVALUATION TO                   C30091
C     THE CASE OF AN ANGLE BETWEEN 0 RADIANS AND ARCTAN(PI/12.)         C30101
C     RADIANS.                                                          C30111
C     THIS VALUE IS COMPUTED BY A POLYNOMIAL EXPANSION. THE             C30121
C     RESULT OF THIS IS THEN EXPANDED TO THE PROPER VALUE.              C30131
C                                                                       C30141
      REAL   COEF(9,4)                                                  C30150
      INTEGER ITERMS(4)                                                 C30161
      LOGICAL REDUC1,REDUC2,REDUC3                                      C30171
      INTEGER ATNPTH                                                    C30181
      COMMON /ATNPTH/ATNPTH                                             C30191
      DATA ITERMS/4,6,7,8/                                              C30201
      DATA COEF/ -.12813334E0,.19935726946E0,-.33332423445E0            C30210
     1 ,.99999979773E0, 0.0E0,0.0E0,0.0E0,0.0E0,                        C30220
     2 -.76123977E-1,.19962936947E0,-.14291524200?E0                    C30230
     3 ,.19999303493?6E0,-.33333329?8?211E0,.99999993995?96E0           C30240
     4 ,0.0E0,0.0E0),       .62221?2411E-1,-.8952203?0?E-1,            C30250
     5 .11104474843?9E0,-.14285542?0?5?9E?,.13999980507?321E?           C30260
     6 ,-.33?33332464829E0,.99990099999437673?E0, 0.0E0,                C30270
     7 -.52096939046-1,.753071491348E-1,-.90?13432247?5E-1              C30280
     8 ,.11110794146029?E0,-.14285?995?488402E0,                        C30290
     9 .19999999949967469?50,-.33333333315992232E?,                     C30300
     A .99999999999999?227E0  /                                         C30310
      DATA PI/3.14159265358979323846E0/                                 C30320
      DATA SQR3/1.732050807568877?E0/,SQR3M1/.732050807568877?E0/       C30330
      DATA PIOV2/1.57079632679489661923E0/,PIOV6/.52359877559829887?1E0/C30340
      REDUC1=.FALSE.                                                    C30350
      REDUC2=.FALSE.                                                    C30360
      REDUC3=.FALSE.                                                    C30371
C     INITIALIZE SWITCHES TO INDICATE RANGE REDUCTIONS NOT MADE         C30381
      IF (XARG) 10,30,20                                                C30390
C     TEST XARG FOR MINUS,ZERO, OR PLUS                                 C30400
   10 REDUC1=.TRUE.                                                     C30411
C     IF HERE THAT X WAS NEGATIVE                                       C30421
```

```
                30    IF (YARG .NE. 0.E0) GO TO 20                                    030440
                C     IF BOTH XARG AND YARG ARE ZERO, ERROR CONDITION                 030450
      60              VATAN2= ATAN2(0.0E0,0.0E0)                                      030460
                      RETURN                                                          030470
                20    IF ( ABS(YARG) .GT.  ABS(XARG)) GO TO 40                        030480
                C     IF Y>X WANT TO USE SECOND REDUCTION(FIGURE ATAN(X/Y))           030490
                      ARG= ABS(VP(YARG/XARG))                                         030500
      65              GO TO 100                                                       030510
                40    REDUC2=.TRUE.                                                   030520
                      ARG= ABS(VP(XARG/YARG))                                         030530
                C     USE SECOND REDUCTION                                            030540
                100   IF (ARG .LE. TAN15) GO TO 150                                   030550
      70        C     IF ARGUMENT IS LESS THAN TAN(PI/12) DON'T USE THIRD REDUC       030560
                      REDUC1=.TRUE.                                                   030570
                      ARG=VP( VP( VP( VP(SQR3M1*ARG) -1.E0) +ARG)  / VP(ARG+SQR3))    030580
                C     ARGUMENT HAS NOW BEEN REDUCED TO TAN(-PI/12.) TO TAN(PI/12.)    030590
                C     NOW USE POLYNOMIAL EXPANSION                                    030600
      75        150   IPATH=ATNRTH                                                    030610
                      IF (IPATH .LE. 0 .OR. IPATH .GE. 5) IPATH=4                     030620
                C     GET NUMBER OF EXPANSION TO USE (1 TO 4)                         030630
                      ARGSQ=VP(ARG*ARG)                                               030640
                C     COMPUTE ARG**2                                                  030650
      80              J=ITERMS(IPATH)                                                 030660
                C     GET NUMBER OF TERMS IN EXPANSION                                030670
                      VATAN2=VP(COEF(1,IPATH))                                        030680
                      DO 320 I=2,J                                                    030690
                C     LOOP OVER REMAINING TERMS                                       030700
      85        300   VATAN2=VP( VP(COEF(I,IPATH))+VP(VATAN2*ARGSQ) )                 030710
                      VATAN2=VP(ARG*VATAN2)                                           030720
                C     COMPLETE EVALUATION OF POLYNOMIAL                               030730
                      IF(REDUC3) VATAN2=VP(VATAN2+VP(PIOV6))                          030740
                C     IF ANGLE WAS REDUCED FROM 30 TO 45 DOWN TO 0 TO 15              030750
      90              IF(REDUC2) VATAN2=VP(VP(PIOV2)-VATAN2)                          030760
                C     IF ANGLE HAS REDUCED FROM 45 TO 90 DOWN TO 1 TO 45              030770
                      IF(REDUC1) VATAN2=VP(VP(PI)-VATAN2)                             030780
                C     IF ANGLE WAS REFLECTED FROM 2 TO 1 QUAD(OR 3 TO 4)              030790
                      VATAN2= SIGN(VATAN2,YARG)                                       030800
      95        C     ADJUST RESULT FOR SIGN OF YARG                                  030810
                      RETURN                                                          030820
                      END                                                             030830
```

CARD NO. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

```
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      35    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
      44    I             CONSTANT TOO LONG.  HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
```

FUNCTION VATAN2 74/74 OPT=0 TRACE FTN 4.6[illegible] 05/26/78 17.12.42 PAGE 3

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM
47 I CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
47 I CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
48 I CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.
48 I CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4 VATAN2

VARIABLES	SN	TYPE	RELOCATION				
234	ARG	REAL		232	ARGSQ	REAL	
0	ATNPTH	INTEGER	ATNPTH	235	CONE	REAL	ARRAY
236	I	INTEGER		231	IPATH	INTEGER	
225	ITERMS	INTEGER	ARRAY	213	J	INTEGER	
215	PI	REAL		220	PIOV2	REAL	
221	PIOV6	REAL		235	REDUC1	LOGICAL	
226	REDUC2	LOGICAL		227	REDUC3	LOGICAL	
216	SQR3	REAL		217	SQR3M1	REAL	
214	TAN15	REAL		224	VATAN2	REAL	
0	XARG	REAL	F.P.	1	YARG	REAL	F.P.

EXTERNALS	TYPE	ARGS					
ATAN2	REAL	2	LIBRARY		VP	REAL	1

INLINE FUNCTIONS	TYPE	ARGS					
ABS	REAL	1	INTRIN		SIGN	REAL	2 INTRIN

STATEMENT LABELS
0 10 INACTIVE 20 20 14 32
32 40 41 100 66 150
0 300

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
107	300	* I	83 85	178	EXT REFS

COMMON BLOCKS	LENGTH
ATNPTH	1

STATISTICS
PROGRAM LENGTH 3010 195
OF LABELED COMMON LENGTH 10 1

********** IWEXLKG //// END OF LIST ////

```
PROGRAM NUMSIM    74/74  OPT=2  TRACE                    FTN 4.5+P405    05/25/76  17.24.46    PAGE  1

      1                 PROGRAM NUMSIM(INPUT,OUTPUT,TAPE5=INPUT,TAPE6,TAPE20,TAPE30)
            C     EXECUTIVE ROUTINE -- CALLS THE APPROPRIATE SUBROUTINES DEPENDENT
            C           ON THE TWO STABILIZATION SELECTED AND THE TIMING
            C           PARAMETERS SPECIFIED
      5     C
                  IMPLICIT REAL(A-H,L-Z)
                  COMMON /CONTRL/  DTIME,      PTIME,      PLTIME,     RSTIME,
                 1      IPREV,      INIT,       ISTOP,      ICMOVL,     ICMOVP
                  COMMON /INPUTS/  AQUANT,     TQUANT,     VQUANT,     START,
                 1      STOP,       PLOTIM,     PRNT,       DSTRT,      DVDT,
                 2      DVD2,       DVD3,       TOLJPK,     HSDTIN,      HSDTNC,
                 2      ITMAXV,     IPRINT,     INCOR,      IMUTYP,     IERLIM,
                 3      IPC(50),    IOPNLP,     SSX0,       SSY0,       SS20,
                 4      PSMAX,      DESMAX,     IFILE
                  COMMON /IMUCAT/  RESID(3),   DV32P(3),   ETA3P(4),   WT(7),
                 1      SF3IP(3),   C2P3S(3,3), C3M1S(3,3), TRESID(3),  C1000(3,3),
                 2    C1C32P(3,3), C3245T(3,3), APESID(7)
                  COMMON /NAV/     C1002P(3,3),V32P(3),    DV32P(3),   PP3(3),
                 1      COPNO(3,3), A(3,3),     P(3,3),     THTEPT(3),  THTIPO(3),
                 2      INTCOR(3),  RXV(3),     G92P(3),    H,          ALPHA,
                 3      SALF,       CALF,       DELT,       ETA(3),     VCMP,
                 4      LAT,        LONG,       V32(3),     FILATT(3,3),FILTA,
                 5      XSALF,      XCALF,      X0002P(3,3),HV32P(3),   DV32P(3),
                 6      S2PHI,      XS2PHI,     XV32P(3),   YH,         DELH,
                 7      C0910(3,3), C0P00(3,3), DH3,        C095(3,3),  DVE02P(3),
                 8      DDX ,       DDY ,       DDZ ,       02P95(4),   DELTP(3),
                 9      GAINS(3,10),IGAINP(3)
                  COMMON /OUTPUT/  TITLE(20),  OLAT9T,     OLONGT,     CALF9T,
                 1      OLAT,       OLONG,      OALF,       DETA9T(3),  DETA(3),
                 2      V92T(3),    DH,         DV(3),      DETA(3),    OLAT,
                 3      OLONG,      OALF,
                 4      IPAGE,      IPLIM,      IP2INT
                  COMMON /UNVRSL/  PI,         HPI,        P8,         P20,
                 1      CF,         CSO,        EERRC,      NEPT,       MADPLP,
                 2      PPSO
                  COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALF9T,
                 1      H9,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,
                 2      TIMEG,      LONG0,      SLAT9T,     CLAT9T,     SALF9T,
                 3      CALF9T
      40    C
            C     COMMON FOR PRECISION VARYING
                  COMMON /SQRTH/SQRTH /SINPTH/SINPTH /COSPTH/COSPTH /ATNPTH/
                 1  ATNPTH /PRECIS/ FRACTL,EXPOL /MRPTH/ ROUND
                  INTEGER SQRTH,SINPTH,COSPTH,ATNPTH,FRACTL,EXPOL,ROUND
      45    C
            C
                  INTEGER LLMECH,PESTAR,TDYN,MODE,NPATH,NSEGT
                  COMMON /PROFSC/ BTO(50),EPSI(50),HEAD(50),HMAX(50),HMIN(50),
                 1 MODE(50),NPATH(50),PACC(50),PTICH(50),PSTAR(50),SEGLNT(50),
                 2 TACC(50),TLIM(50),ZOLFAT,TSTART,WIN,PPSIPO,
                 3 PPITCH,ALFA0,LAT0,LON0,ALT0,IMPRT,IPITE,IPLOT,
                 4 IP2INT,NSEGT,LLMECH
                  NAMELIST /SIMPAR/ AQUANT,TQUANT,VQUANT,START,STOP,PLOTIM,PRNT,
                 A        PSTRT,TOLJPK,HSDTIN,HSDTNC,SSX0,SSY0,SS20,
      55         1        ITMAXV,IPAIT,INCOR,IMUTYP,IERLIM,IOPNLP,
                 2        DVDT,DVD2,DVD3,DDX,DDY,DDZ,DATE,DSTAT,IPFILE,DTMAX,
```

Center here

139

Continue numbering

```
                C                                                                 000670
                C     NAMELIST PARAMETERS FROM PROFGEN RUN                        000680
      60        C                                                                 000690
                C                                                                 000700
                      REWIND 20                                                   000710
                      READ(21) TODAY,CLOCK                                        000720
                      READ(20) IPROB,NSEGT,LLMECH,TSTART,VIO,PHEADO,PPITCH        000730
      65             1  ,ALEAD,LATD,LOND,ALTC,IPRNT,IRITE,IPLOT,ROLPAT          000740
                      READ(20) SEGLNT,RESTAR,TURN,NPATH,PACC,TACC,HEAD,           000750
                     1  PITCH,DTO,MODE,ERROR,HMAX,HMIN                          000760
                      WRITE(6,699) IPROB,NSEGT,LLMECH,TSTART,VIO,PHEADO,PPITCH,   000770
                     1   ALEAD,LATD,LOND,ALTC,IPRNT,IRITE,IPLOT,ROLPAT          000780
      70          699 FORMAT("1PROFGEN PARAMETERS ARE:"/T2,"IPROB:",T10,I11,T22,  000790
                     1 "NSEGT:",T30,I11,T42,"LLMECH:",T52,I11,T62,"TSTART:",T72,  000800
                     2 G11.5,T82,"VIO:",T90,G11.5,T102,"PHEADO:",T110,G11.5/      000810
                     3 T2,"PPITCH:",T10,G11.5,T22,"ALEAD:",T30,G11.5,T42,"LATD:", 000820
                     4 T50,G11.5,T62,"LOND:",T70,G11.5,T82,"ALTC:",T90,G11.5,     000830
      75             5 T102,"IPRNT:",T110,I11/T2,"IRITE:",T10,I11,T22,"IPLOT:",  000840
                     6 T30,I11,T42,"ROLPAT:",T50,G11.5//)                         000850
                      WRITE(6,698) (I,SEGLNT(I),RESTAR(I),TURN(I),NPATH(I),PACC(I), 000860
                     1 TACC(I),HEAD(I),PITCH(I),DTO(I),MODE(I),ERROR(I),HMAX(I),  000870
                     2 HMIN(I),I=1,NSEGT)                                         000880
      80          698 FORMAT(" PARAMETERS FOR PROFILE NO.",I2,":"/T2,"SEGLNT:",   000890
                     1 T10,G11.5,T22,"RESTAR:",T30,I11,T42,"TURN:",T50,I11,T62,"NPATH:",000900
                     2 T70,I11,T82,"PACC:",T90,G11.5,T102,"TACC:",T110,G11.5,     000910
                     3 /T2,"HEAD:",T10,G11.5,T22,"PITCH:",T30,G11.5,T42,"DTO:",   000920
                     4 T50,G11.5,T62,"MODE:",T70,I11,T82,"ERROR:",T90,G11.5,      000930
      85             5 T102,"HMAX:",T110,G11.5/T2,"HMIN:",T10,G11.5//)            000940
                C                                                                 000950
                C                                                                 000960
                      READ(5,5) (ITITLE(I),I=1,20)                                000970
                    5 FORMAT (20A4)                                               000980
      90              WRITE(6,9000) (ITITLE(I),I=1,20),IPAGE                      000990
                9000 FORMAT ("1",2X,"IDEAL INS SIMULATOR",10X,20A4,1X,"PAGE ",I3//, 001000
                     1       10X,"I N I T I A L I Z A T I O N   P A R A M E T E R S "/) 001010
                      IPAGE = IPAGE + 1                                           001020
                      READ (5,SIMPAR)                                             001030
      95              WRITE(6,697) CVD1,CVD2,CVD3,AQUANT,VQUANT,TQUANT,START,STOP, 001040
                     1 PLOTTM,PRNT,RSTRT,INCOR,TOLJPK,TOLLIM,(IPO(I),I=1,30)      001050
                697 FORMAT(" VERTICAL DAMPING:",T33,"CVD1:",T36,G11.5,            001060
                     1 T48,"SEC**-1,",T60,"CVD2:",T66,G11.5,T78,"SEC**-2,",       001070
                     2 T90,"CVD3:",T99,G11.5,T110,"SEC**-3"/                      001080
      100            3 " QUANTIZATION PARAMETERS:",T30,"AQUANT:",T40,G11.5,T52,"RAD", 001090
                     4 T60,"VQUANT:",T82,"FT/SEC",T70,G11.5,T90,"TQUANT:",T112,"RAD", 001100
                     4 T101,G11.5/                                                001110
                     5 " TIMES(SECS, EXCEPT INCOR):",T30,"START:",T40,G11.5,T60,  001120
                     5 "STOP:",T70,G11.5,                                         001130
      105            6 T90,"PLOTTM:",T100,G11.5/T30,"PRNT:",T40,G11.5,T60,"RSTRT:", 001140
                     7 T70,G11.5,T90,"INCOR:",T100,I11/" TOLERANCES:",T30,"TOLJPK:", 001150
                     8 T40,G11.5,T52,"FT/SEC",T62,"TOLLIM:",T73,I11/" IPO:",      001160
                     9 T30,15(I3,",")/T30,14(I3,","),I3)                          001170
                      IF (IMPLVP .EQ. 1) WRITE(6,696) IOPNLP                      001180
      110           696 FORMAT(" LOCAL LEVEL PLATFORM MISALIGNMENTS, IOPNLP:",I11)  001190
                      IF (IMPLVP .EQ. 2) WRITE(6,695) SSXP,SSYP,SSZP              001200
                    695 FORMAT(" SPACE STABLE PLATFORM INITIAL ORIENTATION AS",    001210
                     1 " EULER ANGLES(RADIANS)",T70,"SSXP:",T83,G11.5,T100,"SSYP:", 001220
                     2 T113,G11.5/T70,"SSZP:",T80,G11.5)                          001230
```

```
      IF (IMUTYP .EQ. 3) WRITE(6,694) HSOTIM,HSOINC                     031240
  694 FORMAT(" HIGH SPEED STRAPDOWN NORMALIZATIONS WILL START",         031250
     1  " AT TIME ",G11.5," AND HAPPEN EVERY ",G11.5," SECONDS")        031260
      IF (IPC(25) .NE. 1) WRITE(6,693) PCMAX,PCSMAX,((GAINS(I,J),       031270
     1 I=1,3),J=1,10)                                                  031280
  693 FORMAT(" ATTITUDE FILTER TOLERANCES, PCMAX= ",G11.5,              031290
     1 "   PCSMAX= ",G11.5," FIXED GAINS(COLUMNWISE):"/                 031300
     2 4(3(1X,G11.5),5X,3(1X,G11.5),5X,3(1X,G11.5)/) )                 031310
      WRITE(6,692)                                                      031320
  692 FORMAT(" THIS VERSION DOES NOT IMPLEMENT VARIABLE PRECISION")      031330
      GO TO (991,992,993),IMUTYP                                        031340
  991 CALL LLINIT                                                       031350
      GO TO 420                                                         031360
  992 CALL SSINIT                                                       031370
      GO TO 420                                                         031380
  993 CALL SDINIT                                                       031390
      GO TO 420                                                         031400
    1 CONTINUE                                                          031410
      GO TO (10,100,200),IMUTYP                                         031420
C                                                                       031430
C           THIS LOOP PERFORMS INPUT, IMU MODELING, AND ATTITUDE        031440
C           CALCULATIONS WHEN LOCAL-LEVEL, WANDER=AZIMUTH (LLWA)        031450
C           PLATFORM STABILIZATION IS SELECTED                          031460
C                                                                       031470
   10 DO 30 I=1,ITPNAV                                                  031480
      DO 25 J=1,ITRATT                                                  031490
   11 CALL INPEC                                                        031500
      IF (ISTOP .EQ. 10) GO TO 505                                      031510
      IF (TIME .GT. STOP) GO TO 520                                     031520
      CALL LLINIG                                                       031530
      IF (TIME .NE. TPREV .OR. ISTOP .NE. 0) GO TO 20                   031540
      DO 19 K=1,3                                                       031550
   19 SFSTP(K)=SFST(K)                                                  031560
      GO TO 11                                                          031570
   20 TPREV=TIME                                                        031580
   25 CALL GMINIG                                                       031590
      CALL LLATUD                                                       031600
      CALL LLATT                                                        031610
      IF (I .EQ. ITPNAV) CALL INPNAV                                    031620
      CALL ATUDC                                                        031630
      IF (MOD(I,ITFFIL) .EQ. 0) CALL ATTFTL                             031640
C     FILTER THE ATTITUDE DATA IF IT IS TIME                            031650
   30 CONTINUE                                                          031660
      GO TO 400                                                         031670
C                                                                       031680
C           THIS LOOP PERFORMS INPUT, IMU MODELING, AND ATTITUDE        031690
C           CALCULATIONS WHEN SPACE STABLE PLATFORM STABILIZATION IS     031700
C           SELECTED                                                    031710
C                                                                       031720
  100 DO 130 I=1,ITPNAV                                                 031730
      DO 125 J=1,ITPATT                                                 031740
  101 CALL INPEC                                                        031750
      IF (ISTOP .EQ. 10) GO TO 505                                      031760
      IF (TIME .GT. STOP) GO TO 520                                     031770
      CALL SSINTG                                                       031780
      IF (TIME .NE. TPREV .OR. ISTOP .NE. 0) GO TO 120                  031790
      DO 119 K=1,3                                                      031800
```

```
                119 SFSTP(K)=SFST(K)                                              001810
                    GO TO 101                                                     001820
                120 TPREV=TIME                                                    001830
            125 CALL CNTNTG                                                       001840
                    CALL SSATUD                                                   001850
                    IF (I .EQ. ITRNAV) CALL SSTERM                                001860
                    IF (T .EQ. ITRNAV) CALL INRNAV                                001870
                    CALL SSATT                                                    001880
            130     CALL ATUDF                                                    001890
                    IF (MOD(I,ITRFIL) .EQ. 0) CALL ATTFIL                         001900
                C   FILTER THE ATTITUDE DATA IF IT IS TIME                        001910
                130 CONTINUE                                                      001920
                    GO TO 400                                                     001930
            135 C                                                                 001940
                C           THIS LOOP PERFORMS INPUT, IMU MODELING, ATTITUDE, AND 001950
                C           VELOCITY SUMMING CALCULATIONS WHEN STRAP-DOWN IMU     001960
                C           STABILIZATION IS SELECTED                             001970
                C                                                                 001980
            140     DO 230 I=1,ITRNAV                                             001990
                    DO 225 J=1,ITRATT                                             002000
                201 CALL TIMEC                                                    002010
                    IF (ISTOP .EQ. 10) GO TO 505                                  002020
                    IF (TIME .GT. STOP) GO TO 520                                 002030
            145     CALL SDINTG                                                   002040
                    IF (TIME .NE. TPREV .OR. ISTOP .NE. 0) GO TO 220              002050
                    DO 210 K=1,3                                                  002060
                219 SFSTP(K)=SFST(K)                                              002070
                    GO TO 201                                                     002080
            150     220 TPREV=TIME                                                002090
                225 CALL CNTNTG                                                   002100
                    CALL SDATUD                                                   002110
                    CALL HSINTG                                                   002120
                    IF (I .EQ. ITRNAV) CALL HSINTP                                002130
            155     IF (I .EQ. ITRNAV) CALL INRNAV                                002140
                    CALL ATUDF                                                    002150
                    IF (MOD(I,ITRFIL) .EQ. 0) CALL ATTFIL                         002160
                C   FILTER THE ATTITUDE DATA IF IT IS TIME                        002170
                230 CONTINUE                                                      002180
            160 C                                                                 002190
                C           THIS PATH IS COMMON TO ALL CONFIGURATIONS -- PERFORMS 002200
                C           CONTROL AND OUTPUT FUNCTIONS                          002210
                C                                                                 002220
                400 CONTINUE                                                      002230
            165     420 IF (TIME .LT. PTIME .AND. TIME .LT. PLTIME) GO TO 500     002240
                    CALL OUTUNI                                                   002250
                    IF (TIME .LT. PTIME) GO TO 440                                002260
                    CALL PRINTR                                                   002270
                    PTIME = TIME + PRNT                                           002280
            170     IF (TIME .LT. PLTIME) GO TO 500                               002290
                440 CALL PLTAPE                                                   002300
                    PLTIME = TIME + PLOTIN                                        002310
                500 IF (ISTOP .LT. IEPLTM) GO TO 1                                002320
                505 WRITE(6,510) ISTOP,IEPLTM                                     002330
            175 510 FORMAT (/2X,"***** SIMULATION TERMINATED* ERROR SEVERITY OF "  002340
                  1       ,I2,"* ERROR LIMIT IS ",I2)                             002350
                    STOP                                                          002360
                520 WRITE(6,521) TIME,STOP                                        002370
```

```
                521 FORMAT (/2X,"***** PRESENT TRAJECTORY TIME OF ",G14.8,          002780
  230           1       ". EXCEEDS REQUESTED STOP TIME OF ",G14.8,                  002790
                2       "; SIMULATION TERMINATED")                                  002800
                      STOP                                                          002810
                      END                                                           002820
```

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

CARD NR.	SEVERITY	DETAILS	DIAGNOSIS OF PROBLEM
125	I		AN IF STATEMENT MAY BE MORE EFFICIENT THAN A 2 OR 3 BRANCH COMPUTED GO TO STATEMENT.
133	I		AN IF STATEMENT MAY BE MORE EFFICIENT THAN A 2 OR 3 BRANCH COMPUTED GO TO STATEMENT.

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

12256 NUMSIM

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	1217	ALFA0	REAL		PROTECT
7	ALF9T	REAL		TRAJIN	75	ALPHA	REAL		NAV
1222	ALTO	REAL		PROTECT	0	AQUANT	REAL		INPUTS
100	APESID	REAL	ARRAY	INVDAT	0	ATNPTH	INTEGER		ATNPTH
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALF9T	REAL		TRAJIN	22	CLAT9T	REAL		TRAJIN
13541	CLOCK	REAL			0	COSPTH	INTEGER		COSPTH
10	CV01	REAL		INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL		INPUTS	165	C2P99	REAL	ARRAY	NAV
0	C2P92P	REAL	ARRAY	NAV	154	C9910	REAL	ARRAY	NAV
177	C095	REAL	ARRAY	NAV	45	C1090	REAL	ARRAY	INVDAT
5	C1092P	REAL	ARRAY	INVDAT	20	C2P95	REAL	ARRAY	INVDAT
67	C2P95T	REAL	ARRAY	INVDAT	71	C3MTS	REAL	ARRAY	INVDAT
22	C9PHO	REAL	ARRAY	NAV	54	DALF	REAL		OUTPUT
153	DELH	REAL		NAV	110	DELT	REAL		NAV
127	DELTA	REAL		NAV	15	DELTS	REAL		TRAJIN
47	DETA	REAL	ARRAY	OUTPUT	43	DH	REAL		OUTPUT
62	DLAT	REAL		OUTPUT	53	DLONG	REAL		OUTPUT
66	DPSMAX	REAL		INPUTS	3	DTO	REAL	ARRAY	PROTECT
44	DV	REAL	ARRAY	OUTPUT	219	DV592P	REAL	ARRAY	NAV
3	DV93	REAL	ARRAY	INVDAT	14	DV92P	REAL	ARRAY	NAV
4	EE	REAL		UNIVSL	6	EE2P2	REAL		UNIVSL
62	ERROR	REAL	ARRAY	PROTECT	5	ESQ	REAL		UNIVSL
101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	INVDAT
5	ETA9T	REAL	ARRAY	TRAJIN	1	EXPOL	INTEGER		PRECIS
112	FILATT	REAL	ARRAY	NAV	0	FRACTL	INTEGER		PRECIS
225	GATNS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HP	REAL		TRAJIN
144	HEAD	REAL	ARRAY	PROTECT	225	HMAX	REAL	ARRAY	PROTECT
310	HMIN	REAL	ARRAY	PROTECT	1	HPI	REAL		UNIVSL
15	HSOINC	REAL		INPUTS	14	HSOTTM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	13542	I	INTEGER		
7	ICHGYL	INTEGER		CONTOL	10	ICHGYP	INTEGER		CONTOL

VARIABLES SN TYPE RELOCATION

22	IERLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	23	INCOR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPNLP	INTEGER		INPUTS
55	IPAGE	INTEGER		OUTPUT	23	IPC	INTEGER	ARRAY	INPUTS
56	IPLIM	INTEGER		OUTPUT	1225	IPLOT	INTEGER		PROFGE
57	IPPINT	INTEGER		OUTPUT	1223	IPPNT	INTEGER		PROFGE
1226	IPROD	INTEGER		PROFGE	12.4	IPITE	INTEGER		PROFGE
6	ISTOP	INTEGER		CONTRL	0	ITITLE	INTEGER	ARRAY	OUTPUT
17	ITPATT	INTEGER		INPUTS	67	ITREIL	INTEGER		INPUTS
16	ITPNAV	INTEGER		INPUTS	13563	J	INTEGER		
13564	K	INTEGER			105	LAT	REAL		NAV
1220	LATD	REAL		PROFGE	1	LATGT	REAL		TRAJIN
123C	LLMECH	INTEGER		PROFGE	106	LONG	REAL		NAV
20	LONGD	REAL		TRAJIN	2	LONGGT	REAL		TRAJIN
1221	LOND	REAL		PROFGE	772	MODE	INTEGER	ARRAY	PROFGE
454	MPATH	INTEGER	ARRAY	PROFGE	1227	NSTGT	INTEGER		PROFGE
31	OALF	REAL		OUTPUT	26	OALFGT	REAL		OUTPUT
213	OBX	REAL		NAV	214	OBY	REAL		NAV
215	OBZ	REAL		NAV	36	OBTA	REAL	ARRAY	OUTPUT
32	OBTAGT	REAL	ARRAY	OUTPUT	222	OFILTR	REAL	ARRAY	NAV
176	OHB	REAL		NAV	27	OLAT	REAL		OUTPUT
24	OLATGT	REAL		OUTPUT	33	OLONG	REAL		OUTPUT
25	OLONGT	REAL		OUTPUT	0	OTIME	REAL		CONTRL
142	OV02P	REAL	ARRAY	NAV	536	PACC	REAL	ARRAY	PROFGE
1215	PHEADD	REAL		PROFGE	8	PI	REAL		UNIVSL
620	PITCH	REAL	ARRAY	PROFGE	5	PLOTIM	REAL		INPUTS
2	PLTIME	REAL		CONTRL	1216	PPITCH	REAL		PROFGE
6	PPUT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	13	PADDER	REAL		UNVRSL
9	RESID	REAL	ARRAY	IMUDAT	11	RESQ	REAL		UNVRSL
702	RESTAR	INTEGER	ARRAY	PROFGE	17	RHO	REAL	ARRAY	NAV
1212	ROLRAT	REAL		PROFGE	3	ROUND	INTEGER		VPATH
3	RPD	REAL		UNVRSL	66	RSMAX	REAL		INPUTS
3	RSTIME	REAL		CONTRL	7	RSTRI	REAL		INPUTS
2	RX	REAL		UNVRSL	76	SALF	REAL		NAV
27	SALFGT	REAL		TRAJIN	764	SEGLNT	REAL	ARRAY	PROFGE
13	SFGT	REAL	ARRAY	TRAJIN	15	SFGTP	REAL	ARRAY	IMUDAT
1	SINPTH	INTEGER		SINPTH	31	SLATGT	REAL		TRAJIN
0	SORPTH	INTEGER		SORPTH	62	SOX0	REAL		INPUTS
63	SOY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	1146	TACC	REAL	ARRAY	PROFGE
53	THTCOP	REAL	ARRAY	NAV	56	THTERT	REAL	ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
17	TIMED	REAL		TRAJIN	13543	TODAY	REAL		
13	TOLJPK	REAL		INPUTS	4	TPREV	REAL		CONTRL
1	TOUANT	REAL		INPUTS	42	TRESID	REAL	ARRAY	IMUDAT
1213	TSTART	REAL		PROFGE	1130	TYPN	INTEGER	ARRAY	PROFGE
104	V0MP	REAL		NAV	2	VQUANT	REAL		INPUTS
1214	VTD	REAL		PROFGE	10	V9T	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
40	V92T	REAL	ARRAY	OUTPUT	7	WERT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	65	WXV	REAL	ARRAY	NAV
135	XCALF	REAL		NAV	152	XH	REAL		NAV
134	XCALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV02P	REAL	ARRAY	NAV	136	XX02P	REAL	ARRAY	NAV

PROGRAM NUMSIM 74/76 OPT=0 TRACE FTN 4.5+0446 85/06/26 17.24.46 PAGE 7

FILE NAMES MODE

0	INPUT		2841	OUTPUT	6143	TAPE2#	17266
0	TAPE5	SIX	6107	TAPE6	FMT		

EXTERNALS TYPE ARGS

ATTFIL	0	ETYPE	0
CMINIG	0	KGINIG	0
MCINIT	0	INPFC	1
INPNAM	0	LLATT	0
LLATUT	1	LLINIT	0
LLINIG	0	OUTUNI	1
PLTAPE	0	PRINTR	1
SDATUC	0	SDINIT	1
SDINIC	0	SDATT	1
SDATUC	0	SSINIT	1
SSINIG	0	SSTERM	0

INLINE FUNCTIONS TYPE ARGS

MOD	INTEGER	2	INTEIN

NAMELISTS

SIMPAR

STATEMENT LABELS

12377	1		12287	5		FMT	12427	10	
12411	11		6	19			12457	20	
2	25		6	31			12456	100	
12468	101		6	119			12501	170	
2	125		6	130			12543	200	
12542	201		6	219			12563	220	
3	225		3	235			12617	400	
12602	420		12616	440			12621	500	
12634	515		13503	510	FMT		12637	520	
13522	521	FMT	13467	600	FMT		12665	601	FMT
13622	604	FMT	13375	635	FMT		13351	606	FMT
13251	607	FMT	13136	630	FMT		13063	609	FMT
12771	991		12773	992			12775	993	
13215	9010	FMT							

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES		
12374		*	I	77 77	328	EXT REFS		
12410	30	*	I	130 157	468	EXT REFS	EXITS	NOT INNER
12411	25	*	J	140 151	272	EXT REFS	EXITS	NOT INNER
12625	19		K	146 147	43	INSTACK		
12457	130	*	I	164 183	510	EXT REFS	EXITS	NOT INNER
12460	125	*	J	165 175	278	EXT REFS	EXITS	NOT INNER
12474	110		K	171 172	60	INSTACK		
12531	230	*	I	130 269	519	EXT REFS	EXITS	NOT INNER
12532	225	*	J	191 201	279	EXT REFS	EXITS	NOT INNER
12565	210		K	197 198	47	INSTACK		

COMMON BLOCKS LENGTH

CONTRL	9
INPUTC	56
SMUNIT	67
WRK	182
ISTAT	48
[illegible]	10

COMMON BLOCKS	LENGTH
TRAJEN	21
SQRTH	1
SINPTH	1
COSPTH	1
ATNPTH	1
PRECIS	2
VPRTH	1
PROFGF	665

STATISTICS

PROGRAM LENGTH	12770	703
BUFFER LENGTH	122460	5295
CM LABELED COMMON LENGTH	20518	1065

```
      BLOCK DATA
      IMPLICIT REAL(A-H),REAL(L-Z)
C
C
C
      COMMON /CONTRL/ QTIME,    PTIME,    PLTIME,   RSTIME,
     1    IPREV,    INIT,     ISTOP,    ICMCYL,   ICMCYP
      COMMON /IMUCAT/ RESID(3), DVBP(3),  CIASP(4), WT(3),
     1    SFRTP(3),  C2P96(3,3), C9MIS(3,3), IPRSID(3), C1098(3,3),
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)
      COMMON /INPUTS/ AQUANT,   IQUANT,   VQUANT,   STAPT,
     1    STOP,     PLOTIM,   PRNT,     PSTPT,    CV01,
     2    CV02,     CV04,     TOLPOS,   HSOTIM,   HSCINC,
     2    ITRNAV,   ITRATT,   INCIC,    IMUTYP,   IERLIM,
     3    IPC(30),  IOPULP,   SSX1,     SSY1,     SSZ1,
     4    RSMAX,    DRSMAX,   ITREIL
      COMMON /NAV/  C0P92P(3,3),V92P(3),  DV92P(3),  RHO(3),
     1    C9RHO(3,3), AI(3,3),  B(3,3),   THTE2I(3), THITRO(3),
     2    THTCOR(3), WXV(3),    G92P(3),  H,        ALPHA,
     3    SALF,     CALF,     DELT,     CIA(3),   V91P,
     4    LAT,      LONG,     V92(3),   FILATT(3,3), DELTA,
     5    XCALF,    XCALF,    XDP92P(3,3), WW32P(3),  DW32P(3),
     6    S2PHI,    XS2PHI,   XV32P(3),  XH,       DELH,
     7    C0910(3,3), C0P90(3,3), DHO,    C095(3,3),  DV592P(3),
     8    DBX ,     DY ,      DBZ ,     B2P95(4),  DELTP(3),
     9    GAINS(3,10), IGAINP(3)
      COMMON /OUTPUT/ ITITLE(20), OLAT9T,   OLON9T,   DALE9T,
     1    OLAT,     OLONG,    DALF,     DETART(3), DETA(3),
     2    V92T(3),  DH,       DV(3),    DETA(3),   OLAT,
     3    DLONG,    DALF,
     4    IPAGE,    IPLIM,    IPRINT
      COMMON /PGRAV/  GLHSC,    GPCNT,    GPS2,     GPS4,
     1    GPH,      GPH2,     GPHS2
      COMMON /IMAJIN/ TIME,     LAT9T,    LONG9T,   ALF9T,
     1    HT,       CIA9T(3),  V9T(3),   SF9T(3),  DELTS,
     2    TIMCO,    LONGO,    SLAT9T,   CLAT9T,   SALF9T,
     3    CALF9T
      COMMON /UNVRSL/ PI,       HPI,      P2,       PPS,
     1    FF,       ESQ,      FFRDP,    WERT,     RADPER,
     2    RESQ
C
C
C     VARIABLE PRECISION BLOCKS
      COMMON /SQRPTH/SQRPTH /SINPTH/SINPTH /COSPTH/COSPTH /ATNPTH/
     1 ATNPTH /PRECTS/ FRACTL,EXPOL /VPPTH/ ROUND
      INTEGER SQRPTH,SINPTH,COSPTH,ATNPTH,FRACTL,EXPOL,ROUND
      DIMENSION P DAT(21)
      DIMENSION DEFIMU(67)
      DIMENSION NAVCOM(140)
      DIMENSION OUTDAT(25)
C
      EQUIVALENCE (DATIMU(1),RESID(1))
      EQUIVALENCE (NAVCOM(1),C0P92P(1,1))
      EQUIVALENCE (P2DAT(1),TIME)
      EQUIVALENCE (OUTDAT(1),OLAT9T)
C
C
```

