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	VARIABLE	DESCRIPTION	MAXIMUM VALUE *	COMPUTER NAME
R0001				
R0003				
R0005	-			
R0006	URT0	INITIAL TARGET VECTOR	2 (UNIT VECTOR)	= RTINIT
R0008	-			
R0009	UZ	UNIT VECTOR NORTH	1	= UNITW
R0011	-			
R0012	V	VELOCITY VECTOR	2 VSAT	= VEL
R0014	-			
R0015	R	POSITION VECTOR	2 EXP 29 METERS	= RN
R0017	-			
R0018	VI	INERTIAL VELOCITY	128 M/CENTISEC	= VN
R0020	-			
R0021	RTE	VECTOR EAST AT INITIAL TARGET	2	= RTEAST
R0023	-			
R0024	UTR	NORMAL TO RTE AND UZ	2	= RTNORM
R0026	-			
R0027	URT	TARGET VECTOR	2	= RT
R0029	-			
R0030	UNI	UNIT NORMAL TO TRAJECTORY PLANE	2	
R0031	-			
R0032	DELV	INTEGRATED ACCEL. FROM PIPAS	5.85 16384 CM/S	
R0033	-			
R0034	G	GRAVITY VECTOR	128 M/CENTISEC	= GDT/2
R0036	A0	INITIAL DRAG FOR UPCONTRL	805 FPSS	FPSS=FT/SEC/SEC
R0038	AHOOKDV	TERM IN GAMMAL CALC. = AHOOK DVL	16	
R0039	A1	DRAG VALUE IN FACTOR CALCULATION	805 FPSS	
R0040	ALP	CONST FOR UPCONTRL	1	
R0041	ASKEP	KEPLER RANGE	21600 NM	NM = NAUTICAL MILE
R0043	ASP1	FINAL PHASE RANGE	21600 NM	
R0044	ASPUP	UP-RANGE	21600 NM	
R0045	ASP3	GAMMA CORRECTION	21600 NM	
R0046	ASPDWN	RANGE DOWN TO PULL-UP	21600 NM	
R0047	ASP	PREDICTED RANGE	21600 NM	NOT STORED
R0049	COSG	COSINE(GAMMAL)	2	= COSG/2
R0051	C/D0	RECIPROCAL DRAG, -4/D0 B-8	64/FPSS	
R0052	D	TOTAL ACCELERATION	805 FPSS	
R0053	D0	CONTROLLED CONSTANT D	805 FPSS	
R0054	DHOOK	TERM IN GAMMAL COMPUTATION	805 FPSS	
R0055	DIFF	THETNM-ASP (RANGE DIFFERENCE)	21600 NM	
R0056	DIFFOLD	PREVIOUS VALUE OF DIFF	21600 NM	
R0057	DLEWD	CHANGE IN LEWD	1	
R0058	DR	REFERENCE DRAG FOR DOWNCONTROL	805 FPSS	NOT STORED
R0060	DREFR	REFERENCE DRAG	805 FPSS	NOT STORED
R0062	DVL	VS1-VL	2 VSAT	
R0063	E	ECCENTRICITY	4	NOT STORED
R0065	F1	DRANGE/D DRAG (FINAL PHASE)	2700/805	= FX +5
R0067	F2	DRANGE/D RDOT (FINAL PHASE)	2700/2VS NM/FPS	= FX +4

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R0069	F_3	DRANGE/D (L/D)	2700 NM	= FX
R0071	$FACT_1$	CONST FOR UPCONTRL	805 FPSS	
R0072	$FACT_2$	CONST FOR UPCONTRL	1/805 FPSS	
R0073	FACTOR	USED IN UPCONTRL	1	* MAXIMUM VALUE DENOTES UNSCALED
R0075	GAMMAL	FLIGHT PATH ANGLE AT VL	1 RADIAN	VARIABLE VALUE WHEN SCALED
R0077	$GAMMAL_1$	SIMPLE FORM OF GAMMAL	1 RADIAN	VARIABLE HAS MAXIMUM VALUE OF ONE.

L ENTRY LEXICON USER'S PAGE NO. 3 E0 S3

P0079 R0081	VARIABLE	DESCRIPTION	MAXIMUM VALUE	COMPUTER NAME
R0083	HEADSUP	INDICATOR FOR INITIAL ROLL	1	
R0084	KA	DRAG TO LIFT UP IF DOWN	805 FPSS	= KAT
R0086	KLAT	LATERAL SWITCH GAIN	1	(NOM = .0125)
R0088	K2ROLL	INDICATOR FOR ROLL SWITCH		
R0089	LAD	MAX L/D (MIN ACTUAL VEHICLE L/D)	1	
R0090	LADPAD	NOMINAL VEHICLE L/D, SP PAD LOAD	1	(NOM = 0.3)
R0092	LATANG	LATERAL RANGE	4 RADIANS	
R0093	LEQ	EXCESS C.F. OVER GRAV=(VSQ-1)GS	128.8 FPSS	
R0094	LEWD	UPCONTROL REFERENCE L/D	1	
R0095	LOD	FINAL PHASE L/D	1	(NOM = 0.18)
R0097	LODPAD	FINAL PHASE L/D, SP PAD LOAD	1	
R0098	L/D	DESIRED LIFT TO DRAG RATIO	1	
R0099		(VERTICAL PLANE)		
R0100	L/D_1	TEMP STORAGE FOR L/D IN LATERAL	1	
R0101	L/DCMINR	LAD COS(15DEG)	1	(NOM = 0.2895)
R0103	PREDANGL	PREDICTED RANGE (FINAL PHASE)	2700 NM	= PREDANG
R0105	Q_2	FINAL PHASE RANGE -23500 Q_3	21600 NM	
R0106		Q_2 = PCN(LAD)		
R0107	Q_7	MINIMUM DRAG FOR UPCONTROL	805 FPSS	
R0108	RDOT	ALTITUDE RATE	2 VSAT	
R0109	RDOTREF	REFERENCE RDOT FOR UPCONTROL	2 VSAT	
R0110	RDTR	REFERENCE RDOT FOR DOWNCONT	2 VSAT	NOT SAVED
R0112	ROLLC	ROLL COMMAND	1 REVOLUTION	
R0113	RTOGO	RANGE TO GO (FINAL PHASE)	2700 NM	= PX +2
R0115	SL	SINE OF LATITUDE	1	NOT SAVED
R0117	T	TIME	B 28 CENTISEC	= $TIME_2$,$TIME_1$
R0119	THETA	DESIRED RANGE (RADIANS)	2 PI RADIANS	= THETAH
R0121	THETNM	DESIRED RANGE (NM)	21600 NM	NON EXISTENT
R0123	V	VELOCITY MAGNITUDE	2 VSAT	
R0124	V_1	INITIAL VELOCITY FOR UPCONTROL	2 VSAT	
R0125	VL	EXIT VELOCITY FOR UPCONTROL	2 VSAT	
R0126	VREF	REFERENCE VELOCITY FOR UPCONTROL	2 VSAT	
R0127	VS_1	VSAT OR V_1, WHICHEVER IS SMALLER	2 VSAT	
R0128		$2 \quad 2$		
R0129	VBARS	$VL^2/VSAT^2$	4	
R0130		$2 \quad 2$		
R0131	VSQ	NORMALISED VEL. SQUARED = $V^2/VSAT^2$	4	= VSQUARE
R0133	WT	EARTH RATE TIMES TIME	1 REVOLUTION.	NOT SAVED
R0135				= WIE (DTEAROT)
R0137	X	INTERMEDIATE VARIABLE IN G-LIMITER	2 VSAT	NOT SAVED
R0139	Y	LATERAL MISS LIMIT	4 RADIANS	NOT SAVED

EXTRA COMPUTER ERASABLE LOCATIONS NOT SHOWN ON FLOW CHARTS

	VARIABLE	DESCRIPTION	MAXIMUM VALUE
R0145	GOTOADDR	ADDRESS SELECTED BY SEQUENCER	
R0146	XPIPBUF	BUFFER TO STORE X PIPA COUNTS	
R0147	YPIPBUF	BUFFER TO STORE Y PIPA COUNTS	
R0148	ZPIPBUF	BUFFER TO STORE Z PIPA COUNTS	
R0149	PIPCTR	COUNTS PASSES THRU PIPA READ ROUTINE	
R0150	JJ	INDEX IN FINAL PHASE TABLE LOOK-UP	
R0151	MM	INDEX IN FINAL PHASE TABLE LOOK-UP	
R0152	GRAD	INTERPOLATION FACTOR IN FINAL PHASE	
R0153	PX	DRANGE/D L/D = P_3	2700 NM
R0154	PX + 1	AREF	805 FPSS
R0155	PX + 2	RTOGO	2700 NM
R0156	PX + 3	RDOTREF	VSAT/4
R0157	PX + 4	DRANGE/D RDOT = P_2	21600/ZVS NM/FPS
R0158	PX + 5	DRANGE/D DRAG = P_1	2700/805 NM/FPSS
R0159	TEM1B	TEMPORARY LOCATION	
R0160	TIME/RTO	TIME OF INITIAL TARGET RTINIT	B 28 CENTISEC
R0161	DTEAROT	EST TIME BETWEEN RTINIT AND RT	B 28 CENTISEC
R0162	-		
R0163	UNITV	UNIT V VECTOR	2
R0164	-		
R0165	UNITR	UNIT R VECTOR	2
R0166	-		
R0167	-VREL	NEGATIVE VELOCITY REL TO ATMOSP	2 VSAT

	COMPUTER SWITCHES		INITIAL STATE	CM/FLAGS = STATE +6
R0168				
R0170				
R0172	ENTRYDSP	DO ENTRY DISPLAY, IF SET	NON-BRANCH (1)	92D, BIT13
R0174	GONEPAST	INDICATES OVERSHOOT OF TARGET	NON-BRANCH (0)	95D, BIT10
R0176	RELVELSW	RELATIVE VELOCITY SWITCH	NON-BRANCH (0)	96D, BIT 9
R0178	EGSW	FINAL PHASE SWITCH	NON-BRANCH (0)	97D, BIT 8
R0180	FIRSTPAS	INITIAL PASS THRU HUNTEST	NON-BRANCH (0)	98D, BIT 7
R0182	HIND	INDICATES ITERATION IN HUNTEST	NON-BRANCH (0)	99D, BIT 6
R0184	INRLSW	INDICATES INIT ROLL ATTITUDE SET	NON-BRANCH (0)	100D, BIT 5
R0186	LATSW	INHIBIT DOWNLIFT SWITCH IF NOT SET	BRANCH (1)	101D, BIT 4
R0188	.05GSW	INDICATES DRAG EXCEEDS .05 GS	BRANCH (0)	102D, BIT 3
R0190	GONEBY	INDICATES GONE PAST TARGET (SET)	SELF-INITIALZNG	112D, BIT 8

	CONSTANTS AND GAINS		VALUE		
P0192 R0194	---	---	---		
R0196	C_1	FACTOR IN ALP COMPUTATION	1.25		
R0198	C_{16}	CONSTD GAIN ON DRAG	.01		
R0200	C_{17}	CONSTD GAIN ON RDOT	.001		
R0202	C_{18}	BIAS VEL. FOR FINAL PHASE START	500	FPS	
R0204	C_{20}	MAX DRAG FOR DOWN-LIFT	175	FPSS	
R0206	CHOOK	FACTOR IN AHOOK COMPUTATION	.25		
R0208	CH_1	FACTOR IN GAMMAL COMPUTATION	1.0		
R0210	COS15	COS(15 DEG)	.965		
R0212	$DLEWD_0$	INITIAL VARIATION IN LEWD	-.05		
R0214	D_2	DRAG TO CHANGE LEWD	175	FPSS	
R0216	DT	COMPUTATION CYCLE TIME INTERVAL	2	SEC.	
R0218	GMAX	MAXIMUM ACCELERATION	257.6	FPSS	(8 G-S)
R0220	KA_1	FACTOR IN KA CALC	1.3 GS		
R0222	KA_2	FACTOR IN KA CALC	.2 GS		
R0224	KA_3	FACTOR IN D_0 CALC	90	FPSS	
R0226	KA_4	FACTOR IN D_0 CALC	40	FPSS	
R0228	KB_1	OPTIMIZED UPCONTROL GAIN	3.4		
R0230	KB_2	OPTIMIZED UPCONTROL GAIN	.0034		
R0232	KDMIN	INCREMENT ON Q_7 TO DETECT END OF KEPLER PHASE	.5	FPSS	
R0234	KTETA	TIME OF FLIGHT CONSTANT	1000		
R0236	$KLAT_1$	FACTOR IN KLAT CALC	1/24		
R0238	K44	GAIN USED IN INITIAL ROLL SECTION	19749550	FPS	
R0240	LATBIAS	LATERAL SWITCH BIAS TERM	.41252961	NM	
R0242	$LEWD_1$	NOMINAL UPCONTROL L/D	.15		
R0244	POINT1	FACTOR TO REDUCE UPCONTROL GAIN	.1		
R0246	Q_2	FINAL PHASE RANGE - 23500 Q_3	-1002	NM	
R0248	Q_3	FINAL PHASE DRANGE/D V	.07	NM/FPS	
R0250	Q_5	FINAL PHASE DRANGE/ D GAMMA	7050	NM/RAD	
R0252	Q_6	FINAL PHASE INITIAL FLIGHT PATH ANGLE	.0349	RAD	
R0254	Q_7F	MIN DRAG FOR UPCONTROL	6	FPSS	
R0256	Q_7MIN	MIN VALUE FOR Q_7 IN FACTOR CALCULATION	40	FPSS	
R0258	Q_{19}	FACTOR IN $GAMMAL_1$ CALCULATION	.5		
R0260	Q_{21}	FACTOR IN Q_2 CALCULATION.	1000	NM	
R0262	Q_{22}	FACTOR IN Q_2 CALCULATION.	-1302	NM	
R0264	$VFINAL_1$	VELOCITY TO START FINAL PHASE ON INITIAL ENTRY	27000	FPS	
R0266	VFINAL	FACTOR IN INITIAL UP-DOWN CALC	26600	FPS	
R0268	VLMIN	MINIMUM VL	18000	FPS	
R0270	VMIN	VELOCITY TO SWITCH TO RELATIVE VEL	VSAT/2		
R0272	VRCONTRL	RDOT TO START INTO HUNTEST	700	FPS	
R0274		VRCONT = COMPUTER NAME			
R0275	25NM	TOLERANCE TO STOP RANGE ITERATION	25	NM	
R0277	VQUIT	VELOCITY TO STOP STEERING	1000	FPS	

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P0279 CONVERSION FACTORS AND SCALING CONSTANTS
R0280 ---------- ------- --- ------- ---------

R0281	ATK	ANGLE IN RAD TO NM	3437.7468	NM/RAD
R0283	GS	NOMINAL G VALUE FOR SCALING	32.2	FPSS
R0285	HS	ATMOSPHERE SCALE HEIGHT	28500	FT
R0287	J	GRAVITY HARMONIC COEFFICIENT	.00162346	
R0289	KE	EQUATORIAL EARTH RATE	1546.70168	FPS
R0291	MUE	EARTH GRAVITATIONAL CONSTANT	3.986032233	E 14 CUBIC M/ SEC SEC
R0293	RE	EARTH RADIUS	21202900	FT
R0295	REQ	EARTH EQUATORIAL RADIUS	20925738.2	FT
R0297	VSAT	SATELLITE VELOCITY AT RE	25766.1973	FPS
R0299	WIE	EARTH RATE	.0000729211505	RAD/SEC

A0301
R0302 DISPLAY QUANTITIES (END GSOP AS-278, VOL 1, FIG. 5.6-3 CONSTANTS,GAINS, ETC.)
R0303 ------------------

R0304 (SEE SECTION 4 OF THE GSOP FOR SIGN CONVENTIONS.)

	VARIABLE	DESCRIPTION	MAXIMUM VALUE	
R0305 R0306			-------	-----
R0307	GMAX	PREDICTED MAXIMUM ENTRY ACCEL	183.84 GS	N 60
R0309 R0311	VPRED	PREDICTED VELOCITY AT ALTITUDE 400K FT ABOVE FISCHER RADIUS.	128 M/CENTISEC	N 60
R0312 R0314	GAMMAEI	PREDICTED GAMMA AT ALTITUDE 400K FT ABOVE FISCHER RADIUS.	1 REVOLUTION	N 60
R0315	D	DRAG ACCELERATION	805 FPSS	N 64
R0317	VMAGI	INERTIAL VELOCITY MAGNITUDE	128 M/CENTISEC	N 64, N 68
R0319	THETAH	DESIRED RANGE ANGLE NM	1 REVOLUTION	N 64, N 67
R0321	LAT	PRESENT LATITUDE	1 REVOLUTION	N 67
R0323	LONG	PRESENT LONGITUDE	1 REVOLUTION	N 67
R0325 R0327	RTOGO	RANGE ANGLE TO SPLASH FROM EMSALT FT ABOVE FISCHER RADIUS. (IN NM)	1 REVOLUTION	N 63
R0328 R0330	VIO	PREDICTED VELOCITY AT ALTITUDE EMSALT FT ABOVE FISCHER RADIUS.	128 M/CENTISEC	N 63
R0331 R0333	TTE	TIME OF FREE FALL TO ALT EMSALT FT ABOVE FISCHER RADIUS.	B 28 CENTISEC	N 63
R0334	ROLLC	ROLL COMMAND	1 REVOLUTION	N 66, N 68, N 69
R0336	LATANG	CROSS-RANGE ERROR (XRNGERR)	4 RADIANS	N 66
R0338 R0340	DNRNGERR	DOWN RANGE ERROR (PREDANG - THETAH · IN NM)	1 REVOLUTION	N 66
R0341	HDOT	ALTITUDE RATE	128 M/CENTISEC	N 68
R0343	Of	MINIMUM DRAG FOR UPCONTROL	805 FPSS	N 69
R0345	VL	EXIT VELOCITY FOR UP-CONTROL	2 VSAT	N 69

P0347 BODY ATTITUDE QUANTITIES (CM/POSE)
R0348 ----------

R0349	VARIABLE	DESCRIPTION	MAXIMUM VALUE
R0350	--------	-----------	------- -----
R0351	-		
R0352	-VREL	NEGATIVE VELOCITY REL TO ATMOS.	2 VSAT
R0353	-		
R0354	OLDUYA	USED FOR UYA BELOW 1000 FPS	2
R0355	-		
R0356	UXA/2	UNIT VECTOR TRIAD	2
R0357	-		
R0358	UYA/2	BASED ON	2
R0359	-		
R0360	UZA/2	THE TRAJECTORY.	2
R0361	-		
R0362	UBX/2	UNIT VECTOR	2
R0363	-		
R0364	UBY/2	BODY TRIAD	2
R0365	-		
R0366	UBZ/2	FOR CM.	2

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```
R0001  ENTRY INITIALIZATION ROUTINE
R0002  ----------------------------

 0003                        25,2000              BANK    25
 0004  REF   1               25,2000              SETLOC  REENTRY
 0005                        25,2000              BANK

 0006  REF   1                                    COUNT*  $$/ENTRY
 0007  REF   7  LAST  750    E7,1451              EBANK=  RTINIT

 0008  REF   6  LAST  661      4753       EBENTRY =       EBANK7
 0009  REF  11  LAST  661      4752       EBACQ   EQUALS  EBANK6
 0010  REF   8  LAST  779      4675       NTRYPRIO EQUALS PRIO20          (SERVICER)
 0011  REF  48  LAST  701      0102       CM/FLAGS EQUALS STATE +6

 0012                        25,2000  77776 1  STARTENT EXIT                  MM = 63
A0013                                                  COME HERE FROM  CM/POSE . RESTARTED IN CM/POSE.

 0014  REF   1               25,2001  4 2113 1          CS      ENTMASK       INITIALIZE ALL SWITCHES TO ZERO
A0015                                                                         EXCEPT LATSW, ENTRYDSP AND GONEPAST.
A0016                                                                         GONEBY 112D BIT8 FLAG7,SELF INITIALIZING
 0017                        25,2002  0 0004 0          INHINT
 0018  REF   5  LAST  778    25,2003  7 0102 0          MASK    CM/FLAGS
A0019                                                                         ENTRYDSP = 92D  B13
A0020                                                                         GONEPAST=95D B10,  RELVELSW=96D B9
A0021                                                                         EGSW = 97D  B8
A0022                                                                         HIND=99D B6          INRLSW=100D B5
A0023                                                                         LATSW=101D B4        .05GSW=102D B3

 0024  REF   1               25,2004  6 2114 1          AD      ENTRYSW       SET ENTRYDSP, LATSW, GONEPAST.
 0025  REF   6  LAST  798    25,2005  54 102 0          TS      CM/FLAGS

 0026                        25,2006  0 0003 1          RELINT

 0027  REF 204  LAST  785    25,2007  0 6006 1          TC      INTPRET

 0028                        25,2010  77735 0           SLOAD
 0029  REF   1               25,2011  03011 1                   LODPAD
 0030  REF   2  LAST  116    25,2012  03626 0           STORE   LOD

 0031                        25,2013  77735 0           SLOAD
 0032  REF   1               25,2014  03010 0                   LADPAD
 0033  REF   2  LAST  116    25,2015  03624 1           STORE   LAD

 0034                        25,2016  77605 1           DMP                   L/DCMINR = LAD COS(15)
 0035  REF   1               25,2017  15320 1                   COS15
 0036  REF   2  LAST  116    25,2020  17630 1           STODL   L/DCMINR
 0037  REF   1               25,2021  15145 0                   LATSLOPE
 0038                        25,2022  70405 1           DMP     SR1           KLAT = LAD/24
 0039  REF   3  LAST  798    25,2023  03624 1                   LAD
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0040  REF  2  LAST  116   25,2024  17632 0        STODL  KLAT
0041  REF  1               25,2025  15176 0               Q7P
0042  REF  2  LAST  276   25,2026  17175 1        STODL  Q7          Q7 = Q7P
0043  REF  1               25,2027  17363 1               NEARONE     1.0 -1BIT
0044  REF  2  LAST  116   25,2030  17614 1        STODL  FACTOR
0045  REF  4  LAST  798   25,2031  03824 1               LAD
0046                       25,2032  57565 0        SIGN   DCOMP
0047  REF  6  LAST  747   25,2033  03327 1               HEADSUP     MAY BE NOISE FOR DISPLAY P61
0048  REF  2  LAST  116   25,2034  37634 1        STCALL L/D         L/D = - LAD SGN(HEADSUP)

0049  REF  2  LAST  744   25,2035  52063 0               STARTEN1    RETURN VIA GOTOADDR
0050                       25,2036  47375 0        VLOAD  VXV
0051  REF 14  LAST  790   25,2037  01177 1               VN          (-7) M/CS
0052  REF  4  LAST  789   25,2040  01760 1               UNITR       .5 UNIT          REF COORDS
0053                       25,2041  50256 0        UNIT   DOT
0054  REF  4  LAST  770   25,2042  03474 0               RT          RT/2  TARGET VECTOR      REF COORDS
0055  REF  4  LAST  173   25,2043  03676 0        STORE  LATANG      LATANG = UNI.RT /4
0056                       25,2044  47076 0        DCOMP  RTB
0057  REF 13  LAST  403   25,2045  45707 0               SIGNMPAC
0058  REF  2  LAST  116   25,2046  17644 1        STODL  K2ROLL      K2ROLL = -SGN(LATANG)

0059  REF  5  LAST  799   25,2047  03624 1               LAD
0060                       25,2050  43205 1        DMP    DAD
0061  REF  1               25,2051  15200 1               Q21
0062  REF  1               25,2052  15202 0               Q22
0063  REF  2  LAST  117   25,2053  03712 0        STORE  Q2          Q2 = -1152 + 500 LAD

0064                       25,2054  66331 0        SSP    SSP
0065  REF  3  LAST  752   25,2055  03646 0               GOTOADDR    SET SELECTOR FOR INITIAL PASS
0066  REF  1               25,2056  52260 1               INITROLL
0067  REF  4  LAST  749   25,2057  03325 0               POSEXIT
0068  REF  1               25,2060  52115 0               SCALEPOP    SET CM/POSE TO CONTINUE AT SCALEPOP

0069                       25,2061  77634 0        RTB
0070  REF  2  LAST  756   25,2062  53603 1               SERVNOUT    OMIT INITIAL DISPLAY, SINCE 1ST GUESSBAD

R0071  CALCULATE THE INITIAL TARGET VECTOR' RTINIT, ALSO RTEAST, RTNORM AND RT.  ALL ARE .5 UNIT AND IN
R0073   REFERENCE COORDINATES.

0074                       25,2063  77220 1  STARTEN1 STQ    VLOAD
0075  REF  4  LAST  799   25,2064  03645 0               GOTOADDR
0076  REF  6  LAST  634   25,2065  03401 1               LAT(SPL)    TARGET COORDINATES
0077                       25,2066  43014 0        CLEAR  CLEAR       DO CALL USING PAD RADIUS. WILL UNIT IT.
0078  REF 10  LAST  756   25,2067  00662 0               ERADFLAG    ANYWAY.
0079  REF 19  LAST  756   25,2070  01663 0               LUNAFLAG
0080  REF 10  LAST  634   25,2071  15104 0        STODL  LAT
0081  REF  1               25,2072  15332 1               3ZEROS

0082  REF 11  LAST  799   25,2073  15110 0        STODL  LAT +4      SET ALT=0.
0083  REF 13  LAST  783   25,2074  01205 1               PIPTIME     ESTABLISH RTINIT AT TIME OF PRESENT
```

L REENTRY CONTROL

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A0084
 0085   REF  2  LAST  116   25,2075  37524 0          STCALL  TIME/RTO      RN AND VN.
 0086   REF  7  LAST  730   25,2076  26373 1                  LALOTORV      SAVE TIME BASE OF RTINIT.
 0087                       25,2077  77656 1          UNIT                  C(MPAC) =TIME   (PIPTIME)
 0088   REF  8  LAST  798   25,2100  17452 1          STODL   RTINIT        ANSWER IN ALPHAV ALSO
 0089   REF  1              25,2101  12112 0                  500SEC        .5 UNIT TARGET          REF COORDS
A0090                                                                      NOMINAL ENTRY TIME FOR P63
 0091   REF  7  LAST  770   25,2102  37606 0          STCALL  DTEAROT       TIME/RTO = PIPTIME, STILL.
 0092   REF  1              25,2103  46215 0                  EARROT1       INITIALIZE EARROT
 0093                       25,2104  72441 0          DOT     SL1           GET RT
 0094   REF  5  LAST  799   25,2105  01760 1                  UNITR
 0095                       25,2106  77726 1          ACOS                  RT/2 IN MPAC
 0096   REF  2  LAST  117   25,2107  37702 0          STCALL  THETAH        RANGE ANGLE /360
 0097   REF  5  LAST  799   25,2110  03845 0                  GOTOADDR      RETURN TO CALLER

 0098                       25,2111  00003 1  500SEC  2DEC    50000 B-28    CS
 0098                       25,2112  01520 1
 0099                       25,2113  11774 0  ENTMASK OCT     11774
 0100                       25,2114  11010 0  ENTRYSW OCT     11010         ENTRYDSP B13, GONEPAST B10, LATSW B4
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P0101
 0102                        25,2115   77624 1  SCALEPOP CALL
 0103  REP   1               25,2116   52125 0                TARGETNG

 0104                        25,2117   77776 1           EXIT

 0105  REP  85  LAST  784    25,2120  0 5301 0  REFAZE10 TC     PHASCHNG
 0106                        25,2121   10035 0           OCT    10035          SERVICER 5.3 RESTART AT REFAZE10

 0107  REP 205  LAST  798    25,2122  0 6006 1           TC     INTPRET

R0108          JUMP TO PARTICULAR RE-ENTRY PHASE'

A0109                                          SEQUENCE
 0110                        25,2123   77650 1           GOTO
 0111  REP   6  LAST  800    25,2124   03645 0                GOTOADDR

R0112

R0113          GOTOADDR  CONTAINS THE ADDRESS OF THE ROLL COMMAND EQUATIONS APPROPRIATE TO THE CURRENT PHASE OF
R0115  RE-ENTRY.  SEQUENCING IS AS FOLLOWS'

R0116  INITROLL ADDRESS IS SET HERE INITIALLY. HOLDS INITIAL ROLL ATTITUDE UNTIL KAT  IS EXCEEDED. THEN HOLDS NEW ROLL
R0118          ATTITUDE UNTIL  VRTHRESH  IS EXCEEDED.  THEN BRANCHES TO

R0119  HUNTEST  THIS SECTION CHECKS TO SEE IF THE PREDICTED RANGE AT NOMINAL  L/D FROM PRESENT CONDITIONS IS LESS
R0121          THAN THE DESIRED RANGE.
R0122            IF NOT - A ROLL COMMAND IS GENERATED BY THE CONSTANT DRAG CONTROLLER.
R0124            IF SO -  CONTROL AND GOTOADDR ARE SET TO  UPCONTRL.
R0125          USUALLY NO ITERATION IS INVOLVED EXCEPT IF THE RANGE DESIRED IS TOO LONG ON THE FIRST PASS THROUGH
R0127          HUNTEST.

R0128  UPCONTRL CONTROLS ROLL DURING THE SUPER-CIRCULAR PHASE.  UPCONTRL IS TERMINATED EITHER
R0130            (A)  WHEN THE DRAG (AS MEASURED BY THE PIPAS) FALLS BELOW Q7 ,  OR
R0132            (B)  IF RDOT IS NEGATIVE AND REFERENCE VL EXCEEDS V.
R0133          IN CASE (A),  GOTOADDR  IS SET TO  KEP2  AND IN CASE (B), TO PREDICT3  SKIPPING THE KEPLER PHASE OF
R0135          ENTRY.

R0136  KEP2    GOTOADDR IS SET HERE DURING THE KEPLER PHASE TO MONITOR DRAG. THE SPACECRAFT IS INSTANTANEOUSLY
R0138          TRIMMED IN PITCH AND YAW TO THE COMPUTED RELATIVE VELOCITY. THE LAST COMPUTED ROLL ANGLE IS MAINTAINED.
R0140          WHEN THE MEASURED DRAG EXCEEDS Q7 +0.5,  GOTOADDR  IS SET TO

R0141  PREDICT3 THIS CONTROLS THE FINAL SUB-ORBITAL PHASE. ROLL COMMANDS CEASE
R0142          WHEN  V  IS LESS THAN VQUIT. AN EXIT IS MADE TO

R0143  P67.1    THE LAST COMPUTED ROLL ANGLE IS MAINTAINED. RATE DAMPING IS DONE IN PITCH AND YAW. PRESENT LATITUDE
R0145          AND LONGITUDE ARE COMPUTED FOR DISPLAY.
R0146          ENTRY IS TERMINATED WHEN DISKY RESPONSE IS MADE TO TO THIS FINAL FLASHING DISPLAY.
```

```
P0148   PROCESS AVERAGE G OUTPUT...SCALE IT AND GET INPUT DATA
R0149
R0150   * START  TARGETING ...
 0151   REF   9  LAST  800   E7,1451                    EBANK= RTINIT
A0152                                                  TARGETING IS CALLED BY P81, FROM GROUP 4.
A0153                                                  TARGETING IS CALLED BY ENTRY, FROM GROUP 5.
A0154
 0155                         25,2125   77214 0  TARGETNG BOFF   VLOAD      ALL MM COME HERE.
 0156   REF   1              25,2126   03346 0                  RELVELSW    ENTER WITH PROPER EB FROM CM/POSE(TEST)
 0157   REF   1              25,2127   52133 1                  GETVEL      RELVELSW = 96D  BIT9
 0158   REF   2  LAST  116   25,2130   03526 0                  -VREL       WANT INERTIAL VEL. GO GET IT.
                                                                            NEW V  IS RELATIVE, CONTINUE
 0159                         25,2131   52076 1          VCOMP   GOTO        (VREL) = (V) + KWE UNITR*UNITW
 0160   REF   1              25,2132   52136 1                  GETUNITV -1 - VREL WAS LEFT BY CM/POSE
 0161                         25,2133   74375 0  GETVEL  VLOAD   VXSC       INERTIAL V WANTED
 0162   REF  15  LAST  799   25,2134   01177 1                  VN          KVSCALE = (12800 / .3048) / 2VS
 0163   REF   1              25,2135   15230 1                  KVSCALE     KVSCALE = .81491944
 0164   REF   2  LAST  116   25,2136   03516 0          STORE   VEL         V/2 VS
 0165                         25,2137   44056 1  GETUNITV UNIT   STQ
 0166   REF   6  LAST  770   25,2140   03373 0                  60GENRET
 0167   REF   2  LAST  116   25,2141   17510 0          STODL   UNITV
 0168                         25,2142   00043 0                  34D
 0169   REF   2  LAST  116   25,2143   03622 1          STORE   VSQUARE     VSQ/4
 0170                         25,2144   77625 0          DSU
 0171   REF   1              25,2145   15322 0                  FOURTH      LEQ = VSQUARE - 1
 0172   REF   2  LAST  116   25,2146   17654 0          STODL   LEQ         4 G-S FULL SCALE
                                                                            LEQ/4
 0173                         25,2147   00045 0                  36D
 0174   REF   2  LAST  117   25,2150   27674 1          STOVL   V           V/2 VS = VEL/2 VS
 0175   REF   3  LAST  802   25,2151   03516 0                  VEL
 0176                         25,2152   72441 0          DOT     SL1         RDOT= V.UNITR
 0177   REF   6  LAST  800   25,2153   01760 1                  UNITR
 0178   REF   3  LAST  276   25,2154   27700 0          STOVL   RDOT        RDOT / 2 VS
 0179   REF  10  LAST  790   25,2155   01163 1                  DELV        PIPA COUNTS IN PLATFORM COORDS.
 0180                         25,2156   41246 1          ABVAL   DMP
 0181   REF   1              25,2157   15232 0                  KASCALE
 0182                         25,2160   53152 1          SL1     BZE
 0183   REF   1              25,2161   55132 1                  SETMIND
 0184   REF   3  LAST  275   25,2162   27640 0  DSTORE  STOVL   D           ACCELERATION USED TO APPROX DRAG
 0185   REF   4  LAST  802   25,2163   03516 0                  VEL
 0186                         25,2164   53435 0          VXV     UNIT        UNI = UNIT(V*R)
```

```
0187  REF  7  LAST  802   25,2165  01760 1                  UNITR
0188  REF  4  LAST  766   25,2166  03502 0          STORE   UNI        .5 UNI              REF COORDS.

0189                      25,2167  71214 0          BOFF    DLOAD
0190  REF  2  LAST  802   25,2170  03346 0                  RELVELSW
0191  REF  1               25,2171  55073 0                  GETETA
0192  REF  2  LAST  799   25,2172  15332 1                  3ZEROS
0193                      25,2173  43225 0  UPDATERT DSU    DAD        PIPTIME-TIME/RTO =ELAPSED TIME SINCE
A0194                                                                  RTINIT  WAS ESTABLISHED.
0195  REF  3  LAST  800   25,2174  03524 1                  TIME/RTO
0196  REF  14 LAST  799   25,2175  01205 1                  PIPTIME
0197  REF  8  LAST  800   25,2176  37606 0          STCALL  DTEAROT    GET PREDICTED TARGET VECTOR  RT

0198  REF  3  LAST  770   25,2177  46225 0                  EARROT2
0199                      25,2200  40241 1          DOT     SETPD      SINCE (RT) UNIT VECT, THIS IS 1/4 MAX
0200  REF  5  LAST  803   25,2201  03502 0                  UNI        LATANG = RT.UNI
0201                      25,2202  00001 0                  0
0202  REF  5  LAST  799   25,2203  27676 0          STOVL   LATANG     LATANG = MAC LATANG / 4

0203  REF  5  LAST  799   25,2204  03474 0                  RT
0204                      25,2205  77614 1          CLEAR
0205  REF  1               25,2206  03667 0                  GONEBY     SHOW HAVE NOT GONE PAST TARGET.
0206                      25,2207  50235 0          VXV     DOT        IF RT*UNITR.UNI NEG, GONEBY=1
0207  REF  8  LAST  803   25,2210  01760 1                  UNITR      GONEPAST IS CONDITIONAL SW SET IN
0208  REF  6  LAST  803   25,2211  03502 0                  UNI        FINAL PHASE.
0209                      25,2212  43044 0          BPL     SET
0210                      25,2213  52215 0                  +2
0211  REF  2  LAST  803   25,2214  03467 1                  GONEBY     SHOW HAVE      GONE PAST TARGET.

0212                      25,2215  77775 1          VLOAD
0213  REF  6  LAST  803   25,2216  03474 0                  RT
0214                      25,2217  45241 1  GETANGLE DOT    DSU        THETA = ARCCOS(RT.UNITR)
0215  REF  9  LAST  803   25,2220  01760 1                  UNITR
0216  REF  1               25,2221  15162 0                  NEAR1/4    TO IMPROVE ACCURACY, CALC RANGE BY
0217                      25,2222  43244 1          BPL     DAD        TINYTHET IF HIGH ORDER PART OF
0218  REF  1               25,2223  55135 0                  TINYTHET   ARCCOS ARGUMENT IS ZERO
0219  REF  2  LAST  803   25,2224  15162 0                  NEAR1/4
0220                      25,2225  65552 0          SL1     ACOS
0221  REF  3  LAST  800   25,2226  03702 1  THETDONE STORE  THETAH     THETAH/360
A0222                                                                 HI WORD, LO BIT =1.32 NM=360 60/16384

0223                      25,2227  57414 1          BCN     DCOMP
0224  REF  3  LAST  803   25,2230  03707 1                  GONEBY     =1 IF HAVE GONE PAST TARGET.
A0225                                                                 (SIGN MAY BECOME ERRATIC VERY NEAR
A0226                                                                 TARGET DUE TO LOSS OF PRECISION.)
0227                      25,2231  52232 0                  +1
0228  REF  2  LAST  276   25,2232  17714 0          STODL   RTGON67    RANGE ERROR' NEG IF WILL FALL SHORT.

0229  REF  4  LAST  802   25,2233  03640 0                  D
0230                      25,2234  50025 0          DSU     BMN
```

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```
0231  REP  1                25,2235  15240 0                  .05G
0232  REP  1                25,2236  52255 1                  NO.05G
0233                        25,2237  77214 0        SET       VLOAD
0234  REP  1                25,2240  03074 1                  .05GSW
0235  REP  8  LAST  790     25,2241  03433 0                  DELVREP
0236                        25,2242  50206 0        PUSH      DOT
0237  REP  5  LAST  772     25,2243  03542 1                  UXA/2
0238                        25,2244  63552 0        SL1       DSQ
0239                        25,2245  47515 0        PDVL      VSQ        EXCHANGE WITH PDL.
0240                        25,2246  56225 1        DSU       DDV
0241                        25,2247  00001 0                  0
0242                        25,2250  75400 1        BOV       SQRT
0243  REP  1                25,2251  52253 1                  NOLDCALC
0244  REP  1                25,2252  03727 0        STORE     L/DCALC    OVFL LAST CLEARED IN EARROT2 ABOVE.

0245                        25,2253  77650 1  NOLDCALC GOTO
0246  REP  7  LAST  802     25,2254  03373 0                  60GENRET

0247                        25,2255  52014 0  NO.05G  CLEAR   GOTO       THIS WAY FOR DAP.(MAY INTERRUPT)
0248  REP  2  LAST  804     25,2256  03274 0                  .05GSW     .05GSW = 102D  B3
0249  REP  2  LAST  804     25,2257  52253 1                  NOLDCALC   KEEP SINGLE EXIT FOR TARGETING
```

P0250 SUBROUTINES CALLED BY SCALEPOP (TARGETING)'

```
 0251                          26,3073                    BANK    26
 0252  REF  1                 26,2000                    SETLOC  REENTRY1
 0253                          26,3073                    BANK

 0254  REF  1                                            COUNT*  $$/ENTRY

 0255                          26,3073   56345 0  GETETA  DLOAD   DDV        D = D +D(-RDOT/HS -2D/V)  DT/2
A0256                                                              DT/2  =  2/2  = 1
 0257  REF  4  LAST  802      26,3074   03700 0           RDOT
 0258  REF  1                 26,3075   15314 0           -HSCALED
 0259                          26,3076   41325 0           PDDL    DMP
 0260  REF  5  LAST  803      26,3077   03640 0           .       D
 0261  REF  1                 26,3100   15316 1           -KSCALE
 0262                          26,3101   43271 1           DDV     DAD
 0263  REF  3  LAST  802      26,3102   03674 1           .       V
A0264                                                              -RDOT/HS FROM PDL.
 0265                          26,3103   43205 1           DMP     DAD
 0266  REF  6  LAST  805      26,3104   03640 0           .       D
 0267  REF  7  LAST  805      26,3105   03640 0           .       D
 0268  REF  8  LAST  805      26,3106   03640 0           STORE   D

 0269                          26,3107   71214 0           BON     DLOAD      EGSW INDICATES FINAL PHASE.
 0270  REF  2  LAST   56       26,3110   03307 0           .       EGSW
 0271  REF  1                 26,3111   55116 1           .       SUBETA
 0272  REF  4  LAST  803      26,3112   03702 1           .       THETAH
 0273                          26,3113   52005 0           DMP     GOTO
 0274  REF  1                 26,3114   15234 0           .       KTETA      = 1000X2PI/(2)E14 163.84
 0275  REF  1                 26,3115   52173 0           .       UPDATERT

 0276                          26,3116   45345 1  SUBETA   DLOAD   DSU        SWITCH FROM  INERTIAL TO RELATIVE VEL.
 0277  REF  4  LAST  805      26,3117   03674 1           .       V
 0278  REF  1                 26,3120   15322 0           .       VMIN
 0279                          26,3121   43044 0           BPL     SET
 0280  REF  1                 26,3122   55124 0           .       SUBETA2
 0281  REF  3  LAST  803      26,3123   03066 1           .       RELVELSW

 0282                          26,3124   41345 0  SUBETA2  DLOAD   DMP

 0283  REF  5  LAST  805      26,3125   03702 1           .       THETAH
 0284  REF  1                 26,3126   15238 1           .       KT1        KT1 = KT
 0285                          26,3127   52071 0           DDV     GOTO
 0286  REF  5  LAST  805      26,3130   03674 1           .       V          KT = RE(2 PI)/2 VS 16384 163.84/ 2 VSAT
 0287  REF  2  LAST  805      26,3131   52173 0           .       UPDATERT

 0288                          26,3132   52145 0  SETMIND  DLOAD   GOTO
 0289  REF  2  LAST  634      26,3133   16326 1           .       1BITDP
 0290  REF  1                 26,3134   52162 0           .       DSTORE
```

L REENTRY CONTROL


```
0291
0292  REF  3 LAST 805   26,3135  51425 0  TINYTHET DSU    ABS       ENTER WITH X-.249
0293                    26,3136  16327 0                  1BITDP + 1 GET 1/4 - MPAC
0294                    26,3137  75461 0           SL     SQRT      SCALE UP BEFORE SQRT
0295                    26,3140  20216 0                  13D       HAS FACTOR FOR UP SCALING
0296  REF  1            26,3141  52005 0           DMP    GOTO
0297  REF  1            26,3142  15246 0                  KACOS
                        26,3143  52226 0                  THETDONE
```

```
P0298   * START   INITIAL ROLL  ...

 0299                          25,2260                    BANK   25
 0300   REF  2 LAST  798       25,2000                    SETLOC REENTRY
 0301                          25,2260                    BANK

 0302   REF  2 LAST  798 TO  805'   176   176*           COUNT* $$/ENTRY

A0303                                                                  MM = 63 , 64 ..
 0304                          25,2260   43014 0 INITROLL BON    BOFF  IF D- .05G NEG, GO TO LIMITL/D
 0305   REF  1                 25,2261   03312 1                INRLSW
 0306   REF  1                 25,2262   52354 1                INITRL1
 0307   REF  3 LAST  804       25,2263   03354 0                .05GSW
 0308   REF  1                 25,2264   53520 0                LIMITL/D

A0309                                                                  MM = 64, NOW

A0310                                                                  3
A0311                                                                  KA = KA1 LEQ  + KA2
 0312                          25,2265   63545 0          DLOAD DSQ
 0313   REF  3 LAST  802       25,2266   03654 0                LEQ
 0314                          25,2267   56205 0          DMP   DDV
 0315   REF  4 LAST  807       25,2270   03654 0                LEQ
 0316   REF  1                 25,2271   15304 1                1/KA1          = 25 /(64  1.8)
 0317                          25,2272   47015 0          DAD   RTB
 0318   REF  1                 25,2273   15306 0                KA2            = .2
 0319   REF  1                 25,2274   54432 0                P64            ROLLC        VI           RDOT
A0320                                                                          XXX.XX DEG   XXXXX. FPS   XXXXX. FPS
 0321   REF  2 LAST  117       25,2275   03720 1          STORE KAT

 0322                          25,2276   45345 1          DLOAD DSU      IF V-VFINAL1 NEG, GO TO FINAL PHASE.
 0323   REF  6 LAST  805       25,2277   03674 1                V
 0324   REF  1                 25,2300   15302 1                VFINAL1
 0325                          25,2301   51014 0          CLEAR BPL      (CAN=T CLEAR INRLSW AFTER HERE'RESTARTS)
 0326   REF  1                 25,2302   03265 0                GONEPAST       GONEPAST WAS INITIALLY SET=1 TO FORCE
A0327                                                                          ROLLC TO REMAIN AS DEFINED BY HEADSUP
A0328                                                                          UNTIL START OF P64. (UNTIL D δ .05G)
 0329   REF  1                 25,2303   52310 1                D0EQ
 0330                          25,2304   52131 0          SSP   GOTO
 0331   REF  7 LAST  801       25,2305   03646 0                GOTOADDR
 0332   REF  1                 25,2306   53311 1                KEP2           AND IDLE UNTIL Dδ0.2 G.  (NO P66 HERE)
 0333   REF  1                 25,2307   52343 1                INROLOUT       GO TO LIMITL/D AFTER SETTING INRLSW.

 0334                          25,2310   41345 0 D0EQ     DLOAD DMP      D0 = KA3 LEQ + KA4
 0335   REF  5 LAST  807       25,2311   03654 0                LEQ
 0336   REF  1                 25,2312   15310 1                KA3
 0337                          25,2313   77615 0          DAD
 0338   REF  1                 25,2314   15312 0                KA4
 0339   REF  2 LAST  117       25,2315   03710 1          STORE D0       D0/805
 0340                          25,2316   40065 0          BDDV  BOV
```

L REENTRY CONTROL

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```
0341  REF  1                25,2317  15266 1                    C001          (-4/25 G)  B-8
0342                        25,2320  52321 0                    +1            CLEAR OVFIND, IF ON.
0343  REF  2  LAST  117     25,2321  17706 0          STODL     C/D0          (-4/D0)  B-8
0344  REF  6  LAST  799     25,2322  03624 1                    LAD           IF V-VFINAL +K(RDOT/V)CUBED POS,L/D=-LAD
0345  REF  3  LAST  799     25,2323  17634 0          STODL     L/D
0346  REF  5  LAST  805     25,2324  03700 0                    RDOT
0347                        25,2325  41471 0          DDV       PUSH
0348  REF  7  LAST  807     25,2326  03674 1                    V
0349                        25,2327  41316 0          DSQ       DMP
0350                        25,2330  45271 1          DDV       DSU
0351  REF  1                25,2331  15276 0                    1/K44
0352  REF  1                25,2332  15300 0                    VFINAL
A0353
A0354                                                           V-VFINAL +(RDOT/V)^3 / K44   OVFL S

0355                        25,2333  40015 1          DAD       BOV
0356  REF  8  LAST  808     25,2334  03674 1                    V
0357  REF  2  LAST  807     25,2335  52343 1                    INROLOUT      GO TO LIMITL/D AFTER SETTING INRLSW.
0358                        25,2336  71240 1          BMN       DLOAD
0359  REF  3  LAST  808     25,2337  52343 1                    INROLOUT      GO TO LIMITL/D AFTER SETTING INRLSW.
0360  REF  7  LAST  808     25,2340  03624 1                    LAD
0361                        25,2341  77676 0          DCOMP
0362  REF  4  LAST  808     25,2342  03634 0          STORE     L/D

A0363
0364                        25,2343  77614 1  INROLOUT BOFSET                 SET INRLSW AT END FOR RESTART PROTECTION
0365  REF  2  LAST  807     25,2344  03052 0                    INRLSW        END OF PRE .05G PATH OF INITROLL.
0366  REF  2  LAST  807     25,2345  53520 0                    LIMITL/D      SWITCH IS ZERO INITIALLY.
                                                                             (GO TO)
0367                        25,2346  45345 1  KATEST   DLOAD    DSU           IF KAT - D POS, GO TO CONSTD
0368  REF  3  LAST  807     25,2347  03720 1                    KAT
0369  REF  9  LAST  805     25,2350  03640 0                    D             IF POS, OUT WITH COMMAND VIA LIMITL/D
0370                        25,2351  52044 0          BPL       GOTO
0371  REF  3  LAST  808     25,2352  53520 0                    LIMITL/D
0372  REF  1                25,2353  53224 0                    CONSTD

0373                        25,2354  43345 1  INITRL1   DLOAD    DAD           IF RDOT + VRCONT POS, GO TO HUNTEST
0374  REF  6  LAST  808     25,2355  03700 0                    RDOT
0375  REF  1                25,2356  15260 1                    VRCONT
0376                        25,2357  45040 1          BMN       CALL          IF POSITIVE, FALL INTO HUNTEST.
0377  REF  1                25,2360  52346 1                    KATEST

03771 REF  1                25,2361  53014 1                    FOREHUNT      INITIALIZE HUNTEST.
```

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P0378 * START HUNT TEST ..

```
A0379                                                                   MM = 64
 0380                    25,2362  77731 1          SSP                   INITIALIZE HUNTEST ON FIRST PASS
 0381  REP  8 LAST 807  25,2363  03646 0                GOTOADDR
 0382  REP  1           25,2364  52365 0                HUNTEST          MUST GO AFTER FOREHUNT FOR RESTARTS.

 0389                    25,2365  77745 1  HUNTEST DLOAD
 0390  REP 10 LAST 808  25,2366  03640 0                D
 0391  REP  2 LAST 117  25,2367  17664 0          STODL A1              A1/805  = A1/ 25G

 0392  REP  8 LAST 808  25,2370  03624 1                LAD
 0393  REP  2 LAST 116  25,2371  17647 1          STODL TEM1B
 0394  REP  7 LAST 808  25,2372  03700 0                RDOT
 0395                    25,2373  71240 1          BMN   DLOAD           IF RDOT NEG,TEM1B=LAD, OTHERWISE = LEWD
 0396  REP  1           25,2374  52400 1                A0CALC
 0397  REP  1           25,2375  03725 1                LEWD
 0398  REP  3 LAST 809  25,2376  17647 1          STODL TEM1B

 0399  REP  8 LAST 809  25,2377  03700 0                RDOT
 0400                    25,2400  43271 1  A0CALC DDV   DAD             V1 = V + RDOT/TEM1B
 0401  REP  4 LAST 809  25,2401  03647 1                TEM1B
 0402  REP  9 LAST 808  25,2402  03674 1                V
 0403  REP  2 LAST  70  25,2403  14326 0          STODL V1              V1/2 VS

 0404  REP  9 LAST 809  25,2404  03700 0                RDOT
 0405                    25,2405  56316 0          DSQ   DDV             A0=(V1/V)SQ(D+RDOT SQ/(TEM1B 2 C1 HS)
 0406  REP  5 LAST 809  25,2406  03647 1                TEM1B
 0407                    25,2407  43271 1          DDV   DAD
 0408  REP  1           25,2410  15272 1                2C1HS
 0409  REP 11 LAST 809  25,2411  03640 0                D
 0410                    25,2412  41205 0          DMP   DMP
 0411  REP  3 LAST 809  25,2413  00326 0                V1
 0412  REP  4 LAST 809  25,2414  00326 0                V1
 0413                    25,2415  77671 1          DDV
 0414  REP  3 LAST 802  25,2416  03622 1                VSQUARE
 0415  REP  1           25,2417  14330 1          STODL A0              A0/805  = A0/ 25G

 0416  REP 10 LAST 809  25,2420  03700 0                RDOT
 0417                    25,2421  71244 0          BPL   DLOAD
 0418  REP  1           25,2422  52425 0                V1LEAD
 0419  REP  2 LAST 809  25,2423  00330 1                A0
 0420  REP  3 LAST 809  25,2424  03664 0          STORE A1              A1/25G

 04202                   25,2425  51145 0  V1LEAD DLOAD  BPL             IF L/D NEG, V1=V1 - 1000
 04203 REP  5 LAST 808   25,2426  03634 0                L/D
 04204 REP  1            25,2427  52434 0                HUNTEST1

 04205                   25,2430  45345 1          DLOAD DSU
 04206 REP  5 LAST 809   25,2431  00326 0                V1
```

```
04207  REF  1                  25,2432  15214 1                VQUIT
04208  REF  6  LAST  809       25,2433  00328 0          STORE V1

0421                           25,2434  41345 0  HUNTEST1 DLOAD DMP      ALP = 2 C1 HS A0/LEWD V1 V1
0422   REF  3  LAST  809       25,2435  00330 1                A0
0423   REF  2  LAST  809       25,2436  15272 1                2C1HS
0424                           25,2437  40271 1          DDV   SETPD
0425   REF  7  LAST  810       25,2440  00326 0                V1
0426                           25,2441  00001 0                0
0427                           25,2442  56271 0          DDV   DDV
0428   REF  8  LAST  810       25,2443  00326 0                V1
0429   REF  2  LAST  809       25,2444  03725 1                LEWD
0430   REF  2  LAST  117       25,2445  03704 1          STORE ALP

0431                           25,2446  55221 0          BDSU  BDDV     PACT1 = V1 / (1 - ALP)
0432   REF  1                  25,2447  17363 1                BARELY1
0433   REF  9  LAST  810       25,2450  00326 0                V1
0434   REF  2  LAST  116       25,2451  17616 0          STODL PACT1    PACT1 / 2VS

0435   REF  3  LAST  810       25,2452  03704 1                ALP
0436                           25,2453  41225 1          DSU   DMP      PACT2 = ALP(ALP - 1) / A0
0437   REF  2  LAST  810       25,2454  17363 1                BARELY1
0438   REF  4  LAST  810       25,2455  03704 1                ALP
0439                           25,2456  77671 1          DDV
0440   REF  4  LAST  810       25,2457  00330 1                A0
0441   REF  2  LAST  116       25,2460  03620 0          STORE PACT2    PACT2  (25G)

0442                           25,2461  43205 1          DMP   DAD
0443   REF  3  LAST  799       25,2462  03175 1                Q7       Q7 /805 = Q7 / 25G
0444   REF  5  LAST  810       25,2463  03704 1                ALP      VL=PACT1 (1-SQRT(Q7 PACT2 +ALP)  )
0445                           25,2464  44366 1          SQRT  BDSU
0446   REF  3  LAST  810       25,2465  17363 1                BARELY1
0447                           25,2466  77605 1          DMP
0448   REF  3  LAST  810       25,2467  03616 0                PACT1
0449   REF  2  LAST  276       25,2470  03767 1          STORE VL       VL / 2 VS

0450                           25,2471  41221 0          BDSU  DMP      GAMMAL1 = LEWD (V1-VL)/VL
0451   REF 10  LAST  810       25,2472  00326 0                V1
0452   REF  3  LAST  810       25,2473  03725 1                LEWD
0453                           25,2474  77671 1          DDV
0454   REF  3  LAST  810       25,2475  03767 1                VL
0455   REF  1                  25,2476  14027 1          STODL GAMMAL1  GAMMAL1 USED IN UPCONTROL
A0456
0457   REF  4  LAST  810       25,2477  03767 1                VL       GAMMAL1 = PDL 22D.
0458                           25,2500  50025 0          DSU   BMN      IF VL-VLMIN NEG, GO TO PREFINAL
0459   REF  1                  25,2501  15204 0                VLMIN
0460   REF  1                  25,2502  53325 0                PREFINAL

0461                           25,2503  63545 0          DLOAD DSQ
```

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0462  REP  5 LAST 810   25,2504  03767 1                 VL
0463  REP  2 LAST 117   25,2505  17666 1          STODL  VBARS          VBARS / 4 VS VS

0464  REP  1            25,2506  15330 0                 VSAT
0465                    25,2507  50025 0          DSU    BMN           IF VSAT-VL  NEG,  GO TO CONSTD
0466  REP  6 LAST 811   25,2510  03767 1                 VL
0467  REP  1            25,2511  53220 1                 RVCONSTD      SET MODE=HUNTEST, CONTINUE IN CONSTD
0468  REP  2 LAST 117   25,2512  17662 0          STODL  DVL           DVL / 2VS

0469  REP  2 LAST 811   25,2513  15330 0                 VSAT
0470  REP  2 LAST 117   25,2514  03672 1          STORE  VSI           VSI = VSAT

0471                    25,2515  50025 0          DSU    BMN           IF V1 GREATER THAN VSAT , GO ON
0472  REP 11 LAST 810   25,2516  00326 0                 V1
0473  REP  1            25,2517  52525 1                 GETDHOOK
0474                    25,2520  77621 1          BDSU
0475  REP  3 LAST 811   25,2521  03662 0                 DVL
0476  REP  4 LAST 811   25,2522  17662 0          STODL  DVL           DVL = DVL - (VSAT-V1) = V1 - VL
0477  REP 12 LAST 811   25,2523  00326 0                 V1
0478  REP  3 LAST 811   25,2524  03672 1          STORE  VSI           VSI = V1,  IN THIS CASE

0479                    25,2525  45145 0 GETDHOOK DLOAD  CALL          DHOOK=((1-VSI/PACT1) SQ -ALP)/PACT2
0480  REP  4 LAST 811   25,2526  03672 1                 VSI           VSI /2 VS
0481  REP  1            25,2527  52776 0                 DHOOKYQ7      GO CALC DHOOK
0482  REP  2 LAST 116   25,2530  03656 1          STORE  DHOOK         DHOOK /25G

0483                    25,2531  56261 1          SR     DDV
0484                    25,2532  20607 1                 6             CHOOK
0485  REP  4 LAST 810   25,2533  03175 1                 CH7
0486                    25,2534  77625 0          DSU
0487  REP  1            25,2535  15250 1                 CHOOK         = .25/16 = (-6)
0488  REP  2 LAST 117   25,2536  03660 1          STORE  AHOOKDV

0489                    25,2537  41215 1          DAD    DMP           GAMMAL= GAMMAL1-CH1 DVL SQ(1+AHOOK DVL)
0490  REP  1            25,2540  17357 0                 1/16TH
0491  REP  1            25,2541  15254 0                 CH1
0492                    25,2542  41205 0          DMP    DMP
0493  REP  5 LAST 811   25,2543  03662 0                 DVL
0494  REP  6 LAST 811   25,2544  03662 0                 DVL
0495                    25,2545  56271 0          DDV    DDV
0496  REP  3 LAST 811   25,2546  03656 1                 DHOOK
0497  REP  3 LAST 811   25,2547  03666 1                 VBARS
0498                    25,2550  50021 1          BDSU   BMN
0499  REP  2 LAST 810   25,2551  00027 1                 GAMMAL1
0500  REP  1            25,2552  52743 0                 XSIGMA
0501  REP  1            25,2553  03771 0 HUNTEST3 STORE  GAMMAL        GAMMAL1=GAMMAL1 +Q19 (GAMMAL-GAMMAL1)

0502                    25,2554  77625 0          DSU
0503  REP  3 LAST 811   25,2555  00027 1                 GAMMAL1
0504                    25,2556  43205 1          DMP    DMP
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L REENTRY CONTROL


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0505  REP  1                25,2557   15330 0          Q19
0506  REP  4  LAST  811      25,2560   00027 1          GAMMAL1
0507  REP  5  LAST  812      25,2561   14027 1    STODL GAMMAL1
0508  REP  2  LAST  811      25,2562   03771 0          GAMMAL
```

```
P0509    *START    RANGE PREDICTION ...

A0510                                                          C(MPAC) = GAMMAL
 0511                          25,2563  60516 0  RANGER  DSQ    SR2        COSG = 1-GAMMAL SQ/2, TRUNCATED SERIES
 0512                          25,2564  77621 1           BDSU
 0513  REP  3  LAST  811       25,2565  15330 0                HALVE
 0514  REP  2  LAST  117       25,2566  17670 0           STODL COSG/2
 0515  REP  4  LAST  811       25,2567  03666 1                VBARS      E=SQRT(1+VBARS.....

 0516                          25,2570  41225 1           DSU  DMP
 0517  REP  4  LAST  813       25,2571  15330 0                HALVE
 0518  REP  5  LAST  813       25,2572  03666 1                VBARS
 0519                          25,2573  41205 0           DMP  DMP
 0520  REP  3  LAST  813       25,2574  03670 0                COSG/2
 0521  REP  4  LAST  813       25,2575  03670 0                COSG/2
 0522                          25,2576  43312 0           SL2  DAD
 0523  REP  1                  25,2577  17357 0                C1/16      C1/16 = 1/16
 0524                          25,2600  65366 1           SQRT PDDL       E/4 INTO PDL

 0525  REP  6  LAST  813       25,2601  03666 1                VBARS
 0526                          25,2602  41205 0           DMP  DMP        ASKEP/2 = ARCSIN(VBARS COSG SING/E)
 0527  REP  5  LAST  813       25,2603  03670 0                COSG/2
 0528  REP  3  LAST  812       25,2604  03771 0                GAMMAL
 0529                          25,2605  67471 1           DDV  ASIN
 0530                          25,2606  41552 0           SL1  PUSH       ASKEP TO PDL 0.
 0531  REP  1                  25,2607  17731 1           STODL ASKEP     BALLISTIC RANGE       ASKEP/2PI

A0532                                                                FOR TM, STORE RANGE COMPONENTS OVERLAPPING (SP)
 0533  REP  7  LAST  811       25,2610  03767 1                VL
 0534                          25,2611  43205 1           DMP  DAD        ASP1 = Q2 + Q3 VL
 0535  REP  1                  25,2612  15170 0                Q3
 0536  REP  3  LAST  799       25,2613  03712 0                Q2
 0537  REP  1                  25,2614  03732 1           STORE ASP1      FINAL PHASE RANGE     ASP1/2 PI

 0538                          25,2615  63525 0           PDDL DSQ        ASP1 TO PDL 2.
 0539  REP 13  LAST  811       25,2616  00326 0                V1
A0540                                                                                    2
A0541                                                          ASPUP= -C12 LOG(V1 Q7/VBARS A0)/GAMMAL1
 0542                          25,2617  56205 0           DMP  DDV
 0543  REP  5  LAST  811       25,2620  03175 1                Q7
 0544  REP  7  LAST  813       25,2621  03666 1                VBARS
 0545                          25,2622  45071 0           DDV  CALL
 0546  REP  5  LAST  810       25,2623  00330 1                A0
 0547  REP  1                  25,2624  46155 1                LOG        RETURN WITH -LOG IN MPAC

 0548                          25,2625  56205 0           DMP  DDV
 0549  REP  1                  25,2626  15206 1                C12
 0550  REP  6  LAST  812       25,2627  00027 1                GAMMAL1
 0551  REP  1                  25,2630  03733 0           STORE ASPUP     UP PHASE RANGE        ASPUP / 2 PI
```

```
                           25,2631  41325 0           PDDL   DMP          ASPUP TO PDL 4.
       REF  1              25,2632  15256 1                  KC3          KC3 =-4 VS VS/ 2 PI 805 RE
                                                                          ASPDWN = KC3 RDOT V / A0
       REF 11  LAST 809    25,2633  03700 0                  RDOT
                           25,2634  56205 0           DMP    DDV
       REF 10  LAST 809    25,2635  03674 1                  V
       REF  6  LAST 813    25,2636  00330 1                  A0
                           25,2637  41471 0           DDV    PUSH         ASPDWN TO PDL 6.
       REF  9  LAST 809    25,2640  03624 1                  LAD
       REF  1              25,2641  17734 1           STODL  ASPDWN       RANGE TO PULL OUT       ASPDWN /2 PI

       REF  1              25,2642  15174 1                  Q6
                           25,2643  41225 1           DSU    DMP          ASP3 = Q5(Q6-GAMMAL)
       REF  4  LAST 813    25,2644  03771 0                  GAMMAL
       REF  1              25,2645  15172 1                  Q5
       REF  1              25,2646  27735 0           STOVL  ASP3         GAMMA CORRECTION        ASP3/2PI

       REF  2  LAST 813    25,2647  03731 1                  ASKEP        GET HI-WD AND
       REF  1              25,2650  17126 1           STODL  ASPS(TM)     SAVE HI-WORD OF ASP«S FOR TM.

       REF  2  LAST 814    25,2651  03735 0                  ASP3
                           25,2652  43215 0           DAD    DAD
                                                                          ASPDWN FROM PDL 6.
                                                                          ASPUP FROM PDL 4.
                           25,2653  43215 0           DAD    DAD
                                                                          ASP1 FROM PDL 2.
                                                                          ASKEP FROM PDL 0.
                           25,2654  41025 0           DSU    BOVB         CLEAR OVFIND.
       REF  6  LAST 805    25,2655  03702 1                  THETAH
       REF  3  LAST 758    25,2656  57343 1                  TCDANZIG
       REF  2  LAST 116    25,2657  03610 0           STORE  DIFF         DIFF = (ASP-THETAH) /2 PI
                                                      ASP=ASKEP+ASP1+ASPUP+ASP3+ASPDWN = TOTAL RANGE

                           25,2660  45246 0           ABS    DSU          IF ABS(THETAH-ASP) -25NM NEG, GO TO UPSY
       REF  1              25,2661  15222 1                  25NM
                           25,2662  43040 1           BMN    BON
       REF  1              25,2663  53025 0                  GOTOUPSY
       REF  1              25,2664  03311 1                  HIND
       REF  1              25,2665  52671 0                  GETDLEWD

                           25,2666  51145 0           DLOAD  BPL
       REF  3  LAST 814    25,2667  03610 0                  DIFF
       REF  1              25,2670  53213 1                  DCONSTD      EVENTUALLY SETS MODE = HUNTEST.
                           25,2671  41345 0  GETDLEWD DLOAD  DMP
                                                                          DLEWD = DLEWD (DIFF/(DIFFOLD-DIFF))
       REF  2  LAST 116    25,2672  03642 1                  DLEWD
       REF  4  LAST 814    25,2673  03610 0                  DIFF
                           25,2674  45325 1           PDDL   DSU
       REF  2  LAST 116    25,2675  03612 1                  DIFFOLD
       REF  5  LAST 814    25,2676  03610 0                  DIFF
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0597                                25,2677   77665 1            BDDV
05971                               25,2700   77626 0  LWDSTORE  STADR
0598   BNK   3  LAST  814           25,2701   74135 0            STORE   DLEWD
0599                                25,2702   50015 0            DAD     BMN       IF LEWD+DLEWD NEG,DLEWD=-LEWD/2
0600   BNK   4  LAST  810           25,2703   03725 1                    LEWD
06002  BNK   1                     25,2704   52737 0                    LEWDPTR
06004                               25,2705   77600 1            BOV
0601   BNK   1                     25,2706   52733 1                    LEWDOVFL
0602   BNK   5  LAST  815           25,2707   03725 1            STORE   LEWD

0603                                25,2710   77776 1  SIDETRAK  EXIT

0604   BNK   2  LAST  758           25,2711   3 4753 1           CA      EBENTRY
0605   BNK  34  LAST  758           25,2712   54 003 0           TS      EBANK

06051  BNK  10  LAST  381           25,2713   3 4763 1           CA      PRIO16    DROP GRP 5 RESTART PRIO TO 1 LESS THAN
06052  BNK   1                     25,2714   55∝064 0           TS      PHSPRDT5  GRP 4.

0606   BNK  06  LAST  801           25,2715   0 5301 0           TC      PHASCHNG
0607                                25,2716    00474 0           OCT     00474     RESTART GRP 4 AT PRE-HUNT.
A06071                                                                             FORCE RESTART TO PICK UP IN GRP 4'
A06072                                                                             USE PRIO 17 FOR GRP 4( ± SERVICER PRIO)
0608   BNK  11  LAST  815           25,2717   3 4763 1           CA      PRIO16    CONTINUE GRP 5 AT LOWER PRIO THAN EITHER
A06081                                                                             GRP 4 OR SERVICER.
0609   BNK   9  LAST  648           25,2720   0 5103 0           TC      PRIOCHNG

0610   BNK   1                     25,2721   3 3024 1           CAF     ADENDEXT  SIDETRACK NEXT PASS UNTIL THIS ONE DONE.
0611   BNK   9  LAST  809           25,2722   55∝645 0           TS      GOTOADDR  ONLY AFTER RESTART IS LEFT AFTER DETOUR.

0612   BNK 206  LAST  801           25,2723   0 6006 1           TC      INTPRET

0613                                25,2724    43145 0           DLOAD   SET
0614   BNK   6  LAST  814           25,2725    03610 0                   DIFF
0615   BNK   2  LAST  814           25,2726    03071 1                   HIND
0616   BNK   3  LAST  814           25,2727    17612 1           STODL   DIFFOLD    DIFFOLD / 2 PI

0617   BNK   2  LAST  799           25,2730    15176 0                   Q7F
0621   BNK   6  LAST  813           25,2731    37175 0           STCALL  Q7        Q7 / 805 FPSS
0622   BNK   2  LAST  809           25,2732    52365 0                   HUNTEST    (GO TO )

0623                                25,2733   77745 1  LEWDOVFL  DLOAD
0624   BNK   2  LAST  799           25,2734   17363 1                   NEARONE
0625   BNK   6  LAST  815           25,2735   37725 0           STCALL  LEWD
0626   BNK   2  LAST  814           25,2736   53213 1                   DCONSTD   (GO TO)  ALSO WILL SET MODE = HUNTEST

06262                               25,2737   70545 1  LEWDPTR   DLOAD   SR1
06264  BNK   7  LAST  815           25,2740   03725 1                   LEWD
06266                               25,2741   52076 1           DCOMP   GOTO
06268  BNK   1                     25,2742   52700 1                   LWDSTORE
```

L REENTRY CONTROL

R0627 NEGAMA IS PART OF HUNTEST ...

```
0628                                25,2743  41205 0  NEGAMA   DMP     DMP          ENTER WITH GAMMAL IN MPAC
0629  REF  8  LAST  813            25,2744  03767 1           DMP     VL
0630  REF  1                       25,2745  15146 0           DMP     1/3RD
0631                                25,2746  41325 0           PDDL    DMP          PUSH GAMMAL VL/3
0632  REF  8  LAST  815            25,2747  03725 1           PDDL    LEMD
0633  REF  2  LAST  816            25,2750  15146 0           PDDL    1/3RD
0634                                25,2751  43325 1           PDDL    DAD          PUSH LEMD/3
0635  REF  3  LAST  811            25,2752  03660 1           PDDL    AHOOKDV
0636  REF  1                       25,2753  15252 0           PDDL    1/24TH
0637                                25,2754  41205 0           DMP     DMP          DEL VL =(GAMMAL VL/3)/(LEMD/3-DVL
0638  REF  7  LAST  811            25,2755  03662 0           DMP     DVL          (2/3 + AHOOKDV)(CH1 GS/DHOOK VL))
0639  REF  2  LAST  811            25,2756  15254 0           DMP     CH1
0640                                25,2757  56271 0           DDV     DDV
0641  REF  4  LAST  811            25,2760  03656 1           DDV     DHOOK
0642  REF  9  LAST  816            25,2761  03767 1           DDV     VL
0643                                25,2762  55221 0           BDSU    BDDV         LEMD/3
A0644                                                                               GAMMAL VL /3
A0645
0646                                25,2763  77615 0           DAD
0647  REF 10  LAST  816            25,2764  03767 1           DAD     VL
0648  REF 11  LAST  816            25,2765  37767 0           STCALL  VL           VL/2 VS

0649  REF  2  LAST  811            25,2766  52776 0           STCALL  DHOOKYQ7     GO CALC Q7
A0650                                                                               Q7=((1-VL/FACT1)SQ - ALP)/FACT2
0651  REF  7  LAST  815            25,2767  17175 1           STCALL  Q7           Q7 / 25G

0652  REF 12  LAST  816            25,2770  03767 1           STCALL  VL
0653                                25,2771  77716 1           DSQ
0654  REF  8  LAST  813            25,2772  17666 1           STCALL  VBARS        VBARS / 4 VS VS

0655  REF  3  LAST  803            25,2773  15332 1           STCALL  3ZEROS
0656                                25,2774  77650 1           GOTO
0657  REF  1                       25,2775  52553 0           GOTO    HUNTEST3     SET GAMMAL = 0

0658                                25,2776  56342 1  DHOOKYQ7 SR1     DDV          SUBROUTINE TO CALC DHOOK OR Q7)
0659  REF  4  LAST  810            25,2777  03616 0           DDV     FACT1
0660                                25,3000  72421 0           BDSU    SL1
0661  REF  5  LAST  813            25,3001  15330 0           BDSU    HALVE
0662                                25,3002  45316 1           DSQ     DSU
0663  REF  6  LAST  810            25,3003  03704 1           DSQ     ALP
0664                                25,3004  43471 1           DDV     RVQ
0665  REF  3  LAST  810            25,3005  03620 0           DDV     FACT2
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P06651
A0666                                                  COME TO PRE-HUNT WHEN RESTART OCCURS AFTER
A0667                                                  HUNTEST IS SIDE-TRACKED AT SIDETRAK.
A0668                                                  PICK UP IN GROUP 4.

 0669   REF 207  LAST  815   25,3006  0 6006 1  PRE-HUNT TC      INTPRET
 0670                        25,3007   45014 0            CLEAR   CALL
 0671   REF   3  LAST  815   25,3010   03271 0                    HIND          HIND      99D  BIT 6  FLAG 6
 0672   REF   2  LAST  808   25,3011   53014 1                    FOREHUNT      RE-INITIALIZE HUNTEST AFTER RE-START.
 0673                        25,3012   77650 1            GOTO
 0675   REF   3  LAST  815   25,3013   52365 0                    HUNTEST
 0676                        25,3014   77745 1  FOREHUNT  DLOAD                 INITIALIZE HUNTEST.
 0677   REF   4  LAST  816   25,3015   15332 1                    3ZEROS
 0678   REF   4  LAST  815   25,3016   17612 1            STODL   DIFFOLD
 0679   REF   1               25,3017   15156 1                    DLEWD0
 0680   REF   4  LAST  815   25,3020   17642 1            STODL   DLEWD
 0681   REF   1               25,3021   15150 1                    LEWD1
 0682   REF   9  LAST  816   25,3022   03725 1            STORE   LEWD
 0683                        25,3023   77616 0            RVQ
A0684
 0685   REF   2  LAST  748   25,3024   53570 0  ADENDEXT CADR    ENDEXIT
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P0686   * START  UP CONTROL  ...

A0687
 0688                          25,3025   77634 0  GOTOUPSY RTB
 0689   REF   1                25,3026   54440 0                   P65
A0690
A0691
A0692
A0693

 0694                          25,3027   45345 1  UPCONTRL DLOAD   DSU
 06941  REF  12  LAST  809     25,3030   03640 0                   D
 06942  REF   1                25,3031   15220 0                   C21
 06943                         25,3032   43040 1           BMN     SET
 06944                         25,3033   53035 1                   +2
 06945  REF   1                25,3034   03070 0                   NOSWITCH

 06946                         25,3035   45345 1           DLOAD   DSU
 0695   REF  11  LAST  814     25,3036   03674 1                   V
 0696   REF  14  LAST  813     25,3037   00326 0                   V1
 0697                          25,3040   71244 0           BPL     DLOAD
 0698   REF   1                25,3041   53252 1                   DOWNCNTL
 0699   REF  13  LAST  818     25,3042   03640 0                   D
 0700                          25,3043   50025 0           DSU     BMN
 0701   REF   8  LAST  816     25,3044   03175 1                   Q7
 0702   REF   1                25,3045   53305 1                   KEP
 0703                          25,3046   51145 0           DLOAD   BPL
 0704   REF  12  LAST  814     25,3047   03700 0                   RDOT
 0705   REF   1                25,3050   53057 0                   CONT1

 0706                          25,3051   45345 1  VLTEST   DLOAD   DSU
 0707   REF  12  LAST  818     25,3052   03674 1                   V
 0708   REF  13  LAST  816     25,3053   03787 1                   VL
 0709                          25,3054   50025 0           DSU     BMN
 0710   REF   1                25,3055   15164 0                   C18
 0711   REF   2  LAST  810     25,3056   53325 0                   PREFINAL

 0712                          25,3057   77745 1  CONT1    DLOAD
 0713   REF  14  LAST  818     25,3060   03640 0                   D
 0714                          25,3061   50025 0           DSU     BMN
 0715   REF   7  LAST  814     25,3062   00330 1                   A0
 0716   REF   1                25,3063   53067 0                   CONT3
 0717                          25,3064   52145 0           DLOAD   GOTO
 0718   REF  10  LAST  814     25,3065   03624 1                   LAD
 0719   REF   1                25,3066   53517 1                   STOREL/D
A0720

 0721                          25,3067   41345 0  CONT3    DLOAD   DMP
 0722   REF  15  LAST  818     25,3070   03640 0                   D
 0723   REF   4  LAST  816     25,3071   03620 0                   FACT2
```

```
MM = 65
END OF HUNTEST
HUNTEST USE OF GRP4 IS DISABLED BY P65
USE FOR DISPLAY.
SET MODE = UPCONTRL.
RETURN FROM P65 DIRECTLY TO UPCONTRL
VIA THE GOTOADDR AT REFAZE10.

IF D-140 POS, NOSWITCH =1
(SUPPRESS LATERAL SWITCH)

IF  V-V1  POS, GO TO DOWN CONTROL.