```
                      C  CONTROL DATA                                                    003000
                      C                                                                  003010
     60               C                                                                  003020
                           DATA QTIME/-1.E6      /,PTIME    /-1.E6    /,PLTIME  /1.E6   /003030
                        1  ,RSTIME   /1.E6      /,INIT     /0        /,ICMCYL  /1       /003040
                        1  ,ISTOP   /0         /,ICMCYP   /1        /,TPRCV/1.E6/      003050
                      C                                                                  003060
     65               C                                                                  003070
                      C  IMU DATA                                                        003080
                      C                                                                  003090
                      C                                                                  003100
                           DATA DATIMU/25*0.,1.0,3*0.,1.0,3*0.,1.0,33*0./                003110
     70               C                                                                  003120
                      C                                                                  003130
                      C  INPUT DATA                                                      003140
                      C                                                                  003150
                      C                                                                  003160
     75                    DATA AQUANT/0.E0      /,TQUANT   /0.E0     /,VQUANT  /0.E0   /003170
                        1  ,START    /-1.E6      /,STOP     /1.E6     /,PLOTTM  /1.E     /003180
                        1  ,PRNT    /1.E5       /,RSTRT    /1.E6     /,CVD1    /6.E-2  /003190
                        2  ,CVD2    /1.62E-3    /,CVD3     /1.62E-5  /                 003200
                        2  ,ITRNAV  /0          /,ITRATT   /1        /,INCOR   /100    /003210
     80                 3  ,IELIM   /5          /,TRC                /3*0  /           003220
                        3  ,RSMAX/2.E-3/,    DRSMAX/.02E0/,     ITRFIL/32/             003230
                        4  ,IMUTYP  /1          /,  IGPNLP    /0     /,                003240
                        5  IDLJRK,HSOTIM,HSOINC,SSX0,SSY0,SSZ0/3*1.E6,3*0./            003250
                      C                                                                  003260
     85               C                                                                  003270
                      C  NAVIGATION EQUATION DATA                                        003280
                      C                                                                  003290
                      C                                                                  003300
                           DATA NAVCOM/125*0.E0,1.E0,23*0.E0/                            003310
     90                    DATA AGAINP/1.,1.,1./                                        003320
                           DATA GAINS/1.0E0,0.0E0,0.0E0,  .999997E0,32.05727E0,1.6575205E0,003330
                        1  .999997E0,47.852980E0,1019.2152E0,   .956899E0,34.291964E0,  003340
                        2  525.95031E0,   .795309E0,16.511266E0,147.15806E0,           003350
                        3  .673798E0,9.733765E0,67.194433E0,   .543539E0,5.4079995E0,  003360
                        3  21.417501E0,   .466173E0,3.6031185E0,                       003370
     95                 4  10.93342E0,   .377862E0,2.131194E0,4.53617450,               003380
                        5  .332872E0,1.540656E0,2.6141235E0  /                         003390
                      C                                                                  003400
                      C                                                                  003410
    100               C  OUTPUT DATA                                                     003420
                      C                                                                  003430
                      C                                                                  003440
                           DATA TITLE/20*4H     /                                        003450
                           DATA OUTDAT/25*0.0E0/                                         003460
    105                    DATA IPAGE /1        /,IPLIM    /47       /,IPRINT  /5/     003470
                      C                                                                  003480
                      C                                                                  003490
                      C  GRAVITY MODEL DATA                                              003500
                      C                                                                  003510
    110               C                                                                  003520
                           DATA GLNGC /1.63E-8       /,GMOMT    /3.98773957E0    /     003530
                        1  ,GR52    /0.16939181E0   /,GR54     /7.52810E-4      /     003540
                        2  ,GPH     /0.6227E-8      /,GM2      /6.8512E-15      /     003550
                        3  ,GRH32   /6.4087E-10     /                                 003560
```

```
      C                                                                 003570
      C                                                                 003580
      C  UNIVERSAL CONSTANTS                                            003590
      C                                                                 003600
      C                                                                 003610
      DATA PI /3.1415926536E3 /,HPI     /1.57079632680  /               003620
     1     ,PO      /2.092564CE7   /,PSO      /4.7784263545-9/         003630
     2     ,EE      /3.352779454E-3/,ESQ      /6.69431777AE-3/         003640
     3     ,EERPO   /1.61227508E-10/,WERT     /7.2921151467E-5/        003650
     4     ,RADDER /3.2453292519943E-2/,RESQ /2.0785557125E7 /         003660
      C                                                                 003670
      C                                                                 003680
      C  TRAJECTORY INPUT DATA                                          003690
      C                                                                 003700
      C                                                                 003710
      DATA PRDAI/2150.0/                                                003720
      C                                                                 003730
      C  DEFAULT PRECISION VALUES                                       003740
      DATA SQPTH,ATNPTH,COSPTH,STNPTH/4*4/,ROUND,EXPOL,FRACTL/1,9,4R/   003750
      END                                                               003760
```

SYMBOLIC REFERENCE MAP (R=1)

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VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALEGT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
100	ARESID	REAL	ARRAY	IMUDAT	0	ATNPTH	INTEGER		ATNPTH
44	B	REAL	ARRAY	NAV	22	CALF	REAL		NAV
24	CALFGT	REAL		TRAJIN	22	CLATGT	REAL		TRAJIN
3	COSPTH	INTEGER		COSPTH	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
155	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
45	C1C90	REAL	ARRAY	IMUDAT	55	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	CAMIS	REAL	ARRAY	IMUDAT	22	C3P9C	REAL	ARRAY	NAV
64	DALF	REAL		OUTPUT	0	DATIMU	REAL	ARRAY	IMUDAT
157	DELH	REAL		NAV	100	DELT	REAL		NAV
127	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
47	DETA	REAL	ARRAY	OUTPUT	43	DH	REAL		OUTPUT
52	DLAT	REAL		OUTPUT	53	DLONG	REAL		OUTPUT
56	DPSMAX	REAL		INPUTS	46	DV	REAL	ARRAY	OUTPUT
210	DV502P	REAL	ARRAY	NAV	3	DV9P	REAL	ARRAY	IMUDAT
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNVRSL
6	EEPRC	REAL		UNVRSL	5	ESQ	REAL		UNVRSL
101	ETA	REAL	ARRAY	NAV	6	ETA2P	REAL	ARRAY	IMUDAT
5	ETAPT	REAL	ARRAY	TRAJIN	1	EXPOL	INTEGER		PRECIS
112	FILATT	REAL	ARRAY	NAV	0	FRACTL	INTEGER		PRECIS
225	GAINS	REAL	ARRAY	NAV	0	GLHSQ	REAL		PGRAV
1	GPCNT	REAL		PGRAV	4	GPH	REAL		PGRAV
6	GPHSP	REAL		PGRAV	5	GPH2	REAL		PGRAV
2	GPSQ	REAL		PGRAV	3	GPSQ	REAL		PGRAV
71	H2P	REAL	ARRAY	NAV	74	H	REAL		NAV

BLOCK DATA BLKDAT. 74/74 OPT=0 TRACE FTN 4.5+P486 05/25/76 17.24.46 PAGE 4

VARIABLES	SN	TYPE		RELOCATION					
4	HB	REAL		TRAJIN	1	HDI	REAL		UNVRSL
15	HSOTNC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	7	ICMCYL	INTEGER		CONTRL
10	ICMCYP	INTEGER		CONTRL	22	IDPLIM	INTEGER		INPUTS
253	IGAINP	INTEGER	ARRAY	NAV	21	IMDTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	5	INIT	INTEGER		CONTRL
51	IOPNLP	INTEGER		INPUTS	55	IPAGE	INTEGER		OUTPUT
23	IPC	INTEGER	ARRAY	INPUTS	55	IPLIM	INTEGER		OUTPUT
57	IPRINT	INTEGER		OUTPUT	6	ISTOP	INTEGER		CONTRL
0	ITITLE	INTEGER	ARRAY	OUTPUT	17	ITRATT	INTEGER		INPUTS
47	ITRFIL	INTEGER		INPUTS	16	ITRMAX	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LATGT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGO	REAL		TRAJIN
2	LONGGT	REAL		TRAJIN	1	NAVCOM	REAL	ARRAY	NAV
31	OALF	REAL		OUTPUT	25	OALFGT	REAL		OUTPUT
217	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	35	OETA	REAL	ARRAY	OUTPUT
32	OETAGT	REAL	ARRAY	OUTPUT	222	OFILTR	REAL	ARRAY	NAV
176	OHB	REAL		NAV	27	OLAT	REAL		OUTPUT
24	OLATGT	REAL		OUTPUT	30	OLONG	REAL		OUTPUT
25	OLONGT	REAL		OUTPUT	0	OTIME	REAL		CONTRL
24	OUTDAT	REAL	ARRAY	OUTPUT	142	OV92P	REAL	ARRAY	NAV
0	PI	REAL		UNVRSL	5	PLOTIM	REAL		INPUTS
2	PLTTME	REAL		CONTRL	0	PRDAT	REAL	ARRAY	TRAJIN
6	PONT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	13	RADPER	REAL		UNVRSL
9	RESID	REAL	ARRAY	INUDAT	11	RESQ	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	0	ROUND	INTEGER		VRBTH
1	RPO	REAL		UNVRSL	65	RSMAX	REAL		INPUTS
3	RSTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS
2	SP	REAL		UNVRSL	76	SALF	REAL		NAV
23	SALFGT	REAL		TRAJIN	13	SFGT	REAL	ARRAY	TRAJIN
15	SFGTP	REAL	ARRAY	INUDAT	0	STRPTH	INTEGER		STRPTH
21	SLATGT	REAL		TRAJIN	1	SQRPTH	INTEGER		SQRPTH
62	SSX0	REAL		INPUTS	63	SSY0	REAL		INPUTS
64	SSZ0	REAL		INPUTS	3	START	REAL		INPUTS
4	STOP	REAL		INPUTS	145	S2PHT	REAL		NAV
63	THTCOR	REAL	ARRAY	NAV	56	THTERT	REAL	ARRAY	NAV
69	THTF2P	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
17	TIMEQ	REAL		TRAJIN	13	TOLJCK	REAL		INPUTS
4	TPREV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
42	TRESID	REAL	ARRAY	INUDAT	104	V2MP	REAL		NAV
2	VQUANT	REAL		INPUTS	13	VGT	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
40	V92T	REAL	ARRAY	OUTPUT	7	WEGT	REAL		UNVRSL
12	WT	REAL	ARRAY	INUDAT	56	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHT	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XXP92P	REAL	ARRAY	NAV

COMMON BLOCKS	LENGTH
CONTRL	9
INUDAT	67
INPUTS	56
NAV	192
OUTPUT	48
PCOAV	7

COMMON BLOCKS LENGTH

TRAJTH	21
UNVCOL	10
SQRTH	1
SINPTH	1
COSPTH	1
ATNPTH	1
PCFCTS	2
VPPTH	1

STATISTICS

	CM	CP
PROGRAM LENGTH		
CM LABELED COMMON LENGTH	6278	407

```
      SUBROUTINE INREC                                                  003770
C                                                                       003780
C     INREC -- TRAJECTORY INPUT ROUTINE                                 003790
C                                                                       003800
      IMPLICIT REAL(A-H),REAL(L-Z)                                      003810
      COMMON /CONIPL/ DTIME,      PTIME,      PLTIME,     PSTIME,       003820
     1     TPREV,     INIT,       ISTOP,      ICMCYL,     ICMCYP        003830
      COMMON /INPLTS/ AQUANT,     TQUANT,     VQUANT,     STAQT,        003840
     1     STOP,      PLOTIM,     PRNT,       PSTAT,      CVD1,         003850
     2     CVD2,      CVD3,       IOLJOK,     HSCTIM,     HSCINC,       003860
     2     ITPMAX,    ITPATT,     INCOR,      TMUTYP,     TERLIM,       003870
     3     IOC(30),   IOPNLP,     SSX0,       SSY0,       SSZ0,         003880
     4     PSMAX,     DPSMAX,     ITRETL                                003890
      COMMON /NAV/    CBP92P(3,3),V92P(3),    DV92P(3),   PR0(3),       003900
     1     C9PH0(3,3), A(3,3),     B(3,3),     INTSPT(3),  INTIP0(3),    003910
     2     IWIC03(3),  HXV(3),     G32P(3),    H,          ALPHA,        003920
     3     SALF,       CALF,       DELT,       ETA(3),     VOHP,         003930
     4     LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,        003940
     5     XSALF,      YCALF,      X0P92P(3,3),HV92P(3),   DV92P(3),     003950
     6     S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,         003960
     7     C0910(3,3), C0P90(3,3), DH3,        C095(3,3),  DV502P(3),    003970
     8     DDX ,       DDY ,       DDZ ,       D2P95(4),   DFILTS(3),    003980
     9     GAINS(3,10),IGAINP(3)                                         003990
      COMMON /TRAJIN/ TIME,       LAT9T,      LONG9T,     ALF9T,        004000
     1     H9,        ETA9T(3),   V9T(3),     SF9T(3),    DELTS,        004010
     2     TIME0,     LONG9,      SLAT9T,     CLAT9T,     SALF9T,       004020
     3     CALF9T                                                        004030
C                                                                       004040
      DIMENSION PROAT(14),PRO(14)                                       004050
      EQUIVALENCE (PRO,TIM)                                             004060
      EQUIVALENCE (PROAT,TIME)                                          004070
C                                                                       004080
C                                                                       004090
      IF (INIT .NE. 0) GO TO 200                                        004100
C                                                                       004110
C          INITIALIZATION PATH                                          004120
C                                                                       004130
    4 READ(20) (PROAT(I),I=1,14)                                        004140
      IF (EOF(20) .NE. 0) GO TO 300                                     004150
      IF (TIME .LT. STAQT) GO TO 4                                      004160
C                                                                       004170
C          READ SECOND RECORD TO GET TRAJECTORY SAMPLE PERIOD           004180
C                                                                       004190
      READ(20) (PRO(I),I=1,14)                                          004200
      IF (EOF(20) .NE. 0) GO TO 300                                     004210
      DELTS = TIM - TIME                                                004220
      TIMP1=1./DELTS                                                    004230
      DELTS=1./TIMP1                                                    004240
C                                                                       004250
C          ENSURE ATTITUDE CYCLE PERIOD IS MULTIPLE OF TRAJECTORY       004260
C          SAMPLE PERIOD                                                004270
C                                                                       004280
      IF (ITPATT .LE. 0) GO TO 60                                       004290
      DELTA = 1./ITPATT                                                 004300
      ITPATT = DELTA/DELTS                                              004310
      IF (ITPATT .LT. 1) GO TO 5                                        004320
      IF (ITPATT*DELTS .EQ. DELTA) GO TO 71                             004330
```

```
                50  WRITE(6,55) DELTA,DELTS                                   004340
               55 FORMAT (/2X,"***** TIMING ERROR:  DESIRED ATUD PERIOD IS ",G16.10,004350
     60          1       " SEC:  TRAJECTORY SAMPLE PERIOD IS ",G16.10/,9X,     004360
                 2       "MUST BE EVEN MULTIPLES.       ERROR LEVEL 5"/)       004370
                 ISTOP = 5                                                     004380
                60 DELTA = DELTS                                               004390
                 ITRATT = 1                                                    004400
     65        C                                                               004410
               C          ENSURE NAVIGATION CYCLE PERIOD IS MULTIPLE OF ATTITUDE 004420
               C          CYCLE PERIOD                                        004430
               C                                                              004440
               70    IF (ITRNAV .LE. 0) GO TO 30                              004450
     70          DELT = 1./ITRNAV                                             004460
                 ITRNAV = DELT/DELTA                                          004470
                 IF (ITRNAV .LT. 1) GO TO 20                                  004480
                 IF (ITRNAV*DELTA .EQ. DELT) GO TO 40                         004490
                20 WRITE(6,25) DELT,DELTA                                     004500
     75          25 FORMAT (/2X,"***** TIMING ERROR:  DESIRED NAV PERIOD IS ",G16.10, 004510
                   1       " SEC:  DESIRED ATTITUDE PERIOD IS ",G16.10/,9X,    004520
                   2       "MUST BE EVEN MULTIPLES        ERROR LEVEL 5"/)     004530
                 ISTOP = 5                                                    004540
                30 DELT = DELTA                                               004550
     80          ITRNAV = 1                                                   004560
                40 ITMP1 = 1./DELTS                                           004570
                 ITMP2 = 1./DELTA                                             004580
                 ITMP3 = 1./DELT                                              004590
                 ITMP4 = ITRNAV*ITRATT                                        004600
     85          IF (IPC(25) .EQ. 0) GO TO 430                                004610
                 IF (ITRFIL .LT. 0) GO TO 400                                 004620
                 TEMP=1./ITRFIL                                               004630
                 ITRFIL=TEMP/DELTA                                            004640
                 IF (ITRFIL .LT. 1) GO TO 420                                 004650
     90          IF (ITRFIL*DELTA .EQ. TEMP .AND. MOD(ITRNAV,ITRFIL) .EQ. 0)  004660
                1   GO TO 430                                                 004670
               420 WRITE(6,421)                                               004680
               421 FORMAT (/2X,"***** TIMING ERROR: EITHER ITRFIL IS NOT AN "  004690
                  1 ,"INTEGRAL NUMBER OF ATTITUDE CYCLES, OR",/25X,"ITRNAV ", 004700
     95           2 "IS NOT AN INTEGRAL MULTIPLE OF ITRATT    ERROR LEVEL 5"//) 004710
                 ISTOP=5                                                      004720
                400 TEMP=DELTA                                                004730
                 ITRFIL=1                                                     004740
               430 CONTINUE                                                   004750
    100          WRITE(6,110) ITMP1,DELTS                                     004760
                 WRITE(6,115) ITMP2,DELTA,ITRATT                              004770
                 WRITE(6,120) ITMP3,DELT,ITMP4,ITRNAV                         004780
                 IF (IPC(25) .EQ. 0) GO TO 251                                004790
                 ITMP5=1./TEMP                                                004800
    105          WRITE(6,567) ITMP5,TEMP                                      004810
               567 FORMAT("   FILTER CYCLE RATE",7X,I3," CPS  FILTER PERIOD"  004820
                  1 ,6X,F11.4," SEC")                                         004830
                 GO TO 250                                                    004840
                110 FORMAT (2X,"TIMING PARAMETERS"/,3X,"TRAJECTORY SAMPLE RATE  ", 004850
    110          1       I3," CPS  TRAJECTORY PERIOD  ",F11.9," SEC")         004860
               115 FORMAT (3X,"ATTITUDE CYCLE RATE     ",I3," CPS  ",          004870
                  1       "ATTITUDE PERIOD    ",F11.9," SEC  TRAJ SAMP/ATT CYCLE ", 004880
                  2       I3)                                                 004890
               120 FORMAT (3X,"NAV CYCLE RATE",10X,I3," CPS  NAV PERIOD",9X,F11.9," 004900
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      SUBROUTINE INPEC      74/74   OPT=0 TRACE                    FTN 4.5+P466   05/25/76  17.24.46        PAGE  3

  115                 1        " SEC  TRAJ SAMP/NAV CYCLE ",I3," ATT CYCLE/",                  004910
                      2       "NAV CYCLE ",I3)                                                 004920
                    C                                                                          004930
                    C                                                                          004940
                    C     NORMAL PATH                                                          004950
  120               C                                                                          004960
                      200 CONTINUE                                                             004970
                      IF (INIT .NE. 1) GO TO 245                                               004980
                      DO 240 I=1,14                                                            004990
                      240 PREDAT(I) = P20(I)                                                   005000
  125                 INIT = 2                                                                 005010
                      GO TO 250                                                                005020
                      245 READ(20) (PREDAT(I),I=1,14)                                          005030
                      IF (EOF(20) .NE. 0) GO TO 300                                            005040
                      250 SLAT9T= SIN(LAT9T)                                                   005050
  130                 CLAT9T = COS(LAT9T)                                                      005060
                      SALF9T= SIN(ALF9T)                                                       005070
                      CALF9T= COS(ALF9T)                                                       005080
                      RETURN                                                                   005090
                    C                                                                          005100
  135               C     TAPE ERROR HANDLING                                                  005110
                    C                                                                          005120
                      300 ISTOP = 10                                                           005130
                      WRITE (6,301)                                                            005140
                      301 FORMAT (/2X,"***** INPUT TAPE READ ERROR: ERROR LEVEL 10"/)          005150
  140                 RETURN                                                                   005160
                      END                                                                      005170
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1	INPEC

VARIABLES

SN	TYPE		RELOCATION	SN		TYPE		RELOCATION
33	A	REAL	ARRAY NAV	3	ALF9T	REAL		TRAJIN
75	ALPHA	REAL	NAV	0	AQUANT	REAL		INPUTS
44	B	REAL	ARRAY NAV	77	CALF	REAL		NAV
24	CALF9T	REAL	TRAJIN	22	CLAT9T	REAL		TRAJIN
10	CV01	REAL	INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL	INPUTS	165	C0P99	REAL	ARRAY	NAV
8	C0P92P	REAL	ARRAY NAV	154	C0910	REAL	ARRAY	NAV
177	C095	REAL	ARRAY NAV	23	C9PHC	REAL	ARRAY	NAV
153	DEL	REAL	NAV	190	DELT	REAL		NAV
123	DELTA	REAL	NAV	16	DELTS	REAL		TRAJIN
66	DESMAX	REAL	INPUTS	213	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY NAV	191	ETA	REAL	ARRAY	NAV
6	ETA9T	REAL	ARRAY TRAJIN	212	ETLATT	REAL	ARRAY	NAV
226	GAINS	REAL	ARRAY NAV	71	G0P	REAL	ARRAY	NAV
74	H	REAL	NAV	4	H0	REAL		TRAJIN
15	HCOTUC	REAL	INPUTS	14	HCOTTH	REAL		INPUTS
137	HV92P	REAL	ARRAY NAV	446	I	INTEGER		
7	ICMCYL	INTEGER	CONTRL	13	ICMCYP	INTEGER		CONTRL
27	IFLTM	INTEGER	INPUTS	245	IGAIAP	INTEGER	ARRAY	NAV

VARIABLES SN TYPE RELOCATION

21	IMUTYP	INTEGER		INPUTS	20	INCOP	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
447	ITMP1	INTEGER			450	ITMP2	INTEGER		
451	ITMP3	INTEGER			452	ITMP4	INTEGER		
454	ITMP5	INTEGER			17	ITPATT	INTEGER		INPUTS
67	ITPFIL	INTEGER		INPUTS	16	ITPNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LATPT	REAL		TRAJIN
106	LONG	REAL		NAV	21	LONGP	REAL		TRAJIN
2	LONGPT	REAL		TRAJIN	213	OOX	REAL		NAV
214	OOY	REAL		NAV	215	OOZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OWP	REAL		NAV
0	OTIME	REAL		CONTRL	142	OWRP	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
455	PRP	REAL	ARRAY		3	PRPAT	REAL	ARRAY	TRAJIN
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	QPP95	REAL	ARRAY	NAV	17	PHC	REAL	ARRAY	NAV
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
7	RSTRT	REAL		INPUTS	75	SALE	REAL		NAV
23	SALPPT	REAL		TRAJIN	13	SPAT	REAL	ARRAY	TRAJIN
21	SLATPT	REAL		TRAJIN	62	SSXO	REAL		INPUTS
63	SSYO	REAL		INPUTS	64	SSZO	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	453	TMP	REAL		
61	THTCOR	REAL	ARRAY	NAV	56	THTEPT	REAL	ARRAY	NAV
60	THTTRO	REAL	ARRAY	NAV	455	TTH	REAL		
0	TIME	REAL		TRAJIN	17	TTMEO	REAL		TRAJIN
13	TOLJPK	REAL		INPUTS	4	TPPEV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	194	VPHP	REAL		NAV
2	VQUANT	REAL		INPUTS	10	VPT	REAL	ARRAY	TRAJIN
107	V42	REAL	ARRAY	NAV	11	VRCP	REAL	ARRAY	NAV
66	WXV	REAL	ARRAY	NAV	125	XCALE	REAL		NAV
152	XH	REAL		NAV	124	XSALE	REAL		NAV
146	XS2PHI	REAL		NAV	147	XVRCP	REAL	ARRAY	NAV
126	XQPRCP	REAL	ARRAY	NAV					

FILE NAMES MODE

TAPE20 UNFMT TAPE6 FMT

EXTERNALS TYPE ARGS

COS	REAL	1	LIBRARY	EOF	REAL	1	
SIN	REAL	1	LIBRARY				

INLINE FUNCTIONS TYPE ARGS

400 INTEGER 2 INTRIN

STATEMENT LABELS

3	4		64	20			252	25	FMT
67	30		72	40			42	50	
224	55	FMT	45	60			50	70	
367	110	FMT	373	115	FMT		407	120	FMT
146	200		0	240			157	265	
164	250		175	400			434	401	FMT
127	400		124	420			276	421	FMT
122	470		347	567	FMT				

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
151	240	I	123 124	48	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
INPUTS	56
NAV	192
TRAJIN	21

STATISTICS

PROGRAM LENGTH	4734	315
CM LABELED COMMON LENGTH	4143	269

```
      SUBROUTINE OUTUNI                                                 OUT 10
C                                                                       OUT 20
C     CONVERTS TRAJECTORY AND SIMULATOR DATA FROM INTERNAL UNITS        OUT 30
C     TO EXTERNAL UNITS (DEGREES, FEET, SECONDS).                       OUT 40
C                                                                       OUT 50
      IMPLICIT REAL(A-H,L-Z)                                            OUT 60
      COMMON /NAV/     COR32P(3,3),V92P(3),     OV92P(3),     R50(3),    OUT 70
     1     C92HO(3,3),A(3,3),     B(3,3),     THTE2T(3),    THTTDO(3),  OUT 80
     2     THTCO2(3),  WXV(3),     C32P(3),    H,            ALPHA,      OUT 90
     3     SALE,       CALE,       DELT,       ETA(3),       VCMF,       OUT100
     4     LAT,        LONG,       V32(3),     FILATT(3,3),  DELTA,      OUT110
     5     XSALE,      XCALE,      X8P92P(3,3),XV92P(3),     OV92P(3),   OUT120
     6     S2PHI,      XS2PHI,     XV92P(3),   XH,           DELH,       OUT130
     7     C0910(3,3), C2P99(3,3), OH3,        C499(3,3),    OV592P(3),  OUT140
     8     OOX ,       OOY ,       OOZ ,       O2P95(4),     DELTR(3),   OUT150
     9     GAINS(3,10),IGAINR(3)                                        OUT160
      COMMON /OUTPUT/  ITITLE(20), OLAT9T,     OLON9T,     OALE9T,      OUT170
     1     OLAT,       OLONG,      OALF,       DETA9T(3),  DETA(3),    OUT180
     2     V92T(3),    OH,         OV(3),      DETA(3),    OLAT,       OUT190
     3     OLONG,      OALF,                                            OUT200
     4     IPAGE,      IPLIM,      IP2INT                               OUT210
      COMMON /UNV2SL/  PI,         HPI,        RD,         R2D,        OUT220
     1     FF,         ESQ,        FF2RD,      WERT,       RADSEC,     OUT230
     2     RCSQ                                                         OUT240
      COMMON /TRAJTN/  TIME,       LAT9T,      LONG9T,     ALF9T,      OUT250
     1     HB,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,      OUT260
     2     TIMEO,      LONGO,      SLAT9T,     CLAT9T,     SALE9T,     OUT270
     3     CALE9T                                                       OUT280
C                                                                       OUT290
C     CONVERT ANGLES TO DEGREES                                         OUT300
C                                                                       OUT310
      OLAT9T = LAT9T/RADPER                                             OUT320
      OLON9T = LONG9T/RADPER                                            OUT330
      OALE9T = ALE9T/RADPER                                             OUT340
      OLAT = LAT/RADPER                                                 OUT350
      OLONG = LONG/RADPER                                               OUT360
      OALF = ALPHA/RADPER                                               OUT370
      ETA9T(3) = ETA9T(3) - ALF9T                                       OUT380
      DO 10 I=1,3                                                       OUT390
      DETA9T(I) = ETA9T(I)/RADPER                                       OUT400
      DETA(I) = ETA(I)/RADPER                                           OUT410
   10 CONTINUE                                                          OUT420
C                                                                       OUT430
C     FIND DIFFERENCES BETWEEN TRAJECTORY AND SIMULATOR                 OUT440
C                                                                       OUT450
      V92I(1) = V9T(3)                                                  OUT460
      V92T(2) = -SALE9T*V9T(1) - CALE9T*V9T(2)                          OUT470
      V92T(3) = CALE9T*V9T(1) - SALE9T*V9T(2)                           OUT480
      OH = HB - H                                                       OUT490
      DLAT = OLAT9T - OLAT                                              OUT500
      DLONG = OLON9T - OLONG                                            OUT510
      DALF = OALE9T - OALF                                              OUT520
      DO 50 I=1,3                                                       OUT530
      OV(I) = V92T(I) - V92(I)                                          OUT540
      DETA(I) = DETA9T(I) - DETA(I)                                     OUT550
   50 CONTINUE                                                          OUT560
      RETURN                                                            OUT570
```

END 015750

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 OUTUNI

VARIABLES	SN	TYPE		RELOCATION					
83	A	REAL	ARRAY	NAV	3	ALFGT	REAL		TRAJIN
76	ALPHA	REAL		NAV	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFGT	REAL		TRAJIN
23	CLATGT	REAL		TRAJIN	165	CSPSQ	REAL	ARRAY	NAV
0	CSPSQP	REAL	ARRAY	NAV	154	CUSIG	REAL	ARRAY	NAV
177	CSQS	REAL	ARRAY	NAV	22	CSQHQ	REAL	ARRAY	NAV
54	DALF	REAL		OUTPUT	153	DELH	REAL		NAV
130	DELT	REAL		NAV	123	DELTA	REAL		NAV
16	DELTS	REAL		TRAJIN	47	DETA	REAL	ARRAY	OUTPUT
47	DH	REAL		OUTPUT	52	DLAT	REAL		OUTPUT
51	DLONG	REAL		OUTPUT	44	DV	REAL	ARRAY	OUTPUT
210	DV592P	REAL	ARRAY	NAV	14	DV12P	REAL	ARRAY	NAV
4	EE	REAL		UNVPSL	6	EESQQ	REAL		UNVPSL
5	ESQ	REAL		UNVPSL	111	ETA	REAL	ARRAY	NAV
5	ETAGT	REAL	ARRAY	TRAJIN	112	ETLATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	GSSP	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HP	REAL		TRAJIN
1	HPT	REAL		UNVPSL	137	HV2PP	REAL	ARRAY	NAV
63	I	INTEGER			263	IGAINP	INTEGER	ARRAY	NAV
55	IPAGE	INTEGER		OUTPUT	56	IPLIM	INTEGER		OUTPUT
57	IPRINT	INTEGER		OUTPUT	0	ITITLE	INTEGER	ARRAY	OUTPUT
105	LAT	REAL		NAV	1	LATGT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGQ	REAL		TRAJIN
2	LONGGT	REAL		TRAJIN	31	OALF	REAL		OUTPUT
26	OALFGT	REAL		OUTPUT	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
36	OETA	REAL	ARRAY	OUTPUT	32	OETAGT	REAL	ARRAY	OUTPUT
222	OFILTP	REAL	ARRAY	NAV	176	OHP	REAL		NAV
27	OLAT	REAL		OUTPUT	24	OLATGT	REAL		OUTPUT
30	OLONG	REAL		OUTPUT	25	OLONGT	REAL		OUTPUT
142	OV92P	REAL	ARRAY	NAV	7	PI	REAL		UNVPSL
216	Q2P95	REAL	ARRAY	NAV	10	RADDEG	REAL		UNVPSL
11	RESQ	REAL		UNVPSL	17	RHO	REAL	ARRAY	NAV
3	RRC	REAL		UNVPSL	2	RR	REAL		UNV
76	SALF	REAL		NAV	23	SALFGT	REAL		TRAJ
13	SFGT	REAL	ARRAY	TRAJIN	21	SLATGT	REAL		TRAJ
145	S2PHI	REAL		NAV	63	THTCOP	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	61	THTERQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEQ	REAL		TRAJIN
134	VCHP	REAL		NAV	10	VGT	REAL	ARRAY	TRAJIN
137	V42	REAL	ARRAY	NAV	11	VSQP	REAL	ARRAY	NAV
40	VSGT	REAL	ARRAY	OUTPUT	7	VSGT	REAL		UNVPSL
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV

SUBROUTINE OUTUNT 74/74 OPT=2 IPACS FTN 4.5+436 05/25/75 17.36.45 PAGE 3

VARIABLES SN TYPE RELOCATION
  I2F XSP*02* REAL ARRAY MAP

STATEMENT LABELS
  1 10 0 56

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
21	10	I	39 42	178	OPT
53	56	I	53 56	188	OPT

COMMON BLOCKS LENGTH
  *BLK 192
  OUTPUT 48
  UNVRSL 10
  TRAJIN 21

STATISTICS
  PROGRAM LENGTH 849 52
  SM LABELED COMMON LENGTH 5859 261

```
      SUBROUTINE PRINTP                                                 035700
C                                                                       035720
C     PRINTER OUTPUT SUBROUTINE                                         035740
C                                                                       035760
      IMPLICIT REAL(A-H,L-Z)                                            035800
      COMMON /CONTRL/ OTIME,    PTIME,    PLTIME,   PSTIME,           035820
     1     TPREV,     INIT,     ISTOP,    ICMCYL,   ICMCYP            035840
      COMMON /NAV/    C0P92P(3,3),V92P(3),  DV92P(3),  PH0(3),        035860
     1     C0PH0(3,3), A(3,3),   B(3,3),   THTERT(3), THTIRC(3),      035880
     2     THTCOR(3),  WXW(3),   S92P(3),  H,        ALPHA,           035900
     3     SALF,       CALF,     DELT,     ETA(3),   VPMF,            035920
     4     LAT,        LONG,     V92(3),   FILAT(3,3),DELTA,          035940
     5     XSALF,      YCALF,    X0P92P(3,3),HV92P(3), DV92P(3),      035960
     6     S2PHI,      XS2PHI,   XV92P(3),  XH,      DELH,            035980
     7     C0910(3,3), C0P90(3,3), OMB,     C095(3,3),  PV592P(3),   036000
     8     ODX,        ODY,      ODZ,       D2P95(4),  DELTIP(3),    036020
     9     GAINS(3,10),IGAINP(3)                                      036040
      COMMON /OUTPUT/ TITLE(20), OLATGT,   OLONGT,   OALFGT,          036060
     1     OLAT,       OLONG,    OALF,     DETAGT(3), DETA(3),      036080
     2     V92T(3),    OH,       DV(3),    DETA(3),   OLAT,         036100
     3     OLONG,      DALF,                                         036120
     4     IPAGE,      IPLIM,    IPRINT                              036140
      COMMON /TRAJIN/ TIME,     LATGT,    LONGGT,   ALFGT,          036160
     1     H1,         ETAGT(3), V0T(3),   SFGT(3),  DELTS,         036180
     2     TIMEG,      LONGO,    SLATGT,   CLATGT,   SALFGT,        036200
     3     CALFGT                                                    036220
      COMMON /INPUTS/ AQUANT,   TQUANT,   VQUANT,   START,          036240
     1     STOP,       PLOTIM,   PRNT,     PSTRT,    CV01,          036260
     2     CV02,       CV03,     TOLJPK,   HSCTIM,   HSCINC,        036280
     2     ITRNAV,     TPATT,    TNCOR,    TMUTYP,   IPPLIM,        036300
     3     IPC(30),    IOPHLP,   SGX(),    SCY0,     SCZ,           036320
     4     PSMAX,      PRSMAY,   TTRETL                            036340
      COMMON /UNVRSL/ PI,       HPI,      RG,       RPS,           036360
     1     EE,         ESQ,      EE2M1,    WEPI,     RADPER,        036380
     2     PESO                                                      036400
C                                                                       036420
      IF (INIT .NE. 0) GO TO 1900                                       036440
      IPRINT = 100                                                      036460
C                                                                       036480
C     PERIODIC PRINTOUT                                                 036500
C                                                                       036520
 1900 CONTINUE                                                          036540
      IF (IPRINT .LT. IPLIM) GO TO 1910                                 036560
      WRITE(6,9100) (TITLE(I),I=1,20),IPAGE                             036580
      IPRINT = 5                                                        036600
      IPAGE = IPAGE + 1                                                 036620
 1910 WRITE(6,9105) TIME                                                036640
      WRITE(6,9110) OLATGT,OLAT,DLAT                                    036660
      WRITE(6,9115) OLONGT,OLONG,DLONG                                  036680
      WRITE(6,9120) OALFGT,OALF,DALF                                    036700
      WRITE(6,9125) HR,H,DH                                             036720
      WRITE(6,9130) V92T(1),V92(1),DV(1)                                036740
      WRITE(6,9135) V92T(2),V92(2),DV(2)                                036760
      WRITE(6,9140) V92T(3),V92(3),DV(3)                                036780
      WRITE(6,9145) DETAGT(1),DETA(1),DETA(1)                           036800
      WRITE(6,9150) DETAGT(2),DETA(2),DETA(2)                           036820
      WRITE(6,9155) DETAGT(3),DETA(3),DETA(3)                           036840
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      IPPINT = IPRINT + 12                                              000330
      IF (IPC(25) .EQ. 0) GO TO 2000                                    000340
   60 DO 1950 I=1,3                                                     000350
      DO 1950 J=1,3                                                     000360
 1950 A(I,J)=FLOAT(I,J)/PAPPER                                          000370
      WRITE(6,9160) ((A(I,J),I=1,3),IGAINP(J),J=1,3)                    000380
      IPPINT=IPRINT+6                                                   000390
   65 9100 FORMAT ("1",2X,"IDEAL INS SIMULATOR",12X,20A4,1X,"PAGE ",I3//,14X,000400
     1       "TRAJECTORY",12X,"SIMULATOR",12X,"DIFFERENCE"/)            000410
      9105 FORMAT (2X,"TIME ",G18.12)                                   000420
      9110 FORMAT (2X,"LATITTUDE  ",3(G18.12,3X))                       000430
      9115 FORMAT (2X,"LONGITUDE  ",3(G18.12,3X))                       000440
   70 9120 FORMAT (2X,"ALPHA      ",3(G18.12,3X))                       000450
      9125 FORMAT (2X,"ALTITUDE   ",3(G18.12,3X))                       000460
      9130 FORMAT (2X,"VX (UP)    ",3(G18.12,3X))                       000470
      9135 FORMAT (2X,"VY (EAST)  ",3(G18.12,3X))                       000480
      9140 FORMAT (2X,"V7 (NORTH) ",3(G18.12,3X))                       000490
   75 9145 FORMAT (2X,"ROLL       ",3(G18.12,3X))                       000500
      9150 FORMAT (2X,"PITCH      ",3(G18.12,3X))                       000510
      9155 FORMAT (2X,"YAW        ",3(G18.12,3X))/)                     000520
      9160 FORMAT(2X,"FLIPD ATTUD",8X,"ANGLE",16X,"RATE",17X,           000530
     1  "ACCEL",2X,"PIR"/2X,"ROLL     ",3(G18.12,3X),I3/               000540
   80   2  2X,"PITCH      ",3(G18.12,3X),I3                             000550
     3  /2X,"YAW        ",3(G18.12,3X),I3 / )                          000560
      2000 RETURN                                                       000570
           END                                                          000580
```

SYMBOLIC REFERENCE MAP. (R=1)

ENTRY POINTS

1 PRINTR

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALFDT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALFDT	REAL		TRAJIN	22	CLATDT	REAL		TRAJIN
10	CV01	REAL		INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL		INPUTS	166	CC090	REAL	ARRAY	NAV
9	CC092P	REAL	ARRAY	NAV	154	CC313	REAL	ARRAY	NAV
177	CC95	REAL	ARRAY	NAV	22	CC9HP	REAL	ARRAY	NAV
54	DALF	REAL		OUTPUT	153	DELH	REAL		NAV
100	DELT	REAL		NAV	123	DELTA	REAL		NAV
16	DELTS	REAL		TRAJIN	47	DETA	REAL	ARRAY	OUTPUT
42	DH	REAL		OUTPUT	52	DLAT	REAL		OUTPUT
53	DLONG	REAL		OUTPUT	3	DPSMAX	REAL		INPUTS
44	DV	REAL	ARRAY	OUTPUT	11	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNIVSL
6	EEC89	REAL		UNIVSL	5	EGO	REAL		UNIVSL
101	ETA	REAL	ARRAY	NAV	5	FTADT	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GATHP	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HP	REAL		TRAJIN	1	HPT	REAL		UNIVSL