IF D- Q7 NEG, GO TO KEP

IF RDOT NEG, DO VLTEST

IF V-VL-C18 NEG,EGSW=1,MODE=PREDICT3

IF D-A0 POS, L/D = LAD, GO TO LIMITL/D

VREF=FACT1(1-SQRT(FACT2 D + A1.P))
```

```
0724                        25,3072  75415 0        DAD     SQRT
0725  REP  7  LAST  816      25,3073  03704 1                ALP
0726                        25,3074  41221 0        BDSU    DMP
0727  REP  4  LAST  810      25,3075  17363 1                BARELY1
0728  REP  5  LAST  816      25,3076  03816 0                FACT1
0729  REP  1                 25,3077  01160 1        STORE   VREF            VREF / 2VS

0730                        25,3100  41221 0        BDSU    DMP             RDOTREF = LEWD(V1-VREF)
0731  REP 15  LAST  818      25,3101  00326 0                V1
0732  REP 10  LAST  817      25,3102  03725 1                LEWD
0733  REP  2  LAST   77      25,3103  15156 1        STODL   RDOTREF         RDOTREF / 2VS

0734  REP  5  LAST  811      25,3104  03672 1                VS1
0735                        25,3105  50025 0        DSU     BMN             IF VSAT-VREF NEG, GO TO CONTINU2
0736  REP  2  LAST  819      25,3106  01160 1                VREF
0737  REP  1                 25,3107  53126 1                CONTINU2

0738                        25,3110  41406 0        PUSH    PUSH            VS1-VREF  TO PDL TWICE
0739                        25,3111  56205 0        DMP     DDV             RDHOOK=CH1(1+DV AHOOKDV/DVL) DV DV
0740  REP  4  LAST  816      25,3112  03660 1                AHOOKDV              /DHOOK VREF
0741  REP  8  LAST  816      25,3113  03662 0                DVL             WHERE  DV = (VS1-VREF)
0742                        25,3114  41215 1        DAD     DMP
0743  REP  2  LAST  811      25,3115  17357 0                1/16TH
0744  REP  3  LAST  816      25,3116  15254 0                CH1
0745                        25,3117  41205 0        DMP     DMP
A0746                                                       VS1-VREF  FROM PDL TWICE.
0747                        25,3120  77671 1        DDV
0748  REP  5  LAST  816      25,3121  03656 1                DHOOK
0749                        25,3122  44271 0        DDV     BDSU
0750  REP  3  LAST  819      25,3123  01160 1                VREF
0751  REP  3  LAST  819      25,3124  01156 1                RDOTREF         C(RDOTREF)= LEWD (V1-VREF)
0752  REP  4  LAST  819      25,3125  01156 1        STORE   RDOTREF         RDOTREF = RDOTREF - RDHOOK

0753                        25,3126  45345 1  CONTINU2 DLOAD  DSU
0754  REP 16  LAST  818      25,3127  03640 0                D
0755  REP  1                 25,3130  15312 0                Q7MIN
0756                        25,3131  50004 0        BOVB    BMN
0757  REP  4  LAST  814      25,3132  57343 1                TCDANZIG        CLEAR OVFL IND, IF ON.
0758  REP  1                 25,3133  53144 0                UPCNTRL3
0759                        25,3134  45345 1        DLOAD   DSU
0760  REP  4  LAST  809      25,3135  03664 0                A1
0761  REP  9  LAST  818      25,3136  03175 1                Q7
0762                        25,3137  45325 1        PDDL    DSU
0763  REP 17  LAST  819      25,3140  03640 0                D
0764  REP 10  LAST  819      25,3141  03175 1                Q7
0765                        25,3142  45471 1        DDV     STADR
0766  REP  3  LAST  799      25,3143  74163 0        STORE   FACTOR          FACTOR / 25G
```

L REENTRY CONTROL

P0767 SKIPPER

A0768
A0769

DELTA L/D=-((RDOT-RDOTREF)F_1 KB_1+V-VREF)F_1 KB_2
WHERE F_1 = FACTOR

0770					25,3144	77745 1	UPCNTRL3	DLOAD		
0771	REP	13	LAST	818	25,3145	03700 0			RDOT	
0772					25,3146	41225 1		DSU	DMP	L/D = LEWD
0773	REP	5	LAST	819	25,3147	01156 1			RDOTREF	-((RDOT-RDOTREF)F_1/KB_1+V-VREF)F_1/KB_2
0774	REP	4	LAST	819	25,3150	03614 1			FACTOR	
0775					25,3151	43271 1		DDV	DAD	
0776	REP	1			25,3152	15210 0			1/KB_1	
0777	REP	13	LAST	818	25,3153	03674 1			V	
0778					25,3154	41225 1		DSU	DMP	
0779	REP	4	LAST	819	25,3155	01160 1			VREF	
0780	REP	5	LAST	820	25,3156	03614 1			FACTOR	
0781					25,3157	41471 0		DDV	PUSH	
0782	REP	1			25,3160	15212 1			-1/KB_2	DELTA L/D INTO PDL
0783					25,3161	51400 1		BOV	ABS	NONLINEAR CIRCUIT FOR REDUCING HIGH GAIN
0784	REP	1			25,3162	53464 1			GOMAXL/D	
0785					25,3163	50025 0		DSU	BMN	
0786	REP	1			25,3164	15274 1			PT1/16	
0787	REP	1			25,3165	53172 0			NEXT1	
0788					25,3166	43205 1		DMP	DAD	
0789	REP	1			25,3167	15152 0			POINT1	
0790	REP	2	LAST	820	25,3170	15274 1			PT1/16	
0791					25,3171	41565 1		SIGN	PUSH	ATTACH SIGN OF PUSH TO MPAC THEN PUSH
0792					25,3172	42545 0	NEXT1	DLOAD	SL4	
A0793										DELTA L/D FROM PDL.
0794					25,3173	77615 0		DAD		
0795	REP	11	LAST	819	25,3174	03725 1			LEWD	
0796					25,3175	41400 0	NEGTESTS	BOV	PUSH	L/D TO PDL FOR USE IN NEGTESTS.
0797	REP	2	LAST	820	25,3176	53464 1			GOMAXL/D	
0798	REP	6	LAST	809	25,3177	17634 0		STODL	L/D	
A0799										IF D-C_{20} POS, LATSW =0
A0800										AND IF L/D NEG, L/D = 0.
0801	REP	18	LAST	819	25,3200	03640 0			D	
0802					25,3201	50025 0		DSU	BMN	
0803	REP	1			25,3202	15216 0			C_{20}	
0804	REP	4	LAST	808	25,3203	53520 0			LIMITL/D	
0805					25,3204	71214 0		CLEAR	DLOAD	
0806	REP	1			25,3205	03273 1			LATSW	=21D. ROLL OVER TOP, REGARDLESS.
A0807										L/D FROM PDL.
0808					25,3206	71244 0		BPL	DLOAD	
0809	REP	5	LAST	820	25,3207	53520 0			LIMITL/D	
0810	REP	5	LAST	817	25,3210	15332 1			3ZEROS	
0811	REP	7	LAST	820	25,3211	37634 1		STCALL	L/D	
0812	REP	6	LAST	820	25,3212	53520 0			LIMITL/D	(GO TO)

```
0813                        25,3213  77745 1  DCONSTD  DLOAD
0814  REP  7  LAST  815      25,3214  03610 0                    DIFF
A0815
0817  REP  5  LAST  817      25,3215  17612 1           STODL    DIFFOLD
0818  REP  3  LAST  815      25,3216  15176 0                    Q7P
0819  REP 11  LAST  819      25,3217  03175 1           STORE    Q7

0820                        25,3220  47131 1  BECONSTD SSP      RTB
0821  REP 10  LAST  815      25,3221  03646 0                    GOTOADDR
0822  REP  4  LAST  817      25,3222  52365 0                    HUNTEST
0823  REP  1                25,3223  54505 0                    KILLGRP4

0824                        25,3224  77604 0  CONSTD   BOVB
0825  REP  5  LAST  819      25,3225  57343 1                    TCDANZIG

0826                        25,3226  41345 0           DLOAD    DMP
0827  REP  6  LAST  807      25,3227  03654 0                    LEQ
0828  REP  3  LAST  808      25,3230  03706 0                    C/D0
0829                        25,3231  41325 0           PDDL     DMP
0830  REP  1                25,3232  15262 0                    2HS
0831  REP  3  LAST  807      25,3233  03710 1                    D0
0832                        25,3234  43271 1           DDV      DAD
0833  REP 14  LAST  820      25,3235  03674 1                    V
0834  REP 14  LAST  820      25,3236  03700 0                    RDOT
0835                        25,3237  43205 1           DMP      DAD
0836  REP  1                25,3240  15226 0                    K2D
0837                        25,3241  77725 1           PDDL
0838  REP  4  LAST  821      25,3242  03710 1                    D0

0839                        25,3243  77621 1  CONSTD1  BDSU
0840  REP 19  LAST  820      25,3244  03640 0                    D
0841                        25,3245  43205 1           DMP      DAD
0842  REP  1                25,3246  15224 1                    K1D
0843                        25,3247  52061 1           SL       GOTO
0844                        25,3250  20211 1                    8D
0845  REP  1                25,3251  53175 1                    NEGTESTS
0846                        25,3252  77604 0  DOWNCNTL BOVB
0847  REP  6  LAST  821      25,3253  57343 1                    TCDANZIG

0848                        25,3254  54345 1           DLOAD    SR
0849  REP 11  LAST  818      25,3255  03624 1                    LAD
0850                        25,3256  20611 0                    8D
0851                        25,3257  45325 1           PDDL     DSU
0852  REP 15  LAST  821      25,3260  03674 1                    V
0853  REP 16  LAST  819      25,3261  00326 0                    V1
0854                        25,3262  43205 1           DMP      DAD
0855  REP 12  LAST  821      25,3263  03624 1                    LAD
```

TWO RANGER ENTRIES TO CONSTD HERE

SAVE OLD VALUE OF DIFF FOR NEXT PASS.
DIFFOLD / 2 PI

A HUNTEST ENTRY INTO CONSTD.
RESET MODE TO HUNTEST

DEACTIVATE GRP4 FROM HUNTEST.

CLEAR OVF IND IF ON.

$C/D_0 = -4/D_0$ B-8
LEQ C/D_0 INTO PDL
2HS / 4 VS VS

RDOTREF = - 2 HS D_0/V

C/D_0 LEQ + K_2D(RDOT-RDOTREF) INTO PD

D_0 /805

ENTER WITH DREF IN MPAC

K_2D TERM FROM PUSH

(GO TO)
INITIAL PART OF UPCONTROL.
CLEAR OVFIND , IF ON.

RDTR = LAD(V_1-V)

L REENTRY CONTROL

USER'S PAGE NO. 25 ET S3

```
 0856  REF  15  LAST  821   25,3264  03700 0          RDOT
 0857                       25,3265  43205 1   DMP    DAD
 0858  REF   2  LAST  821   25,3266  15226 0          K2D
A0859                                                 PUSH UP LAD.
 0860                       25,3267  45325 1   PDDL   DSU        LAD + K2D(RDOT-RDTR) INTO PD
 0861  REF  17  LAST  821   25,3270  00326 0          V1
 0862  REF  16  LAST  821   25,3271  03674 1          V
 0863                       25,3272  41316 0   DSQ    DMP
 0864  REF  13  LAST  821   25,3273  03624 1          LAD
 0865                       25,3274  65271 0   DDV    PDDL       (V1-V)SQ LAD/(2 C1 HS) INTO PD
 0866  REF   3  LAST  810   25,3275  15272 1          2C1HS
 0867  REF  18  LAST  822   25,3276  00326 0          V1
 0868                       25,3277  56316 0   DSQ    DDV
 0869  REF   4  LAST  809   25,3300  03622 1          VSQUARE
 0870                       25,3301  45265 1   BDDV   DSU        DREF = (V/V1)SQ A0 - PD
 0871  REF   8  LAST  818   25,3302  00330 1          A0
A0872                                                 PUSH UP HERE
 0873                       25,3303  77650 1   GOTO               C(MPAC) = DREF
 0874  REF   1               25,3304  53243 1          CONSTD1

A0875
A0876
```

$$DREF = (V/V_1)^2 A_0 - (V-V_1)^2 LAD/2\ C_1\ HS$$

```
P0877   * START  BALLISTIC PHASE  ...

A0878                                                          MM = 66     UPCONTRL ENTRY INTO KEP2.
 0879                          25,3305   66234 1  KEP     RTB   SSP
 0880   REP   1               25,3306   54473 0                P66          DISPLAY TRIM GIMBAL ANGLE VALUES.
 0881   REP  11  LAST  821     25,3307   03646 0                GOTOADDR     SET GOTOADDR TO KEPLER PHASE.
 0882   REP   2  LAST  807     25,3310   53311 1                KEP2

A0883                                                          KEP2 CAN ALSO BE STARTED UP DIRECTLY FROM INITROLL
A0884                                                          IN P64. PROGRAM WILL IDLE IN P64 UNTIL D EXCEEDS
A0885                                                          .2 G BEFORE GOING ON TO P67.

 0886                          25,3311   45345 1  KEP2    DLOAD DSU          IF Q7F+KDMIN -D NEG,GO TO FINAL PHASE.
 0887   REP   1               25,3312   15166 1                Q7FKDMIN     (Q7F + KDMIN)/805
 0888   REP  20  LAST  821     25,3313   03640 0                D
 0889                          25,3314   72240 1         BMN    TLOAD
 0891   REP   3  LAST  818     25,3315   53325 0                PREFINAL
A0892                                                                       SET ROLLHOLD = ROLLC, IN CASE CMDAPMOD
 0893   REP   9  LAST  772     25,3316   03316 0                ROLLC        = +1 EVER ENTERED.
 0895                          25,3317   72214 0         BON    TLOAD        IF D δ .05G, KEEP PRESENT ROLL COMMAND.
 0896   REP   4  LAST  807     25,3320   03314 1                .05GSW       IF D ± .05G, SET ROLL COMMAND = 0.
 0897                          25,3321   53323 0                +2
 0898   REP   6  LAST  820     25,3322   15332 1                3ZEROS       SET ROLLC d ROLLHOLD =0.
 0899   REP  10  LAST  823     25,3323   37316 1  +2     STCALL ROLLC        (SP ROLLHOLD FOLLOWS DP ROLLC)
 0900   REP   3  LAST  748     25,3324   54402 0                P82.3        CALC DESIRED GIMBAL ANGLES AT PRESENT
A0901                                                                      RN, VN  TO YIELD TRIM ATTITUDE.
A0902                                                                      AVAILABLE IN CPHI∝S FOR N22.
```

```
P0903   START  FINAL  PHASE  ..

A0904
 0905
 0906   REF  12  LAST  823     25,3325   47131 1  PREFINAL SSP    RTB
 0907   REF   4  LAST  823     25,3326   03646 0                  GOTOADDR
 0908   REF   1                25,3327   53325 0                  PREFINAL
A0909                         25,3330   54477 1                  P67
A0910
A0911
A0912

 0913                         25,3331   66214 0          SET     SSP
 0914   REF   3  LAST  805     25,3332   03067 0                  EBSW
 0915   REF  13  LAST  824     25,3333   03646 0                  GOTOADDR
 0916   REF   1                25,3334   53335 1                  PREDICT3
 0917                         25,3335   45345 1  PREDICT3 DLOAD  DSU
 0918   REF  17  LAST  822     25,3336   03674 1                  V
 0919   REF   2  LAST  810     25,3337   15214 1                  VQUIT
 0920                         25,3340   77440 1          RMN     EXIT
 0921   REF   1                25,3341   53605 1                  STEEROFF

 0922   REF   3  LAST  815     25,3342   3 4753 1         CA      EBENTRY
 0923   REF  35  LAST  815     25,3343   54 003 0         TS      EBANK

 0924   REF   1                25,3344   3 5656 1         CA      TWELVE
 0925   REF   1                25,3345   55∝771 0 BACK    TS      JJ

 0926   REF  18  LAST  824     25,3346   4 1673 0         CS      V
 0927   REF   2  LAST  824     25,3347   51∝771 1         INDEX   JJ
 0928   REF   1                25,3350   6 3631 0         AD      VREFER
 0929   REF 184  LAST  782     25,3351   10 000 0         CCS     A
 0930   REF   3  LAST  824     25,3352   11∝771 0         CCS     JJ
 0931   REF   1                25,3353   1 3345 1         TCF     BACK
 0932   REF  96  LAST  778     25,3354   6 4712 1         AD      ONE
 0933   REF   6  LAST  809     25,3355   55∝646 0         TS      TEM1B

 0934   REF   4  LAST  824     25,3356   51∝771 1         INDEX   JJ
 0935   REF   2  LAST  824     25,3357   4 3631 1         CS      VREFER
 0936   REF   5  LAST  824     25,3360   51∝771 1         INDEX   JJ
 0937   REF   3  LAST  824     25,3361   6 3632 0         AD      VREFER + 1
 0938   REF   7  LAST  824     25,3362   57∝646 1         XCH     TEM1B
 0939                         25,3363   22 007 0         ZL
 0940                         25,3364   0 0006 1         EXTEND
 0941   REF   8  LAST  824     25,3365   11∝646 0         DV      TEM1B
 0942   REF   2  LAST  116     25,3366   55∝651 0         TS      GRAD

 0943   REF  19  LAST  779     25,3367   3 4715 0         CAF     FIVE
```

MM = 67

RESTART PROTECT' RESET GOTOADDR IF CAME FROM HUNTEST.
DISABLES GRP4. FINE IF FROM HUNTEST.BUT MAY ALSO REMOVE RESTART PROTECTION OF N69 (P65).

ROLLC	XRNGERR	DNRNGERR
XXX.XX DEG	XXXX.X NM	XXXX.X NM

IF V-VQUIT NEG, STOP STEERING

PRECAUTIONARY.

VREF - V, HIGHEST VREF AT END OF TABLE.
IF VREF-V POS LOOP BACK
DECREMENT JJ , JJ CANNOT BE ZERO

V-VREF IN TEM1B (MUST BE POSITIVE NUM)

V(K+1) - V(K) (POS NUM)

GRAD = (V-VREF)/(VK+1 - VK) (POS NUM

```
0944  REF   5  LAST  745   25,3370  55∝650 1  BACK2   TS      MM
0945  REF   2  LAST  785   25,3371  3 4720 0          CAF     THIRTEEN
0946  REF   6  LAST  824   25,3372  27∝771 0          ADS     JJ
0947  REF 185  LAST  824   25,3373  50 000 1          INDEX   A
0948  REF   4  LAST  824   25,3374  4 3631 1          CS      VREFER
0949  REF   7  LAST  825   25,3375  51∝771 1          INDEX   JJ
0950  REF   5  LAST  825   25,3376  6 3632 0          AD      VREFER + 1      X(K+1) - X(K)
0951                       25,3377  0 0006 1          EXTEND
0952  REF   3  LAST  824   25,3400  7 1651 0          MP      GRAD
0953  REF   8  LAST  825   25,3401  51∝771 1          INDEX   JJ
0954  REF   6  LAST  825   25,3402  6 3631 0          AD      VREFER
0955  REF   6  LAST  825   25,3403  51∝650 0          INDEX   MM
0956  REF   2  LAST  116   25,3404  55∝652 0          TS      PX              PX = AK + GRAD (AK+1 - AK)
0957  REF   7  LAST  825   25,3405  11∝650 1          CCS     MM
0958  REF   1               25,3406  1 3370 1          TCF     BACK2
0959  REF   3  LAST  825   25,3407  57∝653 0          XCH     PX +1           ZERO PX +1  AND GET DREFR
0960  REF  21  LAST  823   25,3410  6 1637 1          AD      D
0961                       25,3411  0 0006 1          EXTEND
0962  REF   4  LAST  825   25,3412  7 1657 0          MP      PX + 5          F1
0963  REF 280  LAST  782   25,3413  52 155 1          DXCH    MPAC            MPAC = F1(D-DREF)

0964                       25,3414  0 0006 1          EXTEND
0965  REF  16  LAST  822   25,3415  4 1700 0          DCS     RDOT            FORM RDOTREF - RDOT
0966                       25,3416  20 001 1          DDOUBL
0967                       25,3417  20 001 1          DDOUBL
0968                       25,3420  20 001 1          DDOUBL                  SCALE UP BY 8 FOR THIS PHASE.
0969  REF   5  LAST  825   25,3421  6 1655 0          AD      PX + 3          RDOTREF
0970                       25,3422  0 0006 1          EXTEND
0971  REF   6  LAST  825   25,3423  7 1656 1          MP      PX + 4          F2
0972  REF   7  LAST  825   25,3424  6 1654 1          AD      PX +2           RTOGO
0973  REF 281  LAST  825   25,3425  20 155 1          DAS     MPAC            ADD F2(DADV1-DADVR)
0974  REF 282  LAST  825   25,3426  3 0154 1          CA      MPAC
0975  REF   2  LAST  117   25,3427  55∝770 1          TS      PREDANG
A0976                                                                        L/D = LOD +(THETA- PREDANG)/ Y
0977  REF 208  LAST  817   25,3430  0 6006 1          TC      INTPRET

0978                       25,3431   45242 1          SR3     DSU
0979  REF   7  LAST  814   25,3432   03702 1                  THETAH
0980                       25,3433   43014 0          BCN     BOFF
0981  REF   2  LAST  807   25,3434   03305 1                  GONEPAST
0982  REF   1               25,3435   53462 1                  GONEGLAD
0983  REF   4  LAST  803   25,3436   03747 0                  GONEBY
0984  REF   1               25,3437   53445 1                  HAVDNRNG
0985                       25,3440   43145 0          DLOAD   SET             SET GONEPAST IF GONEBY SET d LATCH IN -
0986  REF   1               25,3441   13765 1                  MAXRNG          DISPLAY = 9999.9 IF GONEBY          PLACE
0987  REF   3  LAST  825   25,3442   03065 1                  GONEPAST
0988  REF   3  LAST  276   25,3443   37716 0          STCALL  DNRNGERR
0989  REF   2  LAST  825   25,3444   53462 1                  GONEGLAD

0990  REF   4  LAST  825   25,3445   03716 1  HAVDNRNG STORE  DNRNGERR       = (PREDANG - THETA) /360
```

```
0991                                25,3446  77676 0          DCOMP
0993                                25,3447  56204 1          BOVB    DDV
0994  REP  7  LAST  821             25,3450  57343 1                  TCDANZIG
0995  REP  8  LAST  825             25,3451  03653 1                  PX
0996                                25,3452  40061 1          SL      BOV
0997                                25,3453  20206 1                  5
0998  REP  3  LAST  820             25,3454  53464 1                  GOMAXL/D
0999                                25,3455  40015 1          DAD     BOV
1000  REP  3  LAST  798             25,3456  03626 0                  LOD
1001  REP  4  LAST  826             25,3457  53464 1                  GOMAXL/D
1002  REP  8  LAST  820             25,3460  37634 1          STCALL  L/D
1003  REP  1                       25,3461  53470 1                  GLIMITER

R1004  GONEGLAD AND GOPOSMAX ENTRY POINTS FOR GLIMITER ...

1005                                25,3462  77745 1  GONEGLAD DLOAD
1006  REP  3  LAST  825             25,3463  13463 1                  GONEGLAD

1007                                25,3464  41234 1  GOMAXL/D RTB    DMP
1008  REP 14  LAST  799             25,3465  45707 0                  SIGNMPAC
1009  REP 14  LAST  822             25,3466  03624 1                  LAD
1010  REP  9  LAST  826             25,3467  03634 0          STORE   L/D

1011                                25,3470  45345 1  GLIMITER DLOAD  DSU
1012  REP  1                       25,3471  15160 1                  GMAX/2
1013  REP 22  LAST  825             25,3472  03640 0                  D
1014                                25,3473  43244 1          BPL     DAD
1015  REP  7  LAST  820             25,3474  53520 0                  LIMITL/D
1016  REP  2  LAST  826             25,3475  15160 1                  GMAX/2
1017                                25,3476  41240 1          BMN     DMP
1018  REP  1                       25,3477  53515 0                  GOPOSLAD
1019  REP  2  LAST  821             25,3500  15262 0                  2HS
1020                                25,3501  41325 0          PDDL    DMP
1021  REP  7  LAST  821             25,3502  03654 0                  LEQ
1022  REP  1                       25,3503  15330 0                  1/GMAX
1023                                25,3504  41215 1          DAD     DMP
1024  REP 15  LAST  826             25,3505  03624 1                  LAD
1025                                25,3506  56325 0          PDDL    DDV
1026  REP  1                       25,3507  15264 0                  2HSGMXSQ
1027  REP  5  LAST  822             25,3510  03622 1                  VSQUARE
1028                                25,3511  75415 0          DAD     SQRT
1029                                25,3512  51015 1          DAD     BPL
1030  REP 17  LAST  825             25,3513  03700 0                  RDOT
1031  REP  8  LAST  826             25,3514  53520 0                  LIMITL/D

1032                                25,3515  77745 1  GOPOSLAD DLOAD
1033  REP 16  LAST  826             25,3516  03624 1                  LAD
1034  REP 10  LAST  826             25,3517  03634 0  STOREL/D STORE  L/D
```

PALL SHORT IF NEG, OVERSHOOT IF POS

CLEAR OVFIND IF ON.
PX= DRANGE/D L/D = Y

(GO TO)

SET L/D = -LAD
(ANY NEGATIVE NUMBER WILL DO)

L/D = LAD SIGN(MPAC)

AND FALL INTO GLIMITER SECTION

IF GMAX/2-D POS, GO TO LIMITL/D

IF GMAX -D NEG, GO TO GOPOSLAD

2HS(GMAX-D) INTO PD

2HS(GMAX-D) (LEQ/GMAX+LAD) INTO PD

XLIM = SQRT(PD+(2HSGMAX/V)SQ)
IF RDOT+XLIM POS, GO TO LIMITL/D

```
1035                          25,3520  77745 1  LIMITL/D DLOAD
1036  REF  11  LAST  826      25,3521  03634 0           L/D
1037  REF   3  LAST  173      25,3522  17636 1           STODL  L/D1
1038  REF   6  LAST  826      25,3523  03822 1                  VSQUARE

1039                          25,3524  77614 1           BON                  NO LATERAL CONTROL IF PAST TARGET
1040  REF   4  LAST  825      25,3525  03305 1                  GONEPAST
1041  REF   1                 25,3526  53560 1                  L355
1042                          25,3527  43205 1           DMP    DAD           Y= KLAT VSQUARE + LATBIAS
1043  REF   3  LAST  799      25,3530  03632 0                  KLAT
1044  REF   1                 25,3531  15242 1                  LATBIAS       Y INTO PD
1045                          25,3532  51525 1  L350     PDDL   ABS           IF ABS(L/D)-L/DCMINR NEG, GO TO L353
1046  REF  12  LAST  827      25,3533  03634 0                  L/D
1047                          25,3534  50025 0           DSU    BMN
1048  REF   3  LAST  798      25,3535  03630 1                  L/DCMINR
1049  REF   1                 25,3536  53545 0                  L353
1050                          25,3537  75345 1           DLOAD  SIGN          IF K2ROLL LATANG NEG, GO TO L357
1051  REF   6  LAST  803      25,3540  03676 0                  LATANG
1052  REF   3  LAST  799      25,3541  03644 1                  K2ROLL
1053                          25,3542  71240 1           BMN    DLOAD
1054  REF   1                 25,3543  53624 1                  L357
1055                          25,3544  41542 1           SR1    PUSH          Y = Y/2
1056                          25,3545  75345 1  L353     DLOAD  SIGN          IF LATANG SIGN(K2ROLL)-Y POS, SWITCH
1057  REF   7  LAST  827      25,3546  03676 0                  LATANG
1058  REF   4  LAST  827      25,3547  03644 1                  K2ROLL
1059                          25,3550  77625 0           DSU
1060                          25,3551  71240 1           BMN    DLOAD
1061  REF   2  LAST  827      25,3552  53560 1                  L355
1062  REF   5  LAST  827      25,3553  03644 1                  K2ROLL
1063                          25,3554  57414 1           BONCLR DCOMP         IF NOSWITCH =1, K2ROLL= K2ROLL
10631 REF   2  LAST  818      25,3555  03210 1                  NOSWITCH
10632 REF   3  LAST  827      25,3556  53560 1                  L355
1064  REF   6  LAST  827      25,3557  03644 1           STORE  K2ROLL        K2ROLL = - K2ROLL

1065                          25,3560  56345 0  L355     DLOAD  DDV           ROLLC = ACOS(  (L/D1) / LAD)
1066  REF   4  LAST  827      25,3561  03636 1                  L/D1
1067  REF  17  LAST  826      25,3562  03624 1                  LAD           MPAC SET TO +-1 IF OVERFLOW***
1068                          25,3563  65542 1           SR1    ACOS
1069                          25,3564  43165 1           SIGN   CLEAR
1070  REF   7  LAST  827      25,3565  03644 1                  K2ROLL
10701 REF   3  LAST  827      25,3566  03270 1                  NOSWITCH
1071  REF  11  LAST  823      25,3567  03316 0           STORE  ROLLC

1072                          25,3570  77776 1  ENDEXIT  EXIT

1073  REF  31  LAST  689      25,3571  3 4676 1  OVERNOUT CA     BIT13        ENTRYDSP  =92D  B13
1074  REF   7  LAST  798      25,3572  7 0102 0           MASK   CM/FLAGS
1075                          25,3573  0 0006 1           EXTEND
1076  REF   1                 25,3574  1 3600 0           BZF    NODISKY       OMIT DISPLAY.
```

L REENTRY CONTROL


```
1077  REF   7  LAST  754   25,3575   3 1263 1            CA    ENTRYVN     ALL ENTRY DISPLAYS ARE DONE HERE.
1078  REF 234  LAST  783   25,3576   0 4555 0            TC    BANKCALL
1079  REF   2  LAST  531   25,3577     20621 0           CADR  REGODSPR    NO ABORT IF DISKY IN USE

1080                        25,3600   0 0004 0 NODISKY    INHINT
1081  REF   4  LAST  510   25,3601   10 067 1            CCS   NEWJOB      PROTECT READACCS GRP 5, IF SIDETRACKED.
1082  REF   3  LAST  510   25,3602   0 5057 0            TC    CHANG1
1083  REF  47  LAST  784   25,3603   0 4574 0 SERVNOUT   TC    POSTJUMP    ( COME HERE FROM P67.3)
1084  REF   5  LAST  759   25,3604     77132 1           CADR  SERVEXIT    AND END AVERAGEG JOB VIA  ENDOFJOB.
```

```
P1085           DISPLAY WHEN V IS LESS THAN VQUIT.

 1086                          25,3605   77776 1  STEEROFF EXIT
 1087  REF   4  LAST  824     25,3606   3 4753 1           CA     EBENTRY      PRECAUTIONARY.
 1088  REF  36  LAST  824     25,3607   54 003 0           TS     EBANK

 1089  REF  12  LAST  815     25,3610   3 4763 1           CA     PRIO16       2 LESS THAN NTRYPRIO.
 1090  REF  27  LAST  776     25,3611   0 5027 1           TC     NOVAC
 1091  REF  25  LAST  787     E6,1661                      EBANK= ACG          ANY EB HERE
 1092  REF   3  LAST  754     25,3612     02511 0          2CADR  P67.1        START UP REMAINDER OF P67
 1092                          25,3613     54066 0
A1093                                                                        RTOGO        LAT          LONG
A1094                                                                        XXXX.X NM    XXX.XX DEG   XXX.XX DEG

 1095  REF  28  LAST  784     25,3614   0 5261 1           TC     2PHSCHNG     INHINT/RELINT DONE.
 1096                          25,3615     00414 0          OCT    00414        4.41 RESTART FOR P67.1 DISPLAY JOB.
 1097                          25,3616     10035 0          OCT    10035        SERVICER 5.3 RESTART.

 1098  REF   1                 25,3617   3 3623 0           CA     P67.2CAD     HEREAFTER, DO LAT, LONG.
 1099  REF  14  LAST  824     25,3620   55=645 0           TS     GOTOADDR

 1100  REF 209  LAST  825     25,3621   0 6006 1           TC     INTPRET
 1101                          25,3622     77650 1          GOTO
 1102  REF   1                 25,3623     54530 0  P67.2CAD       P67.2        CONTINUE FOR LAT, LONG THIS TIME.

 1103                          25,3624     75345 1  L357    DLOAD  SIGN         L/D = L/DCMINR SIGN(L/D)
 1104  REF   4  LAST  827     25,3625     03630 1                 L/DCMINR
 1105  REF  13  LAST  827     25,3626     03634 0                 L/D
 1106  REF   5  LAST  827     25,3627     37636 0          STCALL L/D1
 1107  REF   4  LAST  827     25,3630     53560 1                 L355         (GO TO )
```

```
P1108   TABLE USED FOR SUB-ORBITAL REFERENCE TRAJECTORY CONTROL.
 1109                25,3631  00474 0  VREFER  DEC    .019288      REFERENCE VELOCITY SCALED V/51532.3946
 1110                25,3632  01235 1          DEC    .040809      13 POINTS ARE STORED AS THE INDEPENDENT
 1111                25,3633  02337 1          DEC    .076107      VARIABLE AND THEN SIX 13 POINT FUNCTIONS
 1112                25,3634  03721 0          DEC    .122156      OF V ARE STORED CONSECUTIVELY
 1113                25,3635  05230 0          DEC    .165546
 1114                25,3636  06213 1          DEC    .196012
 1115                25,3637  10550 0          DEC    .271945
 1116                25,3640  11717 0          DEC    .309533
 1117                25,3641  13314 0          DEC    .356222
 1118                25,3642  14736 0          DEC    .404192
 1119                25,3643  16255 1          DEC    .448067
 1120                25,3644  16457 0          DEC    .456023
 1121                25,3645  25570 1          DEC    .67918       HIGH VELOCITY FOR SAFETY

 1122                25,3646  77526 0          DEC    -.010337     DRANGE/DA   SCALED DRDA/(2700/805)
 1123                25,3647  77360 1          DEC    -.016550
 1124                25,3650  77106 0          DEC    -.026935
 1125                25,3651  76516 1          DEC    -.042039
 1126                25,3652  76071 0          DEC    -.058974
 1127                25,3653  75570 1          DEC    -.070721
 1128                25,3654  74861 0          DEC    -.098538
 1129                25,3655  74436 0          DEC    -.107482
 1130                25,3656  73212 1          DEC    -.147762
 1131                25,3657  71640 0          DEC    -.193289
 1132                25,3660  54557 1          DEC    -.602557
 1133                25,3661  40000 0          DEC    -.99999
 1134                25,3662  40000 0          DEC    -.99999

 1135                25,3663  77835 1          DEC    -.0478599 B-3  -DRANGE/DRDOT
 1136                25,3664  77563 1          DEC    -.0683663 B-3  SCALED((2VS/8 2700) DR/DRDOT)
 1137                25,3665  77354 0          DEC    -.1343468 B-3
 1138                25,3666  76712 1          DEC    -.2759846 B-3
 1139                25,3667  76066 0          DEC    -.4731437 B-3
 1140                25,3670  75322 0          DEC    -.6472087 B-3
 1141                25,3671  73237 0          DEC    -1.171693 B-3
 1142                25,3672  72104 1          DEC    -1.466382 B-3
 1143                25,3673  70301 1          DEC    -1.905171 B-3
 1144                25,3674  65635 1          DEC    -2.547990 B-3
 1145                25,3675  57311 0          DEC    -4.151220 B-3
 1146                25,3676  50575 0          DEC    -5.813617 B-3
 1147                25,3677  50575 0          DEC    -5.813617 B-3
```

```
P1148
 1149                25,3700   74443 1     DEC    -.0134001   B3  RDOTREF    SCALED (8 RDT/2VS)
 1150                25,3701   74333 1     DEC    -.013947    B3
 1151                25,3702   74433 0     DEC    -.013462    B3
 1152                25,3703   74763 0     DEC    -.011813    B3
 1153                25,3704   75432 0     DEC    -.0095631   B3
 1154                25,3705   75735 1     DEC    -.00806946  B3
 1155                25,3706   76200 1     DEC    -.008828    B3
 1156                25,3707   75735 1     DEC    -.00806946  B3
 1157                25,3710   75140 0     DEC    -.0109791   B3
 1158                25,3711   74075 0     DEC    -.0151496   B3
 1159                25,3712   73312 0     DEC    -.0179817   B3
 1160                25,3713   73732 0     DEC    -.0159061   B3
 1161                25,3714   73732 0     DEC    -.0159061   B3

 1162                25,3715   00015 0     DEC    .0008067        RANGE TO GO SCALED RTOGO/2700
 1163                25,3716   00066 1     DEC    .0032963            8.9
 1164                25,3717   00206 0     DEC    .0081852            22.1
 1165                25,3720   00431 1     DEC    .017148
 1166                25,3721   00712 0     DEC    .027926
 1167                25,3722   01136 1     DEC    .037
 1168                25,3723   02015 1     DEC    .063296
 1169                25,3724   02374 0     DEC    .077889
 1170                25,3725   03123 1     DEC    .098815
 1171                25,3726   04051 1     DEC    .127519
 1172                25,3727   05767 1     DEC    .186963
 1173                25,3730   07476 0     DEC    .238148
 1174                25,3731   11324 1     DEC    .294185185

 1175                25,3732   76272 1     DEC    -.051099        -AREF/805
 1176                25,3733   75472 1     DEC    -.074534
 1177                25,3734   74604 0     DEC    -.101242
 1178                25,3735   74210 1     DEC    -.116646
 1179                25,3736   74052 0     DEC    -.122360
 1180                25,3737   73735 1     DEC    -.127081
 1181                25,3740   73217 1     DEC    -.147453
 1182                25,3741   73013 1     DEC    -.155528
 1183                25,3742   73155 1     DEC    -.149565
 1184                25,3743   74151 1     DEC    -.118509
 1185                25,3744   76703 1     DEC    -.034907
 1186                25,3745   77575 0     DEC    -.007950
 1187                25,3746   77575 0     DEC    -.007950
```

L RESENTRY CONTROL


```
P1188
1189                25,3747   00112 0        DEC     .004491     DRANGE/D L/D SCALED Y/2700
1190                25,3750   00204 1        DEC     .008081
1191                25,3751   00407 1        DEC     .016030
1192                25,3752   01113 0        DEC     .035815
1193                25,3753   02161 0        DEC     .069422
1194                25,3754   03260 0        DEC     .104519
1195                25,3755   03717 0        DEC     .122
1196                25,3756   05411 0        DEC     .172407
1197                25,3757   10057 1        DEC     .252852
1198                25,3760   13476 0        DEC     .363148
1199                25,3761   20324 0        DEC     .512983
1200                25,3762   21677 1        DEC     .558519
1201                25,3763   21677 1        DEC     .558519     END OF STORED REFERENCE
```

P1202 REENTRY CONSTANTS.

R1203 DEFINED BY EQUALS

```
 1204  REF  1                  4721          DEC15     =     LOW4
A1205                                        GAMMAL1   =     22D

 12055                    25,3764   16631 1  MAXRNG    2OCT  16631 06755    DNRNGERR = 9999.9 IF GONEPAST=1
 12055                    25,3765   06755 0

 1206                     26,3144                      BANK  26
 1207  REF  2 LAST  805   26,2000                      SETLOC REENTRY1
 1208                     26,3144                      BANK

 1209  REF  2 LAST  805 TO  807'    41    41*          COUNT* $$/ENTRY

 1210  REF  3 LAST  815   27,3362          BARELY1   =     NEARONE        COMMON TO BOTH DISK,DANCE.DEPND IN TPF
A1211                                      1BITDP              COMMON TO BOTH DISK AND DANCE. DEPND IN VECPOINT.

 1212                     26,3144   02525 1  1/12TH    DEC   .083333      DP 1/12 USES HI WORD IN 1/3 BELOW
 1213                     26,3145   12525 0  1/3RD     2DEC  .3333333333  DP 1/3
 1213                     26,3146   12525 0
 12131 REF  2 LAST  763   27,3356          1/16TH    =     DP2(-4)
```

R1214

R1215 BELOW' VS = VSAT = 25766.1973 FT/SEC

R1216 RE = 21,202,900 FEET

```
 1217                     26,3147   04631 1  LEWD1     2DEC  .15
 1217                     26,3150   23146 0
 1218                     26,3151   03146 1  POINT1    2DEC  .1
 1218                     26,3152   14632 0
 1219                     26,3153   06314 1  POINT2    2DEC  .2           .2
 1219                     26,3154   31463 1
 1220                     26,3155   76314 0  DLEWD0    2DEC  - .05         -.05
 1220                     26,3156   71462 1
 1221                     26,3157   05075 0  GMAX/2    2DEC  .16          8 GS / 2
 1221                     26,3160   16051 1
 1222  REF 23 LAST  763   26,3331          3ZEROS    EQUALS HI6ZEROS
 1223                     26,3161   07777 1  NEAR1/4   2OCT  07777 00000   1/4 LESS 1 BIT IN UPPER PART.
 1223                     26,3162   00000 1
 1224                     26,3163   00236 0  C18       2DEC  .0097026346   500/2VS
 1224                     26,3164   36763 0
 1225                     26,3165   00204 1  Q7FKDMIN  2DEC  .0080745342   6.5/805  (Q7F +KDMIN) = 6 + .5)
 1225                     26,3166   11303 1
 1226  REF  3 LAST  833   27,3356          C1/16     =     DP2(-4)

 1227                     26,3167   05260 0  Q3        2DEC  .167003132    .07 2VS/21600
 1227                     26,3170   05572 1
```

```
1228                26,3171  12343 0  Q5       2DEC    .326388889      .3 23500/21600
1228                26,3172  21616 0
1229                26,3173  01073 1  Q8       2DEC    .0349           2 DEG, APPROX 820/23500
1229                26,3174  31515 1
1230                26,3175  00172 0  Q7P      2DEC    .0074534161     6/805    (VALUE OF Q7 IN FIXED MEM.)
1230                26,3176  03571 1
1231  REF  6 LAST 816  26,3327          Q19      =       HALVE           Q19 = .5
1232                26,3177  00573 0  Q21      2DEC    .0231481481     500/21600
1232                26,3200  10230 1
1233                26,3201  76226 0  Q22      2DEC    -.053333333     -1152/21600
1233                26,3202  45761 0
1234                26,3203  13132 0  VLMIN    2DEC    .34929485       18000/2 VS
1234                26,3204  33062 0
1235  REF  2 LAST 802  26,3321          VMIN     =       FOURTH          (VS/2) / 2VS
1236                26,3205  00160 0  C12      2DEC    .00684572901    32 28500/(21202900 2 PI)
1236                26,3206  05104 1
1237                26,3207  11322 1  1/KB1    2DEC    .29411765       1 / 3.4
1237                26,3210  32265 1
1238                26,3211  75047 0  -1/KB2    2DEC    -.0057074322 B4 = -1/(  .0034  2  VS)  EXP +4
1238                26,3212  72454 1
1239                26,3213  00475 1  VQUIT    2DEC    .019405269      1000 /2VS
1239                26,3214  35746 1
1240                26,3215  06751 1  C20      2DEC    .21739130       (175 FPSS) LIFT UP IF ABOVE C20
1240                26,3216  27515 0
12405               26,3217  05441 0  C21      2DEC    .17391304       140/805
12405               26,3220  14412 0
1241                26,3221  00022 1  25NM     2DEC    .0011574074     25/21600        (25 NAUT MILES)
1241                26,3222  36641 1
1242                26,3223  01003 0  K1D      2DEC    .0314453125     =C16 805/256 = .01 805/256
1242                26,3224  06315 0
1243                26,3225  71435 0  K2D      2DEC    -.201298418     -C17 2VS/256 = -.001 2VS/256
1243                26,3226  75516 1
1244                26,3227  32047 0  KVSCALE  2DEC    .81491944       12800/(2 VS .3048)
1244                26,3230  24367 0
1245                26,3231  37200 1  KASCALE  2DEC    .97657358       5.85 16384/(4 .3048 100 805)
1245                26,3232  05636 1
1246                26,3233  00046 0  KTETA    2DEC*   .383495203 E2 B-14*     1000 2PI/16384(163.84)
1246                26,3234  13137 0
1247                26,3235  00017 1  KT1      2DEC*   .157788327 E 2 B-14*    RE(2PI)/2 VS(16384) 163.84
1247                26,3236  30730 0
1248                26,3237  00040 0  .05G     2DEC    .002            .05/25
1248                26,3240  30447 0
1249                26,3241  00000 1  LATBIAS  2DEC    .00003          APPRX .5 NM/ 4(21600/2 PI)
1249                26,3242  17565 1
1250                26,3243  01727 1  KWE      2DEC    .120056652 B-1
1250                26,3244  20103 1
1251                26,3245  00121 0  KACOS    2DEC    .004973592      1/32(2PI)
1251                26,3246  17460 0
1252                26,3247  00400 0  CHOOK    2DEC    1 B-6           .25/16
1252                26,3250  00000 1
```

```
1253                          26,3251  01252 0  1/24TH   2DEC   .0833333333 B-1
1253                          26,3252  25253 1
1254                          26,3253  24365 1  CH1      2DEC   .32 B1          16 CH1/25 = 16 (1) /25
1254                          26,3254  30244 0
1255                          26,3255  77152 1  KC3      2DEC   -.0247622232    -(4 VS VS/ 2 PI 805 RE)
1255                          26,3256  51354 1
1256                          26,3257  00338 1  VRCONT   2DEC   .0135836886     700/2 VSAT
1256                          26,3260  21610 0
1257  REF  10  LAST  769      26,3327          HALVE    EQUALS HIDPHALF
1258  REF   2  LAST  770      26,3321          FOURTH   EQUALS HIDP1/4

1259  REF   7  LAST  834      26,3327          1/GMAX   EQUALS HALVE          4/GMAX = 4 / 8
1260                          26,3281  00433 0  2HS      2DEC   .0172786611     2 28500 25 32.2/(4 VS VS)
1260                          26,3282  02775 0
1261                          26,3283  00000 1  2HSGMXSQ 2DEC   .0000305717    (2 28500 8 32.2/ 4 VS VS)SQ
1261                          26,3284  20017 0
1262                          26,3285  77765 0  C001     2DEC   -.000625       -(4/25)/256    LEO/D0 CONST
1262                          26,3286  70243 0
1263                          26,3287  31463 1  POINT8   2DEC   .8
1263                          26,3270  06315 0
1264                          26,3271  00541 1  2C1HS    2DEC   .0215983284     2 1.25 28500 805/(2 VS)SQ
1264                          26,3272  33575 0
1265                          26,3273  00146 1  PT1/16   2DEC   .1 B-4
1265                          26,3274  14632 0
1266                          26,3275  00052 0  1/K44    2DEC   .00260929464   2 VS/19749550
1266                          26,3276  30013 0
1267                          26,3277  20411 1  VFINAL   2DEC   .51618016      26600/2 VS
1267                          26,3300  03041 1
1268                          26,3301  20610 1  VFINAL1  2DEC   .523942273     = 27000 / 2 VS
1268                          26,3302  10513 1
1269                          26,3303  11473 1  1/KA1    2DEC   .30048077      25/(1.3 64)
1269                          26,3304  02355 0
1270                          26,3305  00203 0  KA2      2DEC   .008           .2 / 25
1270                          26,3306  02234 0
1271                          26,3307  16237 0  KA3      2DEC   .44720497      = 90  4/805
1271                          26,3310  00146 1
1272                          26,3311  01456 1  KA4      2DEC   .049689441     40/805
1272                          26,3312  03450 0
1273  REF   2  LAST  807      26,3311          QTMIN    =      KA4             = 40/805 = .049689441
1274                          26,3313  56232 1  -HSCALED 2DEC   -.55305018     -28500/2 VS
1274                          26,3314  72332 0
1275                          26,3315  77000 1  -KSCALE  2DEC   -.0312424837   -805/VS
1275                          26,3316  43741 1
1276                          26,3317  36702 1  COS15    2DEC   .965
1276                          26,3320  21727 0
1277  REF   1                 26,3144          LATSLOPE EQUALS 1/12TH
R1278       ... END OF RE-ENTRY CONSTANTS ...
```

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P0001

```
0010                        35,3755                 BANK  35

0011  REF  1                37,2000                 SETLOC BODYATT
0012                        37,3373                 BANK

0013  REF  1                                        COUNT  37/CMBAT

A0014                                               PDL 12D - 15D SAFE.

R0015   VALUES OF GIMBAL AND BODY ANGLES VALID AT PIP TIME ARE SAVED DURING  READACCS.

0017  REF  10  LAST  802    E7,1451                 EBANK= RTINIT       LET INTERPRETER SET EB

0018  REF 210  LAST  829    37,3373  0 6006 1  CM/POSE  TC    INTPRET      COME HERE VIA AVEGEXIT.

0019                        37,3374  77201 1           SETPD  VLOAD
0020                        37,3375  00001 0                  0
0021  REF  16  LAST  802    37,3376  01177 1                  VN
0022                        37,3377  63361 0           VXSC   PDVL
0023  REF   1               37,3400  37672 0                  -KVSCALE
0024  REF  10  LAST  789    37,3401  01714 1                  UNITW
0025                        37,3402  74235 0           VXV    VXSC
0026  REF  10  LAST  803    37,3403  01760 1                  UNITR
0027  REF   1               37,3404  15244 1                  KWE
0028                        37,3405  45455 1           VAD    STADR
0029  REF   3  LAST  802    37,3406  74251 1           STORE  -VREL

0030                        37,3407  72056 1           UNIT   LXA,1
0031                        37,3410  00044 1                  36D
0032  REF   6  LAST  804    37,3411  03542 1           STORE  UXA/2

0033                        37,3412  57435 1           VXV    VCOMP
0034  REF  11  LAST  836    37,3413  01760 1                  UNITR
0035                        37,3414  66256 0           UNIT   SSP
0036  REF  32  LAST  741    37,3415  00051 0                  S1
0037                        37,3416  00476 1  SPVQUIT  DEC    .019405
0038                        37,3417  77300 1           TIX,1  VLOAD
0039  REF   1               37,3420  77422 0                  CM/POSE2
0040  REF   2  LAST  116    37,3421  03534 0                  OLDUYA
0041  REF   3  LAST  772    37,3422  03550 1  CM/POSE2 STORE  UYA/2

0042  REF   3  LAST  836    37,3423  03534 0           STORE  OLDUYA

0043                        37,3424  57435 1           VXV    VCOMP
0044  REF   7  LAST  836    37,3425  03542 1                  UXA/2
0045                        37,3426  77772 0           VSL1
0046  REF   3  LAST  772    37,3427  03556 1           STORE  UZA/2
```

KVSCALE = (12800/ .3048) /2VS

KVSCALE = .81491944
FULL UNIT VECTOR
VREL = V - WE*R

SAVE FOR ENTRY GUIDANCE. REF COORDS

ABVAL(-VREL) TO X1
-UVREL REF COORDS

.5 UNIT REF COORDS
THE FOLLOWING IS TO PROVIDE A STABLE
UN FOR THE END OF THE TERMINAL PHASE.
1000/ 2 VS
IF V-VQUIT POS, BRANCH.
SAVE UYA IN OLDUYA
OTHERWISE CONTINUE TO USE OLDUYA.
REF COORDS

RESTORE, OR SAVE AS CASE MAY BE.

FINISH OBTAINING TRAJECTORY TRIAD.
REF COORDS

```
0047                        37,3430  77751 1          TLOAD                PICK UP CDUX, CDUY, CDUZ CORRESPONDING
0048  REF  3  LAST  778     37,3431  03270 1                   ACG/PIP     TO PIPUP TIME IN 2S,C  AND SAVE.
0049                        37,3432  14031 0  CM/TRIO  STODL   24D
0050                        37,3433  00032 0                   25D         AIG/PIP

0051                        37,3434  41434 1          RTB      PUSH        TO PDL0
0052  REF  7  LAST  447     37,3435  45510 1                   CDULOGIC
0053                        37,3436  77746 1          COS
0054  REF  2  LAST  116     37,3437  17564 0          STODL    UBX/2       CI /2
A0055                                                                     AIG/PIP FROM PDL 0
0056                        37,3440  57556 0          SIN      DCOMP
0057  REF  3  LAST  837     37,3441  17570 0          STODL    UBX/2 +4    -SI /2
0058                        37,3442  00033 1                   26D         AMG/PIP
0059                        37,3443  41434 1          RTB      PUSH        TO PDL 0
0060  REF  8  LAST  837     37,3444  45510 1                   CDULOGIC
0061                        37,3445  65356 1          SIN      PDDL        XCH PDL 0. SAVE SM /2
0062                        37,3446  65346 0          COS      PDDL        CM /2 TO PDL 2
0063                        37,3447  00001 0                   0           SM /2
0064                        37,3450  74276 1          DCOMP    VXSC
0065  REF  4  LAST  837     37,3451  03564 0                   UBX/2
0066                        37,3452  77772 0          VSL1                 NOISE WONT OVFL.
0067  REF  2  LAST  116     37,3453  17572 1          STODL    UBY/2       =(-SMCI, NOISE, SMSI) /2
0068                        37,3454  00003 1                   2           CM /2  REPLACES NOISE
0069  REF  3  LAST  837     37,3455  17574 1          STODL    UBY/2 +2    UBY/2=(-SMCI, CM, SMSI)/2
0070                        37,3456  00031 0                   24D         ACG/PIP
0071                        37,3457  41434 1          RTB      PUSH        TO PDL 4
0072  REF  9  LAST  837     37,3460  45510 1                   CDULOGIC
0073                        37,3461  65356 1          SIN      PDDL        XCH PDL 4. SAVE SO /2
0074                        37,3462  74346 0          COS      VXSC        CO /2
0075  REF  4  LAST  837     37,3463  03572 1                   UBY/2
0076  REF  5  LAST  837     37,3464  17572 1          STODL    UBY/2       UBY/2=(-COSMCI, COCM, COSMSI)/4
0077                        37,3465  00005 1                   4D          SO /2
0078                        37,3466  57405 1          DMP      DCOMP
0079  REF  5  LAST  837     37,3467  03570 0                   UBX/2 +4    -SI /2
0080                        37,3470  77615 0          DAD
0081  REF  6  LAST  837     37,3471  03572 1                   UBY/2        INCREMENT BY (SOSI /4)
0082  REF  7  LAST  837     37,3472  17572 1          STODL    UBY/2
A0083                                                                     SO /2 FROM PDL 4
0084                        37,3473  43205 1          DMP      DAD
0085  REF  6  LAST  837     37,3474  03564 0                   UBX/2       CI /2
0086  REF  8  LAST  837     37,3475  03576 0                   UBY/2 +4
0087  REF  9  LAST  837     37,3476  27576 0          STOVL    UBY/2 +4    YB/4                PLATFORM COORDS

A0088                                                                                 YB = (-COSMCI + SOSI , COCM , COSMSI + SOCI )

0089  REF 10  LAST  837     37,3477  03572 1                   UBY/2
0090                        37,3500  72505 1          VXM      VSL2
0091  REF 33  LAST  790     37,3501  01736 1                   REFSMMAT    .5 UNIT
0092  REF 11  LAST  837     37,3502  17572 1          STODL    UBY/2       YB/2  DONE                  REF COORDS
```

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```
A0093
 0094                                  37,3503   76561 1     VXSC   VSL1          CM /2 FROM PDL 2
 0095   REF   7  LAST  837             37,3504   03564 0            UBX/2
 0096   REF   8  LAST  838             37,3505   17564 0     STODL  UBX/2         =( CMCI, NOISE, -CMSI)/2
 0097                                  37,3506   77626 0     STADR                SM /2 FROM PDL 0
 0098   REF   9  LAST  838             37,3507   50211 0     STOVL  UBX/2 +2      SM /2 REPLACES NOISE
 0099   REF  10  LAST  838             37,3510   03564 0            UBX/2         XB/2              PLATFORM COORDS

A0100                                                                  XB = ( CMCI , SM , -CMSI )

 0101                                  37,3511   76505 0     VXM    VSL1
 0102   REF  34  LAST  837             37,3512   01736 1            REFSMMAT      .5 UNIT
 0103   REF  11  LAST  838             37,3513   03564 0     STORE  UBX/2         XB/2  DONE                REF COORDS

 0104                                  37,3514   76435 1     VXV    VSL1
 0105   REF  12  LAST  837             37,3515   03572 1            UBY/2
 0106   REF   2  LAST  116             37,3516   27600 1     STOVL  UBZ/2         ZB/2  DONE                REF COORDS

A0107
A0108                                                                  EQUIVALENT TO
                                                                       ZB = ( SOSMCI + COSI , -SOCM , -SOSMSI + COCI)

 0109   REF   8  LAST  836             37,3517   03542 1            UXA/2         -UVREL/2 = -UVA/2
 0110                                  37,3520   53435 0     VXV    UNIT          GET UNIT(-UVREL*UBY)/2  = UL/2
 0111   REF  13  LAST  838             37,3521   03572 1            UBY/2         YB/2
 0112                                  37,3522   50206 0     PUSH   DOT           UL/2  TO PDL 0,5
 0113   REF   4  LAST  836             37,3523   03556 1            UZA/2         UNA/2
 0114   REF   3  LAST  544             37,3524   24021 1     STOVL  COSTH         COS(ROLL)/4
 0115                                  37,3525   00001 0            0             UL/2

 0116                                  37,3526   77641 1     DOT
 0117   REF   4  LAST  836             37,3527   03550 1            UYA/2
 0118   REF   3  LAST  544             37,3530   34023 1     STCALL SINTH         -SIN(ROLL)/4
 0119   REF   3  LAST  544             37,3531   47211 0            ARCTRIG
 0120                                  37,3532   24007 0     STOVL  6D            -(ROLL/180) /2
 0121   REF  14  LAST  838             37,3533   03572 1            UBY/2
 0122                                  37,3534   72441 0     DOT    SL1           -UVA.UBY = -SIN(BETA)
 0123   REF   9  LAST  838             37,3535   03542 1            UXA/2         -UVREL/2
 0124                                  37,3536   77736 0     ARCSIN
 0125                                  37,3537   24010 0     STOVL  7D            -(BETA/180) /2
 0126   REF  12  LAST  838             37,3540   03564 0            UBX/2         XB/2
 0127                                  37,3541   77641 1     DOT                  UL.UBX = -SIN(ALFA)
 0128                                  37,3542   00001 0            0             UL/2
 0129   REF   4  LAST  838             37,3543   24023 0     STOVL  SINTH         -SIN(ALFA)/4
 0130                                  37,3544   77641 1     DOT                  UL/2 FROM PDL 0
 0131   REF   3  LAST  838             37,3545   03600 1            UBZ/2
 0132   REF   4  LAST  838             37,3546   34021 0     STCALL COSTH         COS(ALFA)/4
 0133   REF   4  LAST  838             37,3547   47211 0            ARCTRIG
 0134                                  37,3550   24011 1     STOVL  8D            -(ALFA/180) /2
 0135   REF  12  LAST  836             37,3551   01760 1            UNITR         UR/2                REF COORDS
 0136                                  37,3552   72441 0     DOT    SL1
```

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```
0137  REF  5 LAST 838   37,3553  03556 1            UZA/2      MORE ACCURATE AT LARGE ARG.
0138                    37,3554  77726 1      ARCCOS
0139                    37,3555  00013 0      STORE  10D       (-GAMA/180)/2

0140                    37,3556  77551 0      TLOAD  EXIT      ANGLES IN MPAC IN THE ORDER
A0141                                                         -( (ROLL, BETA, ALFA) /180)/2
0142                    37,3557  00007 0             6D        THESE VALUES CORRECT AT PIPUP TIME.
R0143 SPACER
```

L CM BODY ATTITUDE

P0144 BASIC SUBROUTINE TO UPDATE ATTITUDE ANGLES

```
 0145   REP  26  LAST  829   E6,1661                          EBANK= ACC

 0146   REP   1              37,3560  3 4752 0  CM/ATUP  CA    EBACC
 0147   REP  37  LAST  829   37,3561  54 003 0           TS    EBANK
 0148   REP  17  LAST  737   37,3562  50 120 1  CMTR1    INDEX PIXLOC
 0149                        37,3563  4 0012 0           CS    10D          (GAMA/180)/2
 0150   REP   2  LAST  110   37,3564  57∝722 1           XCH   GAMA
 0151   REP  74  LAST  779   37,3565  54 001 1           TS    L

 0152                        37,3566  0 0004 0           INHINT
A0153                                                          MUST REMAIN INHINTED UNTIL UPDATE OF BODY
A0154                                                          ANGLES, SO THAT GAMDIFSW IS VALID FIRST PASS
A0155                                                          INDICATOR.

 0156   REP   8  LAST  827   37,3567  4 0102 0           CS    CM/FLAGS
 0157   REP  23  LAST  732   37,3570  7 4700 0           MASK  BIT11        GAMDIFSW=94D BIT11   INITLY=0
 0158                        37,3571  0 0006 1           EXTEND             DONT CALC GAMA DOT UNTIL HAVE FORMD
A0159                                                                      ONE DIFFERENCE.
 0160   REP   1              37,3572  1 3575 1           BZF   DOGAMDOT     IS OK, GO ON.
 0161   REP   9  LAST  840   37,3573  26 102 0           ADS   CM/FLAGS     KNOW BIT IS 0
 0162   REP   1              37,3574  0 3610 0           TC    NOGAMDOT     SET GAMDOT = 0

 0163   REP  75  LAST  840   37,3575  4 0001 1  DOGAMDOT CS    L
 0164   REP   3  LAST  840   37,3576  6 1722 1           AD    GAMA         DEL GAMA/360= T GAMDOT/360
 0165                        37,3577  0 0006 1           EXTEND
 0166   REP   1              37,3600  7 3673 1           MP    TCDU         TCDU = .1 SEC,   T = 2 SEC.
 0167   REP   2  LAST  110   37,3601  55∝723 1           TS    GAMDOT       GAMA DOT TCDU / 180

 0168                        37,3602  0 0006 1           EXTEND             IGNORE GAMDOT IF LEQ  .5 DEG/SEC
 0169                        37,3603  6 3605 1           BZMF  +2
 0170                        37,3604  4 0000 0           COM
 0171   REP  20  LAST  824   37,3605  6 4715 0           AD    FIVE
 0172                        37,3606  0 0006 1           EXTEND
 0173                        37,3607  6 3612 1           BZMF  +3           SET GAMDOT=+0 AS TAG IF TOO SMALL.

 0174   REP 154  LAST  788   37,3610  3 4714 1  NOGAMDOT CA    ZERO         COME HERE INHINTED.
 0175   REP   3  LAST  840   37,3611  55∝723 1           TS    GAMDOT
A0176                                                          FOR NOW LEAVE IN 2S,C
A0177                                                          UPDATE ANGLES BY CORRECTING EULER ANG
A0178                                                          FOR ACCRUED INCREMENT SINCE PIPUP
A0179                                                          R = R EUIL + R(NOW) -R(PIPUP)
 0180   REP 283  LAST  825   37,3612  4 0154 0           CS    MPAC         GET (R EUL/180) /2
 0181                        37,3613  6 0000 1           DOUBLE             POSSIBLE OVERFLOW
 0182   REP   1              37,3614  0 3663 1           TC    CORANGOV     CORRECT FOR OVFL IF ANY
 0183                        37,3615  0 0006 1           EXTEND
 0184   REP   3  LAST  778   37,3616  61∝672 0           SU    ROLL/PIP     GET INCR SINCE PIPUP
 0185   REP   3  LAST  778   37,3617  6 1664 1           AD    ROLL/180     ONLY SINGLE OVFL POSSIBLE.
 0186   REP   2  LAST  840   37,3620  0 3663 1           TC    CORANGOV     CORRECT FOR OVFL IF ANY
```

```
0187   REP   2  LAST  114   37,3621  55=770 1          TS      TEMPROLL

0188   REP 284  LAST  840   37,3622  4 0156 1          CS      MPAC +2      GET (ALPA EUL/180) /2
0189                        37,3623  6 0000 1          DOUBLE               SAME AS FOR ROLL. NEEDED FOR EXT ATM DAP
0190   REP   3  LAST  840   37,3624  0 3663 1          TC      CORANGOV     CORRECT FOR OVFL IF ANY
0191                        37,3625  0 0006 1          EXTEND
0192   REP   2  LAST  109   37,3626  61=673 1          SU      ALPA/PIP
0193   REP   3  LAST  173   37,3627  6 1665 0          AD      ALPA/180
0194   REP   4  LAST  841   37,3630  0 3663 1          TC      CORANGOV     CORRECT FOR OVFL IF ANY
0195   REP   2  LAST  114   37,3631  55=771 0          TS      TEMPALPA

0196   REP 285  LAST  841   37,3632  4 0155 1          CS      MPAC +1      GET (BETA EUL/180) /2
0197                        37,3633  6 0000 1  CMTR2   DOUBLE
0198                        37,3634  0 0006 1          EXTEND
0199   REP   3  LAST  778   37,3635  61=674 0          SU      BETA/PIP
0200   REP   3  LAST  778   37,3636  6 1666 0          AD      BETA/180
0201   REP   2  LAST  114   37,3637  57=772 1          XCH     TEMPBETA     OVFL NOT EXPECTED.

0202   REP   3  LAST  526   37,3640  3 4744 1          CA      EBANK3
0203   REP  38  LAST  840   37,3641  54 003 0          TS      EBANK

0204   REP   1               E3,1446                   EBANK=  PHSNAME5
0205                        37,3642  0 0006 1          EXTEND
0206   REP   1               37,3643  3 3675 0          DCA     REPOSADR     THIS ASSUMES THAT THE   TC   PHASCHNG
0207   REP   2  LAST  841   37,3644  53=447 0          DXCH    PHSNAME5     IS NOT CHANGED IN       OCT  10035
A0208                                                                       SERVICER.

0209   REP   2  LAST  840   37,3645  3 4752 0          CA      EBACG
0210   REP  39  LAST  841   37,3646  54 003 0          TS      EBANK

0211   REP  27  LAST  840   E6,1661                   EBANK=  ACG
0212                        37,3647  0 0006 1  REDOPOSE EXTEND              RE-STARTS COME HERE
0213   REP   3  LAST  841   37,3650  3 1771 1          DCA     TEMPROLL
0214   REP   4  LAST  840   37,3651  53=665 1          DXCH    ROLL/180
0215   REP   3  LAST  841   37,3652  3 1772 1          CA      TEMPBETA
0216   REP   4  LAST  841   37,3653  55=666 1          TS      BETA/180

0217                        37,3654  0 0003 1          RELINT

0218   REP 211  LAST  836   37,3655  0 6006 1          TC      INTPRET      CANT TC DANZIG AFTER PHASCHNG.
0219                        37,3656   51575 1  CM/POSE3 VLOAD   ABVAL        RETURN FROM CM/ATUP.  (RESTART)
0220   REP  17  LAST  836   37,3657   01177 1          VN                   2(-7)  M/CS
0221   REP   8  LAST  536   37,3660   03723 1          STORE   VMAGI        FOR DISPLAY ON CALL.

0222                        37,3661   77650 1          GOTO
0223   REP   5  LAST  799   37,3662   03324 1                  POSEXIT      ENDEXIT, STARTENT, OR SCALEPOP.

0224   REP  76  LAST  840   37,3663  54 001 1  CORANGOV TS      L
0225   REP 176  LAST  788   37,3664  0 0002 0          TC      Q
0226   REP 186  LAST  825   37,3665  50 000 1          INDEX   A
```

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```
0227  REP  1                    37,3666  3 4673 1            CA      LIMITS
0228  REP  77  LAST  841        37,3667  26 001 1            ADS     L
0229  REP 177  LAST  841        37,3670  0 0002 0            TC      Q          COSTS 2 MCT TO USE. SEE ANGOVCOR.

0230                            37,3671   45730 1  -KVSCALE 2DEC    -.81491944 -12800/(2 VS .3048)
0230                            37,3672   53410 1
0231                            37,3673   03146 1  TCDU     DEC     .1         TCDU = .1 SEC.

0232  REP  28  LAST  841        E6,1661                      EBANK=  ACG
0233  REP  1                    37,3674   03647 1  REPOSADR 2CADR   REDOPOSE
0233  REP  1                    37,3675   76066 0
```