VARIABLES	SN	TYPE		RELOCATION					
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	345	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
22	IEPLIM	INTEGER		INPUTS	265	IGAIN2	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	21	INCO2	INTEGER		INPUTS
5	IPIT	INTEGER		CONTRL	61	IOPHLP	INTEGER		INPUTS
55	IPAGE	INTEGER		OUTPUT	24	IPC	INTEGER	ARRAY	INPUTS
56	IPLIM	INTEGER		OUTPUT	57	IPRINT	INTEGER		OUTPUT
6	ISTOP	INTEGER		CONTRL	0	ITITLE	INTEGER	ARRAY	OUTPUT
17	ITRATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	346	J	INTEGER		
135	LAT	REAL		NAV	1	LATGT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGO	REAL		TRAJIN
2	LONGGT	REAL		TRAJIN	31	OALF	REAL		OUTPUT
26	OALFGT	REAL		OUTPUT	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
35	OETA	REAL	ARRAY	OUTPUT	32	OETAGT	REAL	ARRAY	OUTPUT
222	OFILTP	REAL	ARRAY	NAV	176	OHD	REAL		NAV
27	OLAT	REAL		OUTPUT	24	OLATGT	REAL		OUTPUT
30	OLONG	REAL		OUTPUT	25	OLONGT	REAL		OUTPUT
0	OTIME	REAL		CONTRL	142	OV92P	REAL	ARRAY	NAV
9	PI	REAL		UNVRSL	5	PLTTIM	REAL		INPUTS
2	PLTTMF	REAL		CONTRL	6	PMT	REAL		INPUTS
1	PTIME	REAL		CONTRL	216	QPP95	REAL	ARRAY	NAV
10	RADDEG	REAL		UNVRSL	11	RESO	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	8	RR1	REAL		UNVRSL
65	RSMAX	REAL		INPUTS	3	RSTIMF	REAL		CONTRL
7	RSTRT	REAL		INPUTS	2	RJ	REAL		UNVRSL
76	SALF	REAL		NAV	23	SALFGT	REAL		TRAJIN
13	SEGT	REAL	ARRAY	TRAJIN	21	SLATGT	REAL		TRAJIN
62	SSX0	REAL		INPUTS	63	SSY0	REAL		INPUTS
64	SSZ0	REAL		INPUTS	3	START	REAL		INPUTS
4	STOP	REAL		INPUTS	115	SZPHI	REAL		NAV
53	THTCOR	REAL	ARRAY	NAV	56	THTFGT	REAL	ARRAY	NAV
60	THTIPO	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
17	TIMEJ	REAL		TRAJIN	13	TOLJOK	REAL		INPUTS
4	TPREV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
104	V0MP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	40	V92T	REAL	ARRAY	OUTPUT
7	WEPT	REAL		UNVRSL	56	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	145	XSZPHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XV92Z0	REAL	ARRAY	NAV

FILE NAMES MODE

TAPE6 FMT

STATEMENT LABELS

4	1900		13	1910		0	1950	
104	2000		222	9100	FMT	236	9105	FMT
242	9110	FMT	247	9115	FMT	256	9120	FMT
261	9125	FMT	266	9130	FMT	271	9135	FMT
301	9141	FMT	305	9145	FMT	312	9151	FMT
317	9155	FMT	324	9160	FMT			

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
45	1950	*	I	60 62	128	NOT INNER
46	1950		J	61 62	68	INSTACK
61		*	J	63 63	208	EXT REFS NOT INNER
62		*	I	63 63	119	EXT REFS

COMMON BLOCKS	LENGTH
CONTPL	9
NAV	182
OUTPUT	48
PRAJIN	21
PRPUTS	56
UNVRSL	10

STATISTICS

PROGRAM LENGTH	3478	271
CM LABELED COM. BLOCK LENGTH	5160	326

```
      SUBROUTINE PLTAPE                                                 006540
C                                                                       006600
C          SUBROUTINE TO CREATE A PLOT TAPE.  RECORD FORMAT IS GIVEN    006610
C          BELOW:                                                       006620
C                                                                       006630
C                    TIME (SEC)                                         006640
C                    LATITUDE (DEG)                                     006650
C                    LONGITUDE (DEG)                                    006660
C                    WANDER ANGLE (DEG)                                 006670
C                    ALTITUDE (FT)                                      006680
C                    UP VELOCITY (FT/SEC)                               006690
C                    EAST VELOCITY (FT/SEC)                             006700
C                    NORTH VELOCITY (FT/SEC)                            006710
C                    ROLL ANGLE (DEG)                                   006720
C                    PITCH ANGLE (DEG)                                  006730
C                    YAW ANGLE (DEG)                                    006740
C                                                                       006750
C                    ALL ITEMS ARE DOUBLE PRECISION.                    006760
C                                                                       006770
C                                                                       006780
      IMPLICIT REAL(A-H,L-Z)                                            006790
      COMMON /CONTRL/  DTIME,     PTIME,     PLTIME,    PSTIME,        006800
     1     IPREV,      INIT,      ISTOP,     ICMDVL,    ICMDVR         006810
      COMMON /OUTPUT/  ITITLE(20), OLATPT,    OLONPT,    OALEPT,        006820
     1     OLAT,       OLONG,     OALE,      DETADT(3), DETA(3),       006830
     2     VBDT(3),    DH,        DV(3),     DETA(3),   OLAT,          006840
     3     OLONG,      OALE,                                           006850
     4     IPAGE,      IPLIN,     IPRINT                             006860
      COMMON /TRAJIN/  TIME,      LATPT,     LONGPT,    ALEPT,         006870
     1     HD,         STADT(3),  VDT(3),    SFDT(3),   DELTS,         006880
     2     TIMSG,      LONGD,     SLATPT,    GLATPT,    SALEPT,        006890
     3     CALEPT                                                     006900
C                                                                       006910
C          INITIAL PASS WRITES TITLE AS FIRST RECORD                    006920
C                                                                       006930
      IF(INIT-.NE.0)GO TO 10                                            006940
      WRITE(30) (ITITLE(I),I=1,20)                                      006950
   10 WRITE(30) TIME,OLAT,OLONG,OALE,DH,(DV(I),I=1,3),                  006960
     1          (DETA(I),I=1,3)                                        006970
      RETURN                                                            006980
   90 ISTOP = 10                                                        006990
      WRITE(6,91)                                                       007000
   91 FORMAT (/2X,"***** PLOT TAPE WRITE ERROR;  ERROR LEVEL 10"/)      007010
      RETURN                                                            007020
      END                                                               007030
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 PLTAPE

VARIABLES SN TYPE RELOCATION

7	ALFIF	REAL		TRAJIN	24	DALFST	REAL		TRAJIN
22	DLATST	REAL		TRAJIN	54	DALF	REAL		OUTPUT
16	DELTS	REAL		TRAJIN	47	DETA	REAL	ARRAY	OUTPUT
43	DH	REAL		OUTPUT	52	DLAT	REAL		OUTPUT
53	DLONG	REAL		OUTPUT	44	DV	REAL	ARRAY	OUTPUT
5	ETAST	REAL	ARRAY	TRAJIN	4	H0	REAL		TRAJIN
42	I	INTEGER			7	ICMCYL	INTEGER		CONTRL
10	ICMCYP	INTEGER		CONTRL	6	INIT	INTEGER		CONTRL
56	IPAGE	INTEGER		OUTPUT	55	IPLTM	INTEGER		OUTPUT
57	IPRINT	INTEGER		OUTPUT	6	ISTOP	INTEGER		CONTRL
0	LITTLE	INTEGER	ARRAY	OUTPUT	1	LATST	REAL		TRAJIN
20	LONGO	REAL		TRAJIN	2	LONGST	REAL		TRAJIN
31	MALF	REAL		OUTPUT	25	MALFST	REAL		OUTPUT
45	OETA	REAL	ARRAY	OUTPUT	32	OETAST	REAL	ARRAY	OUTPUT
27	OLAT	REAL		OUTPUT	24	OLATST	REAL		OUTPUT
39	OLONG	REAL		OUTPUT	25	OLONST	REAL		OUTPUT
0	OTIME	REAL		CONTRL	2	PLTIME	REAL		CONTRL
1	PTIME	REAL		CONTRL	3	PSTIME	REAL		CONTRL
23	SALFST	REAL		TRAJIN	13	SET	REAL	ARRAY	TRAJIN
21	SLATST	REAL		TRAJIN	0	TIME	REAL		TRAJIN
17	TIMEO	REAL		TRAJIN	4	TPREV	REAL		CONTRL
13	VST	REAL	ARRAY	TRAJIN	43	VZST	REAL	ARRAY	OUTPUT

FILE NAMES MODE

TAPE?C	UNFMT	TAPE6	FMT

STATEMENT LABELS

5 10 0 90 INACTIVE 33 91 FMT

COMMON BLOCKS LENGTH

CONTRL	9
OUTPUT	48
TRAJIN	21

STATISTICS

PROGRAM LENGTH	438	35
CM LABELED COMMON LENGTH	116B	74

```
      SUBROUTINE OOUT(J)                                                OOT040
C                                                                       OOT050
C     OUTPUTS VARIOUS DATA ITEMS ON REQUEST                             OOT060
C                                                                       OOT070
      IMPLICIT REAL(A-H,L-Z)                                            OOT080
      COMMON /CONTRL/  OTIME,       PTIME,      PLTIME,     PSTIME,     OOT090
     1     IPREV,      INIT,        ISTOP,      ICMCYL,     ICMCYP      OOT100
      COMMON /INVEAT/  PESID(3),    DV9P(3),    FTA9P(4),   HT(7),      OOT110
     1     SF9TP(3),   C2P96(3,3),  C9MIC(3,3), TPSSID(3),  C1092(3,3), OOT120
     2     C1092P(3,3), C2P95T(3,3), ARESID(3)                          OOT130
      COMMON /INPUTS/  AQUANT,      TQUANT,     VQUANT,     START,      OOT140
     1     STOP,       PLOTIM,      PRNT,       PSTPT,      CV01,       OOT150
     2     CV02,       CV03,        TOLJPK,     HSOTIM,      HSCTNG,    OOT160
     2     IIPMAX,     ITRATT,      INCOP,      INUTYP,     IPPLIM,     OOT170
     3     IPC(30),    IOPNLP,      SSX0,       SSY0,       SSZ0,       OOT180
     4     RSMAX,      DPSMAX,      ITRFIL                               OOT190
      COMMON /NAV/     CCP92P(3,3),V92P(3),    DV92P(3),   RHO(7),     OOT200
     1     C92N9(3,3), A(3,3),      B(3,3),     THTERT(3), THTPC0(3),  OOT210
     2     THTCOP(3),  WXV(3),      G92P(3),    H,          ALPHA,      OOT220
     3     SALF,       CALF,        DELT,       FTA(3),     DMAP,       OOT230
     4     LAT,        LONG,        V92(3),     FILATT(3,3),DELTA,      OOT240
     5     XSALF,      XCALF,       XDP92P(3,3),HV92P(3),   DV92P(3),   OOT250
     6     SDPHI,      XSPHI,       XV92P(3),   XH,         DELH,       OOT260
     7     CC910(3,3), C0P91(3,3),  DH3,        C995(3,3),  CVF92P(3),  OOT270
     8     DDX   ,     DDY   ,      DDZ   ,     D2P95(4),   DFILTP(3),  OOT280
     9     GAINS(3,10),IGAINP(3)                                        OOT290
      COMMON /OUTPUT/  TITTLE(20), OLATGT,     OLONGT,     OALGT,      OOT300
     1     OLAT,       OLONG,       OALF,       DFTA9T(3),  DFTA(7),    OOT310
     2     V92T(3),    DH,          DV(3),      DFTA(3),    DLAT,       OOT320
     3     DLONG,      DALF,                                            OOT330
     4     IPAGE,      IPLIN,       IPRINT                              OOT340
      COMMON /PGRAV/   GLHSC,       GPOUT,      GPS2,       GPS4,       OOT350
     1     GPH,        GRH2,        GPHS2                                OOT360
      COMMON /IRAJTM/  TIME,        LATGT,      LONGGT,     ALFGT,      OOT370
     1     HH,         FTA9T(3),    V9T(3),     SF9T(3),    DELTS,      OOT380
     2     TIMEO,      LONGO,       SLATGT,     CLATGT,     SALFGT,     OOT390
     3     CALF9T                                                       OOT400
      COMMON /UNVESL/  PI,          HPI,        2P,         PPO,        OOT410
     1     EE,         ESQ,         EEPPA,      HERT,       RADEEP,     OOT420
     2     RESQ                                                         OOT430
      DIMENSION IMPAPR(3,3)                                             OOT440
C                                                                       OOT450
C                                                                       OOT460
                                                                        OOT470
      IF (IPRINT .LE. 57) GO TO 99                                      OOT480
      WRITE(6,900) IPAGE                                                OOT490
  900 FORMAT ("1",30X,"IDEAL TNS STIMULATOR",61X,"PAGE ",I3//,14X,      OOT500
     1        "TRAJECTORY",12X,"STIMULATOR",12X,"DIFFERENCE"/)          OOT510
      IPAGE = IPAGE + 1                                                 OOT520
      IPRINT = 6                                                        OOT530
   99 GO TO (1,2,3,4,5,6,6,8,9,10,11,12,13,14,15,16,17,18,19,20,       OOT540
     1   21,22,23,24,25,26,27,28,29,30),J                               OOT550
      WRITE(6,101) J                                                    OOT560
  100 FORMAT (5X,"** UNEXPECTED PRINT DATA" = ",I10," NO ACTION"/)      OOT570
      GO TO 999                                                         OOT580
    1 WRITE(6,110) (HT(I),I=1,3)                                        OOT590
  110 FORMAT (5X,"**  HT:TMU    ",(3(2X,G16.10))/)                     OOT600
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                      GO TO 810                                                  007610
                    2 WRITE(6,120) (ETA9P(I),I=1,4)                              007620
 60                 120 FORMAT (5X,"** ETA9P     ",(4(2X,G16.10))/)              007630
                      GO TO 809                                                  007640
                    3 WRITE(6,130) (DV92P(I),I=1,3)                              007650
                    130 FORMAT (5X,"** DV92P     ",(3(2X,G16.10))/)              007660
                      GO TO 810                                                  007670
 65                   4 WRITE(6,140) (V92P(I),I=1,3)                            007680
                    140 FORMAT (5X,"** V92P      ",(3(2X,G16.10))/)              007690
                      GO TO 810                                                  007700
                      5 WRITE(6,150) (PHO(I),I=1,3)                            007710
                    150 FORMAT (5X,"** PHO       ",(3(2X,G16.10))/)              007720
 70                   GO TO 810                                                  007730
                      6 WRITE(6,160) ((C0P92P(K,I),I=1,3),K=1,3)                007740
                    160 FORMAT (18X,(3(2X,G16.10))/,5X,"** C0P92P    ",(3(2X,G16.10))/,  007750
                        18X,(3(2X,G16.10))/)                                     007760
                      GO TO 808                                                  007770
 75                   8 WRITE(6,180) (THTERT(I),I=1,3)                          007780
                    180 FORMAT (5X,"** THTERT    ",(3(2X,G16.10))/)              007790
                      GO TO 810                                                  007800
                      9 WRITE(6,190) (THTTPO(I),I=1,3)                         007810
                    190 FORMAT (5X,"** THTTPO    ",(3(2X,G16.10))/)              007820
 80                   GO TO 810                                                  007830
                     10 WRITE(6,200) (WXV(I),I=1,3)                            007840
                    200 FORMAT (5X,"** WXV       ",(3(2X,G16.10))/)              007850
                      GO TO 810                                                  007860
                     11 WRITE(6,210) VDMP                                       007870
 85                  210 FORMAT (5X,"** VDMP      ",2X,G16.10/)                  007880
                      GO TO 810                                                  007890
                     12 WRITE(6,220) (G92P(I),I=1,3)                           007900
                    220 FORMAT (5X,"** G92P      ",(3(2X,G16.10))/)              007910
                      GO TO 810                                                  007920
 90                  13 WRITE (6,230) A(1,2),A(2,3),A(3,1)                      007930
                    230 FORMAT (5X,"** MISALIGN. ",(3(2X,G16.10))/)             007940
                      GO TO 810                                                  007950
                     14 WRITE(6,240) ((C1P92P(K,I),I=1,3),K=1,3)               007960
                    240 FORMAT (18X,(3(2X,G16.10))/,5X,"** C1P92P    ",(3(2X,G16.10))/,  007970
 95                     18X,(3(2X,G16.10))/)                                    007980
                      GO TO 808                                                  007990
                     15 WRITE(6,250) ((C2P95 (K,I),I=1,3),K=1,3)               008000
                    250 FORMAT (18X,(3(2X,G16.10))/,5X,"** C2P95     ",(3(2X,G16.10))/,  008010
                        18X,(3(2X,G16.10))/)                                     008020
100                   GO TO 808                                                  008030
                     16 WRITE(6,260) ((C095  (K,I),I=1,3),K=1,3)               008040
                    260 FORMAT (18X,(3(2X,G16.10))/,5X,"** C095      ",(3(2X,G16.10))/,  008050
                        18X,(3(2X,G16.10))/)                                     008060
                      GO TO 808                                                  008070
105                  17 WRITE(6,270) TIME                                       008080
                    270 FORMAT(5X,"** TIME       ",2X,G16.10/)                  008090
                      GO TO 810                                                  008100
                     18 CALL MTM(TMPARR,C2P95,C2P95T)                          008110
                     TMPARR(2,1)=-TMPARR(3,1)                                  008120
110                  WRITE(6,280) TMPARR(3,2),TMPARR(3,1),TMPARR(2,1)          008130
                    280 FORMAT(5X,"** INC ANGLES",3(2X,G16.10)/)                008140
                      GO TO 810                                                  008150
                     19 WRITE(6,290) (C2P95(I),I=1,4)                          008160
                    290 FORMAT (5X,"** C2P95     ",(4(2X,G16.10))/)             008170
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      115                 GO TO 809                                          0039190
                      807 IPRINT = IPRINT + 1                                0039190
                      808 IPRINT = IPRINT + 1                                0039200
                      809 IPRINT = IPRINT + 1                                0039210
                      810 IPRINT = IPRINT + 2                                0039220
      120                20 CONTINUE                                         0039230
                         21 CONTINUE                                         0039240
                         22 CONTINUE                                         0039250
                         23 CONTINUE                                         0039260
                         24 CONTINUE                                         0039270
      125                25 CONTINUE                                         0039280
                         26 CONTINUE                                         0039290
                         27 CONTINUE                                         0039300
                         28 CONTINUE                                         0039310
                         29 CONTINUE                                         0039320
      130                30 CONTINUE                                         0039330
                         RETURN                                              0039340
                         END                                                 0039350
```

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

53 I THERE IS NO PATH TO THIS STATEMENT.

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 OOUT

VARIABLES

SN	TYPE		RELOCATION	SN	TYPE		RELOCATION
31	A REAL	ARRAY	NAV	3	ALFST REAL		TRAJIN
75	ALPHA REAL		NAV	0	AMUANT REAL		INPUTS
100	APESID REAL	ARRAY	IMUDAT	44	B REAL	ARRAY	NAV
77	CALF REAL		NAV	24	CALFST REAL		TRAJIN
22	CLATST REAL		TRAJIN	10	CV01 REAL		INPUTS
11	CV02 REAL		INPUTS	12	CV03 REAL		INPUTS
146	C0P90 REAL	ARRAY	NAV	1	C0992P REAL	ARRAY	NAV
154	C0910 REAL	ARRAY	NAV	177	C095 REAL	ARRAY	NAV
45	C1090 REAL	ARRAY	IMUDAT	156	C1092P REAL	ARRAY	IMUDAT
23	C2P95 REAL	ARRAY	IMUDAT	67	C2995T REAL	ARRAY	IMUDAT
31	C9MIS REAL	ARRAY	IMUDAT	22	C92HC REAL	ARRAY	NAV
54	DALF REAL		OUTPUT	153	DELH REAL		NAV
106	DELT REAL		NAV	123	DELTA REAL		NAV
16	DELTS REAL		TRAJIN	47	DETA REAL	ARRAY	OUTPUT
43	DH REAL		OUTPUT	52	DLAT REAL		OUTPUT
53	DLONG REAL		OUTPUT	66	DQSMAX REAL		INPUTS
44	DV REAL	ARRAY	OUTPUT	210	DV592P REAL	ARRAY	NAV
3	DV99P REAL	ARRAY	IMUDAT	14	DV92P REAL	ARRAY	NAV
4	ET REAL		UNIVSL	5	ETP2C REAL		UNIVSL
5	ETS0 REAL		UNIVSL	181	ETA REAL	ARRAY	NAV
6	ETA9P REAL	ARRAY	IMUDAT	5	ETAST REAL	ARRAY	TRAJIN

VARIABLES SN TYPE RELOCATION

112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
0	GLMSC	REAL		PGRAV	1	GRCNT	REAL		PGRAV
4	GPH	REAL		PGRAV	6	GPHS2	REAL		PGRAV
5	GPH2	REAL		PGRAV	2	GRS2	REAL		PGRAV
7	G4C4	REAL		PGRAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HR	REAL		TRAJIN
1	HPI	REAL		UNVPSL	15	HSOING	REAL		INPUTS
14	HSOTIM	REAL		INPUTS	137	HV92P	REAL	ARRAY	NAV
604	I	INTEGER			7	ICHCYL	INTEGER		CONTRL
10	ICHCYP	INTEGER		CONTRL	22	IFRLTN	INTEGER		INPUTS
267	IGAINP	INTEGER	ARRAY	NAV	21	IMUTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	5	INTT	INTEGER		CONTRL
61	IOPNLP	INTEGER		INPUTS	55	IPAGE	INTEGER		OUTPUT
23	IPC	INTEGER	ARRAY	INPUTS	56	IPLTM	INTEGER		OUTPUT
57	IPPINT	INTEGER		OUTPUT	6	ISTOP	INTEGER		CONTRL
0	ITITLE	INTEGER	ARRAY	OUTPUT	12	ITRATT	INTEGER		INPUTS
67	ITPFIL	INTEGER		INPUTS	16	ITPNAV	INTEGER		INPUTS
0	J	INTEGER		E.P.	605	K	INTEGER		
135	LAT	REAL		NAV	1	LATGT	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONGA	REAL		TRAJTN
2	LONGGT	REAL		TRAJIN	31	OALF	REAL		OUTPUT
26	OALFGI	REAL		OUTPUT	213	OOX	REAL		NAV
214	OPV	REAL		NAV	215	OPZ	REAL		NAV
35	OPTA	REAL	ARRAY	OUTPUT	32	OPTAGT	REAL	ARRAY	OUTPUT
222	OPILTR	REAL	ARRAY	NAV	176	OPB	REAL		NAV
27	OLAT	REAL		OUTPUT	24	OLATGT	REAL		OUTPUT
30	OLONG	REAL		OUTPUT	25	OLONGT	REAL		OUTPUT
0	OTIME	REAL		CONTRL	142	OV92P	REAL	ARRAY	NAV
0	PI	REAL		UNVPSL	5	PLOTIM	REAL		INPUTS
2	PLTIME	REAL		CONTRL	6	PRNT	REAL		INPUTS
1	PTIME	REAL		CONTRL	216	Q2345	REAL	ARRAY	NAV
10	RADPER	REAL		UNVPSL	0	RESID	REAL	ARRAY	INPUAT
11	RESO	REAL		UNVPSL	17	RHO	REAL	ARRAY	NAV
3	RPO	REAL		UNVPSL	65	RSMAX	REAL		INPUTS
3	RSTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS
2	R0	REAL		UNVPSL	76	SALF	REAL		NAV
23	SALFGT	REAL		TRAJIN	11	SCRT	REAL	ARRAY	TRAJTN
15	SFGTP	REAL	ARRAY	INUDAT	21	SLATGT	REAL		TRAJTN
62	SSX0	REAL		INPUTS	63	SSY0	REAL		INPUTS
64	SSZ0	REAL		INPUTS	3	START	REAL		INPUTS
4	STOP	REAL		INPUTS	145	S2PHI	REAL		NAV
53	THTCOR	REAL	ARRAY	NAV	55	THTGRT	REAL	ARRAY	NAV
50	THTTRO	REAL	ARRAY	NAV	0	TIME	REAL		TRAJTN
17	TIMEO	REAL		TRAJIN	606	TMPARR	REAL	ARRAY	
13	TOLJRK	REAL		INPUTS	4	TRTFV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TWSTO	REAL	ARRAY	INUDAT
104	VCMP	REAL		NAV	2	VQUART	REAL		INPUTS
10	VGT	REAL	ARRAY	TRAJIN	197	VG2	REAL	ARRAY	NAV
11	VG2P	REAL	ARRAY	NAV	40	VIRT	REAL	ARRAY	OUTPUT
7	WERT	REAL		UNVPSL	12	WT	REAL	ARRAY	INUDAT
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XCALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XV92P	REAL	ARRAY	NAV					

FILE NAMES MODE
TAPE6 FMT

EXTERNALS TYPE ADS
MTM 3

STATEMENT LABELS

62	1			65	2			70	3		
73	4			76	5			101	6		
122	8			125	9			130	10		
133	11			136	12			141	13		
144	14			165	15			206	16		
227	17			232	18			240	19		
252	20			253	21			253	22		
253	23			253	24			253	25		
253	26			253	27			253	28		
253	29			253	30			14	99		
103	100	FMT		316	110	FMT		327	120	FMT	
340	130	FMT		351	140	FMT		362	150	FMT	
375	160	FMT		411	180	FMT		422	190	FMT	
433	200	FMT		444	210	FMT		455	220	FMT	
470	230	FMT		503	240	FMT		521	250	FMT	
537	260	FMT		553	270	FMT		566	280	FMT	
577	290	FMT		0	807	INACTIVE		245	808		
247	809			251	810			264	900	FMT	

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES	
104		*	K	71 71	148	EXT REFS	NOT INNER
105		*	I	71 71	113	EXT REFS	
147		*	K	93 93	148	EXT REFS	NOT INNER
150		*	I	93 93	113	EXT REFS	
170		*	K	97 97	148	EXT REFS	NOT INNER
171		*	I	97 97	113	EXT REFS	
211		*	K	101 101	148	EXT REFS	NOT INNER
212		*	I	101 101	113	EXT REFS	

COMMON BLOCKS	LENGTH
CONTPL	9
INUDAT	67
INPUTS	56
NAV	182
OUTPUT	48
PGRAV	7
TRAJIN	21
UNVPSL	10

STATISTICS

PROGRAM LENGTH	6179	399
CM LABELED COMMON LENGTH	6209	400

```
      SUBROUTINE CMINTG                                                 000760
C                                                                       000770
C     THIS SUBROUTINE PERFORMS THE SUMMATION OF THE SIMULATED           000780
C     ACCELEROMETER DATA, AFTER IT HAS BEEN TRANSFORMED TO THE          000790
C     PLATFORM FRAME                                                    000800
C                                                                       000810
      IMPLICIT REAL(A-H,L-Z)                                            000820
      COMMON /CONTRL/  DTIME,      PTIME,      PLTIME,     RSTIME,      000830
     1     IPRNT,      INIT,       ISTOP,      ICMCYL,     ICMCYP       000840
      COMMON /IMUDAT/  RESID(3),   DV9P(3),    ETA9P(4),   WT(3),       000850
     1     SF9TP(3),   C2P95(3,3), C9MIS(3,3), TRESID(3),  C1092P(3,3), 000860
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                            000870
      COMMON /INPUTS/  AQUANT,     TQUANT,     VQUANT,     STA9T,       000880
     1     STOP,       PLOTIM,     PRNT,       RSTRT,      CVD1,        000890
     2     CVD2,       CVD3,       TOLJPK,     HSOTIM,     RSCING,      000900
     2     IISMAX,     IIPATT,     INCOR,      IMUTYP,     IPRLIN,      000910
     3     IPC(30),    IOPNLP,     SSX1,       SSY1,       SSZ1,        000920
     4     RJMAX,      PSSMAX,     IIPFIL                               000930
      COMMON /NAV/     C9P92P(3,3),V929(3),    DV92P(3),   PHD(3),      000940
     1     C9PHD(3,3), A(3,3),     B(3,3),     THTC9T(3),  THTI9D(3),   000950
     2     THTC9P(3),  WXV(3),     G92P(3),    H,          ALPHA,       000960
     3     SALF,       CALF,       DELT,       ETA(3),     VCMP,        000970
     4     LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,       000980
     5     XSALF,      XCALF,      X9P)2P(3,3),HV92P(3),   DV92P(3),    000990
     6     S2PHI,      XS2PHI,     XV)2P(3),   XH,         DELH,        001000
     7     C0910(3,3), C9P90(3,3), D90,        C0P5(3,3),  DV592P(3),   001010
     8     DDX ,       DDY ,       DDZ ,       02P95(4),   DFILT2(3),   001020
     9     GAINS(3,10),TGAINP(3)                                        001030
      COMMON /UNVPSL/  PI,         HPT,        P0,         R90,         001040
     1     FF,         ESQ,        EER2D,      WERT,       RADPER,      001050
     2     RESQ                                                         001060
      COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALF9T,       001070
     1     HP,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,       001080
     2     TIMEO,      LONGO,      SLAT9T,     CLAT9T,     SALF9T,      001090
     3     CALF9T                                                       001100
C                                                                       001110
C     TEMPORARY (??) PATCH FOR DISCONTINUITIES IN PROFGEN'S ACCE        001120
C                                                                       001130
      DO 55 I=1,3                                                       001140
      IF ( ABS(DELTS*(SF9TP(I)-SF9T(I))) .LE. TOLJPK) GO TO 55          001150
      SF9TP(I)=SF9T(I)                                                  001160
      WRITE(6,6001) I,TIME                                              001170
 6001 FORMAT(" CMINTG: DISCONTINUITY DETECTED ALONG AXIS",I2,           001180
     1 " COMPONENT OF LINEAR ACCELERATION AT TIME = ",F12.6," SEC."/    001190
     2 " DISCONTINUITY ASSUMED AT BEGINNING OF CYCLE")                  001200
   55 CONTINUE                                                          001210
      IF (MOD(ICMCYL,2) .NE. 0) GO TO 63                                001220
C                                                                       001230
C     SIMPSONS RULE IF NUMBER OF INTERVALS IS EVEN                      001240
C                                                                       001250
      DO 170 I=1,3                                                      001260
      IF (ICMCYP .EQ. 1) GO TO 167                                      001270
      IF (ICMCYP .EQ. ICMCYL) GO TO 166                                 001280
      IF (MOD(ICMCYP,2) .EQ. 0) GO TO 165                               001290
      DV9P(I)=DV9P(I)+2.*SF9T(I)                                        001300
      GO TO 170                                                         001310
  166 DV9P(I)=(DV9P(I)+SF9T(I))*DELTS*ICMCYL/(3*ICMCYL-2)               001320
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```
                      GO TO 170                                                 000930
                  167 DV9P(I)=SF9TP(I)+2.*SF9T(I)                               000940
      60              GO TO 170                                                 000950
                  165 DV9P(I)=DV9P(I)+4.*SF9T(I)                                000960
                  170 SF9TP(I)=SF9T(I)                                          000970
                      GO TO 100                                                 000980
                C                                                               000990
      65        C TRAPEZOIDAL RULE IF NUMBER OF INTERVALS IS ODD                000000
                C                                                               000010
                      DO 60 I=1,3                                               000020
                      DV9P(I) = DV9P(I) + ((SF9T(I) + SF9TP(I))/2.0)*DELTS      000030
                   60 SF9TP(I) = SF9T(I)                                        000040
      70        C               QUANTIZE THE VELOCITY OUTPUTS                   000050
                C                                                               000060
                C                                                               000070
                C                                                               000080
                  100 ICMCYP=ICMCYP+1                                           000090
      75              IF (ICMCYP .LE. ICMCYL) RETURN                            000100
                      ICMCYP=1                                                  000110
                      DO 64 I=1,3                                               000120
                      DV9P(I) = DV9P(I) + RESID(I)                              000130
                   64 RESID(I) = DV9P(I)                                        000140
      80              CALL QNTIZ(DV9P(1),VQUANT)                                000150
                      DO 66 I=1,3                                               000160
                   66 RESID(I) = RESID(I) - DV9P(I)                             000170
                   70 RETURN                                                    000180
                      END                                                       000190
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 CMINIG

VARIABLES	SN	TYPE	RELOCATION						
37	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
101	ARCSIN	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
27	CALF	REAL		NAV	24	CALF9T	REAL		TRAJIN
22	CLAT9T	REAL		TRAJIN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C9PHO	REAL	ARRAY	NAV
153	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DESMAX	REAL		INPUTS	211	DV592P	REAL	ARRAY	NAV
7	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EE	REAL		UNV2SL	5	EEMAX	REAL		UNV2SL
5	ESQ	REAL		UNV2SL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	IMUDAT	5	ETAQT	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV

VARIABLES	SN	TYPE		RELOCATION					
71	GG2P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HP	REAL		TRAJIN	1	HPT	REAL		DRVPCL
15	HSCTNC	REAL		INPUTS	14	HSCTTH	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	152	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	13	ICMCYP	INTEGER		CONTRL
72	IFRLIM	1 INTEGER		INPUTS	253	IGAIN2	INTEGER	ARRAY	NAV
61	IMUTYP	INTEGER		INPUTS	23	INCDS	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPTLP	INTEGER		INPUTS
23	IPC	INT GEO	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS	57	ITRFIL	INTEGER		INPUTS
16	ITPMAX	INTEGER		INPUTS	105	LAT	REAL		NAV
1	LATGT	REAL		TRAJIN	135	LOIC	REAL		NAV
25	LONGD	REAL		TRAJIN	2	LONGGT	REAL		TRAJIN
214	OCX	REAL		NAV	214	OCY	REAL		NAV
220	OGZ	REAL		NAV	222	OMILTD	REAL	ARRAY	NAV
173	OMI	REAL		NAV	0	OTIMT	REAL		CONTRL
141	OV92P	REAL	ARRAY	NAV	0	PT	REAL		DRVPCL
2	PLOTIM	REAL		INPUTS	2	PLTIMS	REAL		CONTRL
0	POUT	REAL		INPUTS	1	PTIMS	REAL		CONTRL
210	RDPOS	REAL	ARRAY	NAV	13	RHOPCD	REAL		DRVPCL
0	RETD	REAL	ARRAY	INVDAT	11	RFSD	REAL		DRVPCL
7	RHO	REAL	ARRAY	NAV	3	RTD	REAL		DRVPCL
65	RSMAX	REAL		INPUTS	3	RTTIME	REAL		CONTRL
2	RSTPT	REAL		INPUTS	2	RC	REAL		DRVPCL
76	SALF	REAL		NAV	23	SALFGT	REAL		TRAJIN
13	SFGT	REAL	ARRAY	TRAJIN	15	SFGTP	REAL	ARRAY	INVDAT
21	SLATGT	REAL		TRAJIN	62	SOV2	REAL		INPUTS
62	SSY2	REAL		INPUTS	64	SZ2	REAL		INPUTS
7	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	SUPHI	REAL		NAV	53	THICOR	REAL	ARRAY	NAV
65	THIFPT	REAL	ARRAY	NAV	60	THITGO	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEG	REAL		TRAJIN
13	TOLJPK	REAL		INPUTS	4	TOPEV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRECID	REAL	ARRAY	INVDAT
136	VDMP	REAL		NAV	3	VQUANT	REAL		INPUTS
13	VGT	REAL	ARRAY	TRAJIN	137	VGZ	REAL	ARRAY	NAV
11	VGZP	REAL	ARRAY	NAV	7	VERT	REAL		DRVPCL
12	WT	REAL	ARRAY	INVDAT	66	WXV	REAL	ARRAY	NAV
126	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XZPR2P	REAL	ARRAY	NAV

FILE NAMES MODE
TAPE5 FMT

EXTERNALS TYPE ARGS
QUIT7 2

INLINE FUNCTIONS TYPE ARGS
SQS REAL 1 INTRIN MOD INTEGER 2 INTRIN

STATEMENT LABELS

14	55	3	61	57	57			
3	64	0	65	0	70	THISTIME		
71	100	47	155	34	166			
43	187	52	173	125	6001	FMT		

LOOPS	LABEL		INDEX	BEGIN-TO	LENGTH	PROPERTIES
						EXT REFS
3	55	*	I	39 46	148	
22	170		I	51 62	348	OPT
69	60		I	67 69	118	OPT
77	64		I	77 79	69	INSTACK
113	66		I	81 82	41	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
INUDAT	67
INPUTS	56
NAV	182
UNVRSL	10
TRAJIN	21

STATISTICS

PROGRAM LENGTH	1538	107
CM LABELED COMMON LENGTH	5319	345

```
      SUBROUTINE TORCOP(A0P92P,AV92P)                                   000200
      IMPLICIT REAL(A-H,L-Z)                                            000210
      DIMENSION A0P92P(3,3),AV92P(3)                                    000220
      COMMON/INPUTS/ AQUANT,  TQUANT,  VQUANT,  START,                  000230
     1    STOP,    PLOTIM,  PRNT,    PSTRT,   CV01,                    000240
     2    CV02,    CV03,    TOLJOK,  HSOTIM,  HSCINC,                  000250
     2    IFPNAV,  IFCATT,  INCOP,   IMUTYP,  EFFLIM,                  000260
     3    IPC(30), ICPNLP,  SSX0,    SSY0,    SSZ0,                    000270
     4    RSMAX,   OPSMAX,  ITPFTL                                     000280
     COMMON /NAV/  C0P92P(3,3),V92P(3),  DV92P(3),  PH0(3),            000290
     1    C0PH0(3,3), A(3,3),   R(3,3),   THTEPT(3), THTTP0(3),        000300
     2    THTCOP(3),  WXV(3),   G02P(3),  H,         ALPHA,            000310
     3    SALF,       CALF,     DELT,     ETA(3),   V0MC,             000320
     4    LAT,        LONG,     V92(3),   FILAT(3,3),DELTA,           000330
     5    XSALF,      XCALF,    X0P92P(3,3),HV92P(3), DV02P(3),         000340
     6    S2PHI,      XS2PHI,   XV92P(3),  XH,       DELH,            000350
     7    C0910(3,3), C0P90(3,3), OH1,     C035(3,3),  DV592P(3),     000360
     8    DDX ,       DDY ,     DDZ ,     D2995(4),  DFILTP(3),      000370
     9    GAINS(3,10),IGAINP(3)                                        000380
     COMMON /UNIVRSL/ PI,        HPI,      P2,       R00,             000390
     1    EC,         ESQ,      FFR80,    NCRT,     RADDEG,          000400
     2    RESG                                                         000410
C                                                                       000420
C     TORQ == GENERATE EARTH ANGLE TORQUING ANGLES                      000430
C                                                                       000440
      DO 580 I=1,3                                                      000450
      THTERT(I)=A0P92P(3,I)*WERT*DELT                                   000460
  580 THTTRQ(I)=THTERT(I)+PHC(I)*DELT                                   000470
      IF (IPC(8) .EQ. 0) GO TO 620                                      000480
      CALL DOUT(8)                                                      000490
  620 CONTINUE                                                          000500
      IF (IPC(9) .EQ. 0) GO TO 700                                      000510
      CALL DOUT(9)                                                      000520
  700 CONTINUE                                                          000530
C                                                                       000540
C     COPLS == SENSED ACCELERATION DUE TO ANGULAR VELOCITIES            000550
C                                                                       000560
      DO 710 I=1,3                                                      000570
      THTCOP(I) = THTERT(I) + THTTRQ(I)                                 000580
  710 A(I,I) = 0.                                                       000590
      A(2,1) = -THTCOP(3)                                               000600
      A(3,1) = THTCOP(2)                                                000610
      A(3,2) = -THTCOP(1)                                               000620
      A(1,2) = THTCOP(3)                                                000630
      A(1,3) = -THTCOP(2)                                               000640
      A(2,3) = THTCOP(1)                                                000650
      CALL MATVEC(WXV,A,AV92P)                                          000660
      IF (IPC(10) .EQ. 0) GO TO 800                                     000670
      CALL DOUT(10)                                                     000680
  800 RETURN                                                            000690
      END                                                               000700
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 IORCOR

VARIABLES SN TYPE RELOCATION

37	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
0	AQUANT	REAL		INPUTS	0	AV92P	REAL	ARRAY	F.P.
0	A0P92P	REAL	ARRAY	F.P.	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV12	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C045	REAL	ARRAY	NAV
22	C92H0	REAL	ARRAY	NAV	153	DELH	REAL		NAV
102	DELT	REAL		NAV	123	DELTA	REAL		NAV
66	DPSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNIVRSL
6	EERR0	REAL		UNIVRSL	5	EGO	REAL		UNIVRSL
101	ETA	REAL	ARRAY	NAV	112	ETLATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	1	HPT	REAL		UNIVRSL
15	HSDTHC	REAL		INPUTS	14	HSDTIM	REAL		INPUTS
127	HV92P	REAL	ARRAY	NAV	122	I	INTEGER		
22	IERLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	23	INCOR	INTEGER		INPUTS
61	IOPNLP	INTEGER		INPUTS	23	IPC	INTEGER	ARRAY	INPUTS
17	ITRATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	105	LAT	REAL		NAV
116	LONG	REAL		NAV	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
223	OFILTP	REAL	ARRAY	NAV	175	OH3	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNIVRSL
5	PLOTIM	REAL		INPUTS	6	PRNT	REAL		INPUTS
216	Q2595	REAL	ARRAY	NAV	10	RADDEG	REAL		UNIVRSL
11	RES0	REAL		UNIVRSL	17	RHO	REAL	ARRAY	NAV
3	RR	REAL		UNIVRSL	65	RSMAX	REAL		INPUTS
7	RSTRT	REAL		INPUTS	2	R0	REAL		UNIVRSL
76	SALF	REAL		NAV	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOP	REAL	ARRAY	NAV
56	THTRT	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV
13	TOLJRK	REAL		INPUTS	1	TQUANT	REAL		INPUTS
104	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
7	WRT	REAL		UNIVRSL	66	WXV	REAL	ARRAY	NAV
135	XCALF	REAL		NAV	152	XH	REAL		NAV
134	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	X0P92P	REAL	ARRAY	NAV

EXTERNALS TYPE ARGS

	OUT	1		NATVFO	3

STATEMENT LABELS

6	580	42	620		35	700
4	710	63	800			

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
16	580	I	26 28	129	OPT
36	710	I	38 40	68	INSTACK

COMMON BLOCKS LENGTH

INPUTS	56
NAV	182
UNVRSL	10

STATISTICS

PROGRAM LENGTH	1079	71
BLANK COMMON LENGTH	3708	248