L P37,P70 USER=S PAGE NO. 1 E0 S3

```
 0001                        31,3215                 BANK   31
 00012  REF  1               36,2000                 SETLOC RTE1
 00014                       36,2502                 BANK

 0002   REF  3  LAST  275    E7,1631                 EBANK= RTEDVD
 0003   REF  1                                      COUNT  31/P37

R0050   PROGRAM DESCRIPTION - P37, RETURN TO EARTH

R0051   DESCRIPTION
R0052     A RETURN TO EARTH TRAJECTORY IS COMPUTED PROVIDED THE CSM IS OUTSIDE THE LUNAR SPHERE OF INFLUENCE AT THE
R0054   TIME OF IGNITION. INITIALLY A CONIC TRAJECTORY IS DETERMINED AND RESULTING IGNITION AND REENTRY PARAMETERS ARE
R0056   DISPLAYED TO THE ASTRONAUT. THEN IF THE ASTRONAUT SO DESIRES, A PRECISION TRAJECTORY IS DETERMINED WITH THE
R0058   RESULTING IGNITION AND REENTRY PARAMETERS DISPLAYED. UPON FINAL ACCEPTANCE BY THE ASTRONAUT, THE PROGRAM
R0060   COMPUTES AND STORES THE TARGET PARAMETERS FOR RETURN TO EARTH FOR USE BYSPS PROGRAM (P40) OR RCS PROGRAM (P41).

R0080   CALLING SEQUENCE
R0081     L       TC      P37

R0100   SUBROUTINES CALLED
R0101     PREC100
R0102       V2T100
R0103       RTENCK2
R0104       RTENCK3
R0105       TIMERAD
R0106       PARAM
R0107     V2T100
R0108       GAMDV10
R0109       XT1LIM
R0110       DVCALC
R0111     RTENCK1
R0112       INTSTALL
R0113       INTEGRVS
R0114     RTEVN
R0115       RTEDISP
R0116       TMRAD100
R0117       AUGEKUGL
R0118       LAT-LONG
R0119     TMRAD100
R0120       TIMERAD
R0121     INVC100
R0122       CSMPREC
R0123     GETERAD
R01235    TIMETHET
R0124     P370ALRM
R0125     VN1645
R0126     POLY

R0150   ERASABLE INITIALIZATION REQUIRED
R0151     CSM STATE VECTOR
```

```
R0152   NJETSFLG      NUMBER OF JETS IF THE RCS PROPULSION SYSTEM SELECTED   STATE FLAG     0=4 JETS  1=2 JETS

R0160   ASTRONAUT INPUT
R0161     SPRTETIG    TIME OF IGNITION (OVERLAYS TIG)                        DP     B28     CS
R0163     VPRED       DESIRED CHANGE IN VELOCITY AT TIG(PROGRM COMPUTED IF 0) DP     B7      METERS/CS
R0165     GAMMAEI     DESIRED FLIGHT PATH ANGLE AT REENTRY (COMPUTED IF 0)   DP     B0      REVS  + ABOVE HORIZ.
R0167     OPTION2     PROPULSION SYSTEM OPTION                               SP     B14     1=SPS, 2=RCS

R0180   OUTPUT
R0181     CONIC OR PRECISION TRAJECTORY DISPLAY
R0182       VPRED     VELOCITY MAGNITUDE AT 400,000 FT. ENTRY ALTITUDE       DP     B7      METERS/CS
R0184       T3TOT4    TRANSIT TIME TO 400,000 FT. ENTRY ALTITUDE             DP     B28     CS
R0186       GAMMAEI   FLIGHT PATH ANGLE AT 400,000 FT. ENTRY ALTITUDE        DP     B0      REVS  + ABOVE HORIZON
R0188       DELVLVC   INITIAL VELOCITY CHANGE VECTOR IN LOCAL VERTICAL COORD. VECTOR B7      METERS/CS
R0190       LAT(SPL)  LATITUDE OF THE LANDING SITE                           DP     B0      REVS
R0192       LNG(SPL)  LONGITUDE OF THE LANDING SITE                          DP     B0      REVS
R0194     TARGETING COMPUTATION DISPLAY
R0195       TIG       RECOMPUTED TIG BASED ON THRUST OPTION                  DP     B28     CS
R0197       TTOGO     TIME FROM TIG                                          DP     B28     CS
R0199       +MGA      POSITIVE MIDDLE GIMBAL ANGLE                           DP     B0      REVS  -.02 IF REFSMFLG=0
R0201     THRUST PROGRAM COMMUNICATION
R0202       XDELVFLG  EXTERNAL DELTA V FLAG                                  STATE FLAG     SET 0 FOR LAMBERT AIMPT
R0204       NORMSW    LAMBERT AIMPT ROTATION SWITCH                          STATE FLAG     SET 0 FOR NO ROTATION
R0206       ECSTEER   CROSS PRODUCT STEERING CONSTANT                        SP     B2      SET 1
R0208       RTARG     CONICALLY INTEGRATED REENTRY POSITION VECTOR           VECTOR B29     METERS
R0210       TPASS4    REENTRY TIME                                           DP     B28     CS

0243  REF  87  LAST  815   36,2502  0 5301 0  P37       TC      PHASCHNG     P37 IS NOT RESTARTABLE.
0244                        36,2503   00004 0            OCT     4

0245  REF 212  LAST  841   36,2504  0 6006 1            TC      INTPRET
0246                        36,2505   66170 1            AXT,1   SXA,1
0247                        36,2506   04000 0            OCT     04000
0248  REF   5  LAST  640   36,2507   03424 0                    ECSTEER
0249                        36,2510   77776 1            EXIT
0250  REF   1               36,2511  3 3242 0            CAF     V6N33RTE     INPUT TIG   STORED IN SPRTETIG
0251  REF   1               36,2512  0 3231 1            TCR     P370GOF                  OVERLAYED WITH TIG
0252                        36,2513  1 2511 1            TCF     -2           DESPLAY NEW DATA
0253  REF   1               36,2514  3 3246 1            CAF     V6N60RTE     INPUT REENTRY ANGLE IN GAMMAEI
0254  REF   1               36,2515  0 3205 0            TCR     P37GFRB1       AND DESIRED DELTA V IN RTEDVD
0255                        36,2516  1 2514 1            TCF     -2           DISPLAY NEW DATA
0500  REF 213  LAST  844   36,2517  0 6006 1  RTE299     TC      INTPRET
0501                        36,2520   71331 0            SSP     DLOAD
0502  REF   1               36,2521   00122 0                    OVFIND
05025                       36,2522   00000 1                    0
0503  REF   7  LAST  764   36,2523   03767 1                    VPRED
0504  REF   4  LAST  843   36,2524   17632 0            STODL   RTEDVD
0505  REF   6  LAST  764   36,2525   03771 0                    GAMMAEI
0506  REF   3  LAST  275   36,2526   17634 0            STODL   RTEGAM2D
0509  REF   1               36,2527   31667 1                    1RTEB13
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0510  REP  2 LAST 125  36,2530  17735 0          STODL  CONICX1
0511  REP  1           36,2531  33756 0                 C4RTE
0512  REP  2 LAST 125  36,2532  37652 1          STCALL MAMAX1
0513  REP  1           36,2533  64427 1                 INVC100        GET R(T1)/,V(T1)/,UR1/,UH/
0514                   36,2534  77545 0          DLOAD  EXIT
05145 REP  2 LAST 125  36,2535  03646 0                 R(T1)
0515  REP  2 LAST 286  36,2536  0 7171 1          TC     POLY
0516                   36,2537  00002 0          DEC    2
0517                   36,2540  02544 0          2DEC   181000434.B-31
0517                   36,2541  35436 0
0518                   36,2542  14040 0          2DEC   1.50785145B-2
0518                   36,2543  05066 1
0519                   36,2544  44052 0          2DEC*  -6.49993057E-9B27*
0519                   36,2545  60030 1
0520                   36,2546  26415 0          2DEC*  9.76938928E-18B56*
0520                   36,2547  25057 1
0521  REP 214 LAST 844 36,2550  0 6006 1          TC     INTPRET
0522                   36,2551  77752 1          SL1
0525  REP  2 LAST 125  36,2552  17654 0          STODL  MAMAX2          CO+C1*R+C2*R**2+C3*R**3=MAMAX2 B30
0526  REP  1           36,2553  31717 1                 MGRTEB28
0527  REP  2 LAST 125  36,2554  17730 0          STODL  NN1A
0528  REP  1           36,2555  33762 1                 K2RTE
0529  REP  2 LAST 125  36,2556  17636 1  RTE320  STODL  RCON             RCON=K2
0530  REP  4 LAST 844  36,2557  03634 0                 RTEGAM2D
0531                   36,2560  44254 1          BZE    BDSU
0532  REP  1           36,2561  74570 0                 RTE340         GOTORTE340 IF REENTRY ANGLE NOT INPUT
0533  REP  1           36,2562  31655 0                 1RTEB2
05335                  36,2563  71406 0          PUSH   COS                                            PL02D
0534                   36,2564  73525 1          PDDL   SIN
0535                   36,2565  45465 1          BDDV   STADR                                          PL00D
0536  REP  1           36,2566  40051 1          STCALL X(T2)           X(T2)=COT(GAM2D)                B0
0537  REP  1           36,2567  74603 1                 RTE360
0538                   36,2570  45345 1  RTE340  DLOAD  DSU
0539  REP  3 LAST 845  36,2571  03646 0                 R(T1)
0540  REP  1           36,2572  33760 0                 K1RTE
0541                   36,2573  71240 1          BMN    DLOAD
0542  REP  1           36,2574  74600 1                 RTE350
0543  REP  1           36,2575  33766 0                 K4RTE
0544  REP  2 LAST 845  36,2576  37726 0          STCALL X(T2)           X(T2)=K4
0545  REP  2 LAST 845  36,2577  74603 1                 RTE360
0546                   36,2600  77745 1  RTE350  DLOAD
0547  REP  1           36,2601  33764 1                 K3RTE
0548  REP  3 LAST 845  36,2602  03726 1          STORE  X(T2)           X(T2)=K3
0549                   36,2603  77624 1  RTE360  CALL
0550  REP  1           36,2604  65136 0                 V2T100
0551                   36,2605  52054 1          BZE    GOTO
0552  REP  1           36,2606  74610 0                 RTE367
0553  REP  1           36,2607  74772 0                 RTEALRM
0554                   36,2610  77775 1  RTE367  VLOAD
0555  REP  2 LAST 125  36,2611  03640 0                 R(T1)/
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0556   REP   6  LAST  546   36,2612   16657 1            STODL  RVEC
0557   REP   3  LAST  845   36,2613   03636 1                   RCON
0558   REP   2  LAST   94   36,2614   26760 1            STOVL  RDESIRED
0559   REP   2  LAST  125   36,2615   03700 0                   V2(T1)/
0560   REP  10  LAST  548   36,2616   36746 1            STCALL VVEC
0561   REP   1              36,2617   64272 1                   TMRAD100
0562                        36,2620   77615 0            DAD
0563   REP   2  LAST  125   36,2621   03716 1                   T1
0570   REP   2  LAST  125   36,2622   17736 0            STODL  T2
0571   REP   5  LAST  845   36,2623   03634 0                   RTEGAM2D
0572                        36,2624   52054 1            BZE    GOTO
05725  REP   1              36,2625   74627 1                   RTE369
057251 REP   1              36,2626   74651 0                   RTE372
0573                        36,2627   51575 1  RTE369    VLOAD  ABVAL
0574   REP   2  LAST  125   36,2630   03710 1                   V(T2)/
0575                        36,2631   77776 1            EXIT
0576   REP   3  LAST  845   36,2632  0 7171 1            TC     POLY
0577                        36,2633   00002 0            DEC    2
0578                        36,2634   00000 1            2DEC   0
0578                        36,2635   00000 1
0579                        36,2636   47021 1            2DEC   -4.8760771E-2B4
0579                        36,2637   65002 0
0580                        36,2640   35610 0            2DEC   4.5419476E-4B11
0580                        36,2641   07722 1
0581                        36,2642   63772 0            2DEC   -1.4317675E-6B18
0581                        36,2643   63276 1
0582   REP 215  LAST  845   36,2644  0 6006 1            TC     INTPRET
05825                       36,2645   77615 0            DAD
058251 REP   1              36,2646   01352 1                   RTED1
0583                        36,2647   52052 1            SL3    GOTO          X(T2),=D1+D2V2+D3V2**2+D4V2**3
0587   REP   1              36,2650   74653 1                   RTE373
0588                        36,2651   77745 1  RTE372    DLOAD                X(T2),=X(T2)
0589   REP   4  LAST  845   36,2652   03726 1                   X(T2)
05895                       36,2653   41425 1  RTE373    DSU    PUSH          X(T2)ERR                        B0 PL02D
058951 REP   5  LAST  846   36,2654   03726 1                   X(T2)
0590                        36,2655   53575 0            VLOAD  UNIT
0591   REP   2  LAST  125   36,2656   03656 1                   R(T2)/                                         B58
0592   REP  13  LAST  766   36,2657   36152 1            STCALL ALPHAV
0593   REP   3  LAST  766   36,2660   26437 0                   GETERAD
0594                        36,2661   77615 0            DAD
0606   REP   1              36,2662   33772 0                   E3RTE
0607                        36,2663   45206 1            PUSH   DSU           RCON,=(E1/(1+E2BETA11)**.5)+E3 B29 PL04D
0608   REP   4  LAST  846   36,2664   03636 1                   RCON
0609                        36,2665   45246 0            ABS    DSU
0610   REP   1              36,2666   31754 0                   EPC2RTE
0611                        36,2667   52040 1            BMN    GOTO
0612   REP   1              36,2670   74672 1                   RTE374
0613   REP   1              36,2671   74677 1                   RTE375
0614                        36,2672   51545 1  RTE374    DLOAD  ABS
0615                        36,2673   00001 0                   00D
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0617                          36,2674  50025 0          DSU   BMN
0618  REP  1                  36,2675  31756 1                EPC3RTE
0620  REP  1                  36,2676  74747 0                P37E
0621                          36,2677  43345 1  RTE375  DLOAD DAD
0622  REP  3  LAST  845       36,2700  03730 0                NN1A
0623  REP  1                  36,2701  31675 1                1RTEB28
0624                          36,2702  67240 0          BMN   SLOAD
0625  REP  1                  36,2703  74707 1                RTE380
0626  REP  1                  36,2704  31735 1                CCT805
0627                          36,2705  77650 1          GOTO
0628  REP  2  LAST  845       36,2706  74772 0                RTEALRM    TOO MANY ITERATIONS
0629  REP  4  LAST  847       36,2707  03730 0  RTE380  STORE NN1A
0630                          36,2710  53025 0          DSU   BZE
0631  REP  1                  36,2711  31721 1                M8RTEB28
0632  REP  1                  36,2712  74730 0                RTE385
0633                          36,2713  45345 1          DLOAD DSU
0634                          36,2714  00001 0                00D
0635  REP  2  LAST  125       36,2715  03666 1                DRCON
0636                          36,2716  65301 0          NORM  PDDL       X(T2)ERR-X(T2)ERR,=Z1      PL06D
0637  REP 35  LAST  789       36,2717  00047 1                X1
0638  REP  2  LAST  125       36,2720  03670 0                RPRE,
0639                          36,2721  58225 1          DSU   DDV        X(T2)PRI-X(T2)=Z2          PL04D
0640  REP  6  LAST  848       36,2722  03726 1                X(T2)
06405                         36,2723  53805 1          DMP   SL*        DX(T2)=X(T2)ERR(Z2/Z1)
0641                          36,2724  00001 0                00D
06415                         36,2725  20201 0                0,1
0642                          36,2726  77650 1          GOTO
06425 REP  1                  36,2727  74732 1                RTE390
0643                          36,2730  77745 1  RTE385  DLOAD           DX(T2)=X(T2)ERR
06435                         36,2731  00001 0                00D
0644                          36,2732  14021 1  RTE390  STODL  16D      DX(T2)                     PL02D
06445                         36,2733  77626 0          STADR
0645  REP  5  LAST  846       36,2734  60141 0          STODL RCON       RCON=RCON,
06455                         36,2735  77600 1          BOV
064551 REP 3  LAST  845       36,2736  74603 1                RTE360
0646  REP  3  LAST  847       36,2737  17666 1          STODL DRCON      X(T2)ERR,=X(T2)ERR
06465 REP  7  LAST  847       36,2740  03726 1                X(T2)
0647  REP  3  LAST  847       36,2741  17670 0          STODL RPRE,      X(T2)PRI=X(T2)
06475                         36,2742  00021 1                16D
0648                          36,2743  77615 0          DAD
06485 REP  8  LAST  847       36,2744  03726 1                X(T2)
0649  REP  9  LAST  847       36,2745  37726 0          STCALL X(T2)     X(T2)=X(T2)+DX(T2)
06495 REP  4  LAST  847       36,2746  74603 1                RTE360     REITERATE
0650                          36,2747  77624 1  P37E    CALL           DISPLAY CONIC SOLUTION
0651  REP  1                  36,2750  74776 1                RTEVN
0800                          36,2751  41345 0  RTE505  DLOAD DMP
0801  REP  2  LAST  125       36,2752  03720 1                PCON
0802  REP  2  LAST  125       36,2753  03754 1                BETA1
0803                          36,2754  53021 1          BDSU  BZE
0804  REP  6  LAST  847       36,2755  03636 1                RCON
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 0805  REP  1                  36,2756  74764 1                    RTE510
 0806                          36,2757  71240 1          BMN       DLOAD
 0807  REP  2  LAST  848       36,2760  74764 1                    RTE510
 0808  REP  2  LAST  845       36,2761  31655 0                    1RTEB2
 0809                          36,2762  77650 1          GOTO
 0810  REP  1                  36,2763  74766 0                              ENTRY NEAR APOGEE
 0811                          36,2764  57545 1  RTE510  DLOAD    RTE515
 0812  REP  3  LAST  848       36,2765  31655 0                    1RTEB2     ENTRY NEAR PERIGEE
 0813  REP  2  LAST  125       36,2766  37761 0  RTE515  STCALL   PHI2
 0814  REP  1                  36,2767  64515 1                    PREC100
 0815                          36,2770  77654 0  RTE625  BZE                 PRECISION TRAJECTORY COMPUTATION
 0816  REP  1                  36,2771  75024 0                    P37G
 0817                          36,2772  77624 1  RTEALRM CALL
 0818  REP  1                  36,2773  64255 1                    P370ALRM
 08185                         36,2774  77776 1          EXIT
 0819  REP  2  LAST  200       36,2775  1 2502 0         TCF       P37        RECYCLE AFTER ALARM DISPLAY
R0824
R0825                                  RETURN TO EARTH DISPLAY SUBROUTINE
 0828                          36,2776  45020 1  RTEVN   STO       CALL
 0829  REP  2  LAST  125       36,2777  03763 0                    VNSTORE
 0830  REP  1                  36,3000  64311 0                    RTEDISP    DISPLAY PREPARATION
 0831                          36,3001  77776 1          EXIT
 0832  REP  1                  36,3002  3 3244 0         CAF       V6N61RTE   LATITUDE,LONGITUDE,BLANK
 0833  REP  1                  36,3003  0 3215 1         TCR       P370GOPR     IN LAT(SPL),LNG(SPL),-
 0834  REP  9  LAST  779       36,3004  3 4710 0         CAF       FOUR
 0835  REP  1                  36,3005  0 3211 0         TCR       37BLANK +1
 0836                          36,3006  1 3013 1         TCF       +5
 0837  REP  3  LAST  848       36,3007  1 2502 0         TCF       P37        RECYCLE
 0841  REP  1                  36,3010  3 3245 1         CAF       V6N39RTE   T21 HRS,MIN,SEC IN T3TOT4
 0844  REP  2  LAST  844       36,3011  0 3231 1         TCR       P370GOP
 0845  REP  4  LAST  848       36,3012  1 2502 0         TCF       P37        RECYCLE
 0847  REP  2  LAST  844       36,3013  3 3246 1         CAF       V6N60RTE   DISPLAY BLANK,V(T2),FPA2
 0848  REP  2  LAST  844       36,3014  0 3205 0         TCR       P37GPR81     IN -,VPRED,GAMMAEI
 0849  REP  5  LAST  848       36,3015  1 2502 0         TCF       P37        RECYCLE
 0856  REP  1                  36,3016  3 3247 0         CAF       V6N81RTE   DISPLAY DELTA V (LV) IN DELVLVC
 0859  REP  3  LAST  848       36,3017  0 3231 1         TCR       P370GOP
 0860  REP  6  LAST  848       36,3020  1 2502 0         TCF       P37        RECYCLE
 08615 REP 216  LAST  846       36,3021  0 6006 1         TCR       INTPRET
 0862                          36,3022   77650 1         GOTO
 0863  REP  3  LAST  848       36,3023   03763 0                    VNSTORE
R0864  PRECISION DISPLAY,TARGETING COMPUTATION AND RTE END PROCESSING
 0865                          36,3024   77624 1  P37G    CALL
 0866  REP  2  LAST  847       36,3025   74776 1                    RTEVN
 0867                          36,3026   77776 1          EXIT
 0868  REP 13  LAST  732       36,3027  3 4716 0  P37N    CAF       SEVEN
 0869  REP  6  LAST  608       36,3030  55=131 1         TS        OPTION1
 0870  REP 97  LAST  824       36,3031  3 4712 1         CAF       ONE
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0871  REF  11  LAST  695   36,3032  55 132 1          TS      OPTION2
0872  REF   1              36,3033   3 3243 1        CAF     V4N06RTE      DISPLAY RCS OR SPS OPTION  SPS ASSUMED
0873  REF   4  LAST  848   36,3034   0 3231 1        TCR     P370GOP
0874                       36,3035   1 3033 0        TCF     -2            RECYCLE
0875  REF 217  LAST  848   36,3036   0 6006 1        TC      INTPRET       PROCEED
0876                       36,3037   67201 0         SETPD   SLOAD
0877                       36,3040   00001 0                 00D
0878  REF  12  LAST  849   36,3041   01133 1                 OPTION2
0879                       36,3042   53025 0         DSU     BZE
0880  REF   2  LAST  844   36,3043   31667 1                 1RTEB13
0881  REF   1              36,3044   75053 0                 P37Q
0882                       36,3045   60335 1         SLOAD   NORM          SPS
0883  REF   3  LAST  683   36,3046   00111 0                 EMDOT
0884  REF  36  LAST  847   36,3047   00047 1                 X1
0885                       36,3050   52125 0         PDDL    GOTO
0886  REF   1              36,3051   31725 0                 VCSPS
0887  REF   1              36,3052   75064 1                 P37T
0888                       36,3053   43145 0 P37Q    DLOAD   BON           RCS
0889  REF   1              36,3054   31731 0                 MDOTRCS
0890  REF   3  LAST  682   36,3055   00700 0                 NJETSFLG
0891  REF   1              36,3056   75060 0                 P37R
0892                       36,3057   77752 1         SL1
0893                       36,3060   77752 1 P37R    SL1
0894                       36,3061   65301 0         NORM    PDDL
0895  REF  37  LAST  849   36,3062   00047 1                 X1
0896  REF   1              36,3063   31727 1                 VCRCS
0897                       36,3064   56325 0 P37T    PDDL    DDV           DV/VC                      B7 -B5 = B2 PL02D
0898  REF   2  LAST  125   36,3065   03706 0                 DV
0899                       36,3066   77776 1         EXIT
0900  REF   4  LAST  846   36,3067   0 7171 1        TC      POLY
0901                       36,3070   00001 0         DEC     1
0902                       36,3071   00001 0         2DEC    5.66240507E-4B-3
0902                       36,3072   05070 0
0903                       36,3073   17527 1         2DEC    9.79487897E-1B-1
0903                       36,3074   36700 0
0904                       36,3075   47114 0         2DEC    -.388281955B1
0904                       36,3076   70670 1
0905  REF 218  LAST  849   36,3077   0 6006 1        TC      INTPRET
0906                       36,3100   67206 1         PUSH    SLOAD         (1-E)**(-DV/VC)=A                B3 PL04D
0907  REF   8  LAST  683   36,3101   03076 0                 WEIGHT/G
0908                       36,3102   56205 0         DMP     DDV           DTB=(M0/MDOT)A       B16+B3-B3=B16 PL00D
0909                       36,3103   41257 1         SL*     DMP
0910                       36,3104   20165 1                 0 -12D,1
0911  REF   1              36,3105   31733 1                 CSUBT
0912                       36,3106   77621 1         BDSU
0913  REF   3  LAST  846   36,3107   03716 1                 T1
0914  REF  65  LAST  677   36,3110   03413 1         STORE   TIG           TIG=T1-CT*DTB                    B28
0915                       36,3111   77776 1         EXIT
0916  REF   2  LAST  844   36,3112   3 3242 0        CAF     V6N33RTE      DISPLAY BIASED TIG
0917  REF   5  LAST  849   36,3113   0 3231 1        TCR     P370GOP
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L P37,P70

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0918
09184 BSP 155 LAST 840
09185 BSP  10 LAST 783
09186 BSP   7 LAST 783
0919  BSP 219 LAST 849
09195
091951 BSP  1
0920
092001 BSP  3 LAST 848
092005
09201  BSP  2 LAST 125
092015 BSP  1
09202
092025 BSP  1
09203  BSP  1
092035
09204
092045 BSP  1
09205  BSP  1
092055
09206  BSP  2 LAST 850
092065 BSP  4 LAST 850
09207
092075 BSP  1
09208  BSP  1
092085
09209  BSP  1
092095
0921   BSP  1
092105
09211  BSP  7 LAST 544
092115
09212  BSP  4 LAST 543
092125 BSP  7 LAST 544
09213  BSP  3 LAST 845
092135 BSP  7 LAST 846
09214  BSP  3 LAST 846
092145 BSP 11 LAST 846
09215  BSP  5 LAST 544
0922
0923   BSP  8 LAST 666
0924   BSP  6 LAST 679
0925
0926   BSP  7 LAST 520
0927
0928   BSP 10 LAST 545
0929   BSP  6 LAST 544
0933
0934   BSP  4 LAST 849
0936   BSP 12 LAST 668
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36,3114  1 3112 1
36,3115  3 4714 1
36,3116  55=125 1
36,3117  55=126 1
36,3120  0 6006 1
36,3121  77624 1
36,3122  65055 1
36,3123  53575 0
36,3124  03656 1
36,3125  74315 0
36,3126  03740 1
36,3127  31740 0
36,3130  74315 0
36,3131  03746 1
36,3132  31742 1
36,3133  50255 0
36,3134  50015 0
36,3135  31744 1
36,3136  75163 1
36,3137  50375 0
36,3140  03746 1
36,3141  03656 1
36,3142  71240 1
36,3143  75147 1
36,3144  31746 0
36,3145  52006 0
36,3146  75151 0
36,3147  41545 0  P37U
36,3150  31750 1
36,3151  77756 0  P37V
36,3152  16732 0
36,3153  43146 0
36,3154  03666 1
36,3155  26734 0
36,3156  03640 0
36,3157  26657 1
36,3160  03700 0
36,3161  36746 1
36,3162  24737 1
36,3163  43014 0  P37W
36,3164  01267 0
36,3165  03665 1
36,3166  77214 0
36,3167  01071 0
36,3170  77626 0
36,3171  60362 0
36,3172  00037 0
36,3173  77615 0
36,3174  03716 1
36,3175  27656 1
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        TCF    -2
        CAF    ZERO
        TS     VHFCNT
        TS     TRKMKCNT
        TC     INTPRET
        CALL
               RTENCK1
        VLOAD  UNIT
               R(T2)/
        PDVL   VXSC
               UR1/
               MCOS7.5
        PDVL   VXSC
               UH/
               MSIN7.5
        VAD    DOT
        DAD    BMN
               MCOS22.5
               P37W
        VLOAD  DOT
               UH/
               R(T2)/
        BMN    DLOAD
               P37U
               THETA165
        PUSH   GOTO
               P37V
P37U    DLOAD  PUSH
               THETA210
P37V    SIN
        STODL  SNTH
        COS    CLEAR
               RVSW
        STOVL  CSTH
               R(T1)/
        STOVL  RVEC
               V2(T1)/
        STCALL VVEC
               TIMETHET
P37W    CLEAR  CLEAR
               XDELVFLG
               NORMSW
        SET    VLOAD
               FINALFLG
        STADR
        STODL  RTARG
               T
        DAD
               T1
        STOVL  TPASS4
```

CONICALLY INTEGRATE FROM R1,V1 OVER T12

PL00D

UR2 B1 PL06D

-UR1(COS7.5) B1 PL12D

K/=-UR1(COS7.5)-UH(SIN7.5) B2 PL00D

K/ . UR2 GR COS22.5

```
 0937  REF   4  LAST  850   36,3176  03700 0                    V2(T1)/
 0938                       36,3177  77651 0          VSU
 0939  REF   2  LAST  125   36,3200  03672 1                    V(T1)/
 0940  REF  11  LAST  667   36,3201  37646 1          STCALL    DELVSIN
 0941  REF   5  LAST  520   36,3202  73005 0                    VN1645
 0942                       36,3203  77650 1          GOTO
 0943  REF   2  LAST  850   36,3204  75163 1                    P37W
R0948
R0949  SUBROUTINE TO GO TO GOFLASHR AND BLANK R1

 0950                       36,3205  0 0006 1  P37GPRB1 EXTEND
 0951  REF   2  LAST  125   36,3206  23=762 0            QXCH      SPRTEX
 0952  REF   2  LAST  848   36,3207  0 3215 1            TCR       P370GOFR
 0953  REF  98  LAST  848   36,3210  3 4712 1  37BLANK    CAF       ONE
 0954  REF  15  LAST  727   36,3211  0 5415 1            TCR       BLANKET
 0955  REF 101  LAST  785   36,3212  1 5112 1            TCF       ENDOFJOB
 0956  REF   3  LAST  851   36,3213  0 1762 0            TC        SPRTEX      RECYCLE
 0957  REF   1               36,3214  1 3240 0            TCF       P37PROC     PROCEED
R0958
R0959  SUBROUTINE TO GO TO GOFLASHR

 0960                       36,3215  0 0006 1  P370GOFR EXTEND
 0961  REF   2  LAST  125   36,3216  23=733 1            QXCH      RTENCKEX
 0962  REF 235  LAST  828   36,3217  0 4555 0            TCR       BANKCALL
 0963  REF  19  LAST  752   36,3220   20763 1            CADR      GOFLASHR
 0964  REF  67  LAST  755   36,3221  1 4106 0            TCF       GOTOPOOH    TERMINATE
 0965                       36,3222  1 3225 0            TCF       +3
 0966                       36,3223  1 3227 1            TCF       +4
 0967  REF   3  LAST  851   36,3224  0 1733 1            TC        RTENCKEX    IMMEDIATE RETURN
 0968  REF   4  LAST  851   36,3225  51=733 1            INDEX     RTENCKEX    PROCEED
 0969                       36,3226  1 0004 1            TCF       0 +4
 0970  REF   5  LAST  851   36,3227  51=733 1            INDEX     RTENCKEX    RECYCLE
 0971                       36,3230  1 0003 0            TCF       0 +3
R0973
R0974  SUBROUTINE TO GO TO GOFLASH

 0975                       36,3231  0 0006 1  P370GOF  EXTEND
 0976  REF   4  LAST  851   36,3232  23=762 0            QXCH      SPRTEX
 0977  REF 238  LAST  851   36,3233  0 4555 0            TCR       BANKCALL
 0978  REF  41  LAST  754   36,3234   20624 0            CADR      GOFLASH
 0979  REF  68  LAST  851   36,3235  1 4106 0            TCF       GOTOPOOH
 0980                       36,3236  1 3240 0            TCF       +2
 0981  REF   5  LAST  851   36,3237  0 1762 0            TC        SPRTEX
 0982  REF   6  LAST  851   36,3240  51=762 0  P37PROC   INDEX     SPRTEX
 0983                       36,3241  1 0001 1            TCF       0 +1
 0985                       36,3242   01441 1  V6N33RTE VN        0633
 0986                       36,3243   01006 0  V4N06RTE VN        0406
 0987                       36,3244   01475 0  V6N61RTE VN        0661
 0988                       36,3245   01447 1  V6N39RTE VN        0639
 0989                       36,3246   01474 1  V6N60RTE VN        0660
```

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```
0990                    36,3247   01521 0  V6N81RTB VN      0681
0996                    32,2255                    BANK    32
0997  REF   1           32,2000                    SETLOC  RTB
0998                    32,2255                    BANK
0999  REF   1                                      COUNT   32/RTB
```

```
P1000   ALARM DISPLAY SUBROUTINE
 1050                          32,2255   77420 1  P37OALRM STQ     EXIT
 1051   REF    7  LAST  851    32,2256   03762 1                   SPRTEX
 1055   REF  286  LAST  841    32,2257   3 0154 1          CA      MPAC
 1056   REF    2  LAST  154    32,2260   0 5651 0          TC      VARALARM
 1057   REF    1                32,2261   3 2271 1          CAF     V5N09RTE
 1058   REF  237  LAST  851    32,2262   0 4555 0          TC      BANKCALL
 1059   REF   42  LAST  851    32,2263    20624 0          CADR    GOFLASH
 1060   REF   69  LAST  851    32,2264   1 4106 0          TCF     GOTOPOOH
 1061                          32,2265   1 2261 1          TCF     -4
 1062   REF  220  LAST  850    32,2266   0 6006 1          TC      INTPRET
 1063                          32,2267   77650 1           GOTO
 1064   REF    8  LAST  853    32,2270   03762 1                   SPRTEX
 1065                          32,2271   01211 1  V5N09RTE VN      0509
```

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P2000 TIME RADIUS CALLING SUBROUTINE

R2001	INPUT										
R2002	RVEC.							INITIAL POSITION VECTOR	VECTOR	B_{29}	METERS
R2004	VVEC							INITIAL VELOCITY VECTOR	VECTOR	B_7	METERS/CS
R2006	RDESIRED							FINAL RADIUS FOR WHICH TRANSFER TIME IS TO BE COMPUTED	DP	B_{29}	METERS
R2008	CONICX1							X1 SETTING FOR CONIC SUBROUTINES -2 = EARTH	SP	B_{14}	
R2010	OUTPUT										
R2011	R(T_2)/							FINAL POSITION VECTOR	VECTOR	B_{29}	METERS
R2013	V(T_2)/							FINAL VELOCITY VECTOR	VECTOR	B_7	METERS/CS
R2015	T12							TRANSFER TIME TO FINAL RADIUS	DP	B_{28}	CS

2100					32,2272	43020 1	TMRAD100	STQ	CLEAR	
2101	REF	6	LAST	851	32,2273	03733 0			RTENCKEX	
2102	REF	5	LAST	850	32,2274	03666 1			RVSW	
2103					32,2275	67164 0		AXC,2	SXA,2	
2104					32,2276	20000 0		QCT	20000	
2105	REF	2	LAST	94	32,2277	02756 1			SGNRDOT	
2106					32,2300	45140 0		LXC,1	CALL	
2107	REF	3	LAST	845	32,2301	03734 1			CONICX1	
2108	REF	1			32,2302	25552 1			TIMERAD	
2109	REF	3	LAST	846	32,2303	27710 1		STOVL	V(T_2)/	PL00D
2110					32,2304	77626 0		STADR		
2111	REF	5	LAST	850	32,2305	60121 0		STODL	R(T_2)/	
2112	REF	7	LAST	850	32,2306	00037 0			T	
2113	REF	3	LAST	126	32,2307	37724 1		STCALL	T12	
2114	REF	7	LAST	854	32,2310	03733 0			RTENCKEX	

```
P2200   DISPLAY CALCULATION SUBROUTINE

R2201   DESCRIPTION
R2202     OUTPUT FOR DISPLAY IS CONVERTED TO PROPER UNITS AND PLACED IN OUTPUT STORAGE REGISTERS. LANDING SITE
R2204   COMPUTATION FOR DETERMINING LANDING SITE LATITUDE AND LONGITUDE IS INCLUDED IN THE ROUTINE.

R2206   CALLING SEQUENCE
R2207     L      CALL
R2208     L+1            RTEDISP

R2209   SUBROUTINES CALLED
R2210     TMRAD100
R2211     AUGEKUGL
R2212     LAT-LONG

R2213   ERASABLE INITIALIZATION REQUIRED
R2214     PUSHLIST
R2215       NONE
R2216     MPAC
R2217       NONE
R2218     OTHER
R2219       R(T2)/      FINAL POSITION VECTOR                                  VECTOR  B29   METERS
R2221       V(T2)/      FINAL VELOCITY VECTOR                                  VECTOR  B7    METERS/CS
R2223       T2          FINAL TIME                                             DP      B28   CS
R2225       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR                   VECTOR  B7    METERS/CS
R2227       V(T1)/      INITIAL VELOCITY VECTOR                                VECTOR  B7    METERS/CS
R2229       UR1/        UNIT INITIAL VECTOR                                    VECTOR  B1
R2231       UH/         UNIT HORIZONTAL VECTOR                                 VECTOR  B1

R2233   OUTPUT
R2234     VPRED         VELOCITY MAGNITUDE AT 400,000 FT. ENTRY ALTITUDE       DP      B7    METERS/CS
R2236     T3TOT4        TRANSIT TIME TO 400,000 FT. ENTRY ALTITUDE             DP      B28   CS
R2238     GAMMAEI       FLIGHT PATH ANGLE AT 400,000 FT. ENTRY ALTITUDE        DP      B0    REVS  + ABOVE HORIZ
R2240     DELVLVC       INITIAL VELOCITY CHANGE VECTOR IN LOCAL VERTICAL COORD. VECTOR  B7    METERS/CS
R2242     LAT(SPL)      LATITUDE OF THE LANDING SITE                           DP      B0    REVS
R2244     LNG(SPL)      LONGITUDE OF THE LANDING SITE                          DP      B0    REVS

2275                          32,2311  77220 1  RTEDISP  STQ    VLOAD          DISPLAY
2276  REF  9  LAST  853       32,2312  03762 1           SPRTEX
2277  REF  4  LAST  854       32,2313  03710 1           V(T2)/
2278                          32,2314  65256 0           UNIT   PDDL
2279                          32,2315  00045 0           36D
2280  REF  8  LAST  844       32,2316  17767 1           STODL  VPRED           V(T2)
2281  REF  3  LAST  846       32,2317  03736 0           T2
2282                          32,2320  77625 0           DSU
2283  REF  1                  32,2321  03413 1           SPRTETIG
2284  REF  2  LAST  267       32,2322  26641 0           STOVL  T3TOT4          T21
2285  REF  6  LAST  854       32,2323  03656 1           R(T2)/
2286                          32,2324  50256 0           UNIT   DOT
22865                         32,2325  77752 1           SL1
```

```
2287
2288  REP  4  LAST  848     32,2326  44326 0     ARCCOS  BDSU
                                                        1RTEE2
2289  REP  7  LAST  844     32,2327  31655 0     STOVL   GAMMAEI          PLIGHT PATH ANGLE T2
2290  REP  5  LAST  851     32,2330  27771 0             V2(T1)/
2291                        32,2331  03700 0
2292  REP  3  LAST  851     32,2332  41451 1     VSU     PUSH
2293                        32,2333  03872 1             V(T1)/
2294  REP  3  LAST  850     32,2334  57441 1     DOT     DCOMP
2295                        32,2335  03740 1             UR1/
2296                        32,2336  41515 0     PDVL    PUSH
2297  REP  1                32,2337  63345 0     DLOAD   PDVL
2298                        32,2340  31677 0             ZERORTE
2299  REP  3  LAST  850     32,2341  55441 0     DOT     VDEP
22995                       32,2342  03746 1             UH/
2300  REP 10  LAST  485     32,2343  77772 0     VSL1
2301  REP  7  LAST  855     32,2344  27405 0     STOVL   DELVLVC          DV/ (LVC)
2302  REP  8  LAST  850     32,2345  03656 1             R(T2)/
2303                        32,2346  02657 1     STORE   RVEC             ***** LANDING SITE COMPUTATION *****
2304  REP  1                32,2347  45246 0     ABVAL   DSU
2305  REP  3  LAST  846     32,2350  31723 0             30480RTE
2306  REP  5  LAST  855     32,2351  26760 1     STOVL   RDESIRED
2307  REP 12  LAST  850     32,2352  03710 1             V(T2)/
2308  REP  2  LAST  846     32,2353  36746 1     STCALL  VVEC
2309                        32,2354  64272 1             TMRAD100         R3,V3,T23 FROM TIMERAD
2310  REP  8  LAST  856     32,2355  53575 0     VLOAD   UNIT
2311                        32,2356  03656 1             R(T2)/
2312  REP  6  LAST  856     32,2357  53515 0     PDVL    UNIT             UR3                                  PL06D
2313                        32,2360  03710 1             V(T2)/
2314                        32,2361  72441 0     DOT     SL1              GAMMAE=ARCSIN(UR3 . UV3)             PL00D
2315                        32,2362  65336 1     ARCSIN  PDDL             V(T3)                                PL02D
2316                        32,2363  00045 0             36D
2317                        32,2364  51525 1     PDDL    ABS
2318  REP  2  LAST  634     32,2365  45006 0     PUSH    CALL             /GAMMAE/                             PL04D
2319                        32,2366  64075 1             AUGEKUGL         PHIE                                 PL06D
2320  REP  4  LAST  854     32,2367  43215 0     DAD     DAD
2321  REP  4  LAST  855     32,2370  03724 0             T12              T23
2322                        32,2371  03736 0             T2
2323                        32,2372  14003 1     STODL   02D              T(LS)=T2+T23+TE
2324                        32,2373  00005 1             04D
2325  REP  3  LAST  275     32,2374  77756 0     SIN
2326                        32,2375  17403 0     STODL   LNG(SPL)         LNG(SPL)=SIN(PHIE)                   PL04D
2327  REP  9  LAST  799     32,2376  77746 1     COS
2328                        32,2377  03401 1     STORE   LAT(SPL)         LAT(SPL)=COS(PHIE)
2329  REP  9  LAST  856     32,2400  53575 0     VLOAD   UNIT
2330                        32,2401  03656 1             R(T2)/
2331                        32,2402  41406 0     PUSH    PUSH
2332  REP  7  LAST  856     32,2403  53515 0     PDVL    UNIT                                                 PL22D
2333                        32,2404  03710 1             V(T2)/
2334                        32,2405  47315 0     PDVL    VXV
2335                        32,2406  53435 0     VXV     UNIT             UH3=UNIT(UR3 X UV3 X UR3)            PL10D
                            32,2407  63361 0     VXSC    PDVL
```

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```
2336  REF   4 LAST  856   32,2410   03403 0          LNG(SPL)
2337                      32,2411   53361 0   VXSC   VAD                                  PL04D
2338  REF  10 LAST  856   32,2412   03401 1          LAT(SPL)
2340                      32,2413   43014 0   CLEAR  CLEAR      T(LS) IN MPAC
2341  REF  11 LAST  799   32,2414   00662 0          ERADFLAG
2342  REF  20 LAST  799   32,2415   01663 0          LUNAFLAG
23425 REF  14 LAST  846   32,2416   16152 0   STODL  ALPHAV     ALPHAV=UR3(COSPHIE)+UH3(SINPHIE)  PL02D
2343                      32,2417   77624 1   CALL
2344  REF   6 LAST  756   32,2420   26322 0          LAT-LONG
2345                      32,2421   77745 1   DLOAD
2346  REF  12 LAST  799   32,2422   01104 0          LAT
2347  REF  11 LAST  857   32,2423   17401 1   STODL  LAT(SPL)   LATITUDE LANDING SITE  *****
2348  REF   7 LAST  601   32,2424   01106 1          LONG
2349  REF   5 LAST  857   32,2425   37403 1   STCALL LNG(SPL)   LONGITUDE LANDING SITE  *****
2350  REF  10 LAST  855   32,2426   03762 1          SPRTEX
2400  REF   2 LAST  852 TO  857'   106   106*  COUNT* $$/RTE
```

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P2500 INITIAL VECTOR SUBROUTINE

R2501 DESCRIPTION
R2502 A PRECISION INTEGRATION OF THE STATE VECTOR TO THE TIME OF IGNITION ISPERFORMED.PRECOMPUTATIONS OCCUR.

R2504 CALLING SEQUENCE
R2505 L CALL
R2506 L+1 $INVC_{100}$

R2507 NORMAL EXIT MODE
R2508 AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R2509 ALARM EXIT MODE
R2510 AT L+2 OF CALLING SEQUENCE WITH MPAC = OCTAL 612 FOR STATE VECTOR IN MOONS SPHERE OF INFLUENCE

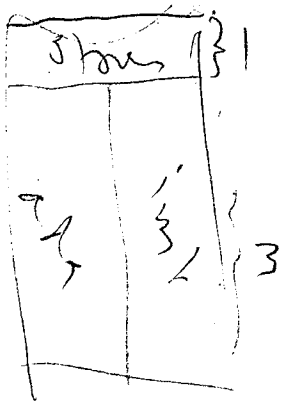
R2512 SUBROUTINES CALLED
R2513 CSMPREC

R2514 ERASABLE INITIALIZATION REQUIRED
R2515 PUSHLIST
R2516 NONE
R2517 MPAC
R2518 NONE
R2519 OTHER
R2520 SPRTETIG TIME OF IGNITION DP B_{28} CS
R2522 CSM STATE VECTOR

R2523 OUTPUT
R2524 $R(T_1)$/ INITIAL POSITION VECTOR AT TIG VECTOR B_{29} METERS
R2526 $V(T_1)$/ INITIAL VELOCITY VECTOR AT TIG VECTOR B_7 METERS/CS
R2528 T_1 INITIAL VECTOR TIME (TIG) DP B_{28} CS
R2530 UR_1/ UNIT INITIAL VECTOR VECTOR B_1
R2532 UH/ UNIT HORIZONTAL VECTOR VECTOR B_1
R2534 CPPA COSINE OF INITIAL FLIGHT PATH ANGLE DP B_1

```
2600                          32,2427  71220 1  INVC100  STQ     DLOAD
2601  REP  11  LAST  857     32,2430  03762 1           SPRTEX
2602  REP   2  LAST  855     32,2431  03413 1           SPRTETIG
2603  REP  44  LAST  734     32,2432  34041 0           STCALL  TDEC1
2604  REP   6  LAST  698     32,2433  27022 1           CSMPREC      PRECISION INTEGRATION  R0,V0 TO R1,V1
2605                          32,2434  67175 0           VLOAD   SXA,2
2606  REP  33  LAST  734     32,2435  00001 0           RATT
2607  REP   2  LAST  125     32,2436  03755 0           P(T1)
2608  REP   4  LAST  850*    32,2437  27640 0           STOVL   R(T1)/
2609  REP  22  LAST  734     32,2440  00007 0           VATT
2610  REP   4  LAST  856     32,2441  17672 1           STODL   V(T1)/
2611  REP   7  LAST  503     32,2442  00015 0           TAT
2612  REP   5  LAST  850     32,2443  03716 1           STORE   T1
2613                          32,2444  53135 0           SLOAD   BZE
2614  REP   3  LAST  858     32,2445  03756 0                   P(T1)
```

```
2615  REP  1                32,2446  64452 0                 INVC109
2624                         32,2447  52135 1  INVC107  SLOAD  GOTO
2625  REP  1                32,2450  31736 1                 CCTB12
2626  REP  3  LAST  847      32,2451  74772 0                 RTBALRM     R1,V1 NOT IN PROPER SPHERE OF INFLUENCE
2650                         32,2452  53575 0  INVC109  VLOAD  UNIT
2651  REP  5  LAST  858      32,2453  03640 0                 R(T1)/
2652  REP  4  LAST  856      32,2454  17740 1          STODL  UR1/        UR1/                          B1
2653                         32,2455  00045 0                 36D
2654  REP  4  LAST  845      32,2456  27646 0          STOVL  R(T1)       R(T1)                         B29
2655  REP  5  LAST  858      32,2457  03672 1                 V(T1)/
2656                         32,2460  77656 1          UNIT
2657  REP  3  LAST  126      32,2461  03746 1          STORE  UV1/
2658                         32,2462  72441 0          DOT    SL1
2659  REP  5  LAST  859      32,2463  03740 1                 UR1/
2660  REP  2  LAST  125      32,2464  03757 1          STORE  CPPA        CPPA                          B1
2661                         32,2465  45246 0          ABS    DSU
2662  REP  1                32,2466  31752 0                 EPC1RTE
2663                         32,2467  71240 1          BMN    DLOAD
2664  REP  1                32,2470  64477 1                 INVC115     NOT NEAR RECTILINEAR
2665  REP  5  LAST  856      32,2471  31655 0                 1RTEB2
2666                         32,2472  41525 0          PDDL   PUSH
2668  REP  2  LAST  856      32,2473  31677 0                 ZERORTE
2669                         32,2474  41466 0          VDEF   PUSH        N/ = (0,0,1)
2670                         32,2475  77650 1          GOTO
2671  REP  1                32,2476  64503 0                 INVC120
2672                         32,2477  47375 0  INVC115  VLOAD  VXV
2673  REP  6  LAST  859      32,2500  03740 1                 UR1/
2674  REP  4  LAST  859      32,2501  03746 1                 UV1/
2675                         32,2502  77606 1          PUSH               N/ = UR X UV                  B2
2676                         32,2503  41545 0  INVC120  DLOAD  PUSH
2677                         32,2504  77244 0          BPL    VLOAD
2678  REP  1                32,2505  64507 1                 INVC125
2683                         32,2506  41476 1          VCOMP  PUSH        CORRECT N/ FOR RETROGRADE TRAJECTORY
2684                         32,2507  77775 1  INVC125  VLOAD
2685                         32,2510  53435 0          VXV    UNIT
2686  REP  7  LAST  859      32,2511  03740 1                 UR1/
2687  REP  4  LAST  856      32,2512  03746 1          STORE  UH/         UH/                           B1
2688                         32,2513  77650 1          GOTO
2689  REP  12 LAST  858      32,2514  03762 1                 SPRTEX
```



	add	2-ins	1-ins	stor
	17	12	5	5

38_{10}

	add	inst	store
38	17	17	5
			5

extra 17

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P3000   PRECISION TRAJECTORY COMPUTATION SUBROUTINE

R3001   DESCRIPTION
R3002     A NUMERICALLY INTEGRATED TRAJECTORY IS GENERATED WHICH FOR THE RETURN TO EARTH PROBLEM SATISFIES THE REENTRY
R3004   CONSTRAINTS (RCON AND X(T2)) ACHIEVED BY THE INITIAL CONIC TRAJECTORY AND MEETS THE DVD REQUIREMENT AS CLOSELY
R3006   AS POSSIBLE.
R3007
R3010   CALLING SEQUENCE
R3011     L       CALL
R3012     L+1             PREC100

R3013   NORMAL EXIT MODE
R3014     AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R3015   ALARM EXIT MODE
R3016     AT L+2 OF CALLING SEQUENCE WITH MPAC =
R3017          OCTAL 605        FOR EXCESS ITERATIONS
R3018          OCTAL 613        FOR REENTRY ANGLE OUT OF LIMITS

R3019   SUBROUTINES CALLED
R3020     INTSTALL
R3021     RTENCK2
R30215    RTENCK3
R3022     TIMERAD
R3023     PARAM
R3024     V2T100

R3025   ERASABLE INITIALIZATION REQUIRED
R3026     PUSHLIST
R3027       NONE
R3028     MPAC
R3029       NONE
R3030     OTHER
R3031       R(T1)/      INITIAL POSITION VECTOR                  VECTOR  B29/B27  METERS
R3033       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR     VECTOR  B7/B5    METERS/CS
R3035       V(T1)/      INITIAL VELOCITY VECTOR                  VECTOR  B7/B5    METERS/CS
R3039       T1          INITIAL VECTOR TIME                      DP      B28      CS
R3041       T12         INITIAL TO FINAL POSITION TIME           DP      B28      CS
R3045       RCON        CONIC FINAL RADIUS                       DP      B29/B27  METERS
R3047       R(T1)       MAGNITUDE OF INITIAL POSITION VECTOR     DP      B29/B27  METERS
R3049       X(T2)       COTANGENT OF FINAL FLIGHT PATH ANGLE     DP      B0
R3051       X(T1)       COTANGENT OF INITIAL FLIGHT PATH ANGLE   DP      B5
R3057       RTEDVD      DELTA VELOCITY DESIRED                   DP      B7/B5    METERS/CS
R3059       MAMAX1      MAJOR AXIS LIMIT FOR LOWER BOUND ON GAMDV ITERATOR  DP  B30/B28  METERS
R3061       MAMAX2      MAJOR AXIS LIMIT FOR UPPER BOUND ON GAMDV ITERATOR  DP  B30/B28  METERS
R3063       UR1/        UNIT INITIAL VECTOR                      VECTOR  B1
R3065       UH/         UNIT HORIZONTAL VECTOR                   VECTOR  B1
R3067       BETA1       1+X(T2)**2                               DP      B1
R3069       PHI2        PERIGEE OR APOGEE INDICATOR              DP      B2       -1 PERIGEE,+1 APOGEE
R3071
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R3072  OUTPUT
R3073    V2(T1)/      POST IMPULSE INITIAL VELOCITY VECTOR          VECTOR  B7      METERS/CS
R3075    R(T2)/       FINAL POSITION VECTOR                         VECTOR  B29     METERS
R3077    V(T2)/       FINAL VELOCITY VECTOR                         VECTOR  B7      METERS/CS
R3079    T2           FINAL TIME                                    DP      B28     CENTISECONDS
R3081
R3100  DEBRIS
R3101    RD           FINAL R DESIRED                               DP      B29/B27 METERS
R3111    R/APRE       R/A                                           DP      B6
R3113    P/RPRE       P/R                                           DP      B2
R3115    RPRE         MAGNITUDE OF R(T2)/                           DP      B29/B27 METERS
R3117    X(T2)PRE     COTANGENT OF GAMMA2                           DP      B0
R3119    DT12         CORRECTION TO FINAL TIME T2                   DP      B28     CENTISECONDS
R3121    RCON         FINAL RADIUS                                  DP      B29/B27 METERS
R3123    DRCON        DELTA RCON                                    DP      B29/B27 METERS
R3125
 3150                          32,2515  71220 1  PREC100  STO     DLOAD
 3151  MPAC  13  LAST  859    32,2516  03762 1           STORE   SPRTEX
 3156  MPAC  1               32,2517  31705 1           STODL   10RTE
 3157  MPAC  5   LAST  847    32,2520  17730 0           STODL   NN1A
 3158  MPAC  7   LAST  847    32,2521  03636 1           STORE   RCON
 3159  MPAC  2   LAST  125    32,2522  03664 0           STORE   RD
 3164                          32,2523  77745 1  PREC120  DLOAD
31645  MPAC  1               32,2524  31715 0           STODL   2RTEB1
31646  MPAC  2   LAST  125    32,2525  17650 1           STODL   DT21PR      DT21PR = POSMAX
 3165  MPAC  1               32,2526  31703 1           STODL   M15RTE
 3166  MPAC  2   LAST  125    32,2527  37732 0           STCALL  NN2
 3169  MPAC  1               32,2530  65103 0           STCALL  RTENCK3
 3170                          32,2531  77624 1  PREC125  CALL
 3171  MPAC  1               32,2532  11527 1           CALL    PARAM
 3172                          32,2533  77745 1           DLOAD
 3173  MPAC  2   LAST  94     32,2534  02742 1           DLOAD   P
 3222  MPAC  1               32,2535  14033 1           STODL   P/RPRE
 3223  MPAC  2   LAST  94     32,2536  02744 1           STODL   R1A
 3224  MPAC  1               32,2537  14035 1           STODL   R/APRE
 3225  MPAC  1               32,2540  00041 1           STODL   R1
 3226  MPAC  1               32,2541  14031 0           STODL   RPRE
 3227  MPAC  3   LAST  124    32,2542  03775 1           STODL   COGA
 3228                          32,2543  77661 0           SL      SL
 3229                          32,2544  20206 1           SL      5
 3230  MPAC  1               32,2545  03724 0           STORE   X(T2)PRE
 3241                          32,2546  43276 0           DCOMP   DAD
 3242  MPAC  10  LAST  847    32,2547  03726 1           DAD     X(T2)
 3243                          32,2550  45246 0           ABS     DSU
 3244  MPAC  1               32,2551  31760 1           STODL   EPC4RTE
 3245                          32,2552  50000 1           BOV     BMN
32455  MPAC  1               32,2553  64555 0           BMN     PREC130
 3246  MPAC  1               32,2554  64736 1           PREC175

R3247  DESIRED REENTRY ANGLE NOT ACHIEVED
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3248
3249  REP  3  LAST  861   32,2555  50145 1  PREC130  DLOAD  BMN
3250  REP  1             32,2556  03732 1           NN2
3251                     32,2557  64563 0           PREC140
3252  REP  2  LAST  847   32,2560  52135 1  PREC132  SLOAD  GOTO      TOO MANY ITERATIONS
3253  REP  1             32,2561  31735 1           OCT805      EXIT WITH ALARM
                         32,2562  65053 1           PRECX

R3259  DETERMINE RADIUS AT WHICH THE DESIRED REENTRY ANGLE WILL BE ACHIEVED

3260
3261  REP  6  LAST  861   32,2563  53145 1  PREC140  DLOAD  BZE
3264  REP  1             32,2564  03730 0           NN1A
3265                     32,2565  64616 1           PREC162
3266  REP  2  LAST  861   32,2566  42545 0  PREC150  DLOAD  SL4       ELLIPTIC CASE
32665                    32,2567  00035 1           R/APRE
3267  REP  2  LAST  861   32,2570  52525 1           PDDL   SL3                          PL02D
3268                     32,2571  00033 1           P/RPRE
3269  REP  3  LAST  847   32,2572  41205 0           DMP    DMP       (P/A)BETA1        B4 PL00D
3270                     32,2573  03754 1           BETA1
3271                     32,2574  57512 0           SL2    DCOMP
3272  REP  6  LAST  859   32,2575  50015 0           DAD    BMN       1-(P/A)BETA1=BETA2  B2
3273  REP  1             32,2576  31655 0           1RTEB2
3274                     32,2577  64602 1           PREC155
3275  REP  1             32,2600  52166 1           SQRT   GOTO      BETA2**.5=BETA3   B1
3276                     32,2601  64604 1           PREC160
3277  REP  3  LAST  859   32,2602  77745 1  PREC155  DLOAD
3278                     32,2603  31677 0           ZERORTE   BETA3=0
3279  REP  3  LAST  848   32,2604  43205 1  PREC160  DMP      DAD
3280  REP  1             32,2605  03761 1           PHI2
3281                     32,2606  31657 1           1RTEB3
3282  REP  3  LAST  862   32,2607  60325 0           PDDL   NORM      1+(PHI2)(BETA3)   B3
3283  REP 38  LAST  849   32,2610  00035 1           R/APRE
3284                     32,2611  00047 1           X1                                  PL00D
3285                     32,2612  77665 1           BDDV
3286                     32,2613  52057 1           SL*    GOTO      (1+PHI2*BETA3)/(R/A)=BETA4  B1
3287  REP  1             32,2614  20175 0           0 -4,1
3288                     32,2615  64624 0           PREC165
32885 REP  2  LAST  861  32,2616  60345 0  PREC162  DLOAD  NORM
3289  REP 39  LAST  862  32,2617  00031 0           RPRE
32895                    32,2620  00047 1           X1
3290  REP  3  LAST  861  32,2621  53665 1           BDDV   SL*       BETA4=RD/RPRE     B1
32905                    32,2622  03664 0           RD
3291                     32,2623  20200 1           0 -1,1
3292  REP  1             32,2624  45206 1  PREC165  PUSH   DSU
32923                    32,2625  31653 0           1RTEB1
329235 REP 2  LAST  118  32,2626  77676 0           DCOMP
32924                    32,2627  03765 0           STORE  BETA12
329243 REP 1             32,2630  71240 1           BMN    DLOAD
329247 REP 2  LAST  861  32,2631  64642 0           PREC168
32925                    32,2632  03724 0           X(T2)PRE
                         32,2633  71240 1           BMN    DLOAD
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329253 REP   1                32,2634  64640 1                    PREC167
329257 REP   3 LAST  862      32,2635  03765 0                    BETA12
32926                         32,2636  77676 0          DCOMP
329265 REP   4 LAST  863      32,2637  03765 0          STORE     BETA12
32927                         32,2640  77745 1  PREC167 DLOAD
329275 REP   5 LAST  863      32,2641  03765 0                    BETA12
3293                          32,2642  45246 0  PREC168 ABS       DSU
3294   REP   1                32,2643  31764 0                    EPC6RTE
3295                          32,2644  71240 1          BMN       DLOAD
3296   REP   2 LAST  861      32,2645  64736 1                    PREC175
3297                          32,2646  72405 0          DMP       SL1
3298   REP   3 LAST  862      32,2647  00031 0                    RPRE
3299                          32,2650  77606 1          PUSH                  RP = NEW RADIUS
3300                          32,2651  43345 1  PREC170 DLOAD     DAD
3301   REP   4 LAST  862      32,2652  03732 1                    NN2
3302   REP   2 LAST  847      32,2653  31675 1                    1RTEB28
3303   REP   5 LAST  863      32,2654  03732 1          STORE     NN2
3304                          32,2655  43175 0          VLOAD     SET
3305   REP  10 LAST  856      32,2656  03656 1                    R(T2)/
3306   REP   6 LAST  854      32,2657  03466 0                    RVSW
3307   REP   9 LAST  856      32,2660  26657 1          STOVL     RVEC
3308   REP   8 LAST  856      32,2661  03710 1                    V(T2)/
3309                          32,2662  77765 0          SIGN
3310   REP   6 LAST  863      32,2663  03765 0                    BETA12
3311   REP  13 LAST  856      32,2664  16746 0          STODL     VVEC
3312   REP   2 LAST  862      32,2665  31653 0                    1RTEB1
3313                          32,2666  57565 0          SIGN      DCOMP
3314   REP   7 LAST  863      32,2667  03765 0                    BETA12
3315                          32,2670  71354 0          LXA,2     DLOAD
3316   REP 287 LAST  853      32,2671  00154 1                    MPAC
3317                          32,2672  67140 0          LXC,1     SXA,2
3318   REP   4 LAST  854      32,2673  03734 1                    CONICX1
3320   REP   3 LAST  854      32,2674  02756 1                    SGNRDOT
3321   REP   4 LAST  856      32,2675  36760 0          STCALL    RDESIRED    COMPUTE DT12 (CORRECTION TO TIME OF
3322   REP   2 LAST  854      32,2676  25552 1                    TIMERAD           NEW RADIUS)
3323                          32,2677  75345 1          DLOAD     SIGN
3324   REP   8 LAST  854      32,2700  00037 0                    T
3325   REP   8 LAST  863      32,2701  03765 0                    BETA12
3326                          32,2702  60325 0          PDDL      NORM        DT21=(PHI4)DT21                    PL02D
3327   REP   3 LAST  861      32,2703  03650 1                    DT21PR
3328   REP  40 LAST  862      32,2704  00047 1                    X1
3329                          32,2705  53665 1          BDDV      SL*
3330                          32,2706  00001 0                    00D
33305                         32,2707  20176 0                    0 -3,1
3331                          32,2710  50006 1          PUSH      BMN         BETA13=(DT21)/(DT21PR)             B3 PL04D
33315  REP   1                32,2711  64716 0                    PREC172
3332                          32,2712  65345 0          DLOAD     PDDL        BETA14=1                           B0 PL04D
33325  REP   2 LAST  861      32,2713  31715 0                    2RTEB1
3333                          32,2714  77650 1          GOTO
33335  REP   1                32,2715  64720 0                    PREC173
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3334
33345 REP  1                    32,2716  65345 0  PREC172  DLOAD   PDDL          BETA14=.6                          B0 PL04D
3335                            32,2717  31707 0           M.6RTE
33355                           32,2720  45271 1  PREC173  DDV     DSU
3336  REP  2  LAST  862         32,2721  00003 1           02D
33365                           32,2722  31657 1           1RTEB3
3337  REP  1                    32,2723  71240 1           BMN     DLOAD
33375                           32,2724  64730 1                   PREC174
3338  REP  4  LAST  863         32,2725  77605 1           DMP
33385                           32,2726  03650 1                   DT21PR
3339                            32,2727  00001 0           STORE   00D           DT21=(BETA14)DT21PR                B28
33395                           32,2730  41545 0  PREC174  DLOAD   PUSH
3340  REP  5  LAST  864         32,2731  00001 0                   00D
3341  REP  1                    32,2732  37650 0           STCALL  DT21PR
3342                            32,2733  65065 1                   RTENCK2
3343  REP  1                    32,2734  77650 1           GOTO
3356                            32,2735  64531 1                   PREC125
3357  REP  4  LAST  863         32,2736  45345 1  PREC175  DLOAD   DSU
3358  REP  4  LAST  862         32,2737  00031 0                   RPRE
3359                            32,2740  03664 0                   RD
3360                            32,2741  51406 1           PUSH    ABS           RPRE-RD = RERR
3361  REP  1                    32,2742  50025 0           DSU     BMN
3362  REP  1                    32,2743  31766 1                   EPC7RTE
                                32,2744  65037 0                   PREC220

R3363  DESIRED RADIUS HAS NOT BEEN ACHIEVED

3364
3365  REP  7  LAST  862         32,2745  53145 1           DLOAD   BZE
3366  REP  1                    32,2746  03730 0                   NN1A
3367                            32,2747  64560 0                   PREC132       TOO MANY ITERATIONS
3368  REP  2  LAST  861         32,2750  53025 0           DSU     BZE
3369  REP  1                    32,2751  31705 1                   10RTE
3370                            32,2752  65005 1                   PREC207
3371  REP  4  LAST  847         32,2753  45345 1  PREC205  DLOAD   DSU           NOT FIRST PASS OF ITERATION
3372  REP  5  LAST  864         32,2754  03670 0                   RPRE,
3373                            32,2755  00031 0                   RPRE          RPRE,-RPRE                         B29/B27
3374  REP 15  LAST  789         32,2756  55301 0           NORM    BDDV
3375  REP  4  LAST  847         32,2757  00050 1                   X2
33755                           32,2760  03666 1                   DRCON
3376                            32,2761  41457 1           SL*     PUSH          DRCON/(RPRE,-RPRE)=S               B2
33765                           32,2762  57600 0                   0 -2,2
3377  REP  3  LAST  863         32,2763  40015 1           DAD     BOV           S GR +4 OR LS -4
33775 REP  1                    32,2764  31653 0                   1RTEB1
3378                            32,2765  64772 1                   PREC205M
33785 REP  4  LAST  864         32,2766  45246 0           ABS     DSU
3379                            32,2767  31653 0                   1RTEB1
33795 REP  1                    32,2770  77640 0           RMN
3380                            32,2771  64775 0                   PREC206
33805 REP  3  LAST  863         32,2772  57545 1  PREC205M DLOAD   DCOMP         S GR 0 OR LS -4
3381                            32,2773  31715 0                   2RTEB1
                                32,2774  77725 1           PDDL          S=-4                               B2
```

```
33815                          32,2775  41345 0 PREC206  DLOAD  DMP
3382                           32,2776  77712 0          SL2
33825 REF   5 LAST  864        32,2777  03666 1          STORE  DRCON        DRCON=S(RERR)                  B29
3383                           32,3000  77615 0          DAD
3384  REF   8 LAST  861        32,3001  03636 1                 RCON
3385  REF   9 LAST  865        32,3002  03636 1          STORE  RCON         RCON+DRCON=RCON
3386                           32,3003  77650 1          GOTO
3387  REF   1                  32,3004  65024 1                 PREC210
3388                           32,3005  63545 0 PREC207  DLOAD  DSQ          FIRST PASS OF ITERATION
3389  REF   5 LAST  864        32,3006  03664 0                 RD
3390                           32,3007  70501 1          NORM   SR1
3391  REF  41 LAST  863        32,3010  00047 1                 X1
3392                           32,3011  60325 0          PDDL   NORM
3393  REF   6 LAST  864        32,3012  00031 0                 RPRE
3394  REF  16 LAST  864        32,3013  00050 1                 X2
3395                           32,3014  55260 0          XSU,1  BDDV
3396  REF  17 LAST  865        32,3015  00047 1                 X2
3397                           32,3016  77657 0          SR*
3398                           32,3017  20600 0                 0 -1,1
3399  REF  10 LAST  865        32,3020  03636 1          STORE  RCON         RD**2/RPRE=RCON
3400                           32,3021  77625 0          DSU
3401  REF   6 LAST  865        32,3022  03664 0                 RD
3402  REF   6 LAST  865        32,3023  03666 1          STORE  DRCON        RCON-RD=DRCON
3403                           32,3024  77745 1 PREC210  DLOAD               PREPARE FOR NEXT ITERATION
3404  REF   7 LAST  865        32,3025  00031 0                 RPRE
3405  REF   5 LAST  864        32,3026  17670 0          STODL  RPRE,
3406  REF   8 LAST  864        32,3027  03730 0                 NN1A
3407                           32,3030  77625 0          DSU
3408  REF   3 LAST  863        32,3031  31675 1                 1RTEB28
3409  REF   9 LAST  865        32,3032  37730 1          STCALL NN1A
3410  REF   2 LAST  845        32,3033  65136 0                 V2T100
3411                           32,3034  52030 0          BHIZ   GOTO
3412  REF   1                  32,3035  64523 1                 PREC120
3413  REF   2 LAST  862        32,3036  65053 1                 PRECX

R3414  DESIRED RADIUS ACHIEVED

3415                           32,3037  45345 1 PREC220  DLOAD  DSU
3416  REF  11 LAST  861        32,3040  03726 1                 X(T2)
3417  REF   3 LAST  862        32,3041  03724 0                 X(T2)PRE
3418                           32,3042  45246 0          ABS    DSU
3419  REF   1                  32,3043  31770 0                 EPC8RTE
3420                           32,3044  67240 0          BMN    SLOAD
3421  REF   1                  32,3045  65051 0                 PREC225
3422  REF   1                  32,3046  31737 0                 OCT813
3423                           32,3047  77650 1          GOTO
3424  REF   3 LAST  865        32,3050  65053 1                 PRECX          IF REENTRY ANGLE OUT OF LIMITS

R3425  DESIRED FINAL ANGLE HAS BEEN REACHED
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3429
3430  REP  4  LAST  862   32,3051  77745 1  PREC225  DLOAD
3431                      32,3052  31677 0                ZERORTE
3432  REP 14  LAST  861   32,3053  77650 1  PRECX    GOTO
                          32,3054  03762 1                SPRTEX
```

P3800 INTEGRATION CALLING SUBROUTINE

R3801 DESCRIPTION
R3802 PERFORMS CONIC AND PRECISION INTEGRATIONS USING SUBROUTINE INTEGRVS. THERE ARE THREE ENTRANCES (RTENCK1,
R3804 RTENCK2 AND RTENCK3) FOR DIFFERENT SOURCES OF INPUT AND DIFFERENT OPTIONS. THERE IS A COMMON SET OF OUTPUT
R3806 WHICH INCLUDES SET UP OF INPUT FOR THE PARAM SUBROUTINE

R3807 RTENCK1 (CONIC INTEGRATION)

R3808 CALLING SEQUENCE
R3809 L CALL
R3810 L+1 RTENCK1

R3811 ERASABLE INITIALIZATION REQUIRED
R3812 SAME AS FOR THE RTENCK3 ENTRANCE

R3813 RTENCK2 (PRECISION INTEGRATION)

R3814 CALLING SEQUENCE
R3815 L CALL
R3816 L+1 RTENCK2

R3817 ERASABLE INITIALIZATION REQUIRED
R3818 PUSHLIST

R3819	PUSHLOC-2 INTEGRATION TIME DT_{12} (CORRECTION TO T_2)	DP	B_{28}	CS
R3821	OTHER			
R3822	$R(T_2)$/ FINAL POSITION VECTOR	VECTOR	B_{29}	METERS
R3824	$V(T_2)$/ FINAL VELOCITY VECTOR	VECTOR	B_7	METERS/CS
R3826	T_2 FINAL TIME	DP	B_{28}	CS

R3828 RTENCK3 (PRECISION INTEGRATION)

R3829 CALLING SEQUENCE
R3830 L CALL
R3831 L+1 RTENCK3

R3832 ERASABLE INITIALIZATION REQUIRED

R3834	$R(T_1)$/ INITIAL POSITION VECTOR	VECTOR	B_{29}	METERS
R3836	$V2(T_1)$/ POST IMPULSE INITIAL VELOCITY VECTOR	VECTOR	B_7	M/CS
R3838	T_1 INITIAL VECTOR TIME	DP	B_{28}	CS
R3840	T_2 FINAL TIME	DP	B_{28}	CS

R3842 EXIT MODE
R3843 AT L+2 OF CALLING SEQUENCE
R3844 SUBROUTINES CALLED
R3845 INTSTALL
R3846 INTEGRVS

R3847 OUTPUT
R3848 PUSHLIST

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R3849       PUSHLOC-6   FINAL POSITION VECTOR R(T2)/
R3851       X1          CONICS MUTABLE ENTRY FOR EARTH (-2)
R3853     MPAC
R3854                   FINAL VELOCITY VECTOR V(T2)/
R3856     OTHER
R3857       R(T2)/      AS IN PUSHLIST
R3858       V(T2)/      AS IN MPAC
R3859       T2          FINAL TIME
R3861
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3897					32,3055	45020 1	RTENCK1	STQ	CALL
3898	REF	8	LAST	854	32,3056	03733 0			RTENCKEX
3899	REF	18	LAST	624	32,3057	27371 1			INTSTALL
3900					32,3060	43175 0		VLOAD	SET
3901	REF	6	LAST	859	32,3061	03640 0			R(T1)/
3902	REF	10	LAST	601	32,3062	01473 0			INTYPFLG
3903					32,3063	77650 1		GOTO	
3904	REF	1			32,3064	65111 0			RTENCK3B
R3905									
3906					32,3065	45020 1	RTENCK2	STQ	CALL
3907	REF	9	LAST	868	32,3066	03733 0			RTENCKEX
3908	REF	19	LAST	868	32,3067	27371 1			INTSTALL
3909					32,3070	77214 0		CLEAR	VLOAD
3910	REF	11	LAST	868	32,3071	01673 1			INTYPFLG
3911	REF	11	LAST	863	32,3072	03656 1			R(T2)/
3912	REF	10	LAST	503	32,3073	25535 0		STOVL	RCV
3913	REF	9	LAST	863	32,3074	03710 1			V(T2)/
3914	REF	9	LAST	503	32,3075	15543 1		STODL	VCV
3915	REF	5	LAST	856	32,3076	03736 0			T2
3916	REF	10	LAST	503	32,3077	01517 0		STORE	TET
3917					32,3100	77615 0		DAD	
3918					32,3101	77650 1		GOTO	
3919	REF	1			32,3102	65117 0			RTENCK3D
R3920									
3921					32,3103	45020 1	RTENCK3	STQ	CALL
3922	REF	10	LAST	868	32,3104	03733 0			RTENCKEX
3923	REF	20	LAST	868	32,3105	27371 1			INTSTALL
3925					32,3106	43175 0	RTENCK3A	VLOAD	CLEAR
3926	REF	7	LAST	868	32,3107	03640 0			R(T1)/
3927	REF	12	LAST	868	32,3110	01673 1			INTYPFLG
3928	REF	11	LAST	868	32,3111	25535 0	RTENCK3B	STOVL	RCV
3929	REF	6	LAST	856	32,3112	03700 0			V2(T1)/
3930	REF	10	LAST	868	32,3113	15543 1		STODL	VCV
3931	REF	6	LAST	858	32,3114	03716 1			T1
3932	REF	11	LAST	868	32,3115	15517 0		STODL	TET
3933	REF	6	LAST	868	32,3116	03736 0			T2
3934	REF	45	LAST	858	32,3117	00041 1	RTENCK3D	STORE	TDEC1
3935					32,3120	45014 0		CLEAR	CALL

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VECTOR	B29	METERS
SP	B14	
VECTOR	BT	M/CS
DP	B28	CS

```
3936  REF  11  LAST  504   32,3121   00263 0          MOONFLAG
3937  REF   6  LAST  503   32,3122   27066 1          INTEGRVS
3938                       32,3123   77775 1    VLOAD
3939  REF  34  LAST  858   32,3124   00001 0          RATT
3950  REF  12  LAST  868   32,3125   03656 1    STORE R(T2)/
3951                       32,3126   70125 0    PDDL  LXC,1
3952  REF   8  LAST  858   32,3127   00015 0          TAT
3953  REF   5  LAST  863   32,3130   03734 1          CONICX1
3954  REF   7  LAST  868   32,3131   27736 0    STOVL T2
3955  REF  23  LAST  858   32,3132   00007 0          VATT
3956  REF  10  LAST  868   32,3133   03710 1    STORE V(T2)/
3957                       32,3134   77650 1    GOTO
3958  REF  11  LAST  868   32,3135   03733 0          RTENCKEX
```

L P37,P70

P4000 V2(T1) COMPUTATION SUBROUTINE

R4001 DESCRIPTION
R4002 A POST IMPULSE VELOCITY VECTOR (V2(T1)) IS COMPUTED WHICH EITHER
R4003 (1) MEETS THE INPUT VELOCITY CHANGE DESIRED (RTEDVD) IN A MINIMUM TIME OR
R4005 (2) IF A VELOCITY CHANGE ISN'T SPECIFIED (RTEDVD) = 0), A V2(T1) IS COMPUTED WHICH MINIMIZES THE IMPULSE (DV)
R4007 AND CONSEQUENTLY FUEL.

R4008 CALLING SEQUENCE
R4009 L CALL
R4010 L+1 V2T100

R4011 NORMAL EXIT MODE
R4012 AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R4013 ALARM EXIT MODE
R4014 AT L+2 OF CALLING SEQUENCE WITH MPAC = OCTAL 605 FOR EXCESS ITERATIONS

R4015 SUBROUTINES CALLED
R4016 GAMDV10
R4017 XT1LIM
R4018 DVCALC

R4019 ERASABLE INITIALIZATION REQUIRED
R4020 PUSHLIST
R4021 NONE
R4022 MPAC
R4023 NONE
R4024 OTHER

R4025	R(T1)	MAGNITUDE OF INITIAL POSITION VECTOR	DP	B29/B27 METERS
R4027	RCON	MAGNITUDE OF FINAL POSITION VECTOR	DP	B29/B27 METERS
R4029	V(T1)/	INITIAL VELOCITY VECTOR	VECTOR	B7/B5 METERS/CS
R4031	RTEDVD	DELTA VELOCITY DESIRED	DP	B7/B5 METERS/CS
R4033	UR1/	UNIT INITIAL VECTOR	VECTOR	B1
R4035	UH/	UNIT HORIZONTAL VECTOR	VECTOR	B1
R4037	X(T2)	COTANGENT OF FINAL FLIGHT PATH ANGLE	DP	B0
R4039	X(T1)	COTANGENT OF INITIAL FLIGHT PATH ANGLE(INPUT FOR PREC)	DP	B5
R4041	CPPA	COSINE OF INITIAL FLIGHT PATH ANGLE	DP	B1
R4043	MAMAX1	MAJOR AXIS LIMIT FOR LOWER BOUND ON GAMDV ITERATOR	DP	B30/B28 METERS
R4045	MAMAX2	MAJOR AXIS LIMIT FOR UPPER BOUND ON GAMDV ITERATOR	DP	B30/B28 METERS
R4049	PHI2	REENTRY NEAR PERIGEE OR APOGEE INDICATE (RTE ONLY)	DP	B2 -1 PERIGEE,+1 APOGEE
R4051	N1	CONIC OR PRECISION ITERATION COUNTER	DP	B28 NEGATIVE CONIC,PLUS PREC
R4053				

R4054 OUTPUT

R4055	V2(T1)/	POST IMPULSE INITIAL VELOCITY VECTOR	VECTOR	B7/B5 METERS/CS
R4057	DV	INITIAL VELOCITY CHANGE	DP	B7/B5 METERS/CS
R4059	X(T1)	COTANGENT OF INITIAL FLIGHT PATH ANGLE (POST IMPULSE)	DP	B5
R4061	PCON	SEMI-LATUS RECTUM	DP	B28/B26 METERS
R4063	BETA1	1+X(T2)**2	DP	B1
R4067				

```
R4068   DEBRIS
R4069     PUSHLIST
R4070       00D         X(T1),,=PREVIOUS PRECISION X(T1)                    DP      B5
R4074       02D         THETA1=BETA5*LAMBDA-1                               TP      B17
R4076       05D         THETA2=Z*R(T1)*(LAMBDA-1)                           TP      B38/B36
R4078       08D         THETA3=MU**.5/R(T1)                                 DP      B-4/B-5
R4080       10D         X(T1)MIN=LOWER BOUND ON X(T1) IN GAMDV ITERATOR     DP      B5
R4082       12D         DX(T1)MAX=MAXIMUM DELTA X(T1)                       DP      B5
R4084       14D         X(T1)MAX=UPPER BOUND ON X(T1) IN GAMDV ITERATOR     DP      B5
R4086       16D         DX(T1)=ITERATOR INCREMENT                           DP      B5
R4088       31D         GAMDV10 SUBROUTINE RETURN ADDRESS
R4089       32D         DVCALC SUBROUTINE RETURN ADDRESS
R4090       33D         V2T100 SUBROUTINE RETURN ADDRESS

 4100                           32,3136  77620 0  V2T100   STQ
 4101                           32,3137  00041 1           33D
 4104                           32,3140  43001 1           SETPD   CLEAR
 4105                           32,3141  00001 0                   0                                                  PL00D
 4106   REF   1                 32,3142  00272 0                   P2RTE
 4107                           32,3143  60345 0           DLOAD   NORM
 4108   REF  11  LAST  865      32,3144  03636 1                   RCON
 4109   REF  42  LAST  865      32,3145  00047 1                   X1
 4110                           32,3146  60325 0           PDDL    NORM
 4111   REF   5  LAST  859      32,3147  03646 0                   R(T1)
 4112   REF  33  LAST  836      32,3150  00051 0                   S1
 4113                           32,3151  00013 0           STORE   10D
 4114                           32,3152  56342 1           SR1     DDV     R1/RCON = LAMBDA                   B1
 4115                           32,3153  65260 0           XSU,1   PDDL                                       PL02D
 4116   REF  34  LAST  871      32,3154  00050 1                   S1
 4117   REF  12  LAST  865      32,3155  03726 1                   X(T2)
 4118                           32,3156  77716 1           DSQ
 4120                           32,3157  43342 0           SR1     DAD
 4121   REF   5  LAST  864      32,3160  31653 0                   1RTEB1
 4122   REF   4  LAST  862      32,3161  03754 1           STORE   BETA1   1+X(T2)**2 = BETA1                B1
 4123                           32,3162  77605 1           DMP
 4124                           32,3163  00001 0                   00D
41245                           32,3164  00035 1           STORE   28D     BETA1*LAMBDA = BETA5
41246                           32,3165  53605 1           DMP     SL*
412461                          32,3166  00001 0                   00D
412462                          32,3167  20172 1                   0 -7,1
 4125                           32,3170  45257 0           SL*     DSU
 4126                           32,3171  20172 1                   0 -7,1
 4127   REF   1                 32,3172  31671 0                   1RTEB17
 4128                           32,3173  65234 1           RTB     PDDL    BETA5*LAMBDA-1 = THETA1            B17 PL05D
41282   REF   3  LAST  617      32,3174  45562 1                   TPMODE
41285   REF   6  LAST  871      32,3175  31653 0                   1RTEB1
41287                           32,3176  57457 0           SR*     DCOMP
 4129                           32,3177  20601 1                   0,1
41295                           32,3200  41215 1           DAD     DMP
 4130                           32,3201  00001 0                   00D
```

```
41302  REP  6  LAST  871   32,3202  03646 0                 R(T1)
41305                      32,3203  47057 0          SL*    RTB
41307                      32,3204  20172 1                 0 -7D,1
4131   REP  4  LAST  871   32,3205  45562 1                 TPMODE
4132                       32,3206  77725 1          PDDL                  2*R(T1)*(LAMBDA-1)=THETA2   B38/B38 PL08D
4133   REP  1              32,3207  33770 1                 RTMURTE
4134                       32,3210  70501 1          NORM   SR1
4135   REP  18 LAST  865   32,3211  00050 1                 X2
4136                       32,3212  56264 1          XSU,2  DDV
4137   REP  35 LAST  871   32,3213  00050 1                 S1
4138                       32,3214  00013 0                 10D
4139                       32,3215  65257 1          SR*    PDDL                  MU**.5/R(T1)=THETA3         B-4/B-5 PL10D
4140                       32,3216  57170 0                 6,2
4141   REP  3  LAST  845   32,3217  03652 0                 MAMAX1
4142                       32,3220  41406 0          PUSH   PUSH                  MAMAX1=MA
4143                       32,3221  77624 1          CALL
4144   REP  1              32,3222  56633 1                 XT1LIM
4145                       32,3223  41476 1          DCOMP  PUSH                  X(T1)MIN                    B5 PL12D
4146                       32,3224  40476 0          DCOMP  SR4
4147                       32,3225  41525 0          PDDL   PUSH                  DX(T1)MAX                   B5 PL14D
4148   REP  3  LAST  845   32,3226  03654 0                 MAMAX2
4149                       32,3227  45006 0          PUSH   CALL
4150   REP  2  LAST  872   32,3230  56633 1                 XT1LIM
4151                       32,3231  50125 1          PDDL   BMN                   X(T1)MAX                    B5 PL16D
4152   REP  10 LAST  865   32,3232  03730 0                 NN1A
4153   REP  1              32,3233  65236 0                 V2T102
4154                       32,3234  77650 1          GOTO
4155   REP  1              32,3235  65250 0                 V2T110

R4156  PROCEED HERE IF NOT PRECISION COMPUTATION

4158
4159   REP  5  LAST  844   32,3236  77745 1  V2T102  DLOAD
4160                       32,3237  03632 0                 RTEDVD
4161   REP  1              32,3240  52054 1          BZE    GOTO
4162   REP  1              32,3241  65243 1                 V2T105
4163                       32,3242  65344 1                 V2T140
4164   REP  3  LAST  859   32,3243  50145 1  V2T105  DLOAD  BMN
4165   REP  2  LAST  872   32,3244  03757 1                 CPPA
4166                       32,3245  65344 1                 V2T140
4167   REP  1              32,3246  77650 1          GOTO
                           32,3247  65352 0                 V2T145

R4168  DURING A PRECISION TRAJECTORY ITERATION CONSTRAIN THE INDEPENDENT
R4169  VARIABLE TO INSURE THAT ALL CONICS PASS THROUGH RCON ON THE SAME PASS
R4170  THROUGH X(T2)

4171
4172   REP  2  LAST  871   32,3250  47145 1  V2T110  DLOAD  RTB
4173   REP  5  LAST  872   32,3251  31671 0                 1RTEB17
4174                       32,3252  45562 1                 TPMODE
                           32,3253  65276 1          DCOMP  PDDL                  -1                          B17 PL19D
```

```
4175  REP  4  LAST  864   32,3254  31715 0            2RTEB1
4176                       32,3255  45257 0      SR*   DSU
41765                      32,3256  20601 1            0,1
4177                       32,3257  00001 0            00D
41775                      32,3260  53605 1      DMP   SL*
4178                       32,3261  00035 1            28D
41785                      32,3262  20172 1            0 -7,1
4179                       32,3263  76257 0      SL*   TAD
41795                      32,3264  20172 1            0 -7,1
4180                       32,3265  65234 1      RTB   PDDL      BETA5(2-LAMBDA)-1=BETA6      B17 PL19D
4181  REP  6  LAST  872    32,3266  45562 1            TPMODE
4182  REP  2  LAST  125    32,3267  03722 0            X(T1)
4183                       32,3270  00001 0      STORE 00D       X(T1),,                      B5
4184                       32,3271  77751 1      TLOAD                                          PL16D
4185                       32,3272  53040 0      BMN   BZE
4186  REP  1               32,3273  65300 1            V2T115
41865 REP  2  LAST  873    32,3274  65300 1            V2T115
4187                       32,3275  52061 1      SL    GOTO
4188                       32,3276  20210 0            7
4189  REP  1               32,3277  65311 1            V2T120
4190                       32,3300  50145 1 V2T115 DLOAD BMN
4191  REP  4  LAST  862    32,3301  03761 1            PHI2
4192  REP  1               32,3302  65322 1            V2T125
4193                       32,3303  77676 0      DCOMP
4194  REP  5  LAST  873    32,3304  17761 1      STODL PHI2
4195  REP  3  LAST  864    32,3305  31705 1            10RTB
4196  REP 11  LAST  872    32,3306  03730 0      STORE NN1A
4197                       32,3307  77650 1      GOTO
4198  REP  2  LAST  873    32,3310  65322 1            V2T125
4199                       32,3311  47166 0 V2T120 SQRT  RTB
4200  REP  2  LAST  494    32,3312  45713 0            DPMODE
42005                      32,3313  50125 1      PDDL  BMN       BETA6**.5=X(T1)LIM           B5 PL18D
4201  REP  6  LAST  873    32,3314  03761 1            PHI2
4202  REP  1               32,3315  65330 1            V2T130
4203                       32,3316  45545 1      DLOAD STADR                                    PL16D
4204                       32,3317  77760 0      STORE 14D       X(T1)LIM = X(T1)MAX
4205                       32,3320  77676 0      DCOMP
4206                       32,3321  00013 0      STORE 10D       -X(T1)LIM = X(T1)MIN
4207                       32,3322  53145 1 V2T125 DLOAD BZE
4208  REP  3  LAST  873    32,3323  03722 0            X(T1)
4209  REP  3  LAST  872    32,3324  65344 1            V2T140
4210                       32,3325  52040 1      BMN   GOTO
4211  REP  4  LAST  873    32,3326  65344 1            V2T140
4212  REP  2  LAST  872    32,3327  65352 0            V2T145
4213                       32,3330  53145 1 V2T130 DLOAD BZE
4214  REP  4  LAST  873    32,3331  03722 0            X(T1)
4215  REP  1               32,3332  65341 1            V2T135
4216                       32,3333  71240 1      BMN   DLOAD                                    PL16D
4217  REP  2  LAST  873    32,3334  65341 1            V2T135
4218                       32,3335  77626 0      STADR
```

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```
4219                                32,3336  77764 1                STORE  10D
4220                                32,3337  77650 1                GOTO
4221  REP  3  LAST  873             32,3340  65352 0                       V2T145
4222                                32,3341  57545 1  V2T135  DLOAD  DCOMP
4223                                32,3342  77626 0                STADR
4224                                32,3343  77760 0                STORE  14D
4225                                32,3344  77745 1  V2T140  DLOAD
4226                                32,3345  00013 0                       10D
4227  REP  5  LAST  873             32,3346  17722 0                STODL  X(T1)
4228                                32,3347  00015 0                       12D
4229                                32,3350  52006 0                PUSH   GOTO
4230  REP  1                        32,3351  65357 0                       V2T150
4231                                32,3352  77745 1  V2T145  DLOAD
4232                                32,3353  00017 1                       14D
4233  REP  6  LAST  874             32,3354  17722 0                STODL  X(T1)
4234                                32,3355  00015 0                       12D
4235                                32,3356  41476 1                DCOMP  PUSH
4236                                32,3357  77624 1  V2T150  CALL
4237  REP  1                        32,3360  65500 1                       GAMDV10
4238                                32,3361  53145 1                DLOAD  BZE
4239  REP  6  LAST  872             32,3362  03632 0                       RTEDVD
4240  REP  1                        32,3363  65476 1                       V2T1X
```