```
      SUBROUTINE INRNAV                                                 000710
C                                                                       000720
C     THIS SUBROUTINE REPRESENTS THOSE CALCULATIONS THAT WOULD BE       000730
C        PERFORMED BY AN AIRBORN AVIONICS COMPUTER                      000740
C                                                                       000750
      IMPLICIT REAL(A-H),REAL(L-Z)                                      000760
      COMMON /CONTPL/  DTIME,      PTIME,      PLTIME,     RSTIME,      000770
     1     TPREV,      INIT,       ISTOP,      ICMCYL,     ICMCYP       000780
      COMMON /INDATA/  RESID(3),   DV3P(3),    FTA92P(4),  HT(7),       000790
     1     SFDIR(3),   C2P95(3,3), CDNIS(3,3), TRESID(3),  C1333(3,3),  000800
     2     C1332P(3,3), C2P95T(3,3), ARESID(3)                          000810
      COMMON /INPUTS/  AQUANT,     IQUANT,     VQUANT,     START,       000820
     1     STOP,       PLOTIM,     PRNT,       PSIRT,      CVD1,        000830
     2     CVD2,       CVD3,       TOLJPK,     HSDTIM,     HSDINC,      000840
     2     ITRNAV,     ITRATT,     INCUP,      IMUTYP,     IRBLIM,      000850
     3     IRC(30),    IOPNLP,     SSX0,       SSY0,       SSZ0,        000860
     4     RSMAX,      DPSMAX,     ITRFIL                               000870
      COMMON /NAV/     CLP92P(3,3),V92P(3),    DV92P(3),   PHD(3),      000880
     1     C3PH0(3,3), A(3,3),     B(3,3),     THTERT(3),  THTPRO(3),   000890
     2     THTCOP(3),  HXV(3),     G92P(3),    H,          ALPHA,       000900
     3     SALF,       CALF,       DELT,       FTA(3),     VPMG,        000910
     4     LAT,        LONG,       V3P(3),     FILAT1(3,3),DELTA,       000920
     5     XSALF,      XCALF,      X0P32P(3,3),HV92P(3),   DV32P(7),    000930
     6     S2PHI,      XS2PHI,     XV32P(7),   XH,         DELH,        000940
     7     CC910(3,3), CCP90(3,3), DH9,        C695(3,3),  DV592P(7),   000950
     8     DDX ,       DDY ,       DDZ ,       C2P95(4),   DFILIP(7),   000960
     9     GAINS(3,10),IGAINP(3)                                        000970
      COMMON /GRAV/    GLNGC,      GRONT,      GRS2,       GRS4,        000980
     1     GPH,        GPH2,       GPHS2                                000990
      COMMON /TRAJIN/  TIMC,       LAT9T,      LONG9T,     ALF9T,       001000
     1     HB,         FTA9T(5),   V9T(3),     SF9T(3),    DELTS,       001010
     2     ITMEC,      LONGO,      SLAT9T,     CLAT9T,     SALF9T,      001020
     3     CALF9T                                                       001030
      COMMON /UNVESL/  PI,         HPI,        RC,         RRO,         001040
     1     EE,         ESQ,        EE2RO,      WERT,       RADPER,      001050
     2     RESQ                                                         001060
C                                                                       001070
C           TRANSFORM VELOCITY INCREMENTS TO LLNAV  ZERO THE VELOCITY   001080
C           SUM FROM THE PLATFORM                                       001090
C                                                                       001100
  100 DO 110 I=1,3                                                      001110
      DV92P(I) = DV9P(I)                                                001120
  110 DV9P(I) = 0.0                                                     001130
      IF (IPC(3) .EQ. 0) GO TO 300                                      001140
      CALL DOUT(3)                                                      001150
C                                                                       001160
C     VLCTY -- VELOCITY UPDATE SUBROUTINE                               001170
C                                                                       001180
  300 CONTINUE                                                          001190
  305 DO 310 I=1,3                                                      001200
      DV92P(I)=V92P(I)                                                  001210
      V92P(I) = V92P(I) + HXV(I) + G92P(I)*DELT + DV92P(I)              001220
  310 CONTINUE                                                          001230
      V92P(I) = V92P(I) + ( V3P0 + DV92P*DELT ) * DELT                  001240
C                                                                       001250
C     AVERAGE OLD AND NEW V92P TO OBTAIN INTERPOLATE VALUES, HV92P      001260
C     ALSO EXTRAPOLATE NEW V92P TO OBTAIN XV92P                         001270
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C                                                                       010280
      IF (IPC(29) .EQ. 0) GO TO 320                                     010290
   60 DO 315 I=1,3                                                      010300
      XV92P(I)=1.5*V92P(I)-0.5*OV92P(I)                                 010310
  315 HV92P(I)=0.5*(OV92P(I)+V92P(I))                                   010320
  320 CONTINUE                                                          010330
      IF (IPC(4) .EQ. 0) GO TO 400                                      010340
   65 CALL DOUT(4)                                                      010350
C                                                                       010360
C     UPDATE == ANGULAR RATES SUBROUTINE                                010370
C                                                                       010380
  400 CONTINUE                                                          010390
   70 C                                                                 010400
  410 IF (IPC(30) .NE. 0) GO TO 420                                     010410
      DCM32S = C0P92P(3,2)**2                                           010420
      DCM33S = C0P92P(3,3)**2                                           010430
      C0PR = 2.0*EFPR0*C0P92P(3,2)*C0P92P(3,3)                          010440
   75 ONEM = 1.0 - H*PR0                                                010450
      PH0(2) = -V92P(3)*BR0*(ONEM-EF*(1.-3.*DCM32S-DCM33S))-V32P(2)*C0PR010460
      PH0(3) = V92P(2)*BR0*(ONEM-EF*(1.-3.*DCM32S-DCM33S))+V92P(2)*C0PR 010470
      GO TO 430                                                         010480
  420 CONTINUE                                                          010490
   80 IF (IPC(29) .EQ. 0) GO TO 422                                     010500
      CALL ANGVL2(HV92P,XSALF,XCALF,XS2PHI,XH)                          010510
      GO TO 430                                                         010520
  422 CONTINUE                                                          010530
      CALL ANGVL2(V92P,SALF,CALF,S2PHI,H)                               010540
   85 430 CONTINUE                                                      010550
      IF (IPC(5) .EQ. 0) GO TO 490                                      010560
      CALL DOUT(5)                                                      010570
  490 CONTINUE                                                          010580
C                                                                       010590
   90 C     DCM UPDATE IS FIRST OR SECOND ORDER                         010600
C                                                                       010610
      CALL DCMUPD(C0PH0,0.E0,PH0(2)*DELT,PH0(3)*DELT,IPC(28),           010620
     1 0.E1,A(1,1),A(1,2),A(1,3))                                       010630
      CALL MM(A,C0P92P,C0PH0)                                           010640
   95 DO 520 I=1,3                                                      010650
      DO 520 J=1,3                                                      010660
      C0P92P(I,J) = C0P92P(I,J) + A(I,J)                                010670
      IF (IPC(29) .EQ. 0) GO TO 520                                     010680
      X0P92P(I,J)=C0P92P(I,J)+0.5*A(I,J)                                010690
  100 520 CONTINUE                                                      010700
C                                                                       010710
C     ORTHONORMALIZE IF OTIME .GE. TIME                                 010720
C                                                                       010730
      IF (IPC(6) .EQ. 0) GO TO 522                                      010740
  105 CALL DOUT(6)                                                      010750
  522 CONTINUE                                                          010760
      IF (TIME .LT. OTIME) GO TO 550                                    010770
      OTIME = TIME + INC0P*DELT                                         010780
      CALL ORTHO(C0P92P)                                                010790
  110 IF (IPC(7) .EQ. 0) GO TO 550                                      010800
      CALL DOUT(7)                                                      010810
  550 CONTINUE                                                          010820
  600 IF (IPC(29) .NE. 0) GO TO 805                                     010830
      CALL TQ2C0P(C0P92P,V92P)                                          010840
```

```
      C                                                                 010950
      C  .. VDAMP == VERTICAL DAMPING                                   010960
      C                                                                 010970
  805 CONTINUE                                                          010980
  810 IF (IPC(29) .NE. 0) GO TO 815                                     010990
  120     H = H + (DV92P(1)+CVD1*DELH)*DELT                           011000
          DELH = HB - H                                               011010
          GO TO 820                                                   011020
  815 H = H + (HV92P(1)+CVD1*DELH)*DELT                               011030
      XH=H+V92P(1)*DELT*5.5                                           011040
  125 XHB=1.5*HB-0.5*OHB                                              011050
      DELH=XHB-XH                                                     011060
      OHB=HB                                                          011070
  820 CONTINUE                                                        011080
      VDMP = VDMP + CVD3*DELH*DELT                                    011090
  130 IF (IPC(11) .EQ. 0) GO TO 900                                   011000
      CALL DOUT(11)                                                   011010
  900 CONTINUE                                                        011020
      IF (IPC(29) .EQ. 0) GO TO 1600                                  011030
      CALL GRAV(XC92P,XS2PHI,XH)                                      011040
  135 IF (IPC(12) .NE. 0) CALL DOUT(12)                               011050
      CALL POSVEL                                                     011060
      CALL ANGVL2(XV92P,XSALF,XCALF,XS2PHI,XH)                        011070
      CALL TORCOR(XD92P,XV92P)                                        011080
      RETURN                                                          011090
  140 1600 CALL GRAV(C0P92P,S2PHI,H)                                  011100
      IF (IPC(12) .NE. 0) CALL DOUT(12)                               011110
      CALL POSVEL                                                     011120
      RETURN                                                          011130
      END                                                             011140
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 INSNAV

VARIABLES	SN	TYPE	RELOCATION						
37	A	REAL	ARRAY	NAV	3	ALFST	REAL		TRAJIN
75	ALPHA	REAL		NAV	5	AQUANT	REAL		INPUTS
104	AVESIQ	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFST	REAL		TRAJIN
22	CLATST	REAL		TRAJIN	370	COSP	REAL		
10	CVD1	REAL		INPUTS	11	CVD2	REAL		INPUTS
12	CVD3	REAL		INPUTS	166	C0P90	REAL	ARRAY	NAV
9	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C905	REAL	ARRAY	NAV	45	C1090	REAL	ARRAY	IMUDAT
56	C1092P	REAL	ARRAY	IMUDAT	20	C2P95	REAL	ARRAY	IMUDAT
57	C2P95T	REAL	ARRAY	IMUDAT	71	C2TS	REAL	ARRAY	IMUDAT
32	C2T90	REAL	ARRAY	NAV	366	C4T2S	REAL		
367	DCM33S	REAL			153	DELH	REAL		NAV
102	DELF	REAL		NAV	123	DELTA	REAL		NAV
16	DELT	REAL		TRAJIN	66	DOSMAX	REAL		INPUTS
210	DV592P	REAL	ARRAY	NAV	3	DV1P	REAL	ARRAY	IMUDAT

VARIABLES	SN	TYPE		RELOCATION					
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNVRSL
6	EERR0	REAL		UNVRSL	5	ESD	REAL		UNVRSL
101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
5	ETA9T	REAL	ARRAY	TRAJI	112	FILATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	3	GLHSC	REAL		PGRAV
1	GMINT	REAL		PGRAV	4	GP4	REAL		PGRAV
6	GPHS2	REAL		PGRAV	5	GP42	REAL		PGRAV
2	GPS2	REAL		PGRAV	3	GPS4	REAL		PGRAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HB	REAL		TRAJIN	1	HPI	REAL		UNVRSL
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	365	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
22	IERLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	INUTYP	INTEGER		INPUTS	23	INPOS	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPHLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITPATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	372	J	INTEGER		
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONG9	REAL		TRAJIN
2	LONG9I	REAL		TRAJIN	213	OBX	REAL		NAV
214	OBY	REAL		NAV	215	OBZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OMB	REAL		NAV
371	ONFM	REAL			0	OTIME	REAL		CONTRL
142	OV92P	REAL	ARRAY	NAV	3	PI	REAL		UNVRSL
5	PLOTIM	REAL		INPUTS	2	PTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	R	REAL		CONTRL
218	R2P96	REAL	ARRAY	NAV	10	RADS	REAL		UNVRSL
3	RESID	REAL	ARRAY	IMUDAT	11	RES1	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	RR2	REAL		UNVRSL
65	RSMAX	REAL		INPUTS	3	RSI 45	REAL		CONTRL
7	RSTRT	REAL		INPUTS	2	RT	REAL		UNVRSL
76	SALF	REAL		NAV	23	SALF9T	REAL		TRAJIN
13	SF9T	REAL	ARRAY	TRAJIN	15	SFSTP	REAL	ARRAY	IMUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
55	THTERI	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIME0	REAL		TRAJIN
13	TOLJPK	REAL		INPUTS	4	TPREV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRSTP	REAL	ARRAY	IMUDAT
194	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	197	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WFT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
373	XHB	REAL			124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XDP92P	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS		
ARCVL2		5	D1MUL0	0
JOUT		1	GRAV	3
MP		3	OPTHP	1
PRVEC1		0	TRPCOR	2

STATEMENT LABELS

0	100	INACTIVE	0	110			13	300	
0	305	INACTIVE	0	310			0	315	
47	320		52	400			0	410	INACTIVE
107	420		113	422			115	430	
120	490		143	520			153	522	
165	550		0	600	INACTIVE		170	905	
0	810	INACTIVE	200	815			217	920	
225	900		241	1600					

LOOPS	LABEL		INDEX	FROM-TO	LENGTH	PROPERTIES
3	110		I	41 43	58	INSTACK
14	310		I	50 53	128	OPT
35	315		I	60 62	128	OPT
130	520	*	I	95 100	200	NOT INNER
131	520		J	96 100	150	OPT

COMMON BLOCKS	LENGTH
CONTRL	9
INUDAT	67
INPUTS	56
NAV	182
PCRAV	7
TRAJIN	
UNVRSL	

STATISTICS

PROGRAM LENGTH	3748	252
CM LABELED COMMON LENGTH	5400	352

```
      SUBROUTINE POSVEL                                                 011150
C                                                                       011160
C     ROUTINE TO CALCULATE THE AIRCRAFT POSITION AND VELOCITY           011170
C     IN THE LVN FRAME (2 SPACES WEN AXES).  POSITION CONSISTS OF       011180
C     LATITUDE, LONGITUDE, AND HANDER ANGLE.                            011190
C                                                                       011200
C                                                                       011210
      IMPLICIT REAL(A-H,L-Z)                                            011220
      COMMON /TRAJIN/  TIME,       LAT0T,      LONG0T,     ALF0T,       011230
     1    H3,         ETA0T(3),   V0T(3),     SF0T(3),    DELTS,       011240
     2    TIME0,      LONG0,      SLAT0T,     CLAT0T,     SALF0T,      011250
     3    CALF0T                                                         011260
      COMMON /NAV/     C0BP32P(3,3),V02P(3),     0V02P(3),   2H0(3),    011270
     1    C0BH0(3,3), A(3,3),     B(3,3),     THTERI(3),  THTIP0(3),   011280
     2    THTC0P(3),  WXV(3),     G02P(3),    H,          ALPHA,       011290
     3    SALF,       CALF,       DELT,       ETA(3),     V0HF,        011300
     4    LAT,        LONG,       V02(3),     PILATI(3,3),DELTA,       011310
     5    XSALF,      XCALF,      X0P02P(3,3),HV02P(3),   0V32P(3),    011320
     6    S2PHI,      XS2PHI,     XV32P(3),   XH,         0ELH,        011330
     7    C0B1J(3,3), C0BP30(3,3), 0H1,       C095(3,3),  0V502P(3),   011340
     8    0DX ,       0DY ,       0DZ ,       02P05(4),   0FTL12(3),   011350
     9    GAINS(3,10),IGAIN2(3)                                          011360
C                                                                       011370
C     FIND THE POSITION ANGLES                                          011380
C                                                                       011390
      TEMP =  SQRT(C0BP32P(1,1)**2+C0BP32P(2,1)**2)                     011400
      LAT =  ATAN2(C0BP32P(3,1),TEMP)                                   011410
      0ALPHA=0.                                                         011420
      0ALPHA=ALPHA                                                      011430
      IF (TEMP .EQ. 0.) GO TO 1200                                      011440
      LONG =  ATAN2(C0BP32P(2,1),C0BP32P(1,1))                          011450
      LONG = LONG + LONG0                                               011460
      ALPHA =  ATAN2(-C0BP32P(3,2),C0BP32P(3,3))                        011470
      0ALPHA=(ALPHA+0ALPHA)/2.                                          011480
C                                                                       011490
C     CONVERT VELOCITIES TO LVN FRAME                                   011500
C                                                                       011510
 1200 SALF =  SIN(ALPHA)                                                011520
      CALF =  COS(ALPHA)                                                011530
      XSALF=SALF+0ALPHA*CALF                                            011540
      XCALF=CALF-0ALPHA*SALF                                            011550
      V02(1) = V02P(1)                                                  011560
      V02(2) = CALF*V02P(2) + SALF*V02P(3)                              011570
      V02(3) = -SALF*V02P(2) + CALF*V02P(3)                             011580
      RETURN                                                            011590
      END                                                               011600
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1 POSVEL

VARIABLES SN TYPE RELOCATION

33	A	REAL	ARRAY	NAV	3	ALFGT	REAL		TRAJIN
75	ALPHA	REAL		NAV	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFGT	REAL		TRAJTN
22	CLATGT	REAL		TRAJIN	165	COPGC	REAL	ARRAY	NAV
0	COP92P	REAL	ARRAY	NAV	154	CP310	REAL	ARRAY	NAV
177	C095	REAL	ARRAY	NAV	22	CP2HC	REAL	ARRAY	NAV
74	DALPHA	REAL			153	DELH	REAL		NAV
100	DELT	REAL		NAV	123	DELTA	REAL		NAV
16	DELT	REAL		TRAJIN	210	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	101	ETA	REAL	ARRAY	NAV
5	ETAGT	REAL	ARRAY	TRAJIN	112	ETLATT	REAL	ARRAY	NAV
226	GAINS	REAL	ARRAY	NAV	71	GP2P	REAL	ARRAY	NAV
74	H	REAL		NAV	5	HP	REAL		TRAJTN
137	HV92P	REAL	ARRAY	NAV	203	IGATIP	INTEGER	ARRAY	NAV
105	LAT	REAL		NAV	1	LATGT	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONGC	REAL		TRAJIN
2	LONGGT	REAL		TRAJIN	75	OALPHA	REAL		
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OELLTP	REAL	ARRAY	NAV
176	OHC	REAL		NAV	142	OV92P	REAL	ARRAY	NAV
216	P2P95	REAL	ARRAY	NAV	17	PHO	REAL	ARRAY	NAV
76	SALF	REAL		NAV	23	SALFGT	REAL		TRAJIN
13	SFGT	REAL	ARRAY	TRAJIN	21	SLATGT	REAL		TRAJTN
145	S2PHI	REAL		NAV	73	TEMP	REAL		
63	THTCOP	REAL	ARRAY	NAV	56	THTGPT	REAL	ARRAY	NAV
60	THTTPQ	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
17	TIMEG	REAL		TRAJTN	104	VOMP	REAL		NAV
10	VGT	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHT	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XC092P	REAL	ARRAY	NAV

EXTERNALS TYPE ARGS

ATAN2	REAL	2	LIBRARY	COS	REAL	1	LIBRARY
SIN	REAL	1	LIBRARY	SQRT	REAL	1	LIBRARY

STATEMENT LABELS

27 1200

COMMON BLOCKS LENGTH

TRAJIN 21
NAV 182

STATISTICS

PROGRAM LENGTH	769	62
CM LABELED COMMON LENGTH	3138	203

```
SUBROUTINE GRAV          74/74   OPT=0 TRACE                    FTN 4.5+2436    05/25/76  17.24.46          PAGE     1

      1                 SUBROUTINE GRAV(A0P92P,AS2PHI,AH)                                          011610
                        C                                                                          011620
                        C     THIS SUBROUTINE COMPUTES THE COMPONENTS OF GRAVITY IN THE LLHA       011630
                        C     FRAME. THESE RESULTS ARE RETURNED IN G92P(1) THRU (3). ALSO          011640
      5                 C     COMPUTED IS SINF(PHI)**2, THIS IS RETURNED THRU THE                  011650
                        C     ARGUMENT LIST. THESE CALCULATIONS DUPLICATE THOSE OF THE             011660
                        C     FLIGHT PROFILE GENERATOR                                             011670
                        C                                                                          011680
                              IMPLICIT REAL(A-H,L-Z)                                               011690
     10                       COMMON /NAV/    C0P92P(3,3),V92P(3),    DV92P(3),   RHO(3),        011700
                          1     C0PH0(3,3),  A(3,3),      0(3,3),     THTEPT(3),  THTTP0(3),     011710
                          2     THTCOR(3),   HXV(3),      G92P(3),    H,          ALPHA,         011720
                          3     SALF,        CALF,        DELT,       ETA(3),     V04P,          011730
                          4     LAT,         LONG,        V92(3),     ETLATT(3,3),DELTA,         011740
     15                   5     XS4LF,       XC4LF,       X0P92P(3,3),WV92P(3),   DV92P(3),      011750
                          6     S2PHI,       XS2PHI,      XV92P(3),   XH,         DELH,          011760
                          7     C0910(3,3),  C(P90(3,3),  OHO,        C0SC(3,3),  DVE92P(3),     011770
                          8     DDX  ,       DDY  ,       DDZ  ,      D2P95(4),   DELTR(3),      011780
                          9     GAINS(3,10),IGAINP(3)                                            011790
     20                   COMMON /PGRAV/  GLHSC,       GPCNT,      GPS2,       GPS4,          011800
                          1     GPH,         GPH2,        GPHS2                                  011810
                        DIMENSION A0P92P(3,3)                                                      011820
                        AS2PHI= A0P92P(3,1)**2                                                     011830
                        COEF = -GLHSC*AH*A0P92P(3,1)                                               011840
     25                 G92P(1) = -(GPCNT +GPS2*AS2PHI +GPS4*AS2PHI**2) * (1. - (GPH -          011850
                          1       GPHS2*AS2PHI)*AH+GPH2*AH**2)                                     011860
                        G92P(2) = -COEF*A0P92P(3,2)                                                011870
                        G92P(3) = -COEF*A0P92P(3,3)                                                011880
                        RETURN                                                                     011890
     30                 END                                                                      011900
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 GRAV

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	0	AH	REAL		F.P.
75	ALPHA	REAL		NAV	0	AS2PHI	REAL		F.P.
3	A0P92P	REAL	ARRAY	F.P.	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	33	COEF	REAL		
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
22	C9PH0	REAL	ARRAY	NAV	153	DELH	REAL		NAV
100	DELT	REAL		NAV	123	DELTA	REAL		NAV
210	DV592P	REAL	ARRAY	NAV	14	DV92P	REAL	ARRAY	NAV
101	ETA	REAL	ARRAY	NAV	112	ETLATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	0	GLHSC	REAL		PGRAV
1	GPCNT	REAL		PGRAV	4	GPH	REAL		PGRAV
6	GPHS2	REAL		PGRAV	5	GPH2	REAL		PGRAV
2	GPS2	REAL		PGRAV	3	GPS4	REAL		PGRAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
137	HV92P	REAL	ARRAY	NAV	263	IGAINP	INTEGER	ARRAY	NAV

VARIABLES	SN	TYPE		RELOCATION				
135	LAT	REAL		NAV	136	LONG	REAL	NAV
213	ODX	REAL		NAV	214	ODY	REAL	NAV
215	ODZ	REAL		NAV	222	OFILTR	REAL ARRAY	NAV
176	OMP	REAL		NAV	142	OV92P	REAL ARRAY	NAV
216	Q2P95	REAL	ARRAY	NAV	17	PHO	REAL ARRAY	NAV
76	SALF	REAL		NAV	145	S2PHI	REAL	NAV
63	THTCOR	REAL	ARRAY	NAV	55	THTCRT	REAL ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	134	V2MP	REAL	NAV
107	VS2	REAL	ARRAY	NAV	11	V92P	REAL ARRAY	NAV
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL	NAV
152	XH	REAL		NAV	124	XSALF	REAL	NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL ARRAY	NAV
126	XC92P	REAL	ARRAY	NAV				

COMMON BLOCKS	LENGTH
NAV	182
PGRAV	7

STATISTICS

PROGRAM LENGTH	340	28
CM LABELED COMMON LENGTH	2759	189

```
      1                 SUBROUTINE ANGVL2 (VLCTY,ASALF,ACALF,AS2PHI,AH)                        011910
                      C                                                                      011920
                      C     THIS SUBROUTINE COMPUTES THE ANGULAR VELOCITY OF THE PLATFORM    011930
                      C     FRAME WITH RESPECT TO THE ROTATING EARTH. THIS ANGULAR VELOCITY  011940
      5               C     IS CAUSED BY THE MOTION OF THE PLATFORM WITH RESPECT TO THE EARTH.011950
                      C     THE RESULTS ARE RETURNED IN RHO(1) THRU (3).                     011960
                      C                                                                      011970
                            IMPLICIT REAL(A-H,L-Z)                                           011980
                            COMMON /NAV/     CGP92P(3,3),V92P(3),    DV92P(3),   RH9(3),     011990
     10                     1      C9RHO(3,3),A(3,3),      B(3,3),     THTEPT(3),  THTTRO(3),  012000
                            2      THTCOP(3),  WXV(3),     G92P(3),    H,          ALPHA,      012010
                            3      SALF,       CALF,       DELT,       ETA(3),     V04P,       012020
                            4      LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,      012030
                            5      XSALF,      XCALF,      X8P92P(3,3),HV92P(3),   DV92P(3),   012040
     15                     6      S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,       012050
                            7      CC910(3,3), CGP90(3,3), OH3,        CC95(3,3),  DV592P(3),  012060
                            8      ODX   ,     ODY   ,     ODZ   ,     02P95(4),   DFILTP(3),  012070
                            9      GAINS(3,10),IGAINP(3)                                    012080
                            COMMON /UNVPSL/  PI,         RPI,        RD,         R2D,        012090
     20                     1      EF,         ESQ,        EF2RD,      WERT,       RADDER,     012100
                            2      PESQ                                                     012110
                            DIMENSION VLCTY(3)                                              012120
                            VE=ACALF*VLCTY(2)+ASALF*VLCTY(3)                                012130
                            VN=-ASALF*VLCTY(2)+ACALF*VLCTY(3)                               012140
     25                     TMP1=1.0/(1.0-ESQ*AS2PHI)                                       012150
                            TMP2= SQRT(TMP1)                                                012160
                            RP=AH+RD*TMP2                                                   012170
                            RM=AH+RESQ*TMP1*TMP2                                            012180
                            WE=-VN/RM                                                       012190
     30                     WN=VE/RP                                                        012200
                            RHO(2)=WE*ACALF-WN*ASALF                                        012210
                            RHO(3)=WE*ASALF+WN*ACALF                                        012220
                            RETURN                                                          012230
                            END                                                             012240
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 ANGVL2

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	0	ACALF	REAL		F.P.
1	AH	REAL		F.P.	75	ALPHA	REAL		NAV
0	ASALF	REAL		F.P.	0	AS2PHI	REAL		F.P.
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
166	CGP90	REAL	ARRAY	NAV	0	CGP92P	REAL	ARRAY	NAV
154	CC910	REAL	ARRAY	NAV	177	CC95	REAL	ARRAY	NAV
33	C92HO	REAL	ARRAY	NAV	153	DELH	REAL		NAV
110	DELT	REAL		NAV	123	DELTA	REAL		NAV
210	DV592P	REAL	ARRAY	NAV	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNVPSL	6	EF2RD	REAL		UNVPSL
5	ESQ	REAL		UNVPSL	101	ETA	REAL	ARRAY	NAV
112	FILATT	REAL	ARRAY	NAV	226	GAINS	REAL	ARRAY	NAV

VARIABLES	SN	TYPE		LOCATION					
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
1	HPI	REAL		UNVRSL	137	HV32P	REAL	ARRAY	NAV
253	IGATNP	INTEGER	ARRAY	NAV	185	LAT	REAL		NAV
136	LONG	REAL		NAV	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	OD7	REAL		NAV
222	OFILTP	REAL	ARRAY	NAV	175	OM3	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	9	PI	REAL		UNVRSL
216	O2P95	REAL	ARRAY	NAV	10	RADPER	REAL		UNVRSL
11	RESO	REAL		UNVRSL	17	RHO	REAL	ARRAY	NAV
60	RM	REAL			57	RP	REAL		
3	R(2	REAL		UNVRSL	2	R2	REAL		UNVRSL
76	SALF	REAL		NAV	145	S2PHI	REAL		NAV
61	THTCOR	REAL	ARRAY	NAV	55	THTEPT	REAL	ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	55	TMP1	REAL		
56	TMP2	REAL			104	V04P	REAL		NAV
53	VE	REAL			0	VLCTY	REAL	ARRAY	F.P.
54	VM	REAL			107	V02	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	51	WC	REAL		
7	WERT	REAL		UNVRSL	52	WN	REAL		
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV32P	REAL	ARRAY	NAV
126	X0P92P	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS
SQRT	REAL	1 LIBRARY

COMMON BLOCKS	LENGTH
NAV	182
UNVRSL	10

STATISTICS

PROGRAM LENGTH	639	51
CM LABELED COMMON LENGTH	3009	192

```
      1            SUBROUTINE ATUDE                                                  012250
                   C                                                                 012260
                   C     THIS ROUTINE CALCULATES THE THREE ATTITUDE ANGLES FROM      012270
                   C     THE BODY (S SPACE) TO LVN (2 SPACE) TRANSFORMATION          012280
      5            C     MATRIX.  THIS ROUTINE IS USED IN ALL IMU CONFIGURATIONS.    012290
                   C                                                                 012300
                        IMPLICIT REAL(A-H,L-Z)                                       012310
                        COMMON /INPUTS/  AQUANT,    TQUANT,    VQUANT,    START,    012320
                       1      STOP,      PLOTIM,    PRNT,      RSTRT,     CVD1,     012330
     10                2      CVD2,      CVD3,      IQLJRK,    HSQITM,    HSCINC,   012340
                       2      ITMNAV,    ITRATT,    INCOR,     TMUTYP,    IERLIM,   012350
                       3      IPC(30),   IOPNLP,    SSX0,      SSY0,      SSZ0,     012360
                       4      PSMAX,     DPSMAX,    ITRFIL                          012370
                        COMMON /IMUDAT/  RESID(3),  DV3P(3),   FTA9P(4),  WT(3),    012380
     15                1      SF91P(3),  C2P95(7,3), C9MIS(3,3), TRESID(3), C1090(3,3), 012390
                       2      C1092P(3,3), C2P95T(3,3), ARESID(3)                   012400
                        COMMON /NAV/     C9P92P(3,3),V92P(7),    DV92P(3),  PHD(7),   012410
                       1      C9PHO(3,3), AI(3),     D(3,7),    THTERT(3), THTIPD(3), 012420
                       2      THTCOP(3),  WXV(3),    G92P(3),   H,         ALPHA,    012430
                       3      SALF,       CALF,      DELT,      ETA(3),    V91P,     012440
     20                4      LAT,        LONG,      V92(3),    FILATT(3,3),DELTA,   012450
                       5      XSALF,      XCALF,     XDP92P(3,3),HV92P(3),  DV92D(3), 012460
                       6      S2PHI,      XC2PHI,    XV92P(3),  XH,        DELH,     012470
                       7      C0910(3,3), C0P90(3,3), DH3,       C995(3,3),  CV592P(3), 012480
     25                8      DDX ,       DDY ,      DDZ ,      C2P95(4),  DFILTP(3), 012490
                       9      GAINS(3,10),IGAINP(3)                                 012500
                        DIMENSION X(3,3)                                             012510
                        EQUIVALENCE (X,C2P95)                                        012520
                        ETA(1)= ATAN2(-X(1,2),X(1,1))                                012530
     30                 ETA(2)= ATAN2(X(1,3), SQRT(X(2,3)**2+X(3,3)**2))            012540
                        ETA(3)= ATAN2(X(2,3),X(3,3))+ALPHA                           012550
                        RETURN                                                       012560
                        END                                                          012570
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1	ATUDE

VARIABLES

SN	TYPE	RELOCATION		SN	TYPE	RELOCATION	
31	A	REAL ARRAY	NAV	75	ALPHA	REAL	NAV
0	AQUANT	REAL	INPUTS	100	ARESID	REAL ARRAY	IMUDAT
44	B	REAL ARRAY	NAV	77	CALF	REAL	NAV
10	CVD1	REAL	INPUTS	11	CVD2	REAL	INPUTS
12	CVD3	REAL	INPUTS	165	C9P90	REAL ARRAY	NAV
8	C9P92P	REAL ARRAY	NAV	154	C991C	REAL ARRAY	NAV
177	C995	REAL ARRAY	NAV	45	C1390	REAL ARRAY	IMUDAT
56	C1P92P	REAL ARRAY	IMUDAT	20	C2P95	REAL ARRAY	IMUDAT
67	C2P95T	REAL ARRAY	IMUDAT	31	C9MIS	REAL ARRAY	IMUDAT
22	C9PHO	REAL ARRAY	NAV	153	DELH	REAL	NAV
103	DELT	REAL	NAV	123	DELTA	REAL	NAV
66	DPSMAX	REAL	INPUTS	210	DV592P	REAL ARRAY	NAV
3	DV3P	REAL ARRAY	IMUDAT	14	DV92P	REAL ARRAY	NAV

VARIABLES	SN	TYPE	RELOCATION					
101	ETA	REAL	ARRAY	NAV	6	ETA0P	REAL	ARRAY	IMUDAT
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G02P	REAL	ARRAY	NAV	74	H	REAL		NAV
15	HSCING	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
177	HV02P	REAL	ARRAY	NAV	22	IOPLTM	INTEGER		INPUTS
263	IGAINP	INTEGER	ARRAY	NAV	21	IMUTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	ITRATT	INTEGER		INPUTS
67	ITPFIL	INTEGER		INPUTS	16	ITPNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	105	LONG	REAL		NAV
213	OOX	REAL		NAV	214	OOY	REAL		NAV
215	OOZ	REAL		NAV	223	OPTLTR	REAL	ARRAY	NAV
176	OR3	REAL		NAV	142	OV32P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	5	PRNT	REAL		INPUTS
216	Q2P95	REAL	ARRAY	NAV	3	RCSIC	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	55	RSMAX	REAL		INPUTS
7	RSTPT	REAL		INPUTS	76	SALF	REAL		NAV
15	SF3TR	REAL	ARRAY	IMUDAT	62	SSX1	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOS	REAL	ARRAY	NAV
56	THTERT	REAL	ARRAY	NAV	60	THTSQ	REAL	ARRAY	NAV
13	TOLJRK	REAL		INPUTS	1	TQUANT	REAL		INPUTS
42	TRESID	REAL	ARRAY	IMUDAT	104	V0MP	REAL		NAV
2	VQUANT	REAL		INPUTS	107	V32	REAL	ARRAY	NAV
11	V42P	REAL	ARRAY	NAV	12	WT	REAL	ARRAY	IMUDAT
66	WXV	REAL	ARRAY	NAV	30	X	REAL	ARRAY	IMUDAT
136	XCALF	REAL		NAV	152	XH	REAL		NAV
134	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	YV92P	REAL	ARRAY	NAV	126	XD0920	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS			
ATAN2	REAL	2 LIBRARY	SQRT	REAL	1 LIBRARY

COMMON BLOCKS	LENGTH
INPUTS	56
IMUDAT	67
NAV	182

STATISTICS

PROGRAM LENGTH	150	29
CM LABELED COMMON LENGTH	4619	305

```
      SUBROUTINE ININIT                                                 012540
C                                                                       012590
C     THIS ROUTINE PERFORMS MUCH OF THE INITIALIZATION OF THE           012600
C     NAV SIMULATOR. THE REST IS PERFORMED BY THE EXEC AND IN430        012610
C                                                                       012620
      IMPLICIT REAL(A-H),REAL(L-Z)                                      012630
      COMMON /CONTRL/  DTIME,      PTIME,      PLTIME,     PCTIME,      012640
     1     IPREV,      INIT,       ISTOP,      ICMCYL,     ICMCYP       012650
      COMMON /INUCAT/  PESID(3),   DVBP(3),    PTABP(4),   WT(3),       012660
     1     SF9IP(3),   C2P95(3,3), C2MIS(3,3), TPESID(3),  C1092(3,3),  012670
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                           012680
      COMMON /INPLTS/  AQUANT,     IQUANT,     VQUANT,     START,       012690
     1     STOP,       PLOTIM,     PRNT,       RSTRT,      CV01,        012700
     2     CV02,       CV03,       IOLJBK,     HSOTIM,     HSCINC,      012710
     2     IT2NAV,     IT2ATT,     INCOR,      IMUTYP,     IC2LIM,      012720
     3     IPC(30),    IOPNLP,     SSX0,       SSY0,       SSZ0,        012730
     4     PSMAX,      BRSMAX,     IIREIL                               012740
      COMMON /NAV/     C0P92P(3,3),V92P(3),    DV92P(3),   RHO(3),      012750
     1     C9RH0(3,3), A(3,3),     B(3,3),     THTC9T(3),  THTP90(3),   012760
     2    THTC0P(3),   HXV(3),     G92P(3),    H,          ALPHA,       012770
     3     SALF,       CALF,       DELT,       ETA(3),     V01P,        012780
     4     LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,       012790
     5     XSALF,      XCALF,      X1P92P(3,3),HV92P(3),   DV12P(3),    012800
     6     S2PHI,      XS2PHI,     XV02P(3),   YH,         DELH,        012810
     7     C0910(3,3), C0P90(3,3), DHO,        C095(3,3),  DV502P(3),   012820
     8     DUX ,       DDY ,       DDZ ,       D2P95(4),   DFILTP(7),   012830
     9     GAINS(3,10),IGAINP(3)                                        012840
      COMMON /PGRAV/   GLHSC,      GPCNT,      GPS2,       GPS4,        012850
     1     GRH,        GPH2,       GPHS2                                012860
      COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALF9T,       012870
     1     HO,         CTA9T(3),   V9T(3),     SF9T(3),    DELTS,       012880
     2     TIMEO,      LONGO,      SLAT9T,     CLAT9T,     SALF9T,      012890
     3     CALF9T                                                       012900
      COMMON /UNV8SL/  PI,         HPI,        P0,         P02,         012910
     1     FF,         FSQ,        EERR0,      WERT,       DAUPER,      012920
     2     RESQ                                                         012930
      LONGO = LONG9T                                                    012940
      TIMEO = TIME                                                      012950
      LAT = LAT9T                                                       012960
      LONG = LONGO                                                      012970
      ALPHA = -ALF9T                                                    012980
      SALF = SIN(ALPHA)                                                 012990
      CALF = COS(ALPHA)                                                 013000
      V92P(1) = V9T(3)                                                  013010
      V92P(2) = -V9T(2)                                                 013020
      V92P(3) = V9T(1)                                                  013030
C                                                                       013040
C     INITIALIZE THE DCM                                                013050
C                                                                       013060
      CALL ROTZYX(C1P92P,0.E0,1.E0,SLAT9T,CLAT9T,-SALF9T,CALF9T)        013070
      IF (IPC(6) .EQ. 0) GO TO 522                                      013080
      CALL DOUT(5)                                                      013090
  522 CONTINUE                                                          013100
      PHO(1) = 0.                                                       013110
      S2PHI=C0P92P(3,1)**2                                              013120
      H = HO                                                            013130
      DHO=HO                                                            013140
```

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                      IF (IPC(30) .NE. 0) GO TO 410                                    013160
                      DCM32S = C0P92P(3,2)**2                                          013170
     60               DCM33S = C0P92P(3,3)**2                                          013180
                      C0P2P = 2.0*EFPR0*C0P92P(3,2)*C0P92P(3,3)                        013190
                      ONEM = 1.0 - H**20                                               013200
                      RHO(2) = -V92P(3)*RHJ*(ONEM-EF*(1.-3.*DCM33S-DCM32S))-V92P(2)*C0PP013210
                      RHO(3) = V92P(2)*RHO*(ONEM-EF*(1.-3.*DCM32S-DCM33S))+V92P(3)*C0PP 013220
     65               GO TO 450                                                        013230
                  410 IF (IPC(29) .EQ. 0) CALL ANGVL2(V92P,SALF,CALF,S2PHI,H)          013240
                  450 IF (IPC(29) .EQ. 0) GO TO 600                                    013250
                      XS2PHI=S2PHI                                                     013260
                      XH=H                                                             013270
     70               XV92P(1)=V92P(1)                                                 013280
                      XV92P(2)=V92P(2)                                                 013290
                      XV92P(3)=V92P(3)                                                 013300
                      XCALF=CALF                                                       013310
                      XSALF=SALF                                                       013320
     75               XV92P(1)=V92P(1)                                                 013330
                      XV92P(2)=V92P(2)                                                 013340
                      XV92P(3)=V92P(3)                                                 013350
                      IF (IPC(30) .NE. 0) CALL ANGVL2(HV92P,XSALF,XCALF,XS2PHI,XH)     013360
                      IF (IPC(5) .NE. 0) CALL DOUT(5)                                  013370
     80               C                                                                013380
                      C     DCM UPDATE IS FIRST OR SECOND ORDER                        013390
                      C                                                                013400
                      CALL DCMUPD(C9PHO,PHO(1)*DELT,PHO(2)*DELT,PHO(3)*DELT,IPC(29),   013410
                     1 0.E0,A(1,1),A(1,2),A(1,3))                                      013420
     85               CALL MM(A,C0P92P,C9PHO)                                          013430
                      DO 520 I=1,3                                                     013440
                      DO 520 J=1,3                                                     013450
                      X0P92P(I,J)=C0P92P(I,J)+0.5*A(I,J)                               013460
                  520 CONTINUE                                                         013470
     90               IF (TIME .LT. OTIME) GO TO 550                                   013480
                      OTIME = TIME + INCOP*DELT                                        013490
                      CALL ORTHO(C0P92P)                                               013500
                      IF (IPC(7) .EQ. 0) GO TO 550                                     013510
                      CALL DOUT(7)                                                     013520
     95           550 CONTINUE                                                         013530
                      CALL GRAV(X0P92P,XS2PHI,XH)                                      013540
                      IF (IPC(12) .NE. 0) CALL DOUT(12)                                013550
                      CALL POSVEL                                                      013560
                      CALL ANGVL2(XV92P,XSALF,XCALF,XS2PHI,XH)                         013570
    100               CALL TORCOR(X0P92P,XV92P)                                        013580
                      INIT=1                                                           013590
                      RETURN                                                           013600
                  600 IF (IPC(5) .NE. 0) CALL DOUT(5)                                  013610
                      CALL TORCOR(C0P92P,V92P)                                         013620
    105               C9PHO(2,1) = PHO(3)*DELT                                         013630
                      C9PHO(3,1) = -PHO(2)*DELT                                        013640
                      C9PHO(3,2) = PHO(1)*DELT                                         013650
                      C9PHO(1,2) = -PHO(3)*DELT                                        013660
                      C9PHO(1,3) = PHO(2)*DELT                                         013670
    110               C9PHO(2,3) = -PHO(1)*DELT                                        013680
                      CALL GRAV(C0P92P,S2PHI,H)                                        013690
                      IF (IPC(12) .NE. 0) CALL DOUT(12)                                013700
                      CALL POSVEL                                                      013710
                      INIT=1                                                           013720
```

```
  115                RETURN                                          61*721
                     END                                             61*730
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    1 ININIT

VARIABLES	SN	TYPE	RELOCATION						
33	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
100	ARESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJIN
22	CLAT9T	REAL		TRAJIN	346	CO2P	REAL		
10	CV01	REAL		INPUTS	11	CV02	REAL		INPUTS
12	CV03	REAL		INPUTS	165	C0P3P	REAL	ARRAY	NAV
0	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
177	C095	REAL	ARRAY	NAV	45.	C1092	REAL	ARRAY	IMUDAT
56	C1092P	REAL	ARRAY	IMUDAT	20	C2P95	REAL	ARRAY	IMUDAT
67	C2P95T	REAL	ARRAY	IMUDAT	31	COMIS	REAL	ARRAY	IMUDAT
22	C9PHO	REAL	ARRAY	NAV	744	DCM33S	REAL		
745	DCM33S	REAL			153	DT19	REAL		NAV
100	DELT	REAL		NAV	123	DELTA	REAL		NAV
16	DELTS	REAL		TRAJIN	66	DPSMAX	REAL		INPUTS
213	DV592P	REAL	ARRAY	NAV	3	DV9P	REAL	ARRAY	IMUDAT
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNIVRSL
6	EE2P0	REAL		UNIVRSL	5	ES0	REAL		UNIVRSL
121	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
5	ETA9T	REAL	ARRAY	TRAJIN	112	ETLATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	3	GLHSG	REAL		PGRAV
1	GRCNT	REAL		PGRAV	4	GP4	REAL		PGRAV
6	GRNS2	REAL		PGRAV	5	GP42	REAL		PGRAV
2	GRS2	REAL		PGRAV	3	GPS4	REAL		PGRAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	H3	REAL		TRAJIN	1	HPT	REAL		UNIVRSL
15	HSGING	REAL		INPUTS	14	HSGTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	361	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	19	ICMCYP	INTEGER		CONTRL
23	IERLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	23	INGO2	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	5	ISTOP	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
15	ITPNAV	INTEGER		INPUTS	351	J	INTEGER		
105	LAT	REAL		NAV	1	LAT9T	REAL		TRAJIN
106	LONG	REAL		NAV	23	LONG9	REAL		TRAJIN
2	LONG9T	REAL		TRAJIN	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFILTP	REAL	ARRAY	NAV	175	OMP	REAL		NAV
347	OPCM	REAL			0	OTIMC	REAL		CONTRL
142	OV92P	REAL	ARRAY	NAV	9	PI	REAL		UNIVRSL
5	PLATIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIMC	REAL		CONTRL

VARIABLES	SN	TYPE		RELOCATION					
216	Q2P05	REAL	ARRAY	NAV	10	RA2P5R	REAL		UNVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RES0	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	R00	REAL		UNVRSL
55	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
2	RSTRT	REAL		INPUTS	2	S0	REAL		UNVRSL
76	SALF	REAL		NAV	23	SALF0T	REAL		TRAJIN
17	SF0T	REAL	ARRAY	TRAJIN	15	SF0TP	REAL	ARRAY	IMUDAT
21	SLAT0T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSYC	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	61	THTCC2	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	60	THTTC1	REAL	ARRAY	NAV
9	TIME	REAL		TRAJIN	17	TIMED	REAL		TRAJIN
17	TOLJRC	REAL		INPUTS	4	TRSEV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRSSTO	REAL	ARRAY	IMUDAT
104	V0MP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WEPT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	66	XXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XII	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XZP92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS			
ANGVL2		5	COS	REAL	1 LIBRARY
DCMUP0		9	DOUT		1
GRAV		3	MM		3
ORTHO		1	PQSVEL		9
POTZYX		7	SIN	REAL	1 LIBRARY
TOPCOP		2			

STATEMENT LABELS							
72	410	75	450			0	520
30	522	161	550			176	600

LOCAS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
174	520	I	86 89	138	NOT INNER
176	520	J	87 89	106	OPT

COMMON BLOCKS	LENGTH
CONTRL	9
IMUDAT	67
INPUTS	56
NAV	182
PQRAV	7
TRAJIN	21
UNVRSL	10

STATISTICS		
PROGRAM LENGTH	3528	234
CM LABELED COMMON LENGTH	5400	352

```
      SUBROUTINE ATTFIL                                                 013740
C                                                                       013750
C     THIS ROUTINE IS A MULTIPLE FIXED GAIN FILTER THAT I             013760
C     TO THE ATTITUDE DATA. ATTITUDE AND ITS FIRST AND SEC            013770
C     DERIVATIVES ARE THE STATE VARIABLES                             013780
C                                                                       013790
      IMPLICIT REAL(A-H,L-Z)                                            013800
      COMMON /INPUTS/ AQUANT,  TQUANT,  VQUANT,  STA  ,               013810
     1     STOP,    PLOTTP,  PRNT,   PSTPT,   CV01,                   013820
     2     CV02,    CV03,    IOLOOK,  HSNTIP,  HSCINC,                013830
     2     IIPMAX,  IIPATT,  INODE,   INPTYP,  IEPLTM,                013840
     3     IPC(50), IOPHLP,  SSX0,    SSY0,    SSZ0,                  013850
     4     RSMAX,   DRSMAX,  IERETL                                   013860
      COMMON /DAVE/ ...  DRP92P(3,3),V320(3),  DV92P(3),  RHO(3),     013870
     1     CIRH0(3,3), A(3,3),   R(3,3),   THTEST(3),  THTIPC(3),     013880
     2     XHTCOS(3),  HXV(3),   G922(3),   H,         ALPHA,         013890
     3     SALF,    CALF,    DELT,    ITA(3),  VOMF,                 013900
     4     LAT,     LONG,    V32(3),  FILATT(3,3),DELTA,             013910
     5     XSALF,   XCALF,   XJP92P(3,3),HV92P(3),  DV32P(3),        013920
     6     S2PHI,   XS2PHI,  XV92P(3),  XH,       DELH,             013930
     7     CC910(3,3), CP92G(3,3), OHO,     CJ95(3,3),  DV592P(3),  013940
     8     ODX,     ODY,     ODZ,     O2P95(4),  DFILT(3),           013950
     9     GAINS(3,10),IGAINP(3)                                      013960
      DIMENSION FILTR(3)                                              013970
C     FILTR ARE FILTER RESIDUALS                                      013980
      IF (IPC(25) .EQ. 3) RETURN                                      013990
C     IF FILTER NOT ACTIVATED, RETURN                                 014000
      DT=IIPFIL*DELTA                                                 014010
      DTSQ2=DT*DT*.5                                                  014020
C                                                                     014030
C     EXTRAPOLATE NEW STATE VECTOR, FIND THIS CYCLES RESIDUALS        014040
C     SELECT GAINS AND UPDATE STATE VECTOR. THE STATE VECTOR          014050
C     HERE IS THE ATTITUDE AND ITS FIRST AND SECOND DERIVATIVE.       014060
C                                                                     014070
      DO 300 J=1,3                                                    014080
C     LOOP OVER ROLL PITCH AND YAW                                    014090
      A(1,J)=FILATT(1,J)+FILATT(2,J)*DT+FILATT(3,J)*DTSQ2             014100
      A(2,J)=FILATT(2,J)+FILATT(3,J)*DT                               014110
      A(3,J)=FILATT(3,J)                                              014120
C     A IS NOW EXTRAPOLATED STATE VECTOR                              014130
      FILTR(J)=FTA(J)-A(1,J)                                          014140
C     RESIDUALS                                                       014150
      IF ( ABS(FILTR(J)) .GE. RSMAX) GO TO 300                        014160
C     IF RESIDUALS ARE TOO BIG, WANT TO MOVE GAINS POINTER LEFT       014170
C     WHICH IMPLIES LESS RELIANCE ON PREVIOUS VALUES                  014180
C     OF THE STATE VECTOR                                             014190
      IF ( ABS(DFILTR(J)-FILTR(J)) .GE. DRSMAX) GO TO 300             014200
C     IF CHANGE OF RESIDUALS TOO BIG, MOVE GAIN POINTER LEFT          014210
C     ELSE MOVE GAIN POINTER RIGHT                                    014220
      K=IGAINP(J)+1                                                   014230
      IF (K .GT. 10) K=10                                             014240
      GO TO 400                                                       014250
  300 K=IGAINP(J)-1                                                   014260
      IF (K .GE. 1) GO TO 400                                         014270
      A(2,J)=0.                                                       014280
      K=1                                                             014290
      A(1,J)=0.                                                       014300
```

```
                C     DISCARD FIRST AND SECOND DERIVATIVES                    014310
                      DO 60 I=1,3                                             014320
                      DO 60 J=1,3                                             014330
                      IGAINP(J)=K                                             014340
                      OFILTP(J)=FILTP(J)                                      014350
                      DO 900 I=1,3                                            014360
                  900 FILATT(I,J)=A(I,J)+GAINS(I,K)*FILTR(J)                  014370
                C     UPDATE STATE VECTOR                                     014380
                      RETURN                                                  014390
                   65 END                                                     014400
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 ATTFIL

VARIABLES

SN	TYPE	RELOCATION							
77	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
0	ACUANT	REAL		INPUTS	44	H	REAL	ARRAY	NAV
77	CALF	REAL		NAV	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	CCP93	REAL	ARRAY	NAV	0	CCP92P	REAL	ARRAY	NAV
154	CCP10	REAL	ARRAY	NAV	177	CC05	REAL	ARRAY	NAV
22	CCPHO	REAL	ARRAY	NAV	153	DELH	REAL		NAV
122	DELT	REAL		NAV	123	DELTA	REAL		NAV
66	DPSMAX	REAL		INPUTS	101	DT	REAL		
104	DTS02	REAL			210	DV592P	REAL	ARRAY	NAV
14	DV92P	REAL	ARRAY	NAV	111	ETA	REAL	ARRAY	NAV
112	FILATT	REAL	ARRAY	NAV	110	FILTP	REAL	ARRAY	
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	15	HPOINC	REAL		INPUTS
14	HSPTIM	REAL		INPUTS	137	HV32P	REAL	ARRAY	NAV
117	I	INTEGER			22	IFLTM	INTEGER		INPUTS
263	IGAINP	INTEGER	ARRAY	NAV	21	IHITYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	ITPATT	INTEGER		INPUTS
67	ITPFIL	INTEGER		INPUTS	16	ITPNAV	INTEGER		INPUTS
105	J	INTEGER			125	K	INTEGER		
105	LAT	REAL		NAV	106	LONG	REAL		NAV
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILTP	REAL	ARRAY	NAV
176	OHP	REAL		NAV	142	OV92P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	6	PUT	REAL		INPUTS
216	QCP95	REAL	ARRAY	NAV	17	RHO	REAL	ARRAY	NAV
65	RSMAX	REAL		INPUTS	7	RSTPT	REAL		INPUTS
76	SALF	REAL		NAV	62	SSX0	REAL		INPUTS
67	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
146	S2PHI	REAL		NAV	61	THTCOR	REAL	ARRAY	NAV
55	THTS2T	REAL	ARRAY	NAV	60	THTTSO	REAL	ARRAY	NAV
13	TOLJPK	REAL		INPUTS	1	TQUANT	REAL		INPUTS
134	VDUP	REAL		NAV	2	VQUANT	REAL		INPUTS
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
66	VV	REAL	ARRAY	NAV	120	XCALF	REAL		NAV
152	XH	REAL		NAV	124	YCALF	REAL		NAV

```
VARIABLES     SN  TYPE          RELOCATION
  146  XS2PHI     REAL                NAV          147  XV92P     REAL        ARRAY     NAV
  126  XDP92P     REAL      ARRAY     NAV

INLINE FUNCTIONS   TYPE   ARGS
       ABS         REAL      1  INTRIN

STATEMENT LABELS
   50  300                                  62  400                                  8  900

LOOPS  LABEL    INDEX      FROM-TO    LENGTH     PROPERTIES
   11  900   * J            35 62        718          NOT INNER
   67  900     I            61 62        108          OPT

COMMON BLOCKS   LENGTH
       INPUTS       56
       NAV         182

STATISTICS
  PROGRAM LENGTH                1139      75
  CM LABELED COMMON LENGTH      3569     238
```

```
      1              SUBROUTINE ORTHO(ARRAY)                                  014390
                     C                                                        014400
                     C     THIS ROUTINE ORTHONORMALIZES IS INPUT               014410
                     C                                                        014420
      5              IMPLICIT REAL(A-H),REAL(L-Z)                             014430
                     DIMENSION ARRAY(3,3),A(3,3),B(3,3)                       014440
                     CALL MTM(A,ARRAY,ARRAY)                                  014450
                     DO 525 I=1,3                                             014460
                 525 A(I,I) = A(I,I) - 1.0                                    014470
     12              CALL MMM(B,ARRAY,A)                                      014480
                     DO 530 I=1,3                                             014490
                     DO 530 J=1,3                                             014500
                 530 ARRAY(I,J) = ARRAY(I,J) - 0.5*B(I,J)                     014510
                     RETURN                                                   014520
     15              END                                                      014530
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 ORTHO

VARIABLES	SN	TYPE	RELOCATION					
61	A	REAL	ARRAY	0	ARRAY	REAL	ARRAY	F.P.
72	B	REAL	ARRAY	57	I	INTEGER		
60	J	INTEGER						

EXTERNALS	TYPE	ARGS			
MM		3		MTM	3

STATEMENT LABELS

0	525	0	530

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
21	525	I	8 9	58	INSTACK
32	530	I	11 13	129	NOT INNER
33	530	J	12 13	70	INSTACK

STATISTICS
PROGRAM LENGTH 1058 69

```
      SUBROUTINE DCMUPD(DCM,DX,DY,DZ,IORDM1,DIAG,DDX,DDY,DDZ)                  014540
      IMPLICIT REAL(A-H,L-Z)                                                   014550
C                                                                              014560
C     THIS ROUTINE CONSTRUCTS A DCM UPDATE MATRIX.  THE INPUTS                 014570
C     ARE THE ROTATIONS (ASSUMED TO BE INCREMENTAL ROTATIONS                   014580
C     IN NO PARTICULAR ORDER), THE ROTATIONS FROM                              014590
C     THE PREVIOUS CYCLE, THE ORDER OF THE ROTATION MINUS 1                    014600
C     (THAT IS 0 MEANS FIRST ORDER, 1 MEANS SECOND ORDER,                      014610
C     ANYTHING ELSE MEANS THIRD ORDER), AND THE VALUE(PRESUMABLY               014620
C     EITHER 0. OR 1.) THAT THE DIAGONAL ENTRIES WILL HAVE FOR ZERO            014630
C     ROTATION(THIS ALLOWS ONE TO GET EITHER A MATRIX THAT REPRESENTS          014640
C     THE AMOUNT THAT THE OLD DCM IS BEING CHANGED, OR TO GET A MATRIX         014650
C     THAT, WHEN MULTIPLIED BY THE OLD DCM, YIELDS THE NEW DCM).               014660
C     THE ROUTINE ALSO SAVES THE NEW ROTATIONS AS THE OLD ROTATIONS FOR         014670
C     USE DURING THE NEXT CYCLE.                                               014680
C                                                                              014690
      DIMENSION DCM(3,3)                                                       014700
C                                                                              014710
C     FORM FIRST ORDER TERMS                                                   014720
C                                                                              014730
  500 DCM(2,1) = DZ                                                            014740
      DCM(3,1) = -DY                                                           014750
      DCM(3,2) = DX                                                            014760
      DCM(1,2) = -DZ                                                           014770
      DCM(1,3) = DY                                                            014780
      DCM(2,3) = -DX                                                           014790
      DCM(1,1)=DIAG                                                            014800
      DCM(2,2)=DIAG                                                            014810
      DCM(3,3)=DIAG                                                            014820
C                                                                              014830
C     FORM AND ADD SECOND ORDER DCM UPDATE TERMS IF IORDM1 .NE. 0              014840
C                                                                              014850
      IF (IORDM1 .EQ. 0) GO TO 510                                             014860
      S1=DX**2                                                                 014870
      S2=DY**2                                                                 014880
      S3=DZ**2                                                                 014890
      DCM(1,1)=DCM(1,1)-0.5*(S2+S3)                                            014900
      DCM(2,2)=DCM(2,2)-0.5*(S3+S1)                                            014910
      DCM(3,3)=DCM(3,3)-0.5*(S1+S2)                                            014920
      T1=.5*DX*DY                                                              014930
      T2=.5*DY*DZ                                                              014940
      T3=.5*DZ*DX                                                              014950
      DCM(2,1)=DCM(2,1)+T1                                                     014960
      DCM(1,2)=DCM(1,2)+T1                                                     014970
      DCM(3,1)=DCM(3,1)+T2                                                     014980
      DCM(3,2)=DCM(3,2)+T2                                                     014990
      DCM(1,3)=DCM(1,3)+T3                                                     015000
      DCM(3,1)=DCM(3,1)+T3                                                     015010
C                                                                              015020
C     FORM AND ADD THIRD ORDER TERMS IF IORDM1 .GT. 1                          015030
C                                                                              015040
      IF (IORDM1 .EQ. 1) GO TO 510                                             015050
      T2=0.                                                                    015060
      T3=0.                                                                    015070
      T1=0.                                                                    015080
      SCL=.16666666666666666E0*(S1+S2+S3)                                      015090
      DCM(2,1)=DCM(2,1)-SCL*DZ+T3                                              015100
```

```
                      DCM(1,2)=DCM(1,2)+SCL*DZ-T3                                0151110
                      DCM(3,1)=DCM(3,1)+SCL*DY-T2                                0151120
                      DCM(1,3)=DCM(1,3)-SCL*DY+T2                                0151130
   60                 DCM(2,3)=DCM(2,3)+SCL*DX-T1                                0151140
                      DCM(3,2)=DCM(3,2)-SCL*DX+T1                                0151150
                  510 ODX=DX                                                     0151160
                      ODY=DY                                                     0151170
                      ODZ=DZ                                                     0151180
   65                 RETURN                                                     0151190
                      END                                                        0151200
```

CARD NR.	SEVERITY	DETAILS	DIAGNOSIS OF PROBLEM
56	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 OCMUPD

VARIABLES	SN	TYPE		RELOCATION					
0	DCM	REAL	ARRAY	F.P.	0	DTAG	REAL		F.P.
0	DX	REAL		F.P.	0	DY	REAL		F.P.
0	DZ	REAL		F.P.	0	IORDP1	INTEGER		F.P.
0	ODX	REAL		F.P.	0	ODY	REAL		F.P.
0	ODZ	REAL		F.P.	162	SCL	REAL		
154	S1	REAL			155	S2	REAL		
156	S3	REAL			157	T1	REAL		
160	T2	REAL			161	T3	REAL		

STATEMENT LABELS
0 500 INACTIVE 143 510

STATISTICS
PROGRAM LENGTH 1630 115

```
      1              SUBROUTINE QNTIZ(ARRAY,UNIT)                          015210
                     C                                                     015220
                     C     THIS SUBROUTINE PERFORMS THE QUANTIZATION FUNCTION.  015230
                     C     IT CAUSES ITS INPUTS TO BE TRUNCATED TO THE NEAREST INTEGRAL  015240
      5              C     MULTIPLE OF A UNIT.                             015250
                     C     A UNIT OF ZERO IS INTERPRETED TO MEAN NO QUANTIZATION.  015260
                     C                                                     015270
                           IMPLICIT REAL(A-H,L-Z)                          015280
                           DIMENSION ARRAY(3)                              015290
     10                    IF (UNIT .EQ. 0.) RETURN                        015300
                           DO 10 I=1,3                                     015310
                    10.    ARRAY(I)=UNIT*FLOAT(INT(ARRAY(I)/UNIT) )        015320
                           RETURN                                          015330
                           END                                             015340
```

SYMBOLIC REFERENCE MAP (R=11)

ENTRY POINTS

3 QNTIZ

VARIABLES	SN	TYPE	RELOCATION				
0	ARRAY	REAL	ARRAY	F.P.	26	I	INTEGER
0	UNIT	REAL		F.P.			

INLINE FUNCTIONS	TYPE	ARGS					
FLOAT	REAL	1	INTRIN	INT	INTEGER	1	INTRIN

STATEMENT LABELS

9 10

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
20	10	I	11 12	58	INSTACK

STATISTICS

PROGRAM LENGTH 338 27

```
SUBROUTINE MATVEC     74/74  OPT=0 TRACE                FTN 4.5+P406    06/26/76 17.24.46          PAGE     1

      1                SUBROUTINE MATVEC(D,B,C)                                        015350
                     C  SUBROUTINE TO MULTIPLY A VECTOR BY A MATRIX                   015360
                     C                                                                015370
                     C  FORM IS:                                                      015380
      5              C                                                                015390
                     C        D = B*C                                                 015400
                     C                                                                015410
                     C        D = 1X3 VECTOR                                          015420
                     C        B = 3X3 MATRIX                                          015430
     10              C        C = 1X3 VECTOR                                          015440
                     C                                                                015450
                     C                                                                015460
                                IMPLICIT REAL(A-H,L-Z)                               015470
                                DIMENSION A(3),B(3,3),C(3),D(3)                      015480
     15                         DO 20 I=1,3                                          015490
                                A(I) = 0.0                                           015500
                                DO 20 J=1,3                                          015510
                           20   A(I) = A(I) + B(I,J)*C(J)                            015520
                                DO 22 I=1,3                                          015530
     20                    22   D(I) = A(I)                                          015540
                                RETURN                                               015550
                                END                                                  015560

1-204


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  MATVEC

VARIABLES     SN  TYPE            RELOCATION
   42  A         REAL     ARRAY                  0  0        REAL     ARRAY     F.P.
    0  C         REAL     ARRAY     F.P.         0  D        REAL     ARRAY     F.P.
   40  I         INTEGER                        41  J        INTEGER

STATEMENT LABELS
    0  20                                       0  22

LOOPS  LABEL    INDEX      FROM-TO     LENGTH     PROPERTIES
   16  20         I          15 18        148                NOT INNER
   21  20         J          17 18         78     INSTACK
   31  22         I          19 20         48     INSTACK

STATISTICS
  PROGRAM LENGTH                530       43
```

```
      1          SUBROUTINE MTM(DD,BB,CC)                                  015677
                 C                                                         015680
                 C                                                         015683
                 C                                                         015686
      5          C     SUBROUTINE TO MULTIPLY A MATRIX BY A TRANSPOSED MATRIX 015690
                 C                                                         015693
                 C     FORM IS:                                            015696
                 C                                                         015699
                 C          DD = BB*CC                                     015703
     10          C                                                         015706
                 C               BB = MATRIX TO BE TRANSPOSED BEFORE MULTIPLYING 015709
                 C                                                         015713
                 C                                                         015716
                 C                                                         015719
     15                 IMPLICIT REAL(A-H,L-Z)                            015723
                        DIMENSION AA(3,3),BB(3,3),CC(3,3),DD(3,3)         015726
                        DO 10 I=1,3                                       015730
                        DO 10 J=1,3                                       015733
                        AA(I,J) = 0.0                                     015736
     20                 DO 10 K=1,3                                       015740
                   10   AA(I,J) = AA(I,J) + BB(K,I)*CC(K,J)               015743
                        DO 12 I=1,3                                       015746
                        DO 12 J=1,3                                       015750
                   12   DD(I,J) = AA(I,J)                                 015753
     25                 RETURN                                            015756
                        END                                               015760
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 MTM

VARIABLES	SN	TYPE		RELOCATION					
56	AA	REAL	ARRAY		0	BB	REAL	ARRAY	F.P.
0	CC	REAL	ARRAY	F.P.	0	DD	REAL	ARRAY	F.P.
51	I	INTEGER			54	J	INTEGER		
55	K	INTEGER							

STATEMENT LABELS

0 10 0 12

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
16	10	* I	17 21	228	NOT INNER
17	10	* J	18 21	178	NOT INNER
23	10	K	20 21	108	OPT
41	12	* I	22 24	119	NOT INNER
42	12	J	23 24	68	INSTACK

STATISTICS

PROGRAM LENGTH 758 61

```
      1                SUBROUTINE MM(A,B,C)                                   015930
                       IMPLICIT REAL(A-H,L-Z)                                 015940
                       DIMENSION A(3,3),B(3,3),C(3,3),D(3,3)                  015950
                       DO 10 I=1,3                                            015960
                     5 DO 10 J=1,3                                            015970
                       A(I,J) = 0.0                                           015980
                       DO 10 K=1,3                                            015990
                    10 A(I,J) = A(I,J) + B(I,K)*C(K,J)                        016000
                       DO 12 I=1,3                                            016010
                    10 DO 12 J=1,3                                            016020
                    12 D(I,J) = A(I,J)                                        016030
                       RETURN                                                 016040
                       END                                                    016050
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 MM

VARIABLES	SN	TYPE	RELOCATION						
56	A	REAL	ARRAY		0	B	REAL	ARRAY	F.P.
70	C	REAL	ARRAY	F.P.	0	D	REAL	ARRAY	F.P.
53	I	INTEGER			54	J	INTEGER		
55	K	INTEGER							

STATEMENT LABELS
0 10 0 12

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
16	10	* I	4 8	220	NOT INNER
17	10	* J	5 8	170	NOT INNER
23	10	K	7 8	100	OPT
41	12	* I	9 11	110	NOT INNER
42	12	J	10 11	60	INSTACK

STATISTICS
PROGRAM LENGTH 758 51

```
      1                 SUBROUTINE ROTXYZ(ARRAY,SZ,CZ,SY,CY,SX,CX)                    015960
                        C                                                             015970
                        C     THIS ROUTINE FORMS THE ROTATION MATRIX THAT ACTS ON AN X-Y-Z   015980
                        C     COLUMN VECTOR AS SPECIFED BY THREE EULER ROTATIONS. FIRST      015990
      5                 C     ROTATION IS MINUS Z DEGREES ABOUT Z, THEN MINUS Y ABOUT Y,     016000
                        C     THEN X DEGREES ABOUT X. THE INPUTS ARE THE SINES AND COSINES OF  016010
                        C     Z,Y, AND X DEGREES. THE RESULT IS STORED IN ARRAY.             016020
                        C                                                             016030
                              IMPLICIT REAL(A-H,L-Z)                                  016040
     10                       DIMENSION ARRAY(3,3)                                    016050
                              SYCZ = SY*CZ                                            016060
                              SYSZ = SY*SZ                                            016070
                              ARRAY(1,1) = CY*CZ                                      016080
                              ARRAY(2,1) = CX*SZ + SX*SYCZ                            016090
     15                       ARRAY(3,1) = -SX*SZ + CX*SYCZ                           016100
                              ARRAY(1,2) = -CY*SZ                                     016110
                              ARRAY(2,2) = CX*CZ + SX*SYSZ                            016120
                              ARRAY(3,2) = -SX*CZ + CX*SYSZ                           016130
                              ARRAY(1,3) = SY                                         016140
     20                       ARRAY(2,3) = -SX*CY                                     016150
                              ARRAY(3,3) = CX*CY                                      016160
                              RETURN                                                  016170
                              END                                                     016180
```

1-207

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

3 ROTXYZ

VARIABLES	SN	TYPE		RELOCATION					
0	ARRAY	REAL	ARRAY	F.P.	0	CX	REAL		F.P.
0	CY	REAL		F.P.	0	CZ	REAL		F.P.
0	SX	REAL		F.P.	0	SY	REAL		F.P.
51	SYCZ	REAL			52	SYSZ	REAL		
0	SZ	REAL		F.P.					

STATISTICS

PROGRAM LENGTH 533 43

```
      1            SUBROUTINE MATRAN(B,A)                                    016190
                   IMPLICIT REAL(A-H),REAL(L-Z)                              016200
                  C                                                          016210
                  C     TRANSPOSE 3X3 MATRIX, A, AND RETURN AS B             016220
      5           C                                                          016230
                   DIMENSION A(3,3),B(3,3)                                   016240
                   B(1,1)=A(1,1)                                             016250
                   B(2,1)=A(1,2)                                             016260
                   B(3,1)=A(1,3)                                             016270
     10            B(1,2)=A(2,1)                                             016280
                   B(2,2)=A(2,2)                                             016290
                   B(3,2)=A(2,3)                                             016300
                   B(1,3)=A(3,1)                                             016310
                   B(2,3)=A(3,2)                                             016320
     15            B(3,3)=A(3,3)                                             016330
                   RETURN                                                    016340
                   END                                                       016350
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
  7 MATRAN

VARIABLES SN TYPE RELOCATION
  0 A REAL ARRAY F.P. 0 B REAL ARRAY F.P.

STATISTICS
  PROGRAM LENGTH 270 23

```
      SUBROUTINE ROTZYX(ARRAY,SZ,CZ,SY,CY,SX,CX)                        016360
C                                                                       016370
C     THIS ROUTINE FORMS THE ROTATION MATRIX THAT ACTS ON AN X-Y-Z      016380
C     VECTOR. THE ROTATION IS SPECIFIED BY THREE EULER ANGLES. FIRST    016390
C     ROTATION IS ABOUT X, NEXT ABOUT Y, THEN ABOUT Z. THE INPUTS       016400
C     ARE THE SINES AND COSINES OF THE ROTATIONS ANGLES. THE OUTPUT IS  016410
C     IN ARRAY                                                          016420
C                                                                       016430
      IMPLICIT REAL(A-H,L-Z)                                            016440
      DIMENSION ARRAY(3,3)                                              016450
      SYSX=SY*SX                                                        016460
      CYCX=CY*CX                                                        016470
      ARRAY(1,1)=CY*CZ                                                  016480
      ARRAY(2,1)=-SZ*CY                                                 016490
      ARRAY(3,1)=SY                                                     016500
      ARRAY(1,2)=SYSX*CZ+SZ*CX                                          016510
      ARRAY(2,2)=-SYSX*SZ+CZ*CX                                         016520
      ARRAY(3,2)=-CY*SX                                                 016530
      ARRAY(1,3)=-CZ*SYCX+SZ*SX                                         016540
      ARRAY(2,3)=SZ*SYCX+SX*CZ                                          016550
      ARRAY(3,3)=CY*CX                                                  016560
      RETURN                                                            016570
      END                                                               016580
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 ROTZYX

VARIABLES	SN	TYPE		RELOCATION					
0	ARRAY	REAL	ARRAY	F.P.	0	CX	REAL		F.P.
0	CY	REAL		F.P.	0	CZ	REAL		F.P.
0	SX	REAL		F.P.	0	SY	REAL		F.P.
52	SYCX	REAL			51	SYSX	REAL		
0	SZ	REAL		F.P.					