R4241 CONTINUE IF TIME CRITICAL MODE

```
4242
4243  REP  3  LAST  849             32,3364  50025 0                DSU    BMN
4244  REP  1                        32,3365  03706 0                       DV
4245                                32,3366  65371 1                       V2T155
4246  REP  1                        32,3367  77650 1                GOTO
4247                                32,3370  65424 0                       V2T175
4248  REP  12  LAST  873            32,3371  50145 1  V2T155  DLOAD  BMN
4249  REP  1                        32,3372  03730 0                       NN1A
4250                                32,3373  65376 0                       V2T160
4251  REP  1                        32,3374  77650 1                GOTO
                                    32,3375  65437 1                       V2T185
```

R4252 CONIC TRAJECTORY COMPUTATION

```
4253
4254  REP  7  LAST  874             32,3376  53145 1  V2T160  DLOAD  BZE
4255  REP  1                        32,3377  03722 0                       X(T1)
4256                                32,3400  65404 1                       V2T165
4257  REP  2  LAST  874             32,3401  52040 1                BMN    GOTO
4258  REP  1                        32,3402  65404 1                       V2T165
4259                                32,3403  65474 0                       V2T300
4260  REP  4  LAST  872             32,3404  53145 1  V2T165  DLOAD  BZE
4261  REP  2  LAST  874             32,3405  03757 1                       CPPA
4262                                32,3406  65474 0                       V2T300
4263  REP  3  LAST  874             32,3407  71240 1                BMN    DLOAD
4264                                32,3410  65474 0                       V2T300
                                    32,3411  00017 1                       14D
```

X(T1)LIM = X(T1)MIN

PL16D

-X(T1)LIM = X(T1)MAX

X(T1)MIN = X(T1)

DX(T1)MAX = DX(T1) PL18D

X(T1)MAX = X(T1)

-DX(T1)MAX = DX(T1) PL18D
GOTO X(T1)-DV ITERATOR

EXIT IF MINIMUM FUEL MODE

```
4265  REF  8  LAST  874   32,3412  17722 0          STODL  X(T1)          X(T1)MAX=X(T1)
4266                      32,3413  00015 0                 12D
4267                      32,3414  77676 0          DCOMP
4268                      32,3415  34021 0          STCALL 16D            -DX(T1)MAX=DX(T1)
4269  REF  2  LAST  874   32,3416  65500 1                 GAMDV10
4270                      32,3417  45345 1          DLOAD  DSU
4271  REF  7  LAST  874   32,3420  03632 0                 RTEDVD
4272  REF  4  LAST  874   32,3421  03706 0                 DV
4273                      32,3422  77640 0          BMN
4274  REF  4  LAST  874   32,3423  65474 0                 V2T300
4279                      32,3424  71214 0  V2T175  SET    DLOAD
4280  REF  2  LAST  871   32,3425  00072 1                 F2RTE
4281  REF  9  LAST  875   32,3426  03722 0                 X(T1)
4282                      32,3427  14017 1          STODL  14D            X(T1)=X(T1)MAX
4283                      32,3430  00015 0                 12D
4284                      32,3431  77676 0          DCOMP
4285                      32,3432  34021 0          STCALL 16D            -DX(T1)MAX=DX(T1)
4286  REF  3  LAST  875   32,3433  65500 1                 GAMDV10
4287                      32,3434  50145 1          DLOAD  BMN
42875 REF 13  LAST  874   32,3435  03730 0                 NN1A
4288  REF  5  LAST  875   32,3436  65474 0                 V2T300
```

R42885 PREVENT A LARGE CHANGE IN INDEPENDENT VARIABLE DURING AN ITERATION FOR A
R428851 PRECISION TRAJECTORY

```
4289                      32,3437  45345 1  V2T185  DLOAD  DSU
4290  REF 10  LAST  875   32,3440  03722 0                 X(T1)
4291                      32,3441  00001 0                 00D
4292                      32,3442  65246 1          ABS    PDDL           /X(T1)-X(T1),,/ = BETA7
4293                      32,3443  00015 0                 12D
4294                      32,3444  44352 0          SL1    BDSU
4295                      32,3445  71240 1          BMN    DLOAD
4296  REF  6  LAST  875   32,3446  65474 0                 V2T300
4297                      32,3447  00001 0                 00D            CONTINUE IF BETA7 LARGER THAN 2DX(T1)MAX
4298  REF 11  LAST  875   32,3450  03722 0          STORE  X(T1)          X(T1),, = X(T1)
4299                      32,3451  50025 0          DSU    BMN
4300                      32,3452  00017 1                 14D
4301  REF  1              32,3453  65461 1                 V2T195
4302                      32,3454  77745 1          DLOAD
4303                      32,3455  00017 1                 14D
4304  REF 12  LAST  875   32,3456  03722 0          STORE  X(T1)          X(T1)MAX = X(T1)
4305                      32,3457  77650 1          GOTO
4306  REF  1              32,3460  65472 0                 V2T205
4307                      32,3461  45345 1  V2T195  DLOAD  DSU
4308  REF 13  LAST  875   32,3462  03722 0                 X(T1)
4309                      32,3463  00013 0                 10D
4310                      32,3464  52040 1          BMN    GOTO
4311  REF  1              32,3465  65467 1                 V2T200
4312  REF  2  LAST  875   32,3466  65472 0                 V2T205
4313                      32,3467  77745 1  V2T200  DLOAD
```

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```
4314
4315  REF  14  LAST  875     32,3470  00013 0                    10D
4316                        32,3471  03722 0          STORE     X(T1)
4317  REF   1               32,3472  77624 1  V2T205  CALL
4318                        32,3473  65701 1                    DVCALC
4319  REF   5  LAST  866     32,3474  77745 1  V2T300  DLOAD
4320                        32,3475  31677 0                    ZERORTE
4321                        32,3476  77650 1  V2T1X    GOTO
                            32,3477  00041 1                    33D
```

X(T1)MIN = X(T1)

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P4400   X(T1)-DV ITERATOR SUBROUTINE

R4401   DESCRIPTION
R4402       COMPUTES A POST IMPULSE VELOCITY VECTOR (V2(T1)) WHICH REQUIRES A MINIMUM DV.
R4404   CALLING SEQUENCE
R4405     L       CALL
R4406     L+1             GAMDV10

R4407   NORMAL EXIT MODE
R4410     AT L+2 OF CALLING SEQUENCE

R4411   ALARM EXIT MODE
R4412     AT V2T1X WITH MPAC = OCTAL 605 FOR EXCESS ITERATIONS

R4413   SUBROUTINES CALLED
R4414     DVCALC

R4415   ERASABLE INITIALIZATION REQUIRED
R4416     PUSHLIST
R4417       02D         THETA1=BETA5*LAMBDA-1                          TP      B17
R4419       05D         THETA2=2*R(T1)*(LAMBDA-1)                      TP      B38/B36
R4421       08D         THETA3=MU**.5/R(T1)                            DP      B-4/B-5
R4423       10D         X(T1)MIN=LOWER BOUND ON INDEPENDENT VARIABLE X(T1)   DP      B5
R4425       12D         DX(T1)MAX=MAXIMUM DX(T1)                       DP      B5
R4427       14D         X(T1)MAX=UPPER BOUND ON INDEPENDENT VARIABLE X(T1)   DP      B5
R4429       16D         DX(T1)=ITERATOR INCREMENT                      DP      B5
R4431     MPAC
R4432       NONE
R4433     OTHER
R4434       V(T1)/      INITIAL VELOCITY VECTOR                        VECTOR  B7/B5   METERS/CS
R4436       RTEDVD      DELTA VELOCITY DESIRED                         DP      B7/B5   METERS/CS
R4438       UR1/        UNIT INITIAL VECTOR                            VECTOR  B1
R4440       UH/         UNIT HORIZONTAL VECTOR                         VECTOR  B1
R4442       X(T1)       COTANGENT OF INITIAL FLIGHT PATH ANGLE (FROM VERTICAL)  DP      B5
R4444       F2RTE       TIME CRITICAL OR MINIMUM FUEL MODE INDICATOR   STATE AREA      0 MIN. FUEL, 1 MIN. TIME
R4446
R4447   OUTPUT
R4448       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR           VECTOR  B7/B5   METERS/CS
R4450       DV          INITIAL VELOCITY CHANGE                        DP      B7/B5   METERS/CS
R4452       X(T1)       COTANGENT OF INITIAL FPA MEASURED FROM VERTICAL DP      B5
R4454       PCON        SEMI-LATUS RECTUM                              DP      B28/B26 METERS
R4456
R4457   DEBRIS
R4458     PUSHLIST
R4459       00D         X(T1),,
R4462       02D         THETA1
R4463       05D         THETA2
R4464       08D         THETA3
R4465       10D         X(T1)MIN
R4466       12D         DX(T1)MAX
```

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```
R4467   14D     X(T1)MAX
R4468   16D     DX(T1)
R4473   22D     DV,=PREVIOUS DV
R4475   24D     BETA8=X(T1)+1.1DX(T1)
R4477   31D     GAMDV10 SUBROUTINE RETURN ADDRESS
R4478   32D     DVCALC SUBROUTINE RETURN ADDRESS
R4479   33D     VZT100 SUBROUTINE RETURN ADDRESS
 4490
 4491
 4500
 4501
 4502  REF  2 LAST 876
 4503
 4504
 4505
 4506
 4507  REF  1
 4508
 4509  REF  1
 4510
 4511  REF  1
 4512
 4513
 4514
 4515  REF  1
 4516
 4517
45175  REF  2 LAST 878
 4518
 4519
 4520
 4521
 4522
 4523  REF  1
 4524  REF  6 LAST 863
 4525
 4526  REF  7 LAST 878
 4527  REF  4 LAST 865
 4528
 4529  REF  1
 4530  REF  3 LAST 862
 4531
 4532  REF  2 LAST 874
 4533  REF  8 LAST 878
 4534
 4535  REF 15 LAST 876
 4536  REF  5 LAST 875
 4537
 4538  REF 16 LAST 878
 4539

 32,3500  77620 0  GAMDV10  STQ     31D
 32,3501  00037 0
 32,3502  45001 1           SETPD   CALL
 32,3503  00023 0                   18D
 32,3504  65701 1                   DVCALC
 32,3505  45345 1           DLOAD   DSU
 32,3506  00017 1                   14D
 32,3507  00013 0                   10D
 32,3510  77600 1           BOV
 32,3511  65531 0                   GAMDV20
 32,3512  45206 1           PUSH    DSU
 32,3513  31772 1                   EPC9RTB
 32,3514  71240 1           BMN     DLOAD
 32,3515  65677 1                   GAMDVX
 32,3516  00023 0                   18D
 32,3517  50025 0           DSU     BMN
 32,3520  00015 0                   12D
 32,3521  65525 0                   GAMDV15
 32,3522  52001 1           SETPD   GOTO
 32,3523  00023 0                   18D
 32,3524  65531 0                   GAMDV20
 32,3525  77745 1  GAMDV15  DLOAD
 32,3526  70565 0           SIGN    SR1
 32,3527  00021 1                   16D
 32,3530  00021 1           STORE   16D
 32,3531  77745 1  GAMDV20  DLOAD
 32,3532  31701 0                   M144RTB
 32,3533  03732 1           STORE   NN2
 32,3534  43345 1  GAMDV25  DLOAD   DAD
 32,3535  03732 1                   NN2
 32,3536  31675 1                   1RTEB28
 32,3537  67240 0           BMN     SLOAD
 32,3540  65544 1                   GAMDV30
 32,3541  31735 1                   OCT805
 32,3542  77650 1           GOTO
 32,3543  65476 1                   V2T1X
 32,3544  03732 1  GAMDV30  STORE   NN2
 32,3545  65345 0           DLOAD   PDDL,
 32,3546  03722 0                   X(T1)
 32,3547  03706 0                   DV
 32,3550  43325 1           PDDL    DAD
 32,3551  03722 0                   X(T1)
 32,3552  00021 1                   16D
```

DP B7/B5
DP B5

PL18D

X(T1)MAX-X(T1)MIN=BETA8 B5 PL20D

BOUNDS CLOSE TOGETHER

BETA8-DX(T1)MAX

PL18D

PL18D

BETA8(SIGNDX(T1))/2=DX(T1)

NN2=NN2+1
X(T1)=X(T1), B5 PL20D

DV=DV, B7/B5 PL22D

```
 4540   REF  17  LAST  878   32,3553   37722 1          STCALL X(T1)        X(T1)+DX(T1)=X(T1)                    B5
 4541   REF   3  LAST  878   32,3554   65701 1                 DVCALC
 4542                        32,3555   71214 0          BON    DLOAD
 4543   REF   3  LAST  875   32,3556   00312 1                 P2RTE
 4544   REF   1              32,3557   65573 0                 GAMDV35
 4545   REF   6  LAST  878   32,3560   03706 0                 DV
 4546                        32,3561   50025 0          DSU    BMN          CONTINUE IF FUEL CRITICAL MODE
 4547                        32,3562   00025 0                 20D
 4548   REF   1              32,3563   65570 0                 GAMDV33
 4549                        32,3564   57545 1  GAMDV32 DLOAD  DCOMP
 4550                        32,3565   00021 1                 16D
 4551                        32,3566   77742 0          SR1
 4552                        32,3567   00021 1          STORE  16D
 4553                        32,3570   52001 1  GAMDV33 SETPD  GOTO
 4554                        32,3571   00023 0                 18D                                          PL18D
 4555   REF   1              32,3572   65636 1                 GAMDV50

R4556   TIME CRITICAL MODE

 4557                        32,3573   45345 1  GAMDV35 DLOAD  DSU
 4558   REF   8  LAST  875   32,3574   03632 0                 RTEDVD
 4559   REF   7  LAST  879   32,3575   03706 0                 DV
 4560                        32,3576   41525 0          PDDL   PUSH         DVD-DV=DVERR                 B7/B5 PL22D
 4561                        32,3577   51545 1  GAMDV40 DLOAD  ABS          DV,                                  PL24D
 4562                        32,3600   00025 0                 20D
 4563                        32,3601   50025 0          DSU    BMN
 4564   REF   1              32,3602   31774 1                 EPC10RTE
 4565   REF   2  LAST  878   32,3603   65677 1                 GAMDVX
 4566                        32,3604   71204 1  GAMDV45 BOVB   DLOAD
45661   REF   8  LAST  826   32,3605   57343 1                 TCDANZIG     ASSURE OVFIND IS 0
 4567                        32,3606   60221 0          BDSU   NORM
 4568   REF   8  LAST  879   32,3607   03706 0                 DV
 4569   REF  19  LAST  872   32,3610   00050 1                 X2
 4570                        32,3611   77725 1          PDDL                DV-DV,                   B7/B5-N2 PL22D
 4571                        32,3612   70501 1          NORM   SR1          DVERR                    B8/B6-N1
 4572   REF  43  LAST  871   32,3613   00047 1                 X1
 4573                        32,3614   65271 0          DDV    PDDL         DVERR/ DV - DV
 4576                        32,3615   41221 0          BDSU   DMP                                               PL18D
 4577   REF  18  LAST  879   32,3616   03722 0                 X(T1)
 4578                        32,3617   77660 1          XSU,1
 4579   REF  20  LAST  879   32,3620   00047 1                 X2
45791                        32,3621   00021 1          STORE  16D          PRESERVE SIGN IF OVERFLOW
45792                        32,3622   40057 1          SR*    BOV
 4580                        32,3623   20600 0                 0 -1,1
45801   REF   1              32,3624   65632 0                 GAMDV47
 4581                        32,3625   00021 1          STORE  16D          (X(T1)-X(T1),)DVERR/(DV-DV,)=DX(T1)
 4582                        32,3626   45246 0          ABS    DSU
 4583                        32,3627   00015 0                 12D
 4584                        32,3630   77640 0          BMN
 4585   REF   2  LAST  879   32,3631   65636 1                 GAMDV50
```

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```
4586                          32,3632  75345 1  GAMDV47  DLOAD   SIGN
4587                          32,3633  00015 0                   12D
4588                          32,3634  00021 1                   16D
4589                          32,3635  00021 1           STORE   16D        DX(T1)MAX(SIGNDX(T1))=DX(T1)

R4590  CHECK TO KEEP INDEPENDENT VARIABLE IN BOUNDS

4591                          32,3636  41345 0  GAMDV50  DLOAD   DMP
4592                          32,3637  00021 1                   16D
4593  REF   1                 32,3640  31711 1                   1.1RTEB1
4594                          32,3641  43352 1           SL1     DAD
4595  REF  19  LAST  879      32,3642  03722 0                   X(T1)
4596                          32,3643  00031 0           STORE   24D        X(T1)+1.1DX(T1)=BETA9          B5
4597                          32,3644  50025 0           DSU     BMN
4598                          32,3645  00017 1                   14D
4599  REF   1                 32,3646  65655 1                   GAMDV55
4600                          32,3647  45345 1           DLOAD   DSU
4601                          32,3650  00017 1                   14D
4602  REF  20  LAST  880      32,3651  03722 0                   X(T1)
4603                          32,3652  77742 0           SR1
4604                          32,3653  34021 0           STCALL  16D        (X(T1)MAX-X(T1))/2=DX(T1)      B5
4605  REF   1                 32,3654  65670 0                   GAMDV65
4606                          32,3655  45345 1  GAMDV55  DLOAD   DSU
4607                          32,3656  00031 0                   24D
4608                          32,3657  00013 0                   10D
4609                          32,3660  52040 1           BMN     GOTO
4610  REF   1                 32,3661  65663 1                   GAMDV60
4611  REF   2  LAST  880      32,3662  65670 0                   GAMDV65
4612                          32,3663  45345 1  GAMDV60  DLOAD   DSU
4613                          32,3664  00013 0                   10D
4614  REF  21  LAST  880      32,3665  03722 0                   X(T1)
4615                          32,3666  77742 0           SR1
4616                          32,3667  00021 1           STORE   16D        (X(T1)MIN-X(T1))/2=DX(T1)      B5
4617                          32,3670  51545 1  GAMDV65  DLOAD   ABS
4618                          32,3671  00021 1                   16D
4619                          32,3672  50025 0           DSU     BMN
4620  REF   2  LAST  878      32,3673  31772 1                   EPC9RTE
4621  REF   3  LAST  879      32,3674  65677 1                   GAMDVX
4622                          32,3675  77650 1           GOTO
4623  REF   1                 32,3676  65534 0                   GAMDV25
4624                          32,3677  77650 1  GAMDVX   GOTO
4625                          32,3700  00037 0                   31D
```

```
P4700   DV CALCULATION SUBROUTINE

R4701   INPUT
R4702     PUSHLIST
R4703       02D         THETA1=BETA5*LAMBDA-1                                   TP      B17
R4705       05D         THETA2=2*R(T1)*(LAMBDA-1)                               TP      B38/B36
R4707       08D         THETA3=MU**.5/R(T1)                                     DP      B-4/B-5
R4709     OTHER
R4710       X(T1)       COTANGENT OF POST IMPULSE INITIAL FLIGHT PATH ANGLE     DP      B5
R4712       V(T1)/      INITIAL VELOCITY VECTOR (PRE IMPULSE)                   VECTOR  B7/B5   METERS/CS
R4714       UR1/        UNIT INITIAL VECTOR                                     VECTOR  B1
R4716       UH/         UNIT HORIZONTAL VECTOR                                  VECTOR  B1
R4718
R4719   OUTPUT
R4720       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR                    VECTOR  B7/B5   METERS/CS
R4722       DV          INITIAL VELOCITY CHANGE                                 DP      B7/B5   METERS/CS
R4724       PCON        SEMI-LATUS RECTUM                                       DP      B28/B26 METERS
R4726
R4727   DEBRIS
R4728       28D         THETA3*PCON**.5                                         DP      B10/B8-N1
R4730       C(PUSLOC)   THETA3(PCON**.5)*X(T1)*UR1/                             VECTOR  B7/B5
R4732       32D         DVCALC SUBROUTINE RETURN ADDRESS
R4733       X1          NORMALIZATION FACTOR FOR VALUE IN 28D

R4734   PUSHLOC IS RESTORED TO ITS ENTRANCE VALUE UPON EXITING DVCALC

 4750                           32,3701  71220 1  DVCALC   STQ     DLOAD
 4751                           32,3702  00040 0           32D
 4752   REF  22  LAST  880      32,3703  03722 0           X(T1)
 4753                           32,3704  54316 1           DSQ     SR
 4754                           32,3705  20610 1           7
 4755                           32,3706  76276 0           DCOMP   TAD
 4756                           32,3707  00003 1           02D
 4757                           32,3710  41501 0           NORM    PUSH
 4758   REF  44  LAST  879      32,3711  00047 1           X1
 4759                           32,3712  60351 0           TLOAD   NORM
 4760                           32,3713  00006 1           05D
 4761   REF  21  LAST  879      32,3714  00050 1           X2
 4762                           32,3715  70434 0           RTB     SR1
47625   REF   3  LAST  873      32,3716  45713 0           DPMODE
476251                         32,3717  56264 1           XSU,2   DDV
 4763   REF  45  LAST  881      32,3720  00046 0           X1
47635                          32,3721  77657 0           SR*
476351                         32,3722  57170 0           6,2
 4764   REF   3  LAST  847      32,3723  03720 1           STORE   PCON    THETA2/(THETA1-X(T1)**2)=PCON B28/26
 4765                           32,3724  41366 1           SQRT    DMP
 4766                           32,3725  00011 1           08D
 4767                           32,3726  77701 1           NORM
 4768   REF  46  LAST  881      32,3727  00047 1           X1
 4769                           32,3730  14035 1           STODL   28D     THETA3*PCON**.5          B10/B8 -N1
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```
4770  REF  23  LAST  881    32,3731  03722 0          X(T1)
4771                        32,3732  74301 0  NORM    VXSC
4772  REF  22  LAST  881    32,3733  00050 1          X2
4773  REF   8  LAST  859    32,3734  03740 1          UR1/
4774                        32,3735  74274 0  XAD,2   VXSC
4775  REF  47  LAST  881    32,3736  00046 0          X1
4776                        32,3737  00035 1          28D
4777                        32,3740  63257 1  VSR*    PDVL
4778                        32,3741  57207 0          0 -9D,2
4779  REF   5  LAST  859    32,3742  03746 1          UH/
4780                        32,3743  53761 1  VXSC    VSR*
4781                        32,3744  00035 1          28D
4782                        32,3745  20575 1          0 -4,1
4783                        32,3746  45455 1  VAD     STADR
4784  REF   7  LAST  868    32,3747  74077 1  STORE   V2(T1)/
4785                        32,3750  51451 0  VSU     ABVAL
4786  REF   6  LAST  859    32,3751  03672 1          V(T1)/
4787  REF   9  LAST  879    32,3752  03706 0  STORE   DV
4788                        32,3753  77650 1  GOTO
4789                        32,3754  00040 0          32D
```

X(T1)*UR1/ B_5+B_1 $-N_2$

THETA3(PCON**.5)X(T1)*UR1/ B_7/B_5

\+

THETA3(PCON**.5)UH/ B_7/B_5

=

V2(T1)/ B_7/B_5

ABVAL(V2(T1)/-V1(T)/)=DV B_7/B_5

```
P4800   SUBROUTINE TO COMPUTE BOUNDS ON INDEPENDENT VARIABLE X(T1)

R4801   INPUT
R4802     PUSHLIST
R4803       PUSHLOC -4  MAJOR AXIS (MA)                                  DP      B30/B28
R4805       PUSHLOC -2  MAJOR AXIS (MA) AGAIN                            DP      B30/B28
R4807       28D         BETA5=LAMBDA*BETA1                               DP      B9
R4809     OTHER
R4810       RCON                                                         DP      B29/B27
R4812       R(T1)                                                        DP      B29/B27
R4814   OUTPUT
R4815     MPAC
R4816       X(T1)LIM    LIMIT ON INDEPENDENT VARIABLE X(T1)              DP      B5
R4818   DEBRIS
R4819     PUSHLIST
R4820       C(PUSHLOC)  MA-RCON                                          DP      (B30/28)-N1
R4823       C(PSHLOC)+2 MA                                               DP      B30/B28
R4825       X1          NORMALIZATION FACTOR FOR MA-RCON
R4826       20D         XT1LIM SUBROUTINE RETURN ADDRESS
R4827   PUSHLOC IS RESTORED TO ITS ENTRANCE VALUE UPON EXITING XT1LIM

 4848   REF  1              27,2000                          SETLOC  RTB2
 4849                      27,2633                          BANK
 4850                      27,2633   71220 1  XT1LIM        STO     DLOAD
 4851                      27,2634   00024 1                 20D
 4852   REF  12  LAST 871  27,2635   03636 1                 RCON
 4853                      27,2636   44342 1                 SR1     BDSU
 4854                      27,2637   65301 0                 NORM    PDDL    MA-RCON                 B30-N1
 4855   REF  23  LAST 882  27,2640   00050 1                 X2
 4856                      27,2641   70525 1                 PDDL    SR1
 4857   REF  7   LAST 872  27,2642   03646 0                 R(T1)
 4858                      27,2643   56221 0                 BDSU    DDV
 4859                      27,2644   41257 1                 SL*     DMP
 4860                      27,2645   57577 0                         0 -1,2
 4861                      27,2646   00035 1                         28D
 48615                     27,2647   77657 0                 SL*
 486151                    27,2650   20172 1                         0 -7,1
 4862                      27,2651   50025 0                 DSU     BMN     (BETA5(MA-R(T1))/(MA-RCON))-1   B10
 4863   REF  1              27,2652   31663 0                         1RTBB10
 4864   REF  1              27,2653   56656 1                         XT1LIM5
 4865                      27,2654   52166 1                 SQRT    GOTO
 4866   REF  1              27,2655   56660 1                         XT1LIMX
 4867                      27,2656   77745 1  XT1LIM5       DLOAD
 4868   REF  6   LAST 876  27,2657   31677 0                         ZERORTB
 4869                      27,2660   77650 1  XT1LIMX       GOTO
 4870                      27,2661   00024 1                 20D
```

P4900 CONSTANTS FOR THE P37 AND P70 PROGRAMS AND SUBROUTINES

```
49005
49006  REF  1          36,3250                    BANK    36
49007                  34,2000                    SETLOC  RTECON
                       34,3652                    BANK

4901
4901                   34,3652  20000 0  1RTEB1    2DEC    1.B-1
4902                   34,3653  00000 1
4902                   34,3654  10000 0  1RTEB2    2DEC    1.B-2
4903                   34,3655  00000 1
4903                   34,3656  04000 0  1RTEB3    2DEC    1.B-3
4904                   34,3657  00000 1
4904                   34,3660  02000 0  1RTEB4    2DEC    1.B-4
4910                   34,3661  00000 1
4910                   34,3662  00020 0  1RTEB10   2DEC    1.B-10
4912                   34,3663  00000 1
4912                   34,3664  00004 0  1RTEB12   2DEC    1.B-12
4913                   34,3665  00000 1
4913                   34,3666  00002 0  1RTEB13   2DEC    1.B-13
4917                   34,3667  00000 1
4917                   34,3670  00000 1  1RTEB17   2DEC    1.B-17
4925                   34,3671  04000 0
4925                   34,3672  00000 1  1RTEB25   2DEC    1.B-25
4928                   34,3673  00010 0
4928                   34,3674  00000 1  1RTEB28   2DEC    1.B-28
4929                   34,3675  00001 0
4929                   34,3676  00000 1  ZERORTE   2DEC    0
4930                   34,3677  00000 1
4930                   34,3700  77777 0  M144RTE   2DEC    -144.B-28
49301                  34,3701  77557 0
49301                  34,3702  77777 0  M15RTE    2DEC    -15
49302                  34,3703  77760 0
49302                  34,3704  00000 1  10RTE     2DEC    10
49303                  34,3705  00012 1
49303                  34,3706  54631 1  M.6RTE    2DEC    -.6
4931                   34,3707  63145 1
4931                   34,3710  21463 0  1.1RTEB1  2DEC    1.1B-1
49311                  34,3711  06315 0
49311                  34,3712  77777 0  M6RTEB28  2DEC    -6
49312                  34,3713  77771 0
49312                  34,3714  37777 1  2RTEB1    2OCT    3777737777
4932                   34,3715  37777 1
4932                   34,3716  77777 0  M9RTEB28  2DEC    -9
4933                   34,3717  77766 0
4933                   34,3720  77777 0  M8RTEB28  2DEC    -8
4934                   34,3721  77767 1
4934                   34,3722  00000 1  30480RTE  2DEC    30480.B-29
4935                   34,3723  35610 0
4935                   34,3724  36703 0  VCSPS     2DEC    30.8811B-5
                       34,3725  03743 1
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4936                    34,3726  33041 1  VCRCS     2DEC    27.0864B-5
4936                    34,3727  37714 1
4937                    34,3730  00003 1  MDOTRCS   2DEC    .0016375B-3
4937                    34,3731  13241 1
4938                    34,3732  20000 0  CSUBT     2DEC    .5
4938                    34,3733  00000 1
4940                    34,3734  00605 1  OCT605    OCT     00605
4941                    34,3735  00612 1  OCT612    OCT     00612
4942                    34,3736  00613 0  OCT613    OCT     00613
4943                    34,3737  40214 1  MCOS7.5   2DEC    -.99144486
4943                    34,3740  45266 1
4944                    34,3741  73645 1  MSIN7.5   2DEC    -.13052619
4944                    34,3742  56536 1
4945                    34,3743  70467 0  MCOS22.5  2DEC    -.92387953B-2
4945                    34,3744  71205 0
4946                    34,3745  16525 1  THETA165  2DEC    .458333333
4946                    34,3746  12525 0
4947                    34,3747  22525 0  THETA210  2DEC    .583333333
4947                    34,3750  12525 0
4951                    34,3751  17775 1  EPC1RTE   2DEC    .99966B-1
4951                    34,3752  06676 0
4952                    34,3753  00000 1  EPC2RTE   2DEC    100.B-29
4952                    34,3754  00062 0
4953                    34,3755  00020 0  EPC3RTE   2DEC    .001
4953                    34,3756  14223 1
4954                    34,3757  00000 1  EPC4RTE   2DEC    .00001
4954                    34,3760  05174 0
4955                    34,3761  00002 0  EPC5RTE   2DEC    .01B-6
4955                    34,3762  21727 0
4956                    34,3763  00000 1  EPC6RTE   2DEC    .000007B-1
4956                    34,3764  01654 1
4957                    34,3765  00000 1  EPC7RTE   2DEC    1000.B-29
4957                    34,3766  00764 1
4958                    34,3767  00040 0  EPC8RTE   2DEC    .002
4958                    34,3770  30447 0
4959                    34,3771  00000 1  EPC9RTE   2DEC    1.B-25
4959                    34,3772  00010 0
4960                    34,3773  00000 1  EPC10RTE  2DEC    .0001B-7
4960                    34,3774  00322 1
4961                    35,3755           BANK      35
4962  REF   1           35,2000           SETLOC    RTECON1
4963                    35,3755           BANK
4964                    35,3755  27657 0  C4RTE     2DEC    8.E8B-30
4964                    35,3756  01000 0
4971                    35,3757  00325 0  K1RTE     2DEC    7.E6B-29
4971                    35,3760  23740 0
4972                    35,3761  00306 1  K2RTE     2DEC    6495000.B-29
4972                    35,3762  06614 1
4973                    35,3763  76027 0  K3RTE     2DEC    -.06105
4973                    35,3764  70156 1
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L P3T,P7D


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4974
4974
4980
4980
4995
4995
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35,3765  74517 1  K4RTE   2DEC  -.10453
35,3766  54131 0
35,3767  30276 1  RTMURTE 2DEC  199650.501B-18
35,3770  05001 0
35,3771  00003 1  E3RTE   2DEC  121920.B-29
35,3772  27040 0
```

```
2000                          23,3140                    BANK    23
2001  REF  1                  42,2000                    SETLOC  SBAND
2002                          42,3565                    BANK

2003  REF  1                                             COUNT*  $$/R05
2004  REF  3  LAST  782       E4,1417                    EBANK=  EMSALT

20061 REF 238  LAST  853      42,3565   0 4555 0  SBANDANT TC     BANKCALL    V 64 E GETS US HERE
20062 REF  8   LAST  757      42,3566    17573 0          CADR   R02BOTH     CHECK IF IMU IS ON AND ALIGNED
2007  REF 221  LAST  853      42,3567   0 6006 1          TC     INTPRET
2008                          42,3570    45034 1         RTB    CALL
2009  REF 24   LAST  744      42,3571    45505 0                LOADTIME    PICKUP CURRENT TIME SCALED B-28
2010  REF  9   LAST  731      42,3572    47432 1                CDUTRIG     COMPUTE SINES AND COSINES OF CDU ANGLES
2012  REF 46   LAST  868      42,3573    34041 0          STCALL TDEC1       ADVANCE INTEGRATION TO TIME IN TDEC1
2013  REF  9   LAST  734      42,3574    27045 0                CSMCONIC    USING CONIC INTEGRATION
2014                          42,3575    46135 1         SLOAD  BHIZ        ORIGIN OF REFERENCE INERTIAL SYSTEM IS
2015  REF 24   LAST  883      42,3576    00050 1                X2          EARTH = 0, MOON = 2
2016  REF  1                  42,3577    65612 1                EISOI
2017                          42,3600    77775 1         VLOAD
2018  REF 35   LAST  869      42,3601    00001 0                RATT
2019  REF  1                  42,3602    00003 1         STORE  RCM         MOVE RATT TO PREVENT WIPEOUT
2020                          42,3603    45145 0         DLOAD  CALL        MOON, PUSH ON
2021  REF  9   LAST  869      42,3604    00015 0                TAT         GET ORIGINAL TIME
2022  REF  1                  42,3605    54115 0                LUNPOS      COMPUTE POSITION VECTOR OF MOON
2023                          42,3606    57455 1         VAD    VCOMP       R= -(REM+RCM) = NEG. OF S/C POS. VEC
2024  REF  2   LAST  887      42,3607    00003 1                RCM
2025                          42,3610    77650 1         GOTO
2026  REF  2   LAST  887      42,3611    65614 1                EISOI +2
2027                          42,3612    57575 1  EISOI  VLOAD  VCOMP       EARTH, R= -RCM
2028  REF 36   LAST  887      42,3613    00001 0                RATT
2029                          42,3614    64201 0         SETPD  MXV         RCS TO STABLE MEMBER- B-1X B-29X B+1
2030                          42,3615    00003 1                2D          2D
2031  REF 35   LAST  838      42,3616    01736 1                REFSMMAT    STABLE MEMBER.  B-1X B-29X B+1= B-29
2032                          42,3617    65372 1         VSL1   PDDL        8D
2033  REF 24   LAST  833      42,3620    15332 1                HI6ZEROS
2034  REF  1                  42,3621    24025 0         STOVL  YAWANG      ZERO OUT YAWANG, SET UP FOR SMNB
2035  REF  3   LAST  887      42,3622    00003 1                RCM         TRANSFORMATION. SM COORD. SCALED B-29
2036                          42,3623    77624 1         CALL
2037  REF  5   LAST  677      42,3624    47577 1                *SMNB*
2038  REF  1                  42,3625    00003 1         STORE  R           SAVE NAV. BASE COORDINATES
2039                          42,3626    63256 0         UNIT   PDVL        14D
2040  REF  2   LAST  887      42,3627    00003 1                R
2041                          42,3630    72431 1         VPROJ  VSL2        COMPUTE PROJECTION OF VECTOR INTO CM
2042  REF  2   LAST  281      42,3631    15324 0                HIUNITZ     XY-PLANE, R-(R.UZ)UZ
2043                          42,3632    40045 1         BVSU   BOV         CLEAR OVERFLOW INDICATOR IF SET
2044  REF  3   LAST  887      42,3633    00003 1                R
2045  REF  1                  42,3634    65635 1                COVCNV
2046                          42,3635    40056 0  COVCNV UNIT   BOV         TEST OVERFLOW FOR INDICATION OF NULL
2047  REF  1                  42,3636    65652 0                NOADJUST    VECTOR
2048                          42,3637    50206 0         PUSH   DOT         20D
```

L S-BAND ANTENNA FOR CM

USER'S PAGE NO. 2 E4 S4

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2049  REP   4  LAST  389     42,3640   15330 0                    HIUNITX
2050                         42,3641   65552 0          SL1       ACOS
2051                         42,3642   50315 0          PDVL      DOT
2052  REP   1                42,3643   00017 1                    URP
2053  REP   2  LAST  281     42,3644   15326 1                    HIUNITY
2054                         42,3645   51152 0          SL1       BPL
2055  REP   2  LAST  887     42,3646   65652 0                    NOADJUST
2056                         42,3647   45345 1          DLOAD     DSU
2057  REP  10  LAST  624     42,3650   15340 1                    DPPOSMAX
2058                         42,3651   77606 1          PUSH
2059                         42,3652   50375 0  NOADJUST VLOAD    DOT
2060  REP   1                42,3653   00011 1                    UR
2061  REP   3  LAST  887     42,3654   15324 0                    HIUNITZ
2062                         42,3655   65552 0          SL1       ACOS
2063                         42,3656   77625 0          DSU
2064  REP   3  LAST  835     42,3657   15322 0                    HIDP1/4
2065  REP   4  LAST  275     42,3660   16321 0          STODL     RHOSB
2066  REP   2  LAST  887     42,3661   00025 0                    YAWANG
2067  REP   2  LAST  275     42,3662   02323 1          STORE     GAMMASB
2068                         42,3663   77776 1          EXIT
20681 REP  19  LAST  743     42,3664   3 1044 0         CA        EXTVBACT
20682 REP  32  LAST  700     42,3665   7 4706 0         MASK      BIT5
20683                        42,3666   0 0006 1         EXTEND
20684 REP  32  LAST  624     42,3667   1 5423 0         BZF       ENDEXT
2069  REP   1                42,3670   3 3704 1         CAF       V06N51
2070  REP 239  LAST  887     42,3671   0 4555 0         TC        BANKCALL
2071  REP   3  LAST  561     42,3672    20504 1         CADR      GOMARKPR
2072  REP   7  LAST  510     42,3673   0 5514 1         TC        B5OFF
2073  REP   8  LAST  888     42,3674   0 5514 1         TC        B5OFF
2074  REP 102  LAST  851     42,3675   0 5112 0         TC        ENDOFJOB
2075  REP  25  LAST  692     42,3676   3 4710 0         CAF       BIT3
2076  REP  16  LAST  851     42,3677   0 5415 1         TC        BLANKET
2077  REP  60  LAST  779     42,3700   3 4712 1         CAF       BIT1
2078  REP 240  LAST  888     42,3701   0 4555 0         TC        BANKCALL
2079  REP  12  LAST  759     42,3702    01732 0         CADR      DELAYJOB
2080  REP   2  LAST  244     42,3703   1 3567 1         TCF       SBANDANT +2
2086                        42,3704    01463 1 V06N51  VN        0651
2087                           0002           RCM     EQUALS    2D
2088                           0010           UR      EQUALS    8D
2089                           0016           URP     EQUALS    14D
2090                           0024           YAWANG  EQUALS    20D
2091                           0026           PITCHANG EQUALS   22D
2092  REP   4  LAST  887        0002           R       EQUALS    RCM
```