STATISTICS
PROGRAM LENGTH 538 43

```
      SUBROUTINE SSATUD                                                 016590
C                                                                       016600
C     THIS ROUTINE GENERATES THAT GYRBAL ANGLES THAT WOULD BE GENRATED  016610
C     BY A PERFECT SPACE STABLE IMU. THE ANGLES ARE ROTATIONS           016620
C     ABOUT Z,X,Y, AND Z (IN THAT ORDER) FROM THE BODY IN               016630
C     TOWARDS THE IMU                                                   016640
C                                                                       016650
      IMPLICIT REAL(A-H),REAL(L-Z)                                      016660
      COMMON /INUDAT/ RESID(3),     DV3P(3),     ETA9P(4),    WT(3),    016670
     1    SESIP(3),   C2P95(3,3),  C9MIS(3,3), TRESID(3),  C1092(3,3), 016680
     2   C1092P(3,3), C2095T(3,3), ARESID(3)                            016690
      COMMON /NAV/    C9P92P(3,3),V92P(3),     DV92P(3),    PHO(3),    016700
     1    C9RHO(3,3), A(3,3),      B(3,3),     THTERT(3),   THTTRO(3), 016710
     2   THTCOR(3),   HXV(3),      G92P(3),    H,           ALPHA,     016720
     3    SALF,       CALF,        DELT,       ETA(3),      VP4P,      016730
     4    LAT,        LONG,        V92(3),     FILATT(3,3), DELTA,     016740
     5    XSALF,      XCALF,       XDP92P(3,3),HV92P(3),    DV92P(3),  016750
     6    SBPHI,      XS2PHI,      XV92P(3),   VH,          DELH,      016760
     7    C0910(3,3), C0190(3,3),  DH3,        C095(3,3),   DV592P(3), 016770
     8    DDX,        DDY,         DDZ,        G2P95(4),    DFILTR(3), 016780
     9    GAINS(3,10),IGAINP(3)                                         016790
      COMMON /UNIVERSL/ PI,         HPI,        DR,          RBD,       016800
     1    EE,         ESQ,         EERRO,      WERT,        RADPER,    016810
     2    RESQ                                                          016820
      COMMON /TRAJIN/ TIME,         LAT3T,      LONG9T,      ALF9T,     016830
     1    H9,         ET49T(3),    V9T(3),     SF9T(3),     DELTS,     016840
     2    TIMEO,      LONGO,       SLAT9T,     CLAT9T,      SALF9T,    016850
     3    CALF9T                                                        016860
      COMMON /INPUTS/ ADUANT,       IDUANT,     VDUANT,      START,     016870
     1    STOP,       PLOTIM,      PONT,       RSTRT,       CVD1,      016880
     2    CVD2,       CVD3,        IDLJPK,     HSOTIP,      HSPINC,    016890
     2    ITPHAV,     ITPAIT,      INSOP,      IMUTYP,      ISALIM,    016900
     3    IOC(30),    IOPNLP,      SSX0,       SSY0,        SSZ0,      016910
     4    PSMAX,      OMSMAX,      ITOFIL                               016920
      EQUIVALENCE (TH1,ETA9P(1)), (TH2,ETA9P(2)), (TH3,ETA9P(3)),      016930
     1   (TH4,ETA9P(4))                                                 016940
      CALL ROTXYZ(C2P95, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),   016950
     1   COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                  016960
      CALL MTIA,C1092R,C2P95)                                           016970
      OTH2=TH4                                                          016980
      OTH1=TH1                                                          016990
      TEMP= SQRT(1.0E0-A(3,3)**2)                                       017000
      IF (TEMP .EQ. 0.E0) GO TO 5                                       017010
      TH2= ATAN2(A(3,1),-A(3,2))                                        017020
      TH1= ATAN2(TEMP,A(3,3))                                           017030
      TH3= ATAN2(A(1,3),A(2,3))                                         017040
    5 DTH2=TH2-OTH2                                                     017050
      DTH1=TH1-OTH1                                                     017060
      IF (DTH2 .GT. HPI .AND. DTH1 .GT. HPI) GO TO 1                    017070
      GO TO 2                                                           017080
    1 TH2=TH2+PI                                                        017090
      TH3=-TH3                                                          017100
      TH1=TH1+PI                                                        017110
    2 CONTINUE                                                          017120
      TH1=TH1-.5*PI                                                     017130
      CALL ORIT2(ETA9P,ADUANT)                                          017140
      ETA9P(4)=ETA9P(2)                                                 017150
```

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                ETA9P(2)=0.                                              017160
                IF (IPC(2) .NE. 0) CALL DOUT(2)                          017170
 69             RETURN                                                   017180
                END                                                      017190
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 SSATUD

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALEGT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	ADUANT	REAL		INPUTS
100	ARESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFGT	REAL		TRAJIN
22	CLATGT	REAL		TRAJIN	10	CVP1	REAL		INPUTS
11	CVP2	REAL		INPUTS	12	CVP3	REAL		INPUTS
155	C9P90	REAL	ARRAY	NAV	0	C9P92P	REAL	ARRAY	NAV
154	C9910	REAL	ARRAY	NAV	177	C9J5	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2295T	REAL	ARRAY	IMUDAT
31	C9HIS	REAL	ARRAY	IMUDAT	22	C9PH0	REAL	ARRAY	NAV
151	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DPSMAX	REAL		INPUTS	164	DTH1	REAL		
163	DTH2	REAL			210	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNVPSL	5	EFDPO	REAL		UNVPSL
5	ESO	REAL		UNVPSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	IMUDAT	5	ETAGT	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HO	REAL		TRAJIN	1	HPT	REAL		UNVPSL
15	HSOINC	REAL		INPUTS	14	HSOTTM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	22	IDELIM	INTEGER		INPUTS
261	IGAINP	INTEGER	ARRAY	NAV	21	IMUTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	ITRATT	INTEGER		INPUTS
57	ITRFIL	INTEGER		INPUTS	16	ITRUAV	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LATGT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGO	REAL		TRAJIN
2	LONGGT	REAL		TRAJIN	213	COX	REAL		NAV
214	OOV	REAL		NAV	215	OOZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OH2	REAL		NAV
161	OTH1	REAL			160	OTH2	REAL		
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVPSL
5	PLOTIN	REAL		INPUTS	6	PPNT	REAL		INPUTS
216	Q2P95	REAL	ARRAY	NAV	19	RADPER	REAL		UNVPSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESI	REAL		UNVPSL
17	RHO	REAL	ARRAY	NAV	3	RPI	REAL		UNVPSL
65	RSMAX	REAL		INPUTS	7	RSTRT	REAL		INPUTS
2	S2	REAL		UNVPSL	76	SALF	REAL		NAV
23	SALFGT	REAL		TRAJIN	13	SFGT	REAL	ARRAY	TRAJIN

VARIABLES	SN	TYPE		RELOCATION					
15	SF91P	REAL	ARRAY	INUDAT	21	SLAT9T	REAL		TRAJIN
62	SSXO	REAL		INPUTS	63	SSYO	REAL		INPUTS
64	SSZO	REAL		INPUTS	3	STAPT	REAL		INPUTS
14	STOP	REAL		INPUTS	145	S2PHT	REAL		NAV
162	TEMP	REAL			53	THICOP	REAL	ARRAY	NAV
55	THIERT	REAL	ARRAY	NAV	60	THITWO	REAL	ARRAY	NAV
5	TH1	REAL		INUDAT	7	TH2	REAL		INUDAT
10	TH3	REAL		INUDAT	11	TH4	REAL		INUDAT
0	TIMF	REAL		TRAJIN	17	TIMEO	REAL		TRAJIN
21	TOLJPK	REAL		INPUTS	1	TQUANT	REAL		INPUTS
42	TPESID	REAL	ARRAY	INUDAT	104	VOMP	REAL		NAV
2	VQUANT	REAL		INPUTS	10	VOT	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
7	WEPT	REAL		UNVCSL	12	WT	REAL	ARRAY	INUDAT
66	WXV	REAL	ARRAY	NAV	125	XCALC	REAL		NAV
152	XII	REAL		NAV	124	XSALE	REAL		NAV
146	XS2PHT	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XOP92P	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS				
ATAN2	REAL	2	LIBRARY	COS	REAL	1 LIBRARY
DOUT		1		MM		3
ONTIZ		2		ROTXYZ		7
SIN	REAL	1	LIBRARY	SQRT	REAL	1 LIBRARY

STATEMENT LABELS							
61	1	70	2			53	5

COMMON BLOCKS	LENGTH
INUDAT	67
NAV	182
UNVCSL	10
TRAJIN	21
INPUTS	56

STATISTICS		
PROGRAM LENGTH	1650	117
CM LABELED COMMON LENGTH	5280	336

```
      SUBROUTINE SSINTG                                                 017200
C                                                                       017210
C     THIS ROUTINE TRANSFORMS THE VELOCITY INCREMENTS FROM              017220
C     THE HANDCP AZIMUTH FRAME TO THE SPACE STABLE FRAME                017230
C                                                                       017240
      IMPLICIT REAL(A-H),REAL(L-Z)                                      017250
      COMMON /INPUTS/ AQUANT,    IQUANT,    VQUANT,    STAST,          017260
     1    STOP,       PLOTIM,    PRNT,      PSTOT,     CVD1,           017270
     2    CVD2,       CVD3,      TOLJPK,    HSOTIM,    HSCTMC,         017280
     2    IIRNAV,     IIRATT,    INCOR,     IMUTYP,    IERLIM,         017290
     3    IPC(30),    IOPNLP,    SSX0,      SSY0,      SSZ0,           017300
     4    RSMAX,      DRSMAX,    ITRFIL                                017310
      COMMON /IMUDAT/ RESID(3),  DV1P(3),   FTA9P(4),  WT(3),          017320
     1    SF9IP(3),   C2P95(3,3), C2N1S(3,3), IPESTO(3), C1092(3,3),   017330
     2    C1N92P(3,3), C2P45T(3,3), ARCSIN(3)                          017340
      COMMON /NAV/    C0PN2P(3,3),VV2P(3),   DV92P(3),   PHD(3),       017350
     1    C0RH0(3,3), A(3,3),    B(3,3),    THTEPT(3),  THTIPO(3),    017360
     2    THTCOR(3),  HXV(3),    G92P(3),   H,          ALPHA,          017370
     3    SALF,       CALF,      DELT,      FTA(3),     VOMP,           017380
     4    LAT,        LONG,      V92(3),    FILATT(3,3),DELTA,          017390
     5    XSALF,      XCALF,     XIP92P(3,3),HV92P(3),  DV92P(3),       017400
     6    S2PHI,      XS2PHI,    XV92P(3),  XH,         DELH,           017410
     7    C0910(3,3), C0P90(3,3), OMB,       C035(3,3),  DV*92P(3),    017420
     8    ODX,        ODY,       ODZ,       D2P95(4),   DELTS(3),       017430
     9    GAINS(3,10),IGAINP(3)                                        017440
      COMMON /TRAJIO/ TIME,      LAT9T,     LONG9T,    ALF9T,          017450
     1    HB,         ETA9T(3),  V9T(3),    SF9T(3),   DELTS,          017460
     2    TIMED,      LONGD,     SLAT9T,    CLAT9T,    SALF9T,         017470
     3    CALF9T                                                       017480
      COMMON /UNIVRSL/ PI,       HPI,       P2,        RPD,            017490
     1    CF,         ESQ,       EPS2C,     WERT,      RADPER,         017500
     2    RESQ                                                         017510
      DIMENSION TEMP(3)                                                017520
      TEMP(1)=-LONG9T*LONGJ-WERT*(TIME-TIMED)                          017530
      CALL ROTZYX(A, SIN(TEMP(1)), COS(TEMP(1)),SLAT9T,CLAT9T,         017540
     1 -SALF9T,CALF9T)                                                 017550
      TEMP(1)=SF9T(3)                                                  017560
      TEMP(2)=-SF9T(2)                                                 017570
      TEMP(3)=SF9T(1)                                                  017580
      CALL MXV(C1092P,C1090,A)                                         017590
      IF (IPC(14) .NE. 0) CALL DOUT(14)                                017600
      CALL MATVEC(SF9T,C1092P,TEMP)                                    017610
      RETURN                                                           017620
      END                                                              017630
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 SSINTG

VARIABLES	SN	TYPE	RELOCATION				
73 A		REAL	ARRAY	NAV	1	ALF9T	REAL	TRAJIO
75 ALPHA		REAL		NAV	0	AQUANT	REAL	INPUTS

VARIABLES SN TYPE RELOCATION

100	APESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFDT	REAL		TRAJIN
22	CLATDT	REAL		TRAJIN	10	CVD1	REAL		INPUTS
11	CVD2	REAL		INPUTS	12	CVD3	REAL		INPUTS
165	C0P90	REAL	APRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C035	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1192P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	C4MTS	REAL	ARRAY	IMUDAT	22	C5P4C	REAL	ARRAY	NAV
153	DELH	REAL		NAV	101	DELT	REAL		NAV
127	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DPSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EE	REAL		UNVPSL	6	EE2P9	REAL		UNVPSL
5	ESQ	REAL		UNVPSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	IMUDAT	5	ETA9T	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HB	REAL		TRAJIN	1	HDT	REAL		UNVPSL
15	HSCINC	REAL		INPUTS	14	HSTTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	23	IDELTM	INTEGER		INPUTS
253	IGAINP	INTEGER	ARRAY	NAV	21	IMUTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	61	IOPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	ITRATT	INTEGER		INPUTS
67	ITRFIL	INTEGER		INPUTS	16	ITYNAV	INTEGER		INPUTS
105	LAT	REAL		NAV	1	LATDT	REAL		TRAJIN
106	LONG	REAL		NAV	20	LONGD	REAL		TRAJIN
2	LONGDT	REAL		TRAJIN	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFTLTP	REAL	ARRAY	NAV	175	OM3	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVPSL
5	PLOTTM	REAL		INPUTS	6	PSNT	REAL		INPUTS
216	Q2P95	REAL	ARRAY	NAV	10	RADPER	REAL		UNVPSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESQ	REAL		UNVPSL
17	RHO	REAL	ARRAY	NAV	3	RRQ	REAL		UNVPSL
65	RSHAV	REAL		INPUTS	7	RSTRT	REAL		INPUTS
2	RR	REAL		UNVPSL	76	SALF	REAL		NAV
21	SALFDT	REAL		TRAJIN	13	SFDT	REAL	ARRAY	TRAJIN
15	SF9TP	REAL	ARRAY	IMUDAT	21	SLATDT	REAL		TRAJIN
62	SSXQ	REAL		INPUTS	61	SSYQ	REAL		INPUTS
64	SSZQ	REAL		INPUTS	3	START	REAL		INPUTS
4	STOP	REAL		INPUTS	145	S2PHI	REAL		NAV
63	TEMP	REAL	ARRAY		63	THTCOP	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	60	THTT2D	REAL	ARRAY	NAV
1	TIME	REAL		TRAJIN	17	TIMED	REAL		TRAJIN
13	TOLJOG	REAL		INPUTS	1	TQUANT	REAL		INPUTS
42	TRESID	REAL	ARRAY	IMUDAT	104	VDYP	REAL		NAV
2	VQUANT	REAL		INPUTS	10	VQT	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
7	WDOT	REAL		UNVPSL	12	WT	REAL	ARRAY	IMUDAT
66	WXV	REAL	ARRAY	NAV	135	XCALF	REAL		NAV
153	XH	REAL		NAV	134	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XZP92P	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS					
COS	REAL	1	LIBRARY	DOUT		1	
MATVEC		3		MM		3	
POTZYX		7		STN	REAL	1	LIBRARY

COMMON BLOCKS	LENGTH
INPUTS	56
INUDAT	67
NAV	182
TRAJIN	21
UNIVRSL	10

STATISTICS

PROGRAM LENGTH	668	54
CM LABELED COMMON LENGTH	5200	336

```
      SUBROUTINE SSINIT                                                 017640
C                                                                       017650
C     THIS ROUTINE PERFORMS THE INITIALIZATION FOR THE SPACE STABLE     017660
C     CASE.ALL INITIALIZATION OF THE NAV EQUATIONS(EXCEPT FOR SSTSPH)   017670
C     IS PERFORMED BY THE COMMON SUBROUTINE ININIT.                     017680
C                                                                       017690
      IMPLICIT REAL(A-H),REAL(L-Z)                                      017700
      COMMON /CONTPL/ OTIME,      PTIME,      PLTIME,     PSTIME,       017710
     1    IPREV,      INIT,       ISTOP,      ICMCYL,     ICMCYP        017720
      COMMON /IMUCAL/ PESID(3),   OVSP(3),    ETASP(4),   MT(3),        017730
     1    SFSTP(3),   C2P3S(3,3), C3MIS(3,3), TPESTO(3),  C1290(3,3),   017740
     2    C1J92P(3,3), C2P95T(3,3), APESID(3)                           017750
      COMMON /INPUTS/ ACUANT,     TQUANT,     VQUANT,     START,        017760
     1    STOP,       PLOTIM,     PINT,       PSTRT,      CV31,         017770
     2    CV02,       CV03,       TOLJPK,     HSOTTH,     HSCTHC,       017780
     2    ITRNAV,     ITRATT,     INCOP,      IMUTYP,     ITRLIM,       017790
     3    IPC(30),    IOPNLP,     SS40,       SSY0,       SSZ0,         017800
     4    PSMAX,      OMSMAX,     ITRFIL                                017810
      COMMON /NAV/    COP32P(3,3),V92P(3),    OV92P(3),   PHO(3),       017820
     1    C9PHO(3,3), A(3,3),     B(3,3),     INTFPT(3),  INTTPO(3),    017830
     2    THTCOP(3),  WXV(3),     G92P(3),    H,          ALPHA,        017840
     3    SALF,       CALF,       DELT,       ETA(3),     VPHF,         017850
     4    LAT,        LONG,       V92(3),     FILAT(3,3),DELTA,         017860
     5    XSALF,      XCALF,      XOP32P(3,3),WV92P(3),   OV92P(3),     017870
     6    S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,         017880
     7    C9910(3,3), COP90(3,3), UNB,        C935(3,3),  WV92P(3),     017890
     8    ODX ,       ODY ,       ODZ ,       O2P95(4),   DELTP(3),     017900
     9    GAINS(3,10),IGAINP(3)                                         017910
      COMMON /TRAJIN/ TIME,       LAT9T,      LONG9T,     ALF9T,        017920
     1    H9,         CTA9T(3),   V9E(3),     SF9T(3),    DELTS,        017930
     2    TIME0,      LONG0,      SLAT9T,     CLAT9T,     SALF9T,       017940
     3    CALF9T                                                        017950
      CALL ROTZYX(C9910, SIN(SSZ0), COS(SSZ0), SIN(SSY0), COS(SSY0),    017960
     1   SIN(SSX0), COS(SSX0))                                          017970
      CALL MATPAN(C1090,C9910)                                          017980
      CALL ROTZYX(C9P90,0.E0,1.E0,0.E0,1.E0,0.E0,1.E0)                  017990
      CALL INPEC                                                        018000
      ICMCYL=ITRNAV*ITRATT                                              018010
      CALL ROTZYX(C9P92P,0.E0,1.E0,SLAT9T,CLAT9T,-SALF9T,CALF9T)        018020
      TIME0=TIME                                                        018030
      LONG0=LONG9T                                                      018040
      CALL SSINIG                                                       018050
      DO 5 I=1,3                                                        018060
    5 SF9TP(I)=SF9T(I)                                                  018070
      WRITE(6,6)                                                        018080
    6 FORMAT(2X,"IMU STABILIZATION IS SPACE STABLE")                    018090
      CALL SSATUP                                                       018100
C     NAV SIMULATOR INIT                                                018110
      CALL SSATT                                                        018120
      CALL ININIT                                                       018130
      CALL ATUPF                                                        018140
      IF (IPC(26) .EQ. 0) GO TO 888                                     018150
C     IF ATTITUDE FILTER REQUEST, INIT STATE VECTOR                     018160
      FILAT(1,1)=STA(1)                                                 018170
      FILAT(1,2)=STA(2)                                                 018180
      FILAT(1,3)=STA(3)                                                 018190
  888 RETURN                                                            018200
```

END 014210

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 SSINIT

VARIABLES	SN	TYPE		RELOCATION					
31	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
101	ARESID	REAL	ARRAY	INUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJIN
22	CLAT9T	REAL		TRAJIN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
155	C0P90	REAL	ARRAY	NAV	0	C2P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C295	REAL	ARRAY	NAV
45	C1T90	REAL	ARRAY	INUDAT	56	C1292P	REAL	ARRAY	INUDAT
20	C2P95	REAL	ARRAY	INUDAT	57	C2P95T	REAL	ARRAY	INUDAT
31	COMIS	REAL	ARRAY	INUDAT	22	C0RHO	REAL	ARRAY	NAV
153	DELH	REAL		NAV	127	DELT	REAL		NAV
129	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DFSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	INUDAT	14	DV92P	REAL	ARRAY	NAV
101	ETA	REAL	ARRAY	NAV	5	ETA9P	REAL	ARRAY	INUDAT
5	ETA9T	REAL	ARRAY	TRAJIN	112	FILATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G32P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HB	REAL		TRAJIN
15	HSGING	REAL		INPUTS	14	HSGTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	157	I	INTEGER		
7	ICHGVL	INTEGER		CONTRL	10	ICHGYP	INTEGER		CONTRL
22	IFRLIM	INTEGER		INPUTS	261	IGAIND	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	IUSOS	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPHLD	INTEGER		INPUTS
21	IPC	INTEGER	ARRAY	INPUTS	5	ISTOP	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS	67	ITSFIL	INTEGER		INPUTS
16	ITSMAX	INTEGER		INPUTS	105	LAT	REAL		NAV
1	LAT9T	REAL		TRAJIN	106	LONG	REAL		NAV
29	LONGD	REAL		TRAJIN	2	LONG9T	REAL		TRAJIN
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILYP	REAL	ARRAY	NAV
176	OHD	REAL		NAV	0	OTIME	REAL		CONTRL
142	OV92P	REAL	ARRAY	NAV	5	PLOTIM	REAL		INPUTS
2	PLTIME	REAL		CONTRL	6	PONT	REAL		INPUTS
1	PTIME	REAL		CONTRL	216	Q2P95	REAL	ARRAY	NAV
9	RESID	REAL	ARRAY	INUDAT	17	RHO	REAL	ARRAY	NAV
66	RSMAX	REAL		INPUTS	3	RTIME	REAL		CONTRL
7	RSTPT	REAL		INPUTS	76	SALF	REAL		NAV
29	SALF9T	REAL		TRAJIN	13	SFGT	REAL	ARRAY	TRAJIN
15	SFGTP	REAL	ARRAY	INUDAT	21	SLAT9T	REAL		TRAJIN
62	SSV0	REAL		INPUTS	63	SSV9	REAL		INPUTS
64	SS70	REAL		INPUTS	5	START	REAL		INPUTS
4	S79P	REAL		INPUTS	145	S2PNI	REAL		NAV
63	THTGOP	REAL	ARRAY	NAV	50	THTP9T	REAL	ARRAY	NAV

SUBROUTINE SSINIT 74/74 OPT=0 TRACE FTN 4.5+P486 05/25/79 17.24.46 PAGE 1

VARIABLES	SN	TYPE	RELOCATION						
65	THTTRO	REAL	ARRAY	NAV	0	TIME	REAL		TRAJIN
17	TIMEO	REAL		TRAJIN	13	TOLJEK	REAL		INPUTS
4	TPREV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
42	TRESID	REAL	ARRAY	IMUDAT	134	V2HR	REAL		NAV
2	VQUANT	REAL		INPUTS	10	V9T	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V922	REAL	ARRAY	NAV
12	WI	REAL	ARRAY	IMUDAT	55	WXV	REAL	ARRAY	NAV
135	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	144	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	/SP020	REAL	ARRAY	NAV

FILE NAMES	MODE
TAPE6	FMT

EXTERNALS	TYPE	ARGS				
ATUDE		0		COS	REAL	1 LIBRARY
ININIT		0		INPEC		0
MATRAN		2		POTZYX		7
SIN	REAL	1 LIBRARY		SSATT		0
SSATUD		0		SSINTG		0

STATEMENT LABELS

0	5	147	6	FMT	67	888	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
47	5	I	43 44	49	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
IMUDAT	67
INPUTS	56
NAV	152
TRAJIN	21

STATISTICS

PROGRAM LENGTH	1608	112
CM LABELED COMMON LENGTH	9178	335

```
      SUBROUTINE SSTERM                                                 018720
C                                                                       018730
C     THIS ROUTINE TRANSFORMS THE VELOCITY INCREMENTS FROM THE IMU      018740
C     THAT IS, SPACE STABLE FRAME, TO THE COMP. FRAME.                  018750
C                                                                       018760
      IMPLICIT REAL(A-H),REAL(L-Z)                                      018770
      COMMON /IMUCAT/ PESID(3),    DV9P(3),     FT49P(4),    WT(7),     018780
     1    SF9IP(3),    C2P95(3,3), C9MIC(3,3), TPESI0(3), C1090(3,3), 018790
     2    C1092P(3,3), C2P95T(3,3), APESI0(3)                          018800
      COMMON /NAV/    CC92P(3,3),V92P(3),     DV92P(3),    RHO(3),    018810
     1    C9PM0(3,3), A(3,3),      B(3,3),     THTEPT(3),  THTTPO(3), 018820
     2    IHICOR(3),  HXV(3),      G92P(3),    H,          ALPHA,     018830
     3    SALF,       CALF,        DELT,       FT1(3),     V9MP,      018840
     4    LAT,        LONG,        V02(3),     FTLAII(3,3),DELTA,     018850
     5    XSALF,      XCALF,       X0P92P(3,3),HV92P(3),   DV92P(3),  018860
     6    S2PHI,      XS2PHI,      XV92P(3),   XH,         DEL4,      018870
     7    C0910(3,3), C0P90(3,3),  OHO,        C096(3,3),  DV592P(3), 018880
     8    ODX,        ODY,         OOZ,        O2P95(4),   DFILTR(3), 018890
     9    GAINS(3,10),IGAINP(3)                                        018900
      COMMON /INPUTS/ AQUANT,      TQUANT,     VQUANT,     START,     018910
     1    STOP,       PLOTIM,      PRNT,       PSTRT,      CVD1,      018920
     2    CVD2,       CVD3,        IOLJBK,     HSOTIM,     HSCINC,    018930
     2    ITPHAV,     ITPATT,      INCOR,      TNUTVR,     ICPLTM,    018940
     3    IPC(30),    IOPNLP,      SSX0,       SSY0,       SSZ0,      018950
     4    PSMAX,      OPSMAX,      ITPFIL                             018960
      COMMON /UNVRSL/ PI,          HPI,        R0,         PR0,       018970
     1    FF,         FSQ,         FFPRC,      HSRT,       RADPER,    018980
     2    RESQ                                                         018990
      COMMON /TRAJIN/ TIME,        LAT9T,      LONG9T,     ALP9T,     019000
     1    H8,         ETA9T(3),    V9T(3),     SF9T(3),    DELTS,     019010
     2    TIME0,      LONG0,       SLAT9T,     CLAT9T,     SALP9T,    019020
     3    CALP9T                                                       019030
      DIMENSION TEMP(3),TEMP2(3)                                        019040
      CALL MATVEC(TEMP,C0910,DV9P)                                      019050
      WET=WEPI*(TIME-TIME0-DELT*.5)                                     019060
      C0P90(1,1)= COS(WET)                                              019070
      C0P90(2,2)=C0P90(1,1)                                             019080
      C0P90(1,2)= SIN(WET)                                              019090
      C0P90(2,1)=-C0P90(1,2)                                            019100
      CALL MATVEC(TEMP2,C0P90,TEMP)                                     019110
      IF (IPC(29) .NE. 0) GO TO 520                                     019120
      CALL MM(A,C0P92P,C92HO)                                           019130
      DO 510 I=1,3                                                      019140
      DO 510 J=1,3                                                      019150
  510 B(J,I)=C0P92P(I,J)+.5*A(I,J)                                      019160
      GO TO 530                                                         019170
  520 CALL MATRAN(B,X0P92P)                                             019180
  530 CALL MATVEC(DV9P,B,TEMP2)                                         019190
      RETURN                                                            019200
      END                                                               019210
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 SSIFRH

VARIABLES	SN	TYPE	RELOCATION						
33	A	REAL	ARRAY	NAV	3	ALEPT	REAL		TRAJTN
76	ALPHA	REAL		NAV	0	ANUANT	REAL		INPUTS
100	APESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALE	REAL		NAV	24	CALEPT	REAL		TRAJTN
22	CLATPT	REAL		TRAJTN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P93P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C035	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	66	C1302P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	32	C9P40	REAL	ARRAY	NAV
153	DELH	REAL		NAV	103	DELT	REAL		NAV
127	DELTA	REAL		NAV	16	DELTS	REAL		TRAJTN
66	DESMAX	REAL		INPUTS	210	DV5020	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNVRSL	6	EF2P0	REAL		UNVRSL
5	ESO	REAL		UNVRSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	IMUDAT	5	ETA9T	REAL	ARRAY	TRAJTN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HP	REAL		TRAJTN	1	HPT	REAL		UNVRSL
15	HSOIHC	REAL		INPUTS	14	HSOTTH	REAL		INPUTS
177	HV92P	REAL	ARRAY	NAV	75	I	INTEGER		
22	IEPLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	INCOS	INTEGER		INPUTS
61	IOPNLP	INTEGER		INPUTS	23	IPC	INTEGER	ARRAY	INPUTS
17	ITPATT	INTEGER		INPUTS	67	ITPFIL	INTEGER		INPUTS
16	ITPNAV	INTEGER		INPUTS	77	J	INTEGER		
105	LAT	REAL		NAV	1	LATPT	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONGP	REAL		TRAJTN
2	LONGPT	REAL		TRAJTN	217	OBX	REAL		NAV
214	OBY	REAL		NAV	215	OBZ	REAL		NAV
222	OFTLTP	REAL	ARRAY	NAV	176	OM3	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVRSL
5	PLOTTM	REAL		INPUTS	6	PONT	REAL		INPUTS
216	P2P95	REAL	ARRAY	NAV	13	PAPER	REAL		UNVRSL
1	PESTO	REAL	ARRAY	IMUDAT	11	PES0	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	R30	REAL		UNVRSL
65	RSMAX	REAL		INPUTS	7	RSTPT	REAL		INPUTS
2	RU	REAL		UNVRSL	76	SALE	REAL		NAV
23	SALEPT	REAL		TRAJTN	13	SEPT	REAL	ARRAY	TRAJTN
15	SF9TP	REAL	ARRAY	IMUDAT	21	SLATPT	REAL		TRAJTN
62	SSV0	REAL		INPUTS	63	SSVP	REAL		INPUTS
64	SST0	REAL		INPUTS		START	REAL		INPUTS
4	STOR	REAL		INPUTS	145	S2PNT	REAL		NAV
109	TEMP	REAL	ARRAY		108	TEMP2	REAL	ARRAY	
63	THTCOP	REAL	ARRAY	NAV	55	THTEPT	REAL	ARRAY	NAV
60	THTTRQ	REAL	ARRAY	NAV	0	TIME	REAL		TRAJTN
17	TTRSO	REAL		TRAJTN	13	TOLJPK	REAL		INPUTS
1	UGRANT	REAL		INPUTS	42	UPSTO	REAL	ARRAY	INPUTS
104	VP9P	REAL		NAV	2	VGRANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJTN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	W2PT	REAL		UNVRSL
75	WET	REAL			12	WT	REAL	ARRAY	INPUTS

VARIABLES	SN	TYPE		RELOCATION					
66	MXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV32P	REAL	ARRAY	NAV
126	X00920	REAL	ARRAY	NAV					

EXTERNALS	TYPE	ARGS			
COS	REAL	1	LIBRARY	MATRAN	?
MATVEC		3		MM	3
SIN	REAL	1	LIBRARY		

STATEMENT LABELS

1 510 42 520 44 530

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
26	510	I	43 45	138	NOT INNER
27	510	J	44 45	108	OPT

COMMON BLOCKS	LENGTH
INUDAT	57
NAV	182
INPUTS	56
UNVRSL	10
ECAJIN	21

STATISTICS

PROGRAM LENGTH 1069 73

CM LABELED COMMON LENGTH 5208 336

```
      SUBROUTINE SSATT                                                  018720
C                                                                       018730
C     THIS ROUTINE CONSTRUCTS THE TRANSFORMATION FROM THE BODY(S)       018740
C     FRAME TO THE LLWA(2P) FRAME                                       018750
C                                                                       018760
      IMPLICIT REAL(A-H,L-Z)                                            018770
      COMMON /IMUCAT/ RESID(3),    DV3P(3),    FTA9P(4),   WT(3),       018780
     1    SF9TP(3),   C2P95(3,3), C94IS(3,3), TRESID(3),  C109C(3,3),  018790
     2    C109?P(3,3), C2P95T(3,3), ARESID(3)                          018800
      COMMON /NAV/    C0P92P(3,3),V32P(3),    DV32P(3),   PHO(3),      018810
     1    C9RHO(3,3), A(3,3),     B(3,3),     THTE?T(3),  THTTPC(3),   018820
     2    IRTCOS(3),  WXV(3),     G92?(3),    H,          ALPHA,       018830
     3    SALF,       CALF,       DELT,       FTA(3),     V?4F,        018840
     4    LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,       018850
     5    XSALF,      XCALF,      X9?92?(3,3),HV92P(3),   DV92P(3),    018860
     6    S2PHI,      XS2PHI,     XV92R(3),   XH,         DELH,        018870
     7    C0910(3,3), C0P91(3,3), DH3,        C095(3,3),  DV592P(3),   018880
     8    ODX,        ODY,        DDZ,        Q2295(4),   DFILT?(3),   018890
     9    GAINS(3,18),IGAINP(3)                                        018900
      COMMON /UNVRSL/ PI,         HPI,        R3,         R90,         018910
     1    FF,         RSO,        EF??0,      WE?T,       RAT?E?,      018920
     2    RES?                                                         018930
      CALL HTM(A,C0P92P,C0P9?)                                          018940
C     1 IS NOW G2P30                                                    018950
      CALL MM(A,A,C0910)                                                018960
C     A IS NOW C2P91                                                    018970
      FTA9?(1)=FTA9P(1)+.5*HPI                                          018980
      C1= COS(FTA9?(1))                                                 018990
      S1= SIN(FTA9?(1))                                                 019000
      C3= COS(FTA9?(3))                                                 019010
      S3= SIN(FTA9?(3))                                                 019020
      C4= COS(FTA9?(4))                                                 019030
      S4= SIN(FTA9?(4))                                                 019040
      S1S4=S1*S4                                                        019050
      S1C3=S1*C3                                                        019060
      S3S4=S3*S4                                                        019070
      C1C4=C1*C4                                                        019080
      B(1,1)=C1C4-S1C3*S4                                               019090
      B(2,1)=-S1*C4-C1*C3*S4                                            019100
      B(3,1)=S3S4                                                       019110
      B(1,2)=C1*S4+S1C3*C4                                              019120
      B(2,2)=-S1S4+C1C4*C3                                              019130
      B(3,2)=-S3*C4                                                     019140
      B(1,3)=S1*S3                                                      019150
      B(2,3)=C1*S3                                                      019160
      B(3,3)=C3                                                         019170
      CALL MM(C2P95,A,B)                                                019180
      RETURN                                                            019190
      END                                                               019200
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 SSATT

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
100	APESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	165	C3P90	REAL	ARRAY	NAV
0	C8P92P	REAL	ARRAY	NAV	154	C8910	REAL	ARRAY	NAV
177	CC35	REAL	ARRAY	NAV	111	C1	REAL		
122	C1C4	REAL			45	C1898	REAL	ARRAY	IMUDAT
56	C1C92P	REAL	ARRAY	IMUDAT	20	C2P95	REAL	ARRAY	IMUDAT
67	C2P95T	REAL	ARRAY	IMUDAT	113	C3	REAL		
115	C4	REAL			31	C9MIS	REAL	ARRAY	IMUDAT
22	C9PHO	REAL	ARRAY	NAV	153	DELH	REAL		NAV
100	DELT	REAL		NAV	123	DELTA	REAL		NAV
210	DVS92P	REAL	ARRAY	NAV	3	DV8P	REAL	ARRAY	IMUDAT
14	DV92P	REAL	ARRAY	NAV	4	EE	REAL		UNVRSL
6	EEPPO	REAL		UNVRSL	5	ESO	REAL		UNVRSL
101	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
1	HPI	REAL		UNVRSL	137	HV92P	REAL	ARRAY	NAV
263	IGAINP	INTEGER	ARRAY	NAV	105	LAT	REAL		NAV
106	LONG	REAL		NAV	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OM3	REAL		NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVRSL
216	Q2P95	REAL	ARRAY	NAV	10	RADPER	REAL		UNVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESO	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	RPO	REAL		UNVRSL
2	R0	REAL		UNVRSL	76	SALF	REAL		NAV
15	SF9TP	REAL	ARRAY	IMUDAT	112	S1	REAL		
120	S1C3	REAL			117	S1S4	REAL		
145	S2PHI	REAL		NAV	114	S3	REAL		
121	S3S4	REAL			116	S4	REAL		
63	THTCOR	REAL	ARRAY	NAV	65	THTERT	REAL	ARRAY	NAV
60	THTIRO	REAL	ARRAY	NAV	42	TRESID	REAL	ARRAY	IMUDAT
104	VONP	REAL		NAV	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WEPI	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	X92PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	X8P92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS			
COS	REAL	1	LIBRARY	MM	3
STM		3		SIN	REAL 1 LIBRARY

COMMON BLOCKS	LENGTH
IMUDAT	67
NAV	102
UNVRSL	10

STATISTICS

PROGRAM LENGTH	1230	83
CM LABELED COMMON LENGTH	4039	259

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      SUBROUTINE LLINTG                                                 019210
C                                                                       019220
C     SUBROUTINE TO COMPUTE MISALIGNMENTS BETWEEN ACTUAL AND            019230
C     IDEAL LLWA PLATFORM FRAMES. TRANSFORM TRAJECTORY SPECIFIC         019240
C     FORCE TO ACTUAL PLATFORM FRAME, AND INTEGRATE SPECIFIC            019250
C     FORCE. DELTA-VELOCITIES ARE COMPUTED IN THE LLWA                  019260
C     PLATFORM FRAME (UEN AXES).                                        019270
C                                                                       019280
      IMPLICIT REAL(A-H,L-Z)                                            019290
      COMMON /CONTRL/ QTIME,    PTIME,    PLTIME,   RSTIME,           019300
     1    IPREV,    INTT,     ISTOP,    ICMCYL,   ICMCYP              019310
      COMMON /IMUDAT/ RESID(3), DV9P(3),  ETA9P(4), WT(3),            019320
     1    SF9TP(3),  C2P95(3,3), COMIS(3,3), TPESID(3), C1P90(3,3),   019330
     2   C1P92P(3,3), C2P95T(3,3), APESID(3)                          019340
      COMMON /INPUTS/ AQUANT,   IQUANT,   VQUANT,   START,            019350
     1    SIOP,     PLOTIM,   PRNT,     3STRT,    CV21,             019360
     2    CV22,     CV23,     TOLJPK,   HSCTIM,   HSCINC,           019370
     2    ITMAX,    ITRATT,   INCOR,    IMUTYP,   IERLIM,           019380
     3    IPC(30),  IOPNLP,   SSX0,     SSY0,     SSZ0,             019390
     4    RSMAX,    CHSMAX,   ITRFIL                                019400
      COMMON /NAV/    CCP92P(3,3),V92P(3),  DV92P(3),  PHO(3),      019410
     1    C2P90(3,3), A(3,3),   B(3,3),   THTERI(3), THTIPO(3),     019420
     2    THTCOR(3), HXV(3),    G32P(3),  H,        ALPHA,          019430
     3    SALF,     CALF,     DEL,      CTA(3),   V2M2,           019440
     4    LAT,      LONG,     V32(3),   FILATI(3,3),DELTA,        019450
     5    XSALF,    XCALF,    XD1P92P(3,3),HV92P(3), DV32P(3),      019460
     6    S2PHI,    XS2PHT,   XV32P(3),  XH,      DELH,           019470
     7    C291G(3,3), CCP90(3,3), OH3,    C295(3,3),  DV592P(3),  019480
     8    DDX ,     DDY ,     DDZ ,     D2P95(4),   DFILTP(3),    019490
     9    GAINS(3,10),IGAINP(3)                                     019500
      COMMON /UNVRSL/ PI,       HPI,      PO,       RTD,            019510
     1    EE,       ESQ,      EE220,    WERT,     RADPER,         019520
     2    RES0                                                      019530
      COMMON /TRAJIN/ TIME,     LAT9T,    LONG9T,   ALF9T,          019540
     1    HB,       FIA9T(3),  V9I(3),   SF9T(3),  DELTS,          019550
     2    TIME0,    LONG0,    SLAT9T,   CLAT9T,   SALF9T,         019560
     3    CALF9T                                                    019570
      DIMENSION TMP(3)                                              019580
      EQUIVALENCE (TMP(1),B(1))                                     019590
C                                                                   019600
   10 IF (IOPNLP .NE. 0) GO TO 50                                   019610
C                                                                   019620
C     TRANSFORM TRAJECTORY VELOCITIES TO LVN FRAME(UEN)             019630
C                                                                   019640
      VN = CALF9T*V9I(1) - SALF9T*V9I(2)                            019650
      VE = -SALF9T*V9I(1) - CALF9T*V9I(2)                           019660
C                                                                   019670
C     COMPUTE RADII OF CURVATURE                                    019680
C                                                                   019690
      TMP1 = 1.0/(1.0 - ESQ*SLAT9T**2)                              019700
      TMP2 =  SQRT(TMP1)                                            019710
      RP = HB + RO*TMP2                                             019720
      RM = HB + RESQ*TMP1*TMP2                                      019730
C                                                                   019740
C     COMPUTE TOTAL VEHICLE ANGULAR RATES                           019750
C                                                                   019760
      WT(1) = WERT*SLAT9T                                           019770
```

```
                      HTE = -VN/RM                                          019780
                      HTN = VE/RP + WERT*CLAT9T                             019790
                C                                                           019800
                C         TRANSFORM TO LLWA FRAME (UEN) AND THEN TO ACTUAL PLATFORM  019810
                C           FRAME                                           019820
                C                                                           019830
                      WT(2) = HTE*CALF9T + HTN*SALF9T                       019840
                      WT(3) = -HTE*SALF9T + HTN*CALF9T                      019850
                      IF (IPC(1) .EQ. 0) GO TO 15                           019860
                      CALL DOUT(1)                                          019870
                   15 CALL MATVEC(WT,C9MIS,WT)                              019880
                C                                                           019890
                C         UPDATE THE MISALIGNMENT MATRIX                    019900
                C                                                           019910
                      DO 17 I=1,3                                           019920
                      THTTRQ(I)=THTTRQ(I)+TRESID(I)                         019930
                   17 TMP(I)=THTTRQ(I)                                      019940
                      CALL QNTIZ(THTTRQ,IQUANT)                             019950
                      DO 19 I=1,3                                           019960
                   19 TRESID(I)=TMP(I)-THTTRQ(I)                            019970
                      A(2,3) = (THTTRQ(1)/DELT - WT(1))*DELTS               019980
                      A(3,2) = -A(2,3)                                      019990
                      A(3,1) = (THTTRQ(2)/DELT - WT(2))*DELTS               020000
                      A(1,3) = -A(3,1)                                      020010
                      A(1,2) = (THTTRQ(3)/DELT - WT(3))*DELTS               020020
                      A(2,1) = -A(1,2)                                      020030
                      IF (IPC(13) .EQ. 0) GO TO 20                          020040
                      CALL DOUT(13)                                         020050
                   20 DO 30 I=1,3                                           020060
                   30 A(I,I) = 1.0                                          020070
                      CALL MM(C9MIS,A,C9MIS)                                020080
                C                                                           020090
                C         TRANSFORM SPECIFIC FORCE TO ACTUAL LLWA PLATFORM FRAME  020100
                C         AND INTEGRATE                                     020110
                C                                                           020120
                   50 TMP(1) = SF9T(3)                                      020130
                      TMP(2) = -SF9T(2)                                     020140
                      TMP(3) = SF9T(1)                                      020150
                      CALL MATVEC(SF9T,C9MIS,TMP)                           020160
                      RETURN                                                020170
                      END                                                   020180
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 LLINIG

VARIABLES	SN	TYPE	RELOCATION						
34	A	REAL	ARRAY	NAV	3	ALF9T	REAL		TRAJTN
75	ALPHA	REAL		NAV	9	AQUANT	REAL		TNPUTS
120	ARESID	REAL	ARRAY	INDIRAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALF9T	REAL		TRAJTN
22	CLAT9T	REAL		TRAJTN	10	CVD1	REAL		TNPUTS

VARIABLES SN TYPE RELOCATION

11	CVD2	REAL		INPUTS	12	CVD3	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
145	C1020	REAL	ARRAY	INUDAT	56	C1092P	REAL	ARRAY	INUDAT
20	C2P95	REAL	ARRAY	INUDAT	67	C2P95T	REAL	ARRAY	INUDAT
31	C9MIS	REAL	ARRAY	INUDAT	22	C92HO	REAL	ARRAY	NAV
153	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
66	DRSMAX	REAL		INPUTS	240	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	INUDAT	14	DV92P	REAL	ARRAY	NAV
4	EF	REAL		UNVPSL	6	FERRO	REAL		UNVPSL
9	ESQ	REAL		UNVPSL	101	ETA	REAL	ARRAY	NAV
6	ETA9P	REAL	ARRAY	INUDAT	5	ETA9T	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HB	REAL		TRAJIN	1	HDI	REAL		UNVPSL
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	170	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
22	IFPLIN	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	20	INCOP	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	51	IOPHLP	INTEGER		INPUTS
27	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	ITPATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
16	ITPNAV	INTEGER		INPUTS	105	LAT	REAL		NAV
1	LAT9T	REAL		TRAJIN	106	LONG	REAL		NAV
20	LONGD	REAL		TRAJIN	2	LONGST	REAL		TRAJIN
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFTEMP	REAL	ARRAY	NAV
176	OHP	REAL		NAV	0	OTIME	REAL		CONTRL
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL		UNVPSL
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	O2P95	REAL	ARRAY	NAV	10	RADPER	REAL		UNVPSL
3	RESID	REAL	ARRAY	INUDAT	11	RESQ	REAL		UNVPSL
17	RHO	REAL	ARRAY	NAV	165	RM	REAL		
164	RP	REAL			13	RPQ	REAL		UNVPSL
65	RSMAX	REAL		INPUTS	3	RSTIME	REAL		CONTRL
7	RSTOL	REAL		INPUTS	2	RU	REAL		UNVPSL
76	SALF	REAL		NAV	23	SALF9T	REAL		TRAJIN
17	SF9T	REAL	ARRAY	TRAJIN	15	SFRTP	REAL	ARRAY	INUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THTCOR	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	60	THTERO	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TTHFO	REAL		TRAJIN
44	TNP	REAL	ARRAY	NAV	152	TNP1	REAL		
163	TNP2	REAL			13	TOLJ2K	REAL		INPUTS
4	TPREV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
43	TRFSID	REAL	ARRAY	INUDAT	104	V0P2	REAL		NAV
161	VF	REAL			161	VI	REAL		
2	VQUANT	REAL		INPUTS	10	VRT	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
7	WE2I	REAL		UNVPSL	12	WI	REAL	ARRAY	INUDAT
166	WTF	REAL			167	WTN	REAL		
56	WVV	REAL	ARRAY	NAV	126	XCALF	REAL		NAV

VARIABLES SN TYPE RELOCATION

152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	X0P92P	REAL	ARRAY	NAV					

EXTERNALS TYPE ARGS

OOUT		1	MATVEC		3
MM		3	ONTT7		2
SQRT	REAL	1 LIBRARY			

STATEMENT LABELS

0	10	INACTIVE	50	15	0	17	
0	19		112	20	0	30	
121	50						

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
53	17	I	72 74	68	INSTACK
64	19	I	76 77	58	INSTACK
113	50	I	86 87	48	INSTACK

COMMON BLOCKS LENGTH

CONTRL	9
IMUDAT	62
INPUTS	56
NAV	182
UPVPSL	10
TRAJIN	21

STATISTICS

PROGRAM LENGTH	1710	121
CM LABELED COMMON LENGTH	5310	345

```
      SUBROUTINE LLATUD                                                 020100
C     ------------------------------------------------------------------020200
C                                                                       020210
C           SUBROUTINE TO COMPUTE THE GIMBAL ANGLES WHICH WOULD BE      020220
C           GENERATED BY THE ACTUAL LLNA IMU.  FOUR GIMBAL ANGLES ARE   020230
C           GENERATED TO SIMULATED INNER ROLL, OUTER ROLL, PITCH, AND   020240
C           YAW.  HOWEVER, THE INNER ROLL ANGLE IS ALWAYS ZERO.         020250
C           GENERATED BY THE ACTUAL LLNA IMU.                           020260
C     ------------------------------------------------------------------020270
C                                                                       020280
C           ETA9P(1) -- OUTER ROLL                                      020290
C           ETA9P(2) -- PITCH                                           020300
C           ETA9P(3) -- INNER ROLL (ALWAYS ZERO)                        020310
C           ETA9P(4) -- YAW                                             020320
C                                                                       020330
C     ------------------------------------------------------------------020340
      IMPLICIT REAL(A-H,L-Z)                                            020350
      COMMON /CONTRL/  DTIME,     PTIME,     PLTIME,    RSTIME,       020360
     1     IPREV,      INIT,      ISTOP,     ICMCYL,    ICMCYP        020370
      COMMON /IMUDAT/  RESID(3),  DV3P(3),   ETA9P(4),  NT(3),        020380
     1     SF9TP(3),   C2P95(3,3), C9MIS(3,3), TRESID(3), C1P92(3,3), 020390
     2     C1942P(3,3), C2P95T(3,3), ARESID(3)                        020400
      COMMON /INPUTS/  ADUANT,    TDUANT,    VDUANT,    START,        020410
     1     STOP,       PLOTTM,    PRNT,      RSTRT,     DV3T,         020420
     2     CVD2,       CVD3,      TOLJSK,    HSOFTM,    HS.INC,       020430
     2     ITRHAV,     ITRATT,    INCOR,     IMUTYP,    IRELTM,       020440
     3     IPC(30),    TOPNLP,    SSXJ,      SSYG,      SSZG,         020450
     4     PSMAX,      DRSMAX,    ITRETL                              020460
      COMMON /NAV/     C2P92P(3,3),V92P(3),   DV92P(3),  RHO(3),      020470
     1     C2PHC(3,3), A(3,3),    B(3,3),    THTERT(3), THETRD(3),    020480
     2     THTCOR(3),  VXV(3),    G92P(3),   H,         ALPHA,        020490
     3     SALF,       CALF,      DELT,      ETA(3),    VD46,         020500
     4     LAT,        LONG,      V92(3),    FILATT(3,3),DELTA,       020510
     5     XSALF,      XCALF,     X2P92P(3,3),HV92P(3),  DV92P(3),    020520
     6     S2PHI,      XS2PHI,    XV92P(3),  XH,        DELH,         020530
     7     C9M10(3,3), C2P90(3,3), OM3,       C995(3,3),  DV992P(3),  020540
     8     ODX ,       ODY ,      ODZ ,      C2P95(4),  DELTP(3),     020550
     9     GAINS(3,10),IGAINP(3)                                      020560
      COMMON /TRAJIN/  TIME,      LAT9T,     LONG9T,    ALF9T,        020570
     1     H9,         ETA9T(3),  V9T(3),    SF9T(3),   DELTS,        020580
     2     TIME0,      LONG1,     SLAT9T,    CLAT9T,    SALF9T,       020590
     3     CALF9T                                                     020600
C                                                                     020610
      CALL POTYX7(C2P95, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),  020620
     1  COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                 020630
      CALL MM(C2P95,C9MIS,C2P95)                                      020640
C                                                                     020650
C           EXTRACT THE GIMBAL ANGLES                                 020660
C                                                                     020670
      ETA9P(1) = ATAN2(-C2P95(1,2),C2P95(1,1))                        020680
      TEMP= SQRT(C2P95(2,3)**2+C2P95(3,3)**2)                         020690
      ETA9P(2)= ATAN2(C2P95(1,3),TEMP)                                020700
      ETA9P(3) =  ATAN2(C2P95(2,3),C2P95(3,3))                        020710
      CALL UNIT7(ETA9P(1),ADUANT)                                     020720
      ETA9P(4) = ETA9P(3)                                             020730
      ETA9P(3) = 0.                                                   020740
      IF (IPC(2) .EQ. 0) GO TO 20                                     020750
      CALL DOUT(7)                                                    020760
   20 RETURN                                                          020770
```

END 020761

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1. LLAIUD

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALFQT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
180	AFESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFQT	REAL		TRAJIN
22	CLAIQT	REAL		TRAJIN	13	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
194	C0910	REAL	ARRAY	NAV	177	C105	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1192P	REAL	ARRAY	IMUDAT
23	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY	IMUDAT
31	COMIS	REAL	ARRAY	IMUDAT	22	C92HC	REAL	ARRAY	NAV
153	DELA	REAL		NAV	103	DELT	REAL		NAV
123	DELTA	REAL		NAV	15	DELTS	REAL		TRAJIN
55	DASNAV	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
3	DV3P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
171	ETA	REAL	ARRAY	NAV	5	ETA0P	REAL	ARRAY	IMUDAT
5	ETA0T	REAL	ARRAY	TRAJIN	112	ETLATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HP	REAL		TRAJIN
15	HSCINC	REAL		INPUTS	14	HSCTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	7	ICMCYL	INTEGER		CONTRL
17	ICYCYP	INTEGER		CONTRL	22	ICRLIM	INTEGER		INPUTS
263	IGAINP	INTEGER	ARRAY	PAR	21	IMUTYP	INTEGER		INPUTS
31	IMCOD	INTEGER		INPUTS	5	IMIT	INTEGER		CONTRL
61	IOPHLP	INTEGER		INPUTS	23	IPC	INTEGER	ARRAY	INPUTS
6	ISTOP	INTEGER		CONTRL	17	IRSATT	INTEGER		INPUTS
67	ITAFIL	INTEGER		INPUTS	16	ITPNAV	INTEGER		INPUTS
175	LAT	REAL		NAV	1	LATQT	REAL		TRAJIN
176	LONG	REAL		NAV	2	LONGT	REAL		TRAJIN
2	LONGQT	REAL		TRAJIN	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFILTP	REAL	ARRAY	NAV	176	OHR	REAL		NAV
9	OTIME	REAL		CONTRL	142	OV92P	REAL	ARRAY	NAV
5	PLATIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PORT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	0	PSITO	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	65	PSMAX	REAL		INPUTS
3	RSTIME	REAL		CONTRL	7	USTQT	REAL		INPUTS
78	SALF	REAL		NAV	23	SALFQT	REAL		TRAJIN
17	SFOT	REAL	ARRAY	TRAJIN	15	SFOTO	REAL	ARRAY	IMUDAT
21	SLAIQT	REAL		TRAJIN	62	SOXC	REAL		INPUTS
63	SOXO	REAL		INPUTS	64	SOZC	REAL		INPUTS
3	STAQT	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	124	TCMP	REAL		
57	THICOP	REAL	ARRAY	NAV	55	THTEQT	REAL	ARRAY	NAV

VARIABLES	SN	TYPE		RELOCATION					
60	INTPO	REAL	ARRAY	NAV	0	TIMF	REAL		TRAJTH
17	TIMES	REAL		TRAJTH	13	TOLJRK	REAL		INPUTS
4	TRFFV	REAL		CONTPL	1	TOUANT	REAL		INPUTS
42	TRESID	REAL	ARRAY	IMUDAT	104	VDMP	REAL		NAV
2	VQUANT	REAL		INPUTS	10	V9T	REAL	ARRAY	TRAJTH
107	V92	REAL	ARRAY	NAV	11	V92P	REAL	ARRAY	NAV
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	145	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XVP92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS				
ATAN2	REAL	2	LIBRARY	COS	REAL	1 LIBRARY
OCUT		1		M4		3
ONTTZ		2		FOTXYZ		7
SIN	REAL	1	LIBRARY	SQRT	REAL	1 LIBRARY

STATEMENT LABELS
55 20

COMMON BLOCKS	LENGTH
CONTPL	4
IMUDAT	67
INPUTS	56
NAV	182
TRAJTH	21

STATISTICS

PROGRAM LENGTH	1350	93
ON LABELED COMMON LENGTH	5173	335

```
      1            SUBROUTINE LLATT                                                  020770
                   C                                                                 020780
                   C          THIS ROUTINE CONSTRUCTS THE BODY TO LVN TRANSFORMATION 020790
                   C          MATRIX FOR USE IN DERIVING THE ATTITUDE ANGLES.  THE   020800
      5            C          MATRIX IS FORMED FROM THE 4 GIMBAL ANGLES CALCULATED IN 020810
                   C          ROUTINE "LLATUD".                                      020820
                   C                                                                 020830
                   C          W -- OUTER ROLL                                        020840
                   C          X -- PITCH                                             020850
     10            C          Y -- INNER ROLL                                        020860
                   C          Z -- YAW                                               020870
                   C                                                                 020880
                        IMPLICIT REAL(A-H,L-Z)                                       020890
                        COMMON /INPUTS/  AQUANT,     IQUANT,     VQUANT,     STAST, 020900
     15                 1     STOP,      PLOTIM,     PRNT,       PSTRT,      CVD1,  020910
                        2     CVD2,      CVD3,       IOLJ2K,     HSOTIM,     PSOINC,020920
                        2     ITRNAV,    ITRATT,     INCOR,      IMUTYP,     ISRLIM,020930
                        3     IPC(30),   IOPNLP,     SSXO,       SSYC,       SSZO,  020940
                        4     PSMAX,     DRSMAX,     ITRETL                         020950
     20                 COMMON /IMUDAT/  RESID(3),   DV9P(3),    FTA9P(4),   WT(3),  020960
                        1     SF9TP(3),  C2P95(3,3), C9MTS(3,3), TRESID(3),  C109J(3,3),020970
                        2     C1092P(3,3), C2P95T(3,3), ARESID(3)                    020980
                        COMMON /NAV/     C0P92P(3,3),V932P(3),    DV92P(3),   RHO(3), 020990
                        1     C92HO(3,3), A(3,3),     B(3,3),     THTERT(3),  THTTPO(3),021000
     25                 2     THTCOR(3),  WXV(3),     692P(3),    W,          ALPHA,  021010
                        3     SALF,       CALF,       DELT,       FTA(3),     V04P,   021020
                        4     LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,  021030
                        5     XSALF,      XCALF,      V92P(3,3),  HV92P(3),   DV92P(3),021040
                        6     S2PHI,      XS2PHT,     XV92P(3),   XH,         DELH,   021050
     30                 7     C0910(3,3), C0P90(3,3), OHB,        C095(3,3),  DV592P(3),021060
                        8     OBX   ,     OBY   ,     OBZ   ,     D2P95(4),   DFILTP(3),021070
                        9     GAINS(3,10),IGAINP(3)                                  021080
                             EQUIVALENCE (W,FTA9P(1)),(X,FTA9P(2)),(Y,FTA9P(3)),(Z,FTA9P(4))021090
                   C                                                                 021100
     35                 CALL ROTXYZ(A, SIN(Y), COS(Y),0.E0,1.E0, SIN(Z), COS(Z))    021110
                        CALL ROTXYZ(B, SIN(W), COS(W), SIN(X), COS(X),0.E0,1.E0)    021120
                        CALL MTI(C2P95,A,3)                                         021130
                        RETURN                                                      021140
                        END                                                         021150
```


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 LLATT

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
0	AQUANT	REAL		INPUTS	100	ARESID	REAL	ARRAY	IMUDAT
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
10	CVD1	REAL		INPUTS	11	CVD2	REAL		INPUTS
12	CVD3	REAL		INPUTS	165	C0P90	REAL	ARRAY	NAV
2	C0P92P	REAL	ARRAY	NAV	154	C0910	REAL	ARRAY	NAV
122	C095	REAL	ARRAY	NAV	45	C1090	REAL	ARRAY	IMUDAT

VARIABLES	SN	TYPE		RELOCATION					
56	C1P92P	REAL	ARRAY	IMUDAT	20	C2P95	REAL	ARRAY	IMUDAT
57	C2P95T	REAL	ARRAY	IMUDAT	31	COMIS	REAL	ARRAY	IMUDAT
22	C9PHO	REAL	ARRAY	NAV	153	DELH	REAL		NAV
130	DELT	REAL		NAV	131	DELTA	REAL		NAV
66	DFSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
3	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
101	ETA	REAL	ARRAY	NAV	6	ETA0P	REAL	ARRAY	IMUDAT
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
15	HSOING	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
177	HV92P	REAL	ARRAY	NAV	22	ICPLIM	INTEGER		INPUTS
267	IGAINP	INTEGER	ARRAY	NAV	21	IMPTYP	INTEGER		INPUTS
20	INCOR	INTEGER		INPUTS	61	IOPHLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	17	ITPATT	INTEGER		INPUTS
67	ITRFIL	INTEGER		INPUTS	15	ITRMAV	INTEGER		INPUTS
105	LAT	REAL		NAV	136	LONG	REAL		NAV
213	OOX	REAL		NAV	214	OOY	REAL		NAV
215	OOZ	REAL		NAV	222	OFILTR	REAL	ARRAY	NAV
176	OHB	REAL		NAV	142	OV92P	REAL	ARRAY	NAV
5	PLOTTM	REAL		INPUTS	6	PPHT	REAL		INPUTS
216	Q2P95	REAL	ARRAY	NAV	9	RESTO	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	65	RSMAX	REAL		INPUTS
7	RSTRT	REAL		INPUTS	76	SALF	REAL		NAV
15	SF9TP	REAL	ARRAY	IMUDAT	32	SSXC	REAL		INPUTS
63	STYO	REAL		INPUTS	64	SZZO	REAL		INPUTS
3	START	REAL		INPUTS	4	STZC	REAL		INPUTS
145	S2PHI	REAL		NAV	63	THICOR	REAL	ARRAY	NAV
55	THTEST	REAL	ARRAY	NAV	51	THTTRO	REAL	ARRAY	NAV
13	TOLJPK	REAL		INPUTS	1	TQUANT	REAL		INPUTS
42	TRESID	REAL	ARRAY	IMUDAT	134	V2MP	REAL		NAV
2	VQUANT	REAL		INPUTS	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	6	U	REAL		IMUDAT
12	JT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
7	X	REAL		IMUDAT	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	XSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XQP92P	REAL	ARRAY	NAV	10	Y	REAL		IMUDAT
11	Z	REAL		IMUDAT					

EXTERNALS	TYPE	ARGS				
COS	REAL	1 LIBRARY		MM		3
ROTXYZ		7		SIN	REAL	1 LIBRARY

COMMON BLOCKS	LENGTH
INPUTS	56
IMUDAT	67
NAV	182

STATISTICS

PROGRAM LENGTH	1060	71
CM LABELED COMMON LENGTH	4618	305

```
      SUBROUTINE LLINIT                                                 021100
C                                                                       021110
C     THIS SUBROUTINE PERFORMS THE INITITALIZATION OF BOTH              021120
C     THE LL IMU SIMULATOR AND THE NAV SIMULATOR(FOR THE LL CASE)       021130
C     IT MAKES USE OF THE COMMON SUBROUTINE FOR NAV SIMULATOR INIT      021200
C                                                                       021210
      IMPLICIT REAL(A-H),REAL(L-Z)                                      021220
      COMMON /CONTRL/  DTIME,      PTIME,      PLTIME,     RSTIME,      021230
     1     TPREV,      INIT,       ISTOP,      ICMCYL,     ICMCYP       021240
      COMMON /IMUCAT/  RESID(3),   DV3P(3),    ETA99(4),   KT(3),       021250
     1     SF9TP(3),   C2P95(3,3), C94I5(3,3), IPCSIO(3),  C1095(3,3),  021260
     2    C1092P(3,3), C2P95T(3,3), ARESID(3)                            021270
      COMMON /INPUTS/  AQUANT,     TQUANT,     VQUANT,     START,       021280
     1     STOP,       PLOTIM,     PRNT,       RSTRT,      CV11,        021290
     2     CV02,       CV03,       TOLJPK,     HSOTIM,      HSCINC,     021300
     2     ITRNAV,     ITRATT,     INCOR,      IMUTYP,     IERLIM,      021310
     3     IPC(30),    IOPNLP,     SS40,       SSYA,       SS2P,        021320
     4     DSMAX,      DRSMAX,     ITRFIL                               021330
      COMMON /NAV/     C0P92P(3,3),V92P(3),    DV92P(3),   PHO(3),      021340
     1     C9RHO(3,3), A(3,3),     B(3,3),     THTE2T(3),  THTIRO(3),   021350
     2     THTCOR(3),  HXV(3),     G92P(3),    H,          ALPHA,       021360
     3     SALE,       CALE,       DELT,       ETA(3),     VBMP,        021370
     4     LAT,        LONG,       V32(3),     PILATT(3,3),DELTA,       021380
     5     XSALF,      YCALF,      X0P32P(3,3),HV92P(3),   DV02P(3),    021390
     6     S2PHI,      YS2PHI,     XV32P(3),   XH,         DELH,        021400
     7     C0910(3,3), C0P90(3,3), DH3,        CJ05(3,3),   DV592P(3),  021410
     8     ODX   ,     ODY   ,     ODZ   ,     O2P95(4),   DFILTR(3),   021420
     9     GAINS(3,10),IGAINP(3)                                        021430
      COMMON /PGRAV/   GLASC,      GRCUT,      GRS2,       GRS4,        021440
     1     G2H,        G2H2,       G2H32                                021450
      COMMON /TRAJIN/  TIME,       LATDT,      LONGDT,     ALFDT,       021460
     1     H3,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,       021470
     2     TIMEO,      LONGO,      SLAT9T,     CLAT9T,     SALFDT,      021480
     3     CALF9T                                                       021490
      COMMON /UNVRSL/  PI,         HPI,        R3,         R2D,         021500
     1     EF,         ESQ,        EFR3O,      HFOT,       RADPER,      021510
     2     PESQ                                                         021520
C                                                                       021530
C     IMU SIMULATOR ( AND SOME NAV SIMULATOR) INIT                      021540
C                                                                       021550
      CALL INREC                                                        021560
      ICMCYL=ITRNAV*ITRATT                                              021570
      SF9TP(1) = SF9T(3)                                                021580
      SF9TP(2) = -SF9T(2)                                               021590
      SF9TP(3) = SF9T(1)                                                021610
      WRITE(6,6)                                                        021610
    6 FORMAT (2X,"IMU STABILIZATION IS LOCAL LEVEL, WANDER AZIMUTH"/)   021620
      IF (IOPNLP .EQ. 0) GO TO 9                                        021630
      WRITE(6,7)                                                        021640
    7 FORMAT (2X,"PERFECT PLATFORM IS SIMULATED:  NO TORQUING ERRORS"/) 021650
    9 CALL LLATUD                                                       021660
      CALL LLAYI                                                        021670
C     NAV SIM INIT                                                      021680
      CALL ININIT                                                       021690
      CALL ATUDE                                                        021700
      IF (IPC(25) .EQ. 0) GO TO 888                                     021710
C     IF ATTITUDE FILTER REQUEST, INIT STATE VECTOR                     021720
```

```
                    FILATT(1,1)=ETA(1)                                    021730
                    FILATT(1,2)=ETA(2)                                    021740
      50            FILATT(1,3)=ETA(3)                                    021750
                888 RETURN                                                021760
                    END                                                   021770
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 LLINIT

VARIABLES	SN	TYPE		RELOCATION					
72	A	REAL	ARRAY	NAV	3	ALFRT	REAL		TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
130	ARFSIG	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFRT	REAL		TRAJIN
22	CLATRT	REAL		TRAJIN	10	CV01	REAL		INPUTS
11	CV02	REAL		INPUTS	12	CV03	REAL		INPUTS
166	CGR90	REAL	ARRAY	NAV	0	CGR92R	REAL	ARRAY	NAV
154	CG910	REAL	ARRAY	NAV	177	CR05	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	IMUDAT	56	C1092R	REAL	ARRAY	IMUDAT
20	C2R95	REAL	ARRAY	IMUDAT	57	C2R95T	REAL	ARRAY	IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C9RHO	REAL	ARRAY	NAV
153	DELH	REAL		NAV	100	DELT	REAL		NAV
123	DELTA	REAL		NAV	15	DELTS	REAL		TRAJIN
56	DVSMAX	REAL		INPUTS	210	DV592R	REAL	ARRAY	NAV
3	DV9R	REAL	ARRAY	IMUDAT	14	DV92R	REAL	ARRAY	NAV
4	EE	REAL		UNVRSL	6	EERR2	REAL		UNVRSL
5	ESO	REAL		UNVRSL	191	ETA	REAL	ARRAY	NAV
6	ETA9R	REAL	ARRAY	IMUDAT	5	ETA9T	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
0	GLNSG	REAL		PGRAV	1	GRCNT	REAL		PGRAV
4	GRH	REAL		PGRAV	6	GRHS2	REAL		PGRAV
5	GRH2	REAL		PGRAV	2	GRS2	REAL		PGRAV
3	GRS4	REAL		PGRAV	71	GS2R	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HR	REAL		TRAJIN
1	HPI	REAL		UNVRSL	15	HSOINC	REAL		INPUTS
14	HSOTTM	REAL		INPUTS	137	HV92R	REAL	ARRAY	NAV
7	ICHGYL	INTEGER		CONTRL	19	ICMGYR	INTEGER		CONTRL
22	IFRLIM	INTEGER		INPUTS	263	IGAINR	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	23	INGSR	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPNLR	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOR	INTEGER		CONTRL
17	ITRATT	INTEGER		INPUTS	67	ITRFIL	INTEGER		INPUTS
15	ITRNAV	INTEGER		INPUTS	105	LAT	REAL		NAV
1	LATRT	REAL		TRAJIN	106	LONG	REAL		NAV
21	LONGD	REAL		TRAJIN	2	LONGRT	REAL		TRAJIN
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILTR	REAL	ARRAY	NAV
176	OH3	REAL		NAV	0	OTIME	REAL		CONTRL
142	OV32R	REAL	ARRAY	NAV	0	PI	REAL		UNVRSL
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL

VARIABLES SN TYPE RELOCATION

216	Q2P95	REAL	ARRAY	NAV	10	RADPER	REAL		UNVRSL
0	RESID	REAL	ARRAY	IMUDAT	11	RESQ	REAL		UNVRSL
17	RHO	REAL	ARRAY	NAV	3	RR2	REAL		UNVRSL
65	RSMAX	REAL		INPUTS	3.	RSTIME	REAL		CONTRL
7	RSTRT	REAL		INPUTS	2	R2	REAL		UNVRSL
76	SALF	REAL		NAV	21	SALFRT	REAL		TRAJIN
13	SFRT	REAL	ARRAY	TRAJIN	15	SFRTP	REAL	ARRAY	IMUDAT
21	SLATRT	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
145	S2PHI	REAL		NAV	53	THTCOR	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEQ	REAL		TRAJIN
13	TOLJPK	REAL		INPUTS	4	TPREV	REAL		CONTRL
1	TQUANT	REAL		INPUTS	42	TRESID	REAL	ARRAY	IMUDAT
104	VDMP	REAL		NAV	2.	VQUANT	REAL		INPUTS
19	VRT	REAL	ARRAY	TRAJIN	107	V32	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WERT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	65	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XZP92P	REAL	ARRAY	NAV

FILE NAMES MODE
TAPE5 FMT

EXTERNALS TYPE ARGS

ATUDE	0	ININIT	0
INREC	0	LLATT	0
LLATUD	0		

STATEMENT LABELS

34	5 FMT	46	7 FMT	16	9
30	888				

COMMON BLOCKS LENGTH

CONTRL	9
IMUDAT	67
INPUTS	56
NAV	182
PGRAV	7
TRAJIN	21
UNVRSL	10

STATISTICS

PROGRAM LENGTH	553	45
CM LABELED COMMON LENGTH	5408	352

```
      SUBROUTINE SDATUD                                                 021780
C     ------------------------------------------------------------------021790
C     THIS SUBROUTINE CALCULATES THE INCREMENTAL GIMBAL ANGLES          021800
C     THAT WOULD BE GENERATED BY A PERFECT STRAPDOWN IMU                021810
C                                                                       021820
      IMPLICIT REAL(A-H),REAL(L-Z)                                      021830
      COMMON /NAV/     C8P82P(3,3),V82P(3),     DV82P(3),    PH2(3),    021840
     1    C8PH0(3,3), A(3,3),      B(3,3),     THTERT(3),   THTTP0(3),  021850
     2    THTC0P(3),  WXV(3),      G82P(3),    H,           ALPHA,      021860
     3    SALE,       CALE,        DELT,       ETA(3),      V0MG,       021870
     4    LAT,        LONG,        V82(3),     FILATT(3,3),DELTA,       021880
     5    XSALE,      XCALE,       X0P82P(3,3),HV82P(3),    0V82P(3),   021890
     6    S2PHI,      CS2PHI,      XV82P(3),   XH,          DELH,       021900
     7    C8910(3,3), C8P90(3,3),  DH3,        C895(3,3),   DVP82P(3),  021910
     8    D0X  ,      D0Y  ,       D0Z  ,      D2P95(4),    DELTP(3),   021920
     9    GAINS(3,10),IGAINP(3)                                          021930
      COMMON /INPUTS/  AQUANT,      TQUANT,     VQUANT,      START,      021940
     1    STOP,       PLOTIP,      PRNT,       PSTRT,       CYD1,       021950
     2    CYD2,       CYD3,        TOLJPK,     MSGTIM,      MSGING,     021960
     2    ITPNAV,     ITPATT,      INCOP,      IMUTYP,      TPRLIM,     021970
     3    IPC(30),    IOPNLP,      OBX0,       SSYB,        SSZB,       021980
     4    PSMAX,      DPSMAX,      ITPFIL                               021990
      COMMON /EMUDAT/  PESID(3),    DV3P(3),    ETA3P(4),    HT(7),      022000
     1    SF9TP(3),   C2P95(3,3), C9MES(7,3), TPESID(3),  C1090(3,3),  022010
     2   C1092P(3,3), C2P95T(3,3), ARESID(3)                            022020
      COMMON /TRAJIN/  TIME,        LAT3T,      LONG9T,      ALF9T,      022030
     1    H9,         ETA9T(3),    V3T(3),     SF9T(3),     DELTS,      022040
     2    TIMEP,      LONG9,       SLAT9T,     CLAT9T,      SALF9T,     022050
     3    CALF9T                                                         022060
      COMMON /UNVFSL/  PI,          HPI,        P2,          RPJ,        022070
     1    EF,         FSQ,         FF2PP,      RERT,        RAOPFP,     022080
     2    RFSQ                                                           022090
      DIMENSION TMP(3)                                                  022100
      TMP(1)=-LONG9T+LONG0-VERT*(TIME-TIME0)                            022110
      CALL ROT7YX(A, SIN(TMP(1)), COS(TMP(1)),SLAT9T,CLAT9T,            022120
     1  -SALF9T,CALF9T)                                                 022130
C     A IS C8P2P                                                        022140
      CALL MM(B,A,C2P95T)                                               022150
C     B IS NEW C895                                                     022160
      CALL MTM(A,C895,3)                                                022170
C     A IS DELTA C895                                                   022180
      DO 15 I=1,3                                                       022190
      DO 15 J=1,3                                                       022200
   15 C895(I,J)=B(I,J)                                                  022210
C     SAVE NEW C895 FOR USE AS NEXT CYCLE'S OLD                         022220
      IF (IPC(16) .NE. 0) CALL DOUT(16)                                 022230
      ETA9P(1)=.5*(A(3,2)-A(2,3))                                       022240
      ETA9P(2)=.5*(A(1,3)-A(3,1))                                       022250
      ETA9P(3)=.5*(A(2,1)-A(1,2))                                       022260
C     ROTATION OF BODY W.R.T. INERTIAL AS SEEN IN BODY                  022270
      STH= SQRT(ETA9P(1)**2+ETA9P(2)**2+ETA9P(3)**2)                    022280
      TH=  ASIN(STH)                                                    022290
      SF=TH/STH                                                         022300
      ETA9P(1)=ETA9P(1)*SF                                              022310
      ETA9P(2)=ETA9P(2)*SF                                              022320
      ETA9P(3)=ETA9P(3)*SF                                              022330
      DO 775 I=1,3                                                      022340
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```
                ETA9P(I)=ETA9P(I)+APESID(I)                                    022350
              776 APESID(I)=ETA9P(I)                                           022360
       60       CALL ONTIZ(ETA9P,AQUANT)                                       022370
                DO 777 I=1,3                                                   022380
              777 APESID(I)=APESID(I)-ETA9P(I)                                 022390
                IF (IPC(2) .NE. 0) CALL DOUT(2)                                022400
                RETURN                                                         022410
       66       END                                                            022420
```

SYMBOLIC REFERENCE MAP (2=1)

ENTRY POINTS

1 SDATUD

VARIABLES

SN	TYPE		RELOCATION					
11	A	REAL	ARRAY	NAV	3	ALF9T	REAL	TRAJIN
75	ALPHA	REAL		NAV	0	AQUANT	REAL	INPUTS
100	APESID	REAL	ARRAY	IMUDAT	44	B	REAL	ARRAY NAV
77	CALF	REAL		NAV	24	CALF9T	REAL	TRAJIN
22	CLAT9T	REAL		TRAJIN	10	CVD1	REAL	INPUTS
11	CVD2	REAL		INPUTS	12	CVD3	REAL	INPUTS
165	C0P90	REAL	ARRAY	NAV	3	C0P92P	REAL	ARRAY NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY NAV
45	C1390	REAL	ARRAY	IMUDAT	55	C1392P	REAL	ARRAY IMUDAT
28	C2P95	REAL	ARRAY	IMUDAT	67	C2P95T	REAL	ARRAY IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C92MC	REAL	ARRAY NAV
153	DELH	REAL		NAV	103	DELI	REAL	NAV
123	DELT4	REAL		NAV	16	DELTS	REAL	TRAJIN
66	DPSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY NAV
7	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY NAV
4	EE	REAL		UNV2SL	6	EE2P0	REAL	UNV2SL
5	ES0	REAL		UNV2SL	101	ET4	REAL	ARRAY NAV
6	ETA9P	REAL	ARRAY	IMUDAT	5	ET49T	REAL	ARRAY TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL	NAV
4	HB	REAL		TRAJIN	1	HPI	REAL	UNV2SL
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL	INPUTS
137	HV92P	REAL	ARRAY	NAV	157	I	INTEGER	
22	IERLIM	INTEGER		INPUTS	263	IGAINP	INTEGER	ARRAY NAV
21	IMUTYP	INTEGER		INPUTS	20	INCOR	INTEGER	INPUTS
61	IOPNLP	INTEGER		INPUTS	23	IPC	INTEGER	ARRAY INPUTS
17	IRATT	INTEGER		INPUTS	57	IT2FIL	INTEGER	INPUTS
16	ITPNAV	INTEGER		INPUTS	160	J	INTEGER	
105	LAT	REAL		NAV	1	LAT9T	REAL	TRAJIN
106	LONG	REAL		NAV	20	LONG0	REAL	TRAJIN
2	LONG9T	REAL		TRAJIN	213	ODX	REAL	NAV
214	ODY	REAL		NAV	215	ODZ	REAL	NAV
222	OFILTC	REAL	ARRAY	NAV	176	OMG	REAL	NAV
142	OV92P	REAL	ARRAY	NAV	0	PI	REAL	UNV2SL
9	PLOTIM	REAL		INPUTS	6	PONT	REAL	INPUTS
216	Q2P95	REAL	ARRAY	NAV	10	RADPER	REAL	UNV2SL
8	RICID	REAL	ARRAY	IMUDAT	11	RES0	REAL	UNV2SL
17	RHO	REAL	ARRAY	NAV	1	RP0	REAL	UNV2SL

VARIABLES	SN	TYPE		RELOCATION					
65	RSMAX	REAL		INPUTS	7	RSTRT	REAL		INPUTS
2	R0	REAL		UNVRSL	76	SALF	REAL		NAV
23	SALF9T	REAL		TRAJIN	163	SF	REAL		
13	SF9T	REAL	ARRAY	TRAJIN	15	SF9TP	REAL	ARRAY	IMUDAT
21	SLAT9T	REAL		TRAJIN	62	SSX0	REAL		INPUTS
63	SSY0	REAL		INPUTS	64	SSZ0	REAL		INPUTS
3	START	REAL		INPUTS	161	ST4	REAL		
4	STOP	REAL		INPUTS	145	S2PHI	REAL		NAV
162	T4	REAL			63	THTCOP	REAL	ARRAY	NAV
55	THTEST	REAL	ARRAY	NAV	60	THTTRQ	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEO	REAL		TRAJIN
164	TMP	REAL	ARRAY		13	TOLJPK	REAL		INPUTS
1	TQUANT	REAL		INPUTS	42	TRTSTD	REAL	ARRAY	IMUDAT
134	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	V9T	REAL	ARRAY	TRAJIN	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	7	WORT	REAL		UNVRSL
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	126	XZ92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS			
ASIN	REAL	1 LIBRARY	COS	REAL	1 LIBRARY
DOUT		1	HP		3
MTH		3	ONITZ		2
ROTZYX		7	SIN	REAL	1 LIBRARY
SQRT	REAL	1 LIBRARY			

STATEMENT LABELS

0	15	0 776	0 777

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
25	15	* I	42 44	119	NOT INNER
26	15	J	43 44	69	INSTACK
72	776	I	57 59	68	INSTACK
103	777	I	61 62	48	INSTACK

COMMON BLOCKS	LENGTH
NAV	182
INPUTS	56
IMUDAT	67
TRAJIN	21
UNVRSL	10

STATISTICS

PROGRAM LENGTH	1678	119
CM LABELED COMMON LENGTH	5200	336

```
      1                SUBROUTINE SOINTG                                                  022420
                       C     THIS ROUTINE IS PART OF THE IMU SIMULATOR FOR THE STRAPDOWN   022430
                       C     CASE. IT TRANSFORMS THE SPECIFIC FORCES FROM THE 2P FRAME    022440
                       C     TO THE BODY FRAME.                                           022450
      5                C                                                                  022460
                             IMPLICIT REAL(A-H),REAL(L-Z)                                 022470
                       COMMON /NAV/     C0P92P(3,3),V92P(3),     DV92P(3),     RHO(3),    022480
                      1      C99H0(3,3),     A(3,3),     B(3,3),     THTERT(3),  THTIRO(3),  022500
                      2      THTCOR(3),  WXV(3),     G92P(3),    H,          ALPHA,      022510
     10               3      CALE,       CALE,       DELT,       ETA(3),     V0MP,       022520
                      4      LAT,        LONG,       V92(3),     FILATT(3,3),DELTA,      022530
                      5      XSALE,      XCALE,      X2P92P(3,3),HV92P(3),   DV92P(3),   022540
                      6      S2PHI,      XS2PHI,     XV92P(3),   XH,         DELH,       022550
                      7      C99A0(3,3), C0P90(3,3), OHB,        C095(3,3),  DVC92P(3),  022560
     15               8      DDX   ,     DDY   ,     DDZ   ,     D2P95(4),   DFI(ITP(7),  022570
                      9      CAIMS(3,10),IGAINP(3)                                        022580
                       COMMON /IMUDAT/  PESTD(3),   DV9P(3),     ETA9P(4),   WI(3),      022590
                      1      SF9IP(3),   C2P95(3,3), C9MIS(3,3), TRESID(3),  C1090(3,3), 022600
                      2    C1092P(3,3), C2P95T(3,3), APESTD(3)                            022610
     20               COMMON /TRAJIN/  TIME,       LAT9T,      LONG9T,     ALF9T,      022620
                      1      HB,         ETA9T(3),   V9T(3),     SF9T(3),    DELTS,      022630
                      2      TIMED,      LONGD,      SLAT9T,     CLAT9T,     SALF9T,     022640
                      3      CALF9T                                                       022650
                             DIMENSION TMP(3)                                             022660
     25               CALL ROTXYZ(C2P95T, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),    022670
                      1  COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                    022680
                       CALL MATPAK(A,C2P95T)                                              022690
                       TMP(1)=SF9T(2)                                                     022700
                       TMP(2)=-SF9T(1)                                                    022710
     30                TMP(3)=SF9T(1)                                                     022720
                       CALL MATVEC(SF9T,A,TMP)                                            022730
                       RETURN                                                             022740
                       END                                                                022750
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 SOINTG

VARIABLES	SN	TYPE		RELOCATION					
37	A	REAL	ARRAY	NAV	1	ALF9T	REAL		TRAJIN
75	ALPHA	REAL		NAV	100	APESID	REAL	ARRAY	IMUDAT
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
24	CALF9T	REAL		TRAJIN	22	CLAT9T	REAL		TRAJIN
166	C0P90	REAL	ARRAY	NAV	0	C0P92P	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C095	REAL	ARRAY	NAV
46	C1090	REAL	ARRAY	IMUDAT	55	C1092P	REAL	ARRAY	IMUDAT
20	C2P95	REAL	ARRAY	IMUDAT	57	C2P95T	REAL	ARRAY	IMUDAT
31	C9MIS	REAL	ARRAY	IMUDAT	22	C2P90	REAL	ARRAY	NAV
163	DELH	REAL		NAV	100	DELT	REAL		NAV
127	DELTA	REAL		NAV	16	DELTS	REAL		TRAJIN
212	DV92P	REAL	ARRAY	NAV	3	DV9P	REAL	ARRAY	IMUDAT
14	DV92P	REAL	ARRAY	NAV	101	ETA	REAL	ARRAY	NAV

SUBROUTINE SOINTS 74474 OPT=0 TRACE FTN 4.5+P406 05/25/76 17.34.46 PAGE 2

VARIABLES SN TYPE RELOCATION

6	ETA9P	REAL	ARRAY	IMUDAT	5	ETA9T	REAL	ARRAY	TRAJIN
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
73	G02P	REAL	ARRAY	NAV	74	H	REAL		NAV
4	HH	REAL		IRAJIN	137	HV32P	REAL	ARRAY	NAV
251	IGAINP	INTEGER	ARRAY	NAV	105	LAT	REAL		NAV
1	LAT9T	REAL		TRAJIN	106	LONG	REAL		NAV
28	LONGD	REAL		TRAJIN	2	LONG9T	REAL		TRAJIN
213	ODX	REAL		NAV	214	ODY	REAL		NAV
215	ODZ	REAL		NAV	222	OFILTP	REAL	ARRAY	NAV
175	OHR	REAL		NAV	142	OV32P	REAL	ARRAY	NAV
216	P2P95	REAL	ARRAY	NAV	9	PSITP	REAL	ARRAY	IMUDAT
17	QHQ	REAL	ARRAY	NAV	76	SALF	REAL		NAV
27	SELF9T	REAL		TRAJIN	13	SF9T	REAL	ARRAY	TRAJIN
15	SF9TP	REAL	ARRAY	IMUDAT	21	SLAT9T	REAL		TRAJIN
145	S2PHI	REAL		NAV	53	THTCOR	REAL	ARRAY	NAV
55	THTF2T	REAL	ARRAY	NAV	50	THTT2P	REAL	ARRAY	NAV
0	TIME	REAL		TRAJIN	17	TIMEP	REAL		TRAJIN
131	THP	REAL	ARRAY		42	TPSIP	REAL	ARRAY	IMUDAT
104	VUMP	REAL		NAV	10	VBT	REAL	ARRAY	TRAJIN
107	VV2	REAL	ARRAY	NAV	11	V32P	REAL	ARRAY	NAV
12	WT	REAL	ARRAY	IMUDAT	66	WXV	REAL	ARRAY	NAV
125	XCALF	REAL		NAV	152	XH	REAL		NAV
124	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV42P	REAL	ARRAY	NAV	126	XZP32P	REAL	ARRAY	NAV

EXTERNALS TYPE ARGS

COS	REAL	1	LIBRARY	MATRAN	3
SETVEC		3		ROTXYZ	3
SIN	REAL	1	LIBRARY		

COMMON BLOCKS LENGTH

NAV	192
IMUDAT	67
TRAJIN	21

STATISTICS

PROGRAM LENGTH	1040	68
CM LABELED COMMON LENGTH	4168	270

```
      SUBROUTINE SDINIT                                                 022760
C                                                                       022770
C     THIS ROUTINE PERFORMS THE INITIALIZATION OF THE STRAPDOWN         022780
C     CASE. THE NAV EQUATIONS ARE INITIALIZED WITH THE COMMON           022790
C     SUBROUTINE.                                                       022800
C                                                                       022810
      IMPLICIT REAL(A-H),REAL(L-Z)                                      022820
      COMMON /CONTRL/ DTIME,    PTIME,    PLTIME,   RSTIME,           022830
     1     TPREV,     INIT,     ISTOP,    ICMCYL,   ICMCYP            022840
      COMMON /IMUCAT/ RESID(3), DV9P(3),  ETA9P(4), HT(3),            022850
     1     SF9IP(3),  C2P95(3,3), C9NIS(3,3), TRESID(3), C1J9P(3,3),  022860
     2     C1092P(3,3), C2P95T(3,3), ARESID(3)                        022870
      COMMON /INPUTS/ ADUANT,   IQUANT,   VQUANT,   START,            022880
     1     STOP,      PLOTIM,   PRNT,     PSTRT,    CV01,            022890
     2     CV02,      CV03,     TOLJCK,   HSDTIM,   HSDINC,          022900
     2     IIRNAV,    IIRATT,   INCOD,    INUTYP,   IERLIM,          022910
     3     IPC(30),   IDPNLP,   SSX0,     SSY0,     SSZ0,            022920
     4     PSMAX,     DPSMAX,   ITRFIL                                022930
      COMMON /NAV/    C0P92P(3,3),V92P(3),  DV92P(3),  RHO(3),        022940
     1     CORHO(3,3), A(3,3),   B(3,3),   INTERT(3), INTTRC(3),      022950
     2     THTCOR(3), PXV(3),    G92P(3),  H,        ALPHA,           022960
     3     SALE,      CALE,      OCLT,     ETA(3),   VOMP,            022970
     4     LAT,       LONG,      V92(3),   FILATT(3,3),DELTA,         022980
     5     XSALE,     XCALE,     X0P92P(3,3),HV92P(3), DV92P(3),      022990
     6     S2PHI,     XS2PHI,    XV92P(3), XH,       DELH,            023000
     7     C0910(3,3), C0P90(3,3), OHO,     C095(3,3),  DV502P(3),   023010
     8     ODX ,      ODY ,      ODZ ,     O2P95(4),   DELTP(3),      023020
     9     GAINS(3,10),IGAINP(3)                                      023030
      COMMON /TRAJ1N/ TIME,     LAT9T,    LONG9T,   ALE9T,           023040
     1     NP,        ETA9T(3),  V91(3),   SF9T(3),  DELTS,           023050
     2     TIMEO,     LONGO,     SLAT9T,   CLAT9T,   SALE9T,          023060
     3     CALE9T                                                     023070
C                                                                       023080
      CALL INPEC                                                        023090
      TCMCYL=ITRATT                                                     023100
      CALL ROTZYX(C0P92P,0.E0,1.E0,SLAT9T,CLAT9T,-SALE9T,CALE9T)        023110
      CALL ROTXYZ(C2P95, SIN(ETA9T(1)), COS(ETA9T(1)), SIN(ETA9T(2)),   023120
     1  COS(ETA9T(2)), SIN(ETA9T(3)), COS(ETA9T(3)) )                  023130
      IF (IPC(27) .EQ. 0) GO TO 3                                       023140
C     FOLLOWING CODE INITIALIZES QUATERNION                             023150
      Q2P95(1)= SQRT(C2P95(1,1)+C2P95(2,2)+C2P95(3,3)+1.E0)*.5          023160
      Q2P95(2)=(C2P95(3,2)-C2P95(2,3))/(4.E0*Q2P95(1))                  023170
      Q2P95(3)=(C2P95(1,3)-C2P95(3,1))/(4.E0*Q2P95(1))                  023180
      Q2P95(4)=(C2P95(2,1)-C2P95(1,2))/(4.E0*Q2P95(1))                  023190
    3 CALL MM(C095,C0P92P,C2P95)                                        023200
      CALL SDINIG                                                       023210
      DO 5 I=1,3                                                        023220
    5 SF9IP(I)=SF9T(I)                                                  023230
      WRITE(6,6)                                                        023240
    6 FORMAT(" IMU STABILIZATION IS STRAPDOWN"/)                        023250
      CALL INIMIT                                                       023260
      CALL ATUDE                                                        023270
      IF (IPC(25) .EQ. 0) GO TO 888                                     023280
C     IF ATTITUDE FILTER REQUEST, INIT STATE VECTOR                     023290
      FILATT(1,1)=ETA(1)                                                023300
      FILATT(1,2)=ETA(2)                                                023310
      FILATT(1,3)=ETA(3)                                                023320
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```
      888 RETURN                                                    023330
          END                                                       023340
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 SOINIT

VARIABLES

SN	TYPE	RELOCATION		SN	TYPE	RELOCATION	
33	A	REAL ARRAY	NAV	3	ALF9T	REAL	TRAJIN
75	ALPHA	REAL	NAV	0	AQUANT	REAL	INPUTS
100	ARESID	REAL ARRAY	IMUDAT	44	C	REAL ARRAY	NAV
77	CALF	REAL	NAV	24	CALF9T	REAL	TRAJIN
22	CLAT9T	REAL	TRAJIN	10	CV01	REAL	INPUTS
11	CV02	REAL	INPUTS	12	CV03	REAL	INPUTS
165	C0P90	REAL ARRAY	NAV	3	C0P92P	REAL ARRAY	NAV
154	C0910	REAL ARRAY	NAV	177	C095	REAL ARRAY	NAV
45	C1090	REAL ARRAY	IMUDAT	56	C1092P	REAL ARRAY	IMUDAT
20	C2P95	REAL ARRAY	IMUDAT	67	C2P95T	REAL ARRAY	IMUDAT
31	C9MIS	REAL ARRAY	IMUDAT	22	C92H0	REAL ARRAY	NAV
153	DELH	REAL	NAV	130	DELT	REAL	NAV
123	DELTA	REAL	NAV	16	DELTS	REAL	TRAJIN
66	DRSMAX	REAL	INPUTS	211	DV592P	REAL ARRAY	NAV
3	DV9P	REAL ARRAY	IMUDAT	14	DV92P	REAL ARRAY	NAV
101	ETA	REAL ARRAY	NAV	6	ET49P	REAL ARRAY	IMUDAT
5	ETA9T	REAL ARRAY	TRAJIN	112	FILATT	REAL ARRAY	NAV
225	GAINS	REAL ARRAY	NAV	71	G02P	REAL ARRAY	NAV
74	H	REAL	NAV	4	H0	REAL	TRAJIN
15	HSOINC	REAL	INPUTS	14	HSOTIM	REAL	INPUTS
137	HV92P	REAL ARRAY	NAV	167	I	INTEGER	
7	ICMCYL	INTEGER	CONTRL	10	ICMCYP	INTEGER	CONTRL
22	IFLIM	INTEGER	INPUTS	263	IGAINP	INTEGER ARRAY	NAV
21	IMUTYP	INTEGER	INPUTS	20	INCOR	INTEGER	INPUTS
5	INIT	INTEGER	CONTRL	61	IOPNLP	INTEGER	INPUTS
23	IPC	INTEGER ARRAY	INPUTS	6	ISTOP	INTEGER	CONTRL
17	ITRATI	INTEGER	INPUTS	67	ITRETL	INTEGER	INPUTS
16	ITRNAV	INTEGER	INPUTS	105	LAT	REAL	NAV
1	LAT9T	REAL	TRAJIN	106	LONG	REAL	NAV
20	LONGO	REAL	TRAJIN	2	LONG9T	REAL	TRAJIN
213	ODX	REAL	NAV	214	ODY	REAL	NAV
215	ODZ	REAL	NAV	222	OFILTR	REAL ARRAY	NAV
176	OHR	REAL	NAV	0	OTIME	REAL	CONTRL
142	OV92P	REAL ARRAY	NAV	5	PLOTIM	REAL	INPUTS
2	PLTIME	REAL	CONTRL	6	PRNT	REAL	INPUTS
1	PTIME	REAL	CONTRL	216	Q2P95	REAL ARRAY	NAV
0	RESID	REAL ARRAY	IMUDAT	17	RHO	REAL ARRAY	NAV
65	RSMAX	REAL	INPUTS	3	RSTIME	REAL	CONTRL
7	RSTRT	REAL	INPUTS	76	SALF	REAL	NAV
23	SALF9T	REAL	TRAJIN	11	SEAT	REAL ARRAY	TRAJIN
15	SEATP	REAL ARRAY	IMUDAT	21	SLAT9T	REAL	TRAJIN
62	SSX0	REAL	INPUTS	63	SSY0	REAL	INPUTS
64	SSZ0	REAL	INPUTS	5	START	REAL	INPUTS
4	STOP	REAL	INPUTS	146	S2PHI	REAL	NAV

SUBROUTINE SOINIT 74/74 OPT=0 TRACE FTN 4.5+436 05/25/76 17.34.45 PAGE 3

VARIABLES SN TYPE RELOCATION

53	INTCOP	REAL	ARRAY	BLNK	55	THETCT	REAL	ARRAY	BLNK
58	INTIRO	REAL	ARRAY	BLNK	1	TIME	REAL		TRAJIN
17	TIMEB	REAL		TRAJIN	13	TOLJPK	REAL		TRAJIN
4	TPPEW	REAL		CONTRL	1	TOUART	REAL		INPUTS
42	TPTSID	REAL	ARRAY	INUDAT	124	V040	REAL		BLNK
2	VOUANT	REAL		INPUTS	13	V0T	REAL	ARRAY	TRAJIN
107	V92	REAL	ARRAY	BLNK	11	V0TP	REAL	ARRAY	BLNK
12	WT	REAL	ARRAY	INUDAT	66	WXV	REAL	ARRAY	BLNK
125	XCALF	REAL		BLNK	152	XII	REAL		BLNK
134	XSALF	REAL		BLNK	145	XSCPHI	REAL		BLNK
147	XV92P	REAL	ARRAY	BLNK	125	XP0020	REAL	ARRAY	BLNK

FILE NAMES MODE

TAPE6 FMT

EXTERNALS TYPE ARG

ATUPE		0	COS	REAL	1 LIBRARY
INTMIT		3	ENDEC		3
MM		3	POLYXZ		7
MOBZYX		7	SQRTG		3
SSN	REAL	1 LIBRARY	SQRT	REAL	1 LIBRARY

STATEMENT LABELS

61 3 0 5 156 6 FMT

193 999

LOOPS LABEL INDEX FROM-TO LENGTH ATTRIBUTES

65 5 I 47 48 48 INSTACK

COMMON BLOCKS LENGTH

CONTROL 9

INUDAT 67

INPUTS 56

BLNK 182

TRAJIN 21

STATISTICS

PROGRAM LENGTH 1733 126

BLANK COMMON LENGTH 5178 365

1243

```
      SUBROUTINE HSINTG                                                 023350
C                                                                       023360
C     THIS ROUTINE IS PART OF THE STRAP DOWN FLIGHT CODE. IT PERFORMS   023370
C     THE SUMMATION OF VELOCITY INCREMENTS AT THE ATTITUDE CYCLE RATE.  023380
C                                                                       023390
      IMPLICIT REAL(A-H),REAL(L-Z)                                      023400
      COMMON /CONTRL/ OTIME,      RTIME,      PLTIME,     RSTIME        023410
     1    IPRCV,      INIT,       ISTOP,      ICMCYL,     ICMCYP        023420
      COMMON /IMUCMT/ RESID(3),   DV3P(3),    STAGP(4),   WT(3),        023430
     1    SFBIP(3),   C2P3S(3,3), C3AIS(3,3), RRESID(3),  C1B93(3,3),   023440
     2    C1B9CP(3,3), C2P95T(3,3), ARESID(3)                           023450
      COMMON /IMPLTS/ ADVANT,     IDVANT,     VDVANT,     STARI,        023460
     1    STOP,       PLOTIM,     PRNT,       PSTPT,      CV01,         023470
     2    CV02,       CV03,       TOLJCK,     HSOTIM,     HSCING,       023480
     3    IFSNAV,     IIPART,     TASCOP,     THDTYP,     IFPLTM,       023490
     4    IPC(39),    IOPNLP,     SCY0,       SSY0,       SSZ0,         023500
     5    RSMAX,      RRSMAX,     ITRETL                                023510
      COMMON /NAV/    C2B92P(3,3),V32P(3),    DV32P(3),   RR(3),        023520
     1    C9BRB(3,3), A(3,3),     B(3,3),     THTCPT(3),  THTCC0(3),    023530
     2    THTCOF(3),  RXV(3),     G92P(3),    H,          ALPHA,        023540
     3    SALF,       CALF,       DELT,       STA(3),     VCMB,         023550
     4    LAT,        LONG,       V32(3),     FILATT(3,3),DELTA,        023560
     5    XSALF,      XCALF,      XAB92P(3,3),WV32P(3),   DV32P(3),     023570
     6    S2PHI,      XS2PHI,     XV32P(3),   YH,         DELH,         023580
     7    C99101(3,3), C6P90(3,3), DH3,       C095(3,3),  CV592P(3),    023590
     8    DDX ,       DDY ,       DDZ ,       C2P95(4),   DELTP(3),     023600
     9    GAINS(3,10),TGAINP(3)                                         023610
      COMMON /TRAJEM/ TIME,       LAT9T,      LONG9T,     ALF9T,        023620
     1    HB,         STA9I(3),   V9T(3),     SF9T(3),    DELTS,        023630
     2    TIMF0,      LONG0,      SLAT9T,     CLAT9T,     SALF9T,       023640
     3    CALF9T                                                        023650
      EQUIVALENCE (Q0,C2P95(1)),(Q1,C2P95(2)),(Q2,C2P95(3)),(Q3,C2P95(4)) 023660
     1    )                                                             023670
      DIMENSION TMP(3)                                                  023680
      CALL MAT-AN(A,C2P95)                                              023690
C     A IS C92P                                                         023700
      CALL MATVEC(TMP,A,THTTP0)                                         023710
C     TMP IS ANGLE OF INERTIAL W.R.T. COMP COORDINATIZED IN BODY        023720
      DO 10 I=1,3                                                       023730
   10 TMP(I)=STA9E(I)-DELTA/DELT*TMP(I)                                 023740
C     TMP IS ROTATION OF COMP W.R.T. BODY IN BODY                       023750
      IF (IPC(27) .EQ. 1) GO TO 900                                     023760
C     IF QUATERNION UPDATE MODE, BRANCH                                 023770
      CALL OCMUP2(4,TMP(1),TMP(2),TMP(3),IPC(25),1.0E3,DDX  ,DDY  ,     023780
     1 DDZ  )                                                           023790
      CALL MULT(Q,C2P95,A)                                              023800
      GO TO 900                                                         023810
C                                                                       023820
C     THIS IS QUATERNION UPDATE,OPTIONAL NORMALIZE, AND DCM FORMATION   023830
C                                                                       023840
  800 TMP(1)=TMP(1) *.5                                                 023850
      TMP(2)=TMP(2)*.5                                                  023860
      TMP(3)=TMP(3)*.5                                                  023870
      Q0=1                                                              023880
      IF (IPC(2C) .EQ. 0) GO TO 830                                     023890
      TSQ2=(TMP(1)*TMP(1)+TMP(2)*TMP(2)+TMP(3)*TMP(3))*.5               023900
      Q0=1.-TSQ2                                                        023910
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      IF (IPC(26) .EQ. 1) GO TO *                                       023920
      XDIX=0.                                                           023930
   60 XDIY=0.                                                           023940
      XDIZ=0.                                                           023950
      CON=1.-TS02*.5+TS02**2*.333333333333333E0                         023960
      P1=CON*TMP(1)+XDIX                                                023970
      P2=CON*TMP(2)+XDIY                                                023980
   65 P3=CON*TMP(3)+XDIZ                                                023990
      C  WE JUST FINISHED FORMING ROTATION QUATERNION                   024000
      QDX=TMP(1)                                                        024010
      QDY=TMP(2)                                                        024020
      QDZ=TMP(3)                                                        024030
   70 GO TO 841                                                         024040
      C  FORM VECTOR TERMS OF 1ST OR 2ND ORDER ROT QUAT                 024050
  830 P1=TMP(1)                                                         024060
      P2=TMP(2)                                                         024070
      P3=TMP(3)                                                         024080
   75 C  FORM UPDATE QUATERNION AND MULTIPLY                            024090
  840 QQN=QQ*P1-Q1*P1-Q2*P2-Q3*P3                                       024100
      Q1N=P1*QQ+PQ*Q1+P3*Q2-P2*Q3                                       024110
      Q2N=P2*QQ-P3*Q1+PQ*Q2+P1*Q3                                       024120
      Q3=P3*QQ+P2*Q1-P1*Q2+PQ*Q3                                        024130
   80 QQ=QQN                                                            024140
      Q1=Q1N                                                            024150
      Q2=Q2N                                                            024160
      C  NORMALIZE QUATERNION IF TIME TO DO SO                          024170
      IF (TIME .LT. HSQTIM) GO TO 860                                   024180
   85 HSQTIM=TIME+HSQINC                                                024190
      COR=1.5E0-(Q1*QQ+Q1*Q1+Q2*Q2+Q3*Q3)*.5                            024200
      QQ=COR*QQ                                                         024210
      Q1=Q1*COR                                                         024220
      Q2=Q2*COR                                                         024230
   90 Q3=Q3*COR                                                         024240
      C  FORM NEW DCM BASED ON QUATERNION                               024250
  860 Q1S=Q1*Q1                                                         024260
      Q2S=Q2*Q2                                                         024270
      Q3S=Q3*Q3                                                         024280
   95 QQ1=QQ*Q1                                                         024290
      QQ2=QQ*Q2                                                         024300
      QQ3=QQ*Q3                                                         024310
      Q12=Q1*Q2                                                         024320
      Q23=Q2*Q3                                                         024330
  100 Q31=Q3*Q1                                                         024340
      B(1,1)=1.-2.*(Q2S+Q3S)                                            024350
      B(1,2)=2.*(Q12-QQ3)                                               024360
      B(1,3)=2.*(Q31+QQ2)                                               024370
      B(2,1)=2.*(Q12+QQ3)                                               024380
  105 B(2,2)=1.-2.*(Q3S+Q1S)                                            024390
      B(2,3)=2.*(Q23-QQ1)                                               024400
      B(3,1)=2.*(Q31-QQ2)                                               024410
      B(3,2)=2.*(Q23+QQ1)                                               024420
      B(3,3)=1.-2.*(Q1S+Q2S)                                            024430
  110 900 DO 15 I=1,3                                                   024440
      DO 15 J=1,3                                                       024450
      A(I,J)=(B(I,J)+C2P95(I,J))/2.                                     024460
   15 C2P95(I,J)=B(I,J)                                                 024470
      IF (IPC(15) .NE. 1) CALL DOUT(15)                                 024480
```

```
  115          C     UPDATE BODY TO COMP FRAME TRANSFORM WITH INCREMENTAL ROTATION.      024491
                     IF (TIME .LT. HSOTIM) GO TO 20                                     024500
                     HSOTIM=TIME+HSOINC                                                 024510
                     CALL OUTHO(C2R95)                                                  024520
                20   CALL MATVEC(TMP,A,DV9P)                                           024531
  120                DO 60 I=1,3                                                       024540
                60   DV592P(I)=DV592P(I)+TMP(I)                                        024550
                C    DV592P HOLD SUMMATION UNTIL TIME WHEN INRNAV WILL BE CALLED       024560
                     IF (IPC(17) .NE. 0) CALL DOUT(17)                                 024570
                     IF (IPC(18) .NE. 0) CALL DOUT(18)                                 024580
  125                RETURN                                                            024590
                     END                                                               024600
```

CARD NR.	SEVERITY	DETAILS	DIAGNOSIS OF PROBLEM
62	I		CONSTANT TOO LONG. HIGH ORDER DIGITS RETAINED, BUT SOME PRECISION LOST.

1-246

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 HSINIG

VARIABLES	SN	TYPE		RELOCATION					
33	A	REAL	ARRAY	NAV	3	ALFBT	REAL		TRAJTN
75	ALPHA	REAL		NAV	0	AQUANT	REAL		INPUTS
180	AXESID	REAL	ARRAY	INUDAT	44	B	REAL	ARRAY	NAV
77	CALF	REAL		NAV	24	CALFBT	REAL		TRAJIN
22	CLATBT	REAL		TRAJIN	354	CON	REAL		
363	COS	REAL			10	CV21	REAL		INPUTS
11	CV22	REAL		INPUTS	12	CV23	REAL		INPUTS
165	C0P90	REAL	ARRAY	NAV	0	C0P929	REAL	ARRAY	NAV
154	C0910	REAL	ARRAY	NAV	177	C995	REAL	ARRAY	NAV
45	C1090	REAL	ARRAY	INUDAT	56	C1092B	REAL	ARRAY	INUDAT
20	C2095	REAL	ARRAY	INUDAT	67	C2095T	REAL	ARRAY	INUDAT
74	C9MIS	REAL	ARRAY	INUDAT	22	C9RR0	REAL	ARRAY	NAV
153	DELH	REAL		NAV	101	DELT	REAL		NAV
133	DELTA	REAL		NAV	16	DELTS	REAL		TRAJTN
66	DPSMAX	REAL		INPUTS	210	DV5929	REAL	ARRAY	NAV*
3	DV9P	REAL	ARRAY	INUDAT	14	DV32B	REAL	ARRAY	NAV
181	ETA	REAL	ARRAY	NAV	6	ETA39	REAL	ARRAY	INUDAT
5	ETA9T	REAL	ARRAY	TRAJIN	113	FILATT	REAL	ARRAY	NAV
225	GAINS	REAL	ARRAY	NAV	71	G92P	REAL	ARRAY	NAV
74	H	REAL		NAV	4	HR	REAL		TRAJIN
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92*	REAL	ARRAY	NAV	345	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	13	ICMCYP	INTEGER		CONTRL
22	IDELTI	INTEGER		INPUTS	261	IGATHP	INTEGER	ARRAY	NAV
21	INDIVP	INTEGER		INPUTS	22	INDOF	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	INPNLP	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISIGP	INTEGER		CONTRL

VARIABLES	SN	TYPE		RELOCATION					
17	ITRATT	INTEGER		INPUTS	67	ITRETL	INTEGER		INPUTS
16	ITRNAV	INTEGER		INPUTS	375	J	INTEGER		
105	LAT	REAL		NAV	1	LATGT	REAL		TRAJTN
106	LONG	REAL		NAV	20	LONGG	REAL		TRAJTN
2	LONGGT	REAL		TRAJTN	213	OOX	REAL		NAV
214	OOY	REAL		NAV	215	OOZ	REAL		NAV
220	OPTLTR	REAL	ARRAY	NAV	176	OMG	REAL		NAV
0	OTIME	REAL		CONTRL	142	OV92P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
6	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
347	P0	REAL			355	P1	REAL		
356	P2	REAL			357	P3	REAL		
216	Q0	REAL		NAV	360	QBN	REAL		
367	Q01	REAL			370	Q12	REAL		
371	Q23	REAL			217	Q1	REAL		NAV
361	Q1N	REAL			364	Q1S	REAL		
372	Q12	REAL			220	Q2	REAL		NAV
362	Q2N	REAL			216	Q2P95	REAL	ARRAY	NAV
	Q2S	REAL			373	Q23	REAL		
	Q3	REAL		NAV	366	Q3S	REAL		
374	Q31	REAL			0	RESID	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	55	RSMAX	REAL		INPUTS
7	RSTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS
76	SALF	REAL		NAV	23	SALFGT	REAL		TRAJTN
13	SF9T	REAL	ARRAY	TRAJTN	15	SF9TP	REAL	ARRAY	IMUDAT
21	SLATGT	REAL		TRAJTN	62	SSXG	REAL		INPUTS
63	SSYG	REAL		INPUTS	64	SSZG	REAL		INPUTS
3	START	REAL		INPUTS	4	STOP	REAL		INPUTS
146	S2PHI	REAL		NAV	67	THTGDR	REAL	ARRAY	NAV
55	THTERT	REAL	ARRAY	NAV	61	THTRDG	REAL	ARRAY	NAV
0	TIME	REAL		TRAJTN	17	TIMEG	REAL		TRAJTN
376	TMP	REAL	ARRAY		13	TOLJRK	REAL		INPUTS
4	TPREV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
42	TPESID	REAL	ARRAY	IMUDAT	251	TSD2	REAL		
104	VDMP	REAL		NAV	2	VQUANT	REAL		INPUTS
10	VGT	REAL	ARRAY	TRAJTN	107	VR2	REAL	ARRAY	NAV
41	V92P	REAL	ARRAY	NAV	12	WT	REAL	ARRAY	IMUDAT
66	WXV	REAL	ARRAY	NAV	135	XCALF	REAL		NAV
361	XDTX	REAL			362	XDTY	REAL		
363	XDTZ	REAL			152	XH	REAL		NAV
134	XSALF	REAL		NAV	146	XS2PHI	REAL		NAV
147	XV92P	REAL	ARRAY	NAV	136	XZP92P	REAL	ARRAY	NAV

EXTERNALS	TYPE	ARGS			
DCMUPD		9	DOUT	1	
MATPAN		2	MATVEC	3	
MM		3	ORTHO	1	

STATEMENT LABELS

9	10	0	15	261	20		
0	60	24	830	70	830		
75	940	157	860	271	900		

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
7	10	I	39 40	60	INSTACK
232	15	* I	110 113	168	NOT INNER
233	16	J	111 113	138	OPT

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
264	50	I	120 121	49	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
IMUDAT	67
INPUTS	56
NAV	182
TRAJTN	21

STATISTICS

PROGRAM LENGTH	4013	257
CM LABELED COMMON LENGTH	5173	335

```
      SUBROUTINE HSINT2                                                 024611
C                                                                       024620
C     THIS ROUTINE EXISTS ONLY TO PUT THE OUTPUT OF HSINT6 IN DV9P      024630
C     FOR USE BY IMPNAV AT THE PROPER TIME.                             024640
C                                                                       024650
      IMPLICIT REAL(A-H),REAL(L-Z)                                      024660
      COMMON /CONTRL/ OTIME,    PTIME,    PLTIME,   RSTIME,           024670
     1    TPREV,    INIT,     ISTOP,    ICMCYL,   ICMCYP              024680
      COMMON /INUPAT/ RESID(3), DV9P(3),  ETA9P(4), WT(7),            024690
     1    SEGTP(3), C2P95(3,3), C9MIS(3,3), TRESID(3), C1992(3,3),    024700
     2   C1992P(3,3), C2P95T(3,3), ARESID(3)                          024710
      COMMON /INPLIS/ AQUANT,   TQUANT,   VQUANT,   START,            024720
     1    STOP,     PLOTTM,   PRNT,     PSTPT,    CVD1,             024730
     2    CVD2,     CVD3,     TOLJPK,   HSOTIM,   HSCINC,           024740
     2    ITPNAV,   ITRATT,   INCOR,    IMUTYP,   ISPLIM,           024750
     3    IPC(30),  IOPNLE,   CSXD,     SSYD,     SSZD,             024760
     4    PSMAX,    OPSMAX,   TT2FTL                                024770
      COMMON /NAV/  C0P92P(3,3),V92P(3),  DV92P(3),  PHD(7),        024780
     1    C9PHD(3,3), A(3,3),   B(3,3),   THTEPT(3), THTTPD(3),     024790
     2    INTCOS(3),  WXV(3),   G92P(3),  H,        ALPHA,          024800
     3    SALF,     CALF,     DELT,     ETA(3),   VP4P,           024810
     4    LAT,      LONG,     V92(3),   FILATT(3,3),DELTA,        024820
     5    XSALF,    XCALF,    X0232P(3,3),HV92P(3), DV92D(3),     024830
     6    S2PHI,    XS2PHI,   XV32P(3),  XH,       DELH,          024840
     7   CC910(3,3), C0P90(3,3), QH1,     CC95(3,3),  DV592P(3), 024850
     8    DDX ,     DDY ,     DDZ ,     D2P95(4),  DFILTP(3),     024860
     9    GAINS(3,16),IGAINP(5)                                     024870
      DO 10 I=1,3                                                   024880
      DV9P(I)=DV592P(I)                                             024890
   10 DV592P(I)=0.                                                  024900
      RETURN                                                        024910
      END                                                           024920
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS

1 HSINT2

VARIABLES	SN	TYPE	RELOCATION						
33	A	REAL	ARRAY	NAV	75	ALPHA	REAL		NAV
0	AQUANT	REAL		INPUTS	100	ARESID	REAL	ARRAY	IMUDAT
44	B	REAL	ARRAY	NAV	77	CALF	REAL		NAV
10	CVD1	REAL		INPUTS	11	CVD2	REAL		INPUTS
12	CVD3	REAL		INPUTS	155	C0P90	REAL	ARRAY	NAV
0	C0P92P	REAL	ARRAY	NAV	154	CC910	REAL	ARRAY	NAV
177	CC95	REAL	ARRAY	NAV	65	C1990	REAL	ARRAY	IMUDAT
56	C1992P	REAL	ARRAY	IMUDAT	20	C2P95	REAL	ARRAY	IMUDAT
67	C2P95T	REAL	ARRAY	IMUDAT	31	C9MIS	REAL	ARRAY	IMUDAT
22	C9PHD	REAL	ARRAY	NAV	153	D2LH	REAL		NAV
101	DELT	REAL		NAV	125	DELTA	REAL		NAV
66	DPSMAX	REAL		INPUTS	210	DV592P	REAL	ARRAY	NAV
7	DV9P	REAL	ARRAY	IMUDAT	14	DV92P	REAL	ARRAY	NAV
111	ETA	REAL	ARRAY	NAV	6	ETA9P	REAL	ARRAY	IMUDAT

VARIABLES	SN	TYPE		RELOCATION					
112	FILATT	REAL	ARRAY	NAV	225	GAINS	REAL	ARRAY	NAV
71	G92P	REAL	ARRAY	NAV	74	H	REAL		NAV
15	HSOINC	REAL		INPUTS	14	HSOTIM	REAL		INPUTS
137	HV92P	REAL	ARRAY	NAV	11	I	INTEGER		
7	ICMCYL	INTEGER		CONTRL	10	ICMCYP	INTEGER		CONTRL
32	ICPLIN	INTEGER		INPUTS	263	ICSINP	INTEGER	ARRAY	NAV
21	IMUTYP	INTEGER		INPUTS	23	IMCOP	INTEGER		INPUTS
5	INIT	INTEGER		CONTRL	61	IOPULS	INTEGER		INPUTS
23	IPC	INTEGER	ARRAY	INPUTS	6	ISTOP	INTEGER		CONTRL
17	IIPATT	INTEGER		INPUTS	67	IIPETL	INTEGER		INPUTS
16	IIPNAV	INTEGER		INPUTS	115	LAT	REAL		NAV
106	LONG	REAL		NAV	213	ODX	REAL		NAV
214	ODY	REAL		NAV	215	ODZ	REAL		NAV
222	OFILTR	REAL	ARRAY	NAV	176	OMG	REAL		NAV
9	OTIME	REAL		CONTRL	142	OV92P	REAL	ARRAY	NAV
5	PLOTIM	REAL		INPUTS	2	PLTIME	REAL		CONTRL
8	PRNT	REAL		INPUTS	1	PTIME	REAL		CONTRL
216	Q2P95	REAL	ARRAY	NAV	9	RCSID	REAL	ARRAY	IMUDAT
17	RHO	REAL	ARRAY	NAV	65	RSMAX	REAL		INPUTS
3	RSTIME	REAL		CONTRL	7	RSTRT	REAL		INPUTS
76	SALF	REAL		NAV	15	SFATP	REAL	ARRAY	IMUDAT
62	SSX0	REAL		INPUTS	53	SSY0	REAL		INPUTS
64	SS70	REAL		INPUTS	3	STAST	REAL		INPUTS
4	STOP	REAL		INPUTS	145	S2PHI	REAL		NAV
67	THTCOR	REAL	ARRAY	NAV	55	THTERT	REAL	ARRAY	NAV
60	THTTPQ	REAL	ARRAY	NAV	13	TOLJPK	REAL		INPUTS
4	TPREV	REAL		CONTRL	1	TQUANT	REAL		INPUTS
42	TRESID	REAL	ARRAY	IMUDAT	194	V24P	REAL		NAV
2	VQUANT	REAL		INPUTS	107	V92	REAL	ARRAY	NAV
11	V92P	REAL	ARRAY	NAV	12	WT	REAL	ARRAY	IMUDAT
66	WXV	REAL	ARRAY	NAV	125	XCALF	REAL		NAV
152	XH	REAL		NAV	124	YSALF	REAL		NAV
146	XS2PHI	REAL		NAV	147	XV92P	REAL	ARRAY	NAV
126	XZP92P	REAL	ARRAY	NAV					

STATEMENT LABELS
0 10

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
3	10	I	28 30	59	INSTACK

COMMON BLOCKS	LENGTH
CONTRL	9
IMUDAT	67
INPUTS	56
NAV	182

STATISTICS
PROGRAM LENGTH 129 10
CM (WORDS) COMMON LENGTH 4723 314

********** 14 LINES //// END OF LIST ////

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