```
COMPUTE YAW ANGLE = ACOS (URP.UX)
REVOLUTIONS SCALED B0
22D YAWANG

COMPUTE FOLLOWING- URP.UY
POSITIVE
YES, 0- 180 DEGREES
NO, 181-360 DEGREES 20D
COMPUTE 2 PI MINUS YAW ANGLE
22D YAWANG
COMPUTE PITCH ANGLE
ACOS (UR.UZ) - PI/2

REVOLUTIONS B0



PATCH FOR CHECKOUT

IS BIT 5 STILL ON


NO, WE HAVE BEEN ANSWERED
DISPLAY ANGLES


TERMINATE

RECYCLE
IMMEDIATE RETURN
BLANK R3
DELAY MINIMUM TIME TO ALLOW DISPLAY IN
```

```
0001                          31,3215                    BANK    31
0002   REF   1                31,2000                    SETLOC  R35
0003                          31,3215                    BANK

0004   REF   1                                           COUNT   31/R35

0005   REF   2  LAST   88     E4,1724                    EBANK=  JLOOPCNT
0006   REF 222  LAST  887     31,3215   0 6006 1 LNDMKSEL TC      INTPRET
0007                          31,3216    77634 0         RTB
0008   REF  25  LAST  887     31,3217    45505 0                 LOADTIME      PICK UP TIME SCALED B-28
0009   REF  37  LAST  697     31,3220    01046 1         STORE   DSPTEM1
0010                          31,3221    77776 1         EXIT
0011   REF   1                31,3222   3 3535 1 DISGET  CAF     V06N34**      DISPLAY GROUND ELAPSED TIME
0012   REF 241  LAST  888     31,3223   0 4555 0         TC      BANKCALL
0013   REF   6  LAST  562     31,3224    20465 1         CADR    GOMARKP
0014   REF  33  LAST  888     31,3225   0 5423 1         TC      ENDEXT        TERMINATE WITH V34E
0015   REF   1                31,3226   0 3230 0         TC      CALCTLS       PROCEED WITH V33E
0016   REF   1                31,3227   0 3222 0         TC      DISGET        NEW TIME LOADED VIA V25E
0017   REF 223  LAST  889     31,3230   0 6006 1 CALCTLS  TC      INTPRET
0018                          31,3231    43175 0         VLOAD   SET
00181  REF   8  LAST  697     31,3232    02026 1                 RLS
001815 REF  12  LAST  857     31,3233    00462 1                 ERADFLAG      SET. CONSTANT REARTH (RM)
00182                         31,3234    14001 0         STODL   0D            PD0-5 & RP VECTOR
00183  REF   1                31,3235    23534 1                 RRCSML
00184                         31,3236    14007 0         STODL   6D            PD6-7 & DUMMY TIME
00185  REF   2  LAST  889     31,3237    23534 1                 RRCSML        MPAC & NON-ZERO FOR MOON CASE
001853                        31,3240    77614 1         SET
001856 REF  21  LAST  857     31,3241    01463 1                 LUNAFLAG      SET. LUNAR LAT-LONG
00186                         31,3242    77624 1         CALL
00187  REF   1                31,3243    61762 0                 RPTOLONG      RP TO LONG
00188                         31,3244    77745 1         DLOAD
00189  REF   8  LAST  857     31,3245    01106 1                 LONG
001895 REF   1                31,3246    16353 0         STODL   LSLONG        SAVE LND SITE LONG.
0019   REF  38  LAST  889     31,3247    01046 1                 DSPTEM1
0020   REF  47  LAST  887     31,3250    34041 0         STCALL  TDEC1         ADVANCE INTEGRATION TO TIME IN TDEC1
0021   REF   7  LAST  858     31,3251    27022 1                 CSMPREC       USING PRECISION INTEGRATION
0022                          31,3252    77775 1         VLOAD
0023   REF   6  LAST  598     31,3253    00017 1                 RATT1
0025   REF   2  LAST   88     31,3254    02337 1         STORE   POSVECT       SAVE POSITION VECTOR SCALED B-27
0026   REF  15  LAST  857     31,3255    26152 0         STOVL   ALPHAV        FOR LAT-LONG
0028   REF   5  LAST  503     31,3256    00025 0                 VATT1
0030   REF   2  LAST   88     31,3257    16345 1         STODL   VELVECT       SAVE VEL. VECTOR B-5
0031   REF  10  LAST  887     31,3260    00015 0                 TAT
0032   REF   2  LAST   88     31,3261    36323 0         STCALL  VECTIME       SAVE TIME
0033   REF   7  LAST  857     31,3262    26322 0                 LAT-LONG      COMPUTE LAT, LONG, ALT OF S/C  PD600
0034                          31,3263    76145 0         DLOAD   AXT,1         SAVE S/C LONGITUDE
0035   REF   9  LAST  889     31,3264    01106 1                 LONG
0036   REF   2  LAST  889     31,3265    02352 1                 LSLONG        XR1 = LANDING SITE LONG---SINUS MEDII,OCE
0037   REF   2  LAST   88     31,3266    36335 1         STCALL  LONGSAVE      ANUS PROCELLARUM, MARE TRANQUILLITEATIS
0038   REF   1                31,3267    63414 0                 ELAPTIME      COMPUTE TL (TIME TO LANDING SITE)
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```
0039  REF  39  LAST  889   301,3270  01046 1            STORE  DSPTEM1        SAVE TL FOR OUTPUT TO DSKY
0040                       301,3271  77776 1            EXIT
0041  REF   1              301,3272  3 3536 1  DISTLS   CAF    V06N31**       DISPLAY TIME TO LANDING SITE
0042  REF 242  LAST  889   301,3273  0 4555 0           TC     BANKCALL
0043  REF   7  LAST  889   301,3274  20465 1            CADR   GOMARKP
0044  REF  34  LAST  889   301,3275  0 5423 1           TC     ENDEXT         TERMINATE WITH V34E
0045  REF   1              301,3276  0 3300 1           TC     PROCLMKS       PROCEED WITH V33E
0046  REF   1              301,3277  0 3272 0           TC     DISTLS         ILLEGAL RESPONSE, DO AGAIN
0047  REF 224  LAST  889   301,3300  0 6006 1  PROCLMKS TC     INTPRET        BEGIN LANDMARK PROCESSING
0048                       301,3301  75170 0            AXT,1  AXC,2         SET COUNTERS FOR LOOP CONTROL
0049  REF   1              301,3302  00005 1                   KCOUNT
0050  REF   1              301,3303  00002 0                   JCOUNT
0051                       301,3304  43134 0            SXA,2  SET
0052  REF   3  LAST  889   301,3305  02324 0                   JLOOPCNT
0053  REF  13  LAST  889   301,3306  00462 1                   ERADFLAG       USE MEAN LUNAR RADIUS
0054                       301,3307  66730 0  KLOOP    SXA,1  SLOAD*
0055  REF   3  LAST  257   301,3310  02325 1                   KLOOPCNT
0056  REF   1              301,3311  23534 1                   BANDTABL +5,1
0057  REF   2  LAST   88   301,3312  16327 0            STODL  NKVAL          SAVE LONGITUDE BAND
0058  REF  11  LAST  888   301,3313  15340 1                   DPPOSMAX
0059  REF   2  LAST   88   301,3314  02330 0            STORE  DELTAL
0060                       301,3315  54170 0  JLOOPP   AXT,1  XSU,1          SET XR1 FOR LONGITUDE OF LANDMARK
0061  REF   3  LAST  622   301,3316  63620 0                   LONGTAB -2
0062  REF   4  LAST  890   301,3317  02324 0                   JLOOPCNT
0063                       301,3320  77624 1            CALL
0064  REF   2  LAST  889   301,3321  63414 0                   ELAPTIME       COMPUTE TL (TIME TO LANDMARK)
0065  REF   3  LAST  126   301,3322  02321 0            STORE  XR1HOLD
0066                       301,3323  45014 0            SET    CALL            COMPUTE LATITUDE AND LONGITUDE OF S/C
0067  REF  22  LAST  889   301,3324  01463 1                   LUNAFLAG       AT LANDMARK
0068  REF   8  LAST  889   301,3325  26322 0                   LAT-LONG                                    PD=00
0069                       301,3326  77754 1            LXA,2
0070  REF   5  LAST  890   301,3327  02324 0                   JLOOPCNT
0071                       301,3330  44343 0            DLOAD* BDSU
0072  REF   3  LAST  622   301,3331  54240 0                   LATTAB -2,2
0073  REF  13  LAST  857   301,3332  01104 0                   LAT
0074                       301,3333  41446 1            ABS    PUSH           DELTA LAT = ABS(LAT - LATJ)      PD=02
0075                       301,3334  51025 1            DSU    BPL            DELTAL GREATER THAN DELTA LAT
0076  REF   3  LAST  890   301,3335  02330 0                   DELTAL
0077  REF   1              301,3336  63345 0                   LMKLOOP        NO
0078                       301,3337  45545 1            DLOAD  STADR                                       PD=00
0079  REF   4  LAST  890   301,3340  61447 1            STODL  DELTAL         DELTA LAT = DELTAL
0080  REF   4  LAST  890   301,3341  02321 0                   XR1HOLD
0081  REF  40  LAST  890   301,3342  01046 1            STORE  DSPTEM1        SAVE TIME TO LANDMARK
0082                       301,3343  77734 1            SXA,2
0083  REF   2  LAST   88   301,3344  02333 0                   INDEXNUM       SAVE LANDMARK I.D.
0084                       301,3345  67114 1  LMKLOOP  INCR,2 SXA,2          J = J + 2
0085                       301,3346  77775 1            OCT    -2
0086  REF   6  LAST  890   301,3347  02324 0                   JLOOPCNT
0087                       301,3350  45335 0            SLOAD  DSU
0088  REF  25  LAST  887   301,3351  00050 1                   X2
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0089  REP  3  LAST  890   31,3352   02327 0                 NKVAL
0090                      31,3353   52030 0          BHIZ   GOTO      J = NKVAL
0091  REP  1              31,3354   63356 1                 DISLID    YES, GO DISPLAY LANDMARK ID, MAYBE TL
0092  REP  1              31,3355   63315 0                 JLOOPP    NO, ONE MORE TIME
0093                      31,3356   70535 0  DISLID SLOAD   SR1       ID = -INDEXNUM/2 + 1
0094  REP  3  LAST  890   31,3357   02334 1                 INDEXNUM
0095                      31,3360   63144 0          LXC,2  INCR,2
0096  REP 288  LAST  863  31,3361   00154 1                 MPAC +0
0097                      31,3362   00001 0                 1D
0098                      31,3363   77534 0          SXA,2  EXIT
0099  REP 24   LAST  732  31,3364   02751 0                 LANDMARK
0100  REP  1              31,3365   3 3537 0         CAF    V05N70**  DISPLAY LANDMARK ID
0101  REP 243  LAST  890  31,3366   0 4555 0         TC     BANKCALL
0102  REP  4   LAST  888  31,3367    20504 1         CADR   GOMARKFR
0103  REP 35   LAST  890  31,3370   0 5423 1         TC     ENDEXT    TERMINATE WITH V34E
0104  REP  1              31,3371   0 3376 0         TC     DISTTL    PROCEED WITH V33E
0105  REP  1              31,3372   0 3404 1         TC     NEXTBAND  RECYCLE WITH V32E
0106  REP 21   LAST  840  31,3373   3 4715 0         CAF    FIVE      BLANK R1 AND R3
0107  REP 17   LAST  888  31,3374   0 5415 1         TC     BLANKET
0108  REP 103  LAST  888  31,3375   0 5112 0         TC     ENDOPJOB
0109  REP  2   LAST  889  31,3376   3 3535 1  DISTTL CAF    V06N34**  DISPLAY GROUND ELAPSED TIME TO LANDMARK
0110  REP 244  LAST  891  31,3377   0 4555 0         TC     BANKCALL
0111  REP  8   LAST  890  31,3400    20465 1         CADR   GOMARKF
0112  REP 36   LAST  891  31,3401   0 5423 1         TC     ENDEXT    TERMINATE WITH V34E
0113  REP  2   LAST  891  31,3402   0 3404 1         TC     NEXTBAND  PROCEED WITH V33E
0114  REP  2   LAST  891  31,3403   0 3376 0         TC     DISTTL    ILLEGAL RESPONSE, DO AGAIN
0115  REP 225  LAST  890  31,3404   0 6006 1  NEXTBAND TC     INTPRET   MUST WE GO ON
0116                      31,3405   66350 1          LXA,1  SSP       RESTORE COUNTER
0117  REP  4   LAST  890  31,3406   02325 1                 KLOOPCNT
0118  REP 36   LAST  872  31,3407   00051 0                 S1
0119                      31,3410   00001 0                 1D
0120                      31,3411   77500 1          TIX,1  EXIT
0121  REP  1              31,3412   63307 0                 KLOOP     YES, K = K - 1
0122  REP 37   LAST  891  31,3413   0 5423 1         TC     ENDEXT    K = 0, EXIT R35
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0123                          31,3414  66020 0  ELAPTIME STQ    SXA,1          SAVE RETURN AND INDEX 1
0124  REP   1                 31,3415  02321 0                  RETLOCN
0125  REP   5  LAST  890      31,3416  02320 1                  XR1HOLD
0126                          31,3417  77601 0          SETPD
0127                          31,3420  00001 0                  0D
0128                          31,3421  65375 0          VLOAD   PDDL                                    PD=00
0129  REP   4  LAST  888      31,3422  15324 0                  HIUNITZ                                 PD=06
0130  REP   3  LAST  889      31,3423  02323 1                  VECTIME        SET UP FOR RP-TO-R
0131                          31,3424  45125 0          PDDL    CALL                                    PD=08
0132  REP  12  LAST  890      31,3425  15340 1                  DPPOSMAX
0133  REP   5  LAST  732      31,3426  55341 1                  RP-TO-R        TRANSFORM PLANETARY TO RCS PD=00
0134                          31,3427  53515 0          PDVL    UNIT           COMPUTE AND STORE UZ       PD=06
0135  REP   3  LAST  889      31,3430  02337 1                  POSVECT        POSITION VECTOR OF CM SCALED B-27
0136                          31,3431  47206 0          PUSH    VXV            COMPUTE AND STORE UR = UNIT(R) PD=12
0137  REP   1                 31,3432  00001 0                  UZZ
0138                          31,3433  53572 1          VSL1    UNIT
0139                          31,3434  47206 0          PUSH    VXV            COMPUTE AND STORE UW=UNIT(UR X UZ) PD=18
0140  REP   2  LAST  892      31,3435  00001 0                  UZZ
0141                          31,3436  53572 1          VSL1    UNIT
0142                          31,3437  47315 0          PDVL    VXV            COMPUTE AND STORE UN=UNIT(UW X UZ) PD=24
0143  REP   4  LAST  892      31,3440  02337 1                  POSVECT        POSITION VECTOR OF CM SCALED B-27
0144  REP   3  LAST  889      31,3441  02345 1                  VELVECT        VELOCITY VECTOR OF CM SCALED B-5
0145                          31,3442  53572 1          VSL1    UNIT           COMPUTE AND STORE U = UNIT(R X V) PD=30
0146                          31,3443  70125 0          PDDL    LXC,1          RESTORE INDEX 1 COMPLEMENTED
0147  REP   3  LAST  889      31,3444  02335 0                  LONGSAVE
0148  REP   6  LAST  892      31,3445  02320 1                  XR1HOLD
0149                          31,3446  41223 1          DSU*    DMP
0150                          31,3447  00001 0                  0,1
0151  REP   3  LAST  889      31,3450  23534 1                  RRCSML
0152                          31,3451  73406 1          PUSH    SIN            DLONG = .997(LONG - LONGJ) PD=32
0153                          31,3452  76561 1          VXSC    VSL1
0154  REP   1                 31,3453  00023 0                  UNN            U'W = UW COS(DLONG) + UN SIN(DLONG)
0155                          31,3454  71525 0          PDDL    COS                                     PD=36
0156                          31,3455  76561 1          VXSC    VSL1
0157  REP   1                 31,3456  00015 0                  UW
0158                          31,3457  47255 0          VAD     VXV                                     PD=30,PD=24
0159                          31,3460  53572 1          VSL1    UNIT           UD = UNIT (U'W X U)
0160  REP  16  LAST  889      31,3461  02152 0          STORE   ALPHAV         SET UD FOR LAT-LONG--POINT OF CLOSEST
0161                          31,3462  72441 0          DOT     SL1            APPROACH
0162  REP   1                 31,3463  00007 0                  URR            COS (THETA) = (UD . UR)
0163  REP   8  LAST  850      31,3464  02734 0          STORE   CSTH
0164                          31,3465  73526 1          ACOS    SIN            THETA = ACOS(UD.UR), 0 TO PI
0165  REP   8  LAST  850      31,3466  26732 0          STOVL   SNTH           SIN (THETA), 0 TO PI
01651 REP   2  LAST  892      31,3467  00007 0                  URR
01652                         31,3470  50235 0          VXV     DOT
01653 REP  17  LAST  892      31,3471  02152 0                  ALPHAV
01654                         31,3472  00031 0                  24D
01655                         31,3473  71244 0          BPL     DLOAD          CHK (UR X UD).U
01656                         31,3474  63500 1                  +4D
01657 REP   9  LAST  892      31,3475  02732 0                  SNTH           NEG, THETA = 2 PI - THETA
```

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01658                          31,3476  77676 0          DCOMP                ERGO SIN (THETA) = - SIN (THETA)
01659  REP  10  LAST  892      31,3477  02732 0          STORE   SNTH
0166                           31,3500  43175 0          VLOAD   SET
0167   REP   5  LAST  892      31,3501  02337 1                  POSVECT
0168   REP   7  LAST  863      31,3502  03466 0                  RVSW         TIME ONLY
0169   REP  10  LAST  863      31,3503  26657 1          STOVL   RVEC
0170   REP   4  LAST  892      31,3504  02345 1                  VELVECT
0171   REP  14  LAST  863      31,3505  02746 0          STORE   VVEC
0172                           31,3506  45160 1          AXC,1   CALL
0173                           31,3507  00012 1                  10D          MOON ONLY
0174   REP   6  LAST  850      31,3510  24737 1                  TIMETHET     COMPUTE TRANSFER TIME
0175                           31,3511  43014 0          BON     BON
0176   REP   1                 31,3512  04313 1                  COGAFLAG     NO SOLUTION SINCE NEAR RECTILINEAR
0177   REP   1                 31,3513  63523 0                  ETERROR
0178   REP   1                 31,3514  04310 1                  INFINFLG     NO PHYSICAL SOLUTION EXISTS
0179   REP   2  LAST  893      31,3515  63523 0                  ETERROR
0180                           31,3516  43345 1          DLOAD   DAD          COMPUTE GROUND ELAPSED TIME        PD=00
0181   REP   4  LAST  892      31,3517  02323 1                  VECTIME
0182   REP   9  LAST  863      31,3520  00037 0                  T
0183                           31,3521  77650 1          GOTO
0184   REP   2  LAST  892      31,3522  02321 0                  RETLOCN      EXIT ELAPTIME
0185                           31,3523  52145 0  ETERROR DLOAD   GOTO         RETURN WITH ZERO
0186   REP  25  LAST  887      31,3524  15332 1                  HI6ZEROS
0187   REP   3  LAST  893      31,3525  02321 0                  RETLOCN
```

```
L       LUNAR LANDMARK SELECTION FOR CM

R018703 SUBROUTINE TO CONVERT RP (VECTOR IN PLAN. COORD. SYSTEM, EITHER
R018706  EARTH-FIXED OR MOON-FIXED) TO LAT, LONG, ALT.
R018709 CALLING SEQUENCE
R018712  L       CALL
R018715  L+1             RPTOLONG
R018718 SUBROUTINES USED
R018721  RP-TO-R, LAT-LONG
R018724 INPUT
R018727  PD0-5D = RP VECTOR
R01873   PD6-7D = TIME
R018733  MPAC = 0 FOR EARTH, NON-ZERO FOR MOON.
R018736  ERADFLAG, LUNAFLAG.
R018739 OUTPUT
R018742  LATITUDE  IN LAT     (REVS. B-0)
R018745  LONGITUDE IN LONG    (REVS. B-0)
R018748  ALTITUDE  IN ALT     (METERS B-29)
 018749 REF   1                30,2000                    SETLOC R35A
 01875                         30,3762                    BANK

 018751
 018754 REF   4  LAST  893     30,3762  45020 1  RPTOLONG STQ    CALL      SAVE RETURN
 018757 REF   6  LAST  892     30,3763  02321 0           CALL    RETLOCN
 01876                         30,3764  55341 1           CALL    RP-TO-R   CONVERT RP TO R, B-27 FOR MOON
 018763 REF  23  LAST  890     30,3765  70414 1           BOFF    VSR2      IF LUNAR RESCALE B-27 TO B-29
 018766                        30,3766  01743 0           CALL    LUNAFLAG
 018769 REF  18  LAST  892     30,3767  61770 0           DSU     +1
 018772 REF   4  LAST  892     30,3770  16152 0           STODL   ALPHAV    MPAC & DUMMY TIME
 018775                        30,3771  23534 1           CALL    RRCSML
 018778 REF   9  LAST  890     30,3772  77624 1           CALL
 01879                         30,3773  26322 0           CALL    LAT-LONG
 018793 REF   5  LAST  894     30,3774  77650 1           GOTO
 018795 REF   2  LAST  889     30,3775  02321 0           CALL    RETLOCN
 018796                        31,2000                    SETLOC R35
                               31,3526                    BANK

 0188                          31,3526  77763 0  BANDTABL DEC     -12       +60 DEGREE BAND
 0189                          31,3527  77751 1           DEC     -22       +30 DEGREE BAND
 0190                          31,3530  77737 1           DEC     -32       +00 DEGREE BAND
 0191                          31,3531  77725 1           DEC     -42       -30 DEGREE BAND
 0192                          31,3532  77713 1           DEC     -52       -60 DEGREE BAND
 0193                          31,3533  37716 0  RRCSML   2DEC    .997
 0193                          31,3534  33106 0
 0194                          31,3535  01442 1  V06N34** VN      00634     ****************************************
 0195                          31,3536  01437 0  V06N31** VN      00631
 0196                          31,3537  01306 0  V05N70** VN      00570
 0197                            0005           KCOUNT   EQUALS  5D
 0198                            0002           JCOUNT   EQUALS  2D
 0199                            0022           UNN      EQUALS  18D
 0200                            0014           UW       EQUALS  12D
 0201                            0006           URR      EQUALS  6D
 0202                            0000           UZZ      EQUALS  0D
```

R0203 **** TEMPORARY VALUES FOR LANDMARK TABLES-LEVINE/SAPONARO****

R02031 LATTAB HAS LATITUDES THAT GO FROM +8 TO -8 DEGREES
R02032 LONGTAB HAS LONGITUDES THAT GO FROM +60 TO -60 DEGREES
R02033 LATTAB AND LONGTAB ARE SCALED REVOLUTIONS B0
R02034 ALTTAB HAS ALTITUDES MEASURED ABOVE THE MEAN LUNAR RADIUS
R02035 ALTTAB IS SCALED IN METERS B-29

							COUNT	31/LNDMK				
02036	REF 1											
0204		31,3540	77406 0	LATTAB	2DEC	-.015231481	2	5	29	S		
0204		31,3541	56241 0									
0205		31,3542	00043 0		2DEC	.002175926	3	0	47	N		
0205		31,3543	24640 0									
0206		31,3544	00046 0		2DEC	.002361111	4	0	51	N		
0206		31,3545	25716 0									
0207		31,3546	77741 0		2DEC	-.001851852	5	0	40	S		
0207		31,3547	65060 1									
0208		31,3550	00055 1		2DEC	.002777778	6	1	00	N		
0208		31,3551	20266 1									
0209		31,3552	77720 1		2DEC	-.002916667	7	1	03	S		
0209		31,3553	46646 1									
0210		31,3554	77646 0		2DEC	-.005462963	10	1	58	S		
0210		31,3555	57652 1									
0211		31,3556	00155 0		2DEC	.006666667	11	2	24	N		
0211		31,3557	07202 0									
0212		31,3560	00486 0		2DEC	.018935185	12	6	49	N		
0212		31,3561	07373 1									
0213		31,3562	00050 1		2DEC	.00250	13	0	54	N		
0213		31,3563	36561 0									
0214		31,3564	00070 0		2DEC	.003425926	14	1	14	N		
0214		31,3565	04130 1									
0215		31,3566	77662 0		2DEC	-.004722222	15	1	42	S		
0215		31,3567	64143 0									
0216		31,3570	77747 0		2DEC	-.001481481	16	0	32	S		
0216		31,3571	67215 0									
0217		31,3572	00062 0		2DEC	.003101852	17	1	07	N		
0217		31,3573	32207 0									
0218		31,3574	00070 0		2DEC	.003472222	20	1	15	N		
0218		31,3575	34343 1									
0219		31,3576	77463 0		2DEC	-.0125	21	4	30	S		
0219		31,3577	46314 0									
0220		31,3600	00004 0		2DEC	.000277777	22	0	06	N		
0220		31,3601	21505 1									
0221		31,3602	00271 0		2DEC	.011342592	23	4	05	N		
0221		31,3603	32622 0									
0222		31,3604	00101 1		2DEC	.003981481	24	1	26	N		
0222		31,3605	07343 1									
0223		31,3606	77574 1		2DEC	-.008009259	25	2	53	S		
0223		31,3607	70656 0									
0224		31,3610	00065 1		2DEC	.003240741	26	1	10	N		
0224		31,3611	03052 0									

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0225  31,3612  77642 1
0225  31,3613  66360 1
0226  31,3614  00045 0
0226  31,3615  05267 1
0227  31,3616  77577 1
0227  31,3617  71734 1
0228  31,3620  00130 0
0228  31,3621  27711 0
0229  31,3622  05120 1   LONGTAB  2DEC  -.005694444   27   2  03 S
0229  31,3623  14712 0
0230  31,3624  05076 0             2DEC   .002268518   30   0  49 N
0230  31,3625  06264 1
0231  31,3626  04453 1             2DEC  -.007824074   31   2  49 S
0231  31,3627  23531 1
0232  31,3630  03554 0             2DEC   .005416667   32   1  57 N
0232  31,3631  33074 1
0233  31,3632  03326 0             2DEC   .161157407    2  58  01 E
0233  31,3633  25112 1
0234  31,3634  03263 0             2DEC   .160046296    3  57  37 E
0234  31,3635  00252 1
0235  31,3636  03014 1             2DEC   .143287037    4  51  35 E
0235  31,3637  34505 0
0236  31,3640  03007 0             2DEC   .116018518    5  41  46 E
0236  31,3641  22564 0
0237  31,3642  02740 0             2DEC   .106851852    6  38  28 E
0237  31,3643  04432 0
0238  31,3644  02531 1             2DEC   .104875926    7  37  41 E
0238  31,3645  04017 0
0239  31,3646  02066 0             2DEC   .094537037   10  34  02 E
0239  31,3647  23501 1
0240  31,3650  01502 1             2DEC   .094212963   11  33  55 E
0240  31,3651  13664 1
0241  31,3652  01272 1             2DEC   .091805555   12  33  03 E
0241  31,3653  23036 0
0242  31,3654  00570 0             2DEC   .083564815   13  30  05 E
0242  31,3655  37365 0
0243  31,3656  00252 1             2DEC   .065833333   14  23  42 E
0243  31,3657  25253 1
0244  31,3660  00000 1             2DEC   .050925926   15  18  20 E
0244  31,3661  30213 1
0245  31,3662  77703 0             2DEC   .042638889   16  15  21 E
0245  31,3663  52142 1
0246  31,3664  77254 1             2DEC   .023009259   17   8  17 E
0246  31,3665  76114 1
0247  31,3666  77173 1             2DEC   .010416667   20   3  45 E
0247  31,3667  64334 1
0248  31,3670  76265 1             2DEC   .000046296   21   0  01 E
0248  31,3671  51114 1
0249  31,3672  75644 0             2DEC  -.003703704   22   1  20 W
0249  31,3673  77223 1
                                   2DEC  -.020694444   23   7  27 W

                                   2DEC  -.023703704   24   8  32 W

                                   2DEC  -.051435185   25  18  31 W

                                   2DEC  -.068055556   26  24  30 W
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0250                31,3674  75215 0          2DEC  -.085092593   27  30  38 W
0250                31,3675  72762 1
0251                31,3676  74613 0          2DEC  -.100833333   30  36  18 W
0251                31,3677  76225 0
0252                31,3700  74571 1          2DEC  -.101944444   31  36  42 W
0252                31,3701  67600 0
0253                31,3702  74174 0          2DEC  -.117407407   32  42  16 W
0253                31,3703  54550 0
0254                31,3704  77777 0  ALTTAB  2DEC  -2090 B-29      2
0254                31,3705  75752 0
0255                31,3706  77777 0          2DEC  -2090 B-29      3
0255                31,3707  75752 0
0256                31,3710  77777 0          2DEC  -1790 B-29      4
0256                31,3711  76200 1
0257                31,3712  77777 0          2DEC  -1090 B-29      5
0257                31,3713  76736 1
0258                31,3714  77777 0          2DEC  -940 B-29       6
0258                31,3715  77051 0
0259                31,3716  77777 0          2DEC  -290 B-29       7
0259                31,3717  77556 1
0260                31,3720  77777 0          2DEC  -290 B-29       10
0260                31,3721  77556 1
0261                31,3722  77777 0          2DEC  -1549 B-29      11
0261                31,3723  76370 1
0262                31,3724  77777 0          2DEC  -890 B-29       12
0262                31,3725  77102 1
0263                31,3726  77777 0          2DEC  -1490 B-29      13
0263                31,3727  76426 0
0264                31,3730  77777 0          2DEC  -3230 B-29      14
0264                31,3731  74660 1
0265                31,3732  00000 1          2DEC  5110 B-29       15
0265                31,3733  04773 0
0266                31,3734  00000 1          2DEC  6910 B-29       16
0266                31,3735  06577 1
0267                31,3736  00000 1          2DEC  5110 B-29       17
0267                31,3737  04773 0
0268                31,3740  00000 1          2DEC  3010 B-29       20
0268                31,3741  02741 1
0269                31,3742  00000 1          2DEC  3910 B-29       21
0269                31,3743  03643 0
0270                31,3744  77777 0          2DEC  -935 B-29       22
0270                31,3745  77053 1
0271                31,3746  00000 1          2DEC  2360 B-29       23
0271                31,3747  02234 0
0272                31,3750  00000 1          2DEC  2510 B-29       24
0272                31,3751  02347 0
0273                31,3752  00000 1          2DEC  210 B-29        25
0273                31,3753  00151 1
0274                31,3754  00000 1          2DEC  960 B-29        26
0274                31,3755  00740 1
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L LUNAR LANDMARK SELECTION FOR CM


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0275                    31,3756   00000 1
0275                    31,3757   01217 1     2DEC   1310 B-29     27
0276                    31,3760   00000 1
0276                    31,3761   01301 1     2DEC   1410 B-29     30
0277                    31,3762   77777 0
0277                    31,3763   75337 1     2DEC   -2624 B-29    31
0278                    31,3764   77777 0
0278                    31,3765   75470 0     2DEC   -2445 B-29    32
*** END OF PANDORA .080 ***
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L TVCINITIALIZE USER=S PAGE NO. 1 E0 S3

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R1000   NAME     TVCDAPON (TVC DAP INITIALIZATION AND STARTUP CALL)
R1001   MOD NO 3                        DATE  8 JUNE,1967
R1002   MOD BY ENGEL                    LOG SECTION P40-P47

R1003   FUNCTIONAL DESCRIPTION
R1004        PERFORMS TVCDAP INITIALIZATION (GAINS, TIMING PARAMETERS, FILTER VARIABLES, ETC.)
R1006        COMPUTES STEERING (S40.8) GAIN KPRIMEDT, AND ZEROES PASTDELV,+1 VARIABLE
R1008        MAKES INITIALIZATION CALL TO ..NEEDLER.. FOR TVC DAP NEEDLES-SETUP
R1009        PERFORMS INITIALIZATION FOR ROLL DAP
R1010        CALLS TVCEXECUTIVE AT TVCEXEC, VIA WAITLIST
R1011        CALLS TVCDAP CDU-RATE INITIALIZATION PKG AT DAPINIT  VIA T5
R1012        MRCLEAN AND TVCINIT4 ARE POSSIBLE TVC-RESTART ENTRIES
R1013   CALLING SEQUENCE - T5LOC=2CADR(TVCDAPON,EBANK=BZERO), T5=.6SECT5
R1014        IN PARTICULAR, CALLED BY ..IGNOVER..
R1015   NORMAL EXIT MODE
R1016        TCP RESUME
R1017   SUBROUTINES CALLED
R1018        NEEDLER, MASSPROP
R1019   ALARM OR ABORT EXIT MODES
R1020        NONE
R1021   ERASABLE INITIALIZATION REQUIRED
R1022        CSMMASS, LEMMASS, DAPDATR1 (FOR MASSPROP SUBROUTINE)
R1023        TVC PAD LOADS (SEE LEVEL III DAP AND/OR P40 TESTS)
R1024        PACTOFF, YACTOFF, CDUX
R1025        TVCPHASE, T5BITS OF FLAGWRD6, FOR RESTART PROTECTION (SEE IGNOVER)
R1026   OUTPUT
R1027        ALL TVC AND ROLL DAP ERASABLES, FLAGWRD6 (BITS 13,14), T5, WAITLIST
R1028   DEBRIS
R1029        NONE

 1030   REF   1                                          COUNT* $$/INIT
 1031                        17,2030                    BANK   17
 1032   REF   3  LAST  683  17,2000                     SETLOC DAPS7
 1033                        17,2030                    BANK

 1034   REF   2  LAST  184  E6,1742                     EBANK= BZERO

 1035   REF   7  LAST  691  17,2030  22 016 0  TVCDAPON LXCH   BANKRUPT      T5 RUPT ARRIVAL (CALL BY DOTVCON - P40)
 1036                        17,2031  0 0006 1           EXTEND               SAVE Q REQUIRED IN RESTARTS (MRCLEAN AND
10361   REF   7  LAST  692  17,2032  22 012 1           QXCH   QRUPT              TVCINIT4 ARE ENTRIES)
 1038   REF   1              17,2033  3 2205 1  MRCLEAN  CAF   NZERO        NUMBER TO ZERO, LESS ONE  (MUST BE ODD)
A1039                                                                           TVC RESTARTS ENTER HERE  (NEW BANK)
 1040   REF 187  LAST  841  17,2034  10 000 0    +1     CCS   A
 1041   REF  14  LAST  687  17,2035  55#447 0           TS    CNTR
 1042   REF 156  LAST  850  17,2036  3 4714 1           CAF   ZERO
 1043   REF  78  LAST  842  17,2037  54 001 1           TS    L
 1044   REF  15  LAST  899  17,2040  51#447 1           INDEX CNTR
 1045   REF   1              17,2041  53#530 1           DXCH  OMEGAYC        FIRST (LAST) TWO LOCATIONS
 1046   REF  16  LAST  899  17,2042  11#447 0           CCS   CNTR
 1047   REF   1              17,2043  1 2034 0           TCF   MRCLEAN +1
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10471                                                                   SET UP ANOTHER T5 RUPT TO CONTINUE
10472  REP   1                    17,2044  0 0006 1          EXTEND        INITIALIZATION AT TVCINIT1
10473  REP  12  LAST  692         17,2045  3 2212 1          DCA   INITLOC2
10474  REP  17  LAST  777         17,2046  53∝313 0          DXCH  T5LOC   THE PHSCHK2 ENTRY (REDOTVC) AT TVCDAPON
10475  REP   8  LAST  692         17,2047  3 4672 0          CAF   POSMAX      +3 IS IN ANOTHER BANK. MUST RESET
10476  REP  28  LAST  692         17,2050  54 030 0          TS    TIME5       BBCON TOO (FULL 2CADR), FOR THAT
10477  REP   8  LAST  899         17,2051  1 5222 1  ENDMRC  TCF   RESUME      ENTRY.
10478                              17,2052  22 016 0  TVCINIT1 LXCH  BANKRUPT
10479  REP   8  LAST  899         17,2053  0 0006 1          EXTEND
                                   17,2054  22 012 1          QXCH  QRUPT

1048   REP  31  LAST  690         17,2055  0 4633 0          TC    IBNKCALL    UPDATE IXX, IAVG/TLX FOR DAP GAINS (R03
1049   REP   4  LAST  654         17,2056   13207 0          CADR  MASSPROP       OR NOUNS 46 AND 47 MUST BE CORRECT)

1050   REP   4  LAST  849         17,2057  30 110 1          CAE   EMDOT      SPS FLOW RATE, SC AT B+3 KG/CS
1051                               17,2060  0 0006 1          EXTEND
1052   REP   1                    17,2061  7 2206 0          MP    ONETHOU
1053   REP   2  LAST  103         17,2062  55∝647 1          TS    TENMDOT     10-SEC MASS LOSS B+16 KG
1054                               17,2063  4 0000 0          COM
1055   REP  11  LAST  664         17,2064  6 1474 1          AD    CSMMASS
1056   REP   7  LAST  664         17,2065  55∝662 0          TS    MASSIMP     DECREMENT FOR FIRST 10 SEC OF BURN

1059   REP  60  LAST  692         17,2066  31∝466 1          CAE   DAPDATR1    CHECK LEM-ON/OFF
1060   REP  44  LAST  747         17,2067  7 4675 0          MASK  BIT14
1061   REP 188  LAST  899         17,2070  10 000 0          CCS   A
1062   REP  61  LAST  888         17,2071  3 4712 1          CAF   BIT1        LEM-ON (BIT1)
1063   REP  17  LAST  899         17,2072  55∝447 0          TS    CNTR        LEM-OFF (ZERO)

10631  REP  18  LAST  900         17,2073  51∝447 1          INDEX CNTR        PICK UP LM-OFF,-ON KTLX/I
106312 REP   1                    17,2074  31∝416 0          CAE   EKTLX/I
106314 REP   2  LAST  103         17,2075  55∝646 0          TS    KTLX/I

10632  REP  32  LAST  900         17,2076  0 4633 0          TC    IBNKCALL    COMPUTE 1/CONACC, VARK
106322 REP   1                    17,2077   35145 1          CADR  S40.15

1064   REP   1                    17,2100  31∝420 0  TVCINIT2 CAE   ETVCDT/2    LEM-ON VALUE (PAD-LOAD, CS / 2)
1065   REP  79  LAST  899         17,2101  54 001 1          TS    L
1066   REP  34  LAST  778         17,2102  3 4711 1          CAF   BIT2        LEM-OFF VALUE (4CS / 2)
1067   REP  19  LAST  900         17,2103  51∝447 1          INDEX CNTR
1068   REP 189  LAST  900         17,2104  30 000 1          CAE   A
1069   REP   3  LAST  677         17,2105  55∝644 1          TS    KPRIMEDT    (TEMP STORE)

1070                               17,2106  4 0000 0          COM               PREPARE T5TVCDT
1071   REP  18  LAST  900         17,2107  6 4672 0          AD    POSMAX
1072   REP  62  LAST  900         17,2110  6 4712 1          AD    BIT1
1073   REP   3  LAST  245         17,2111  55∝635 1          TS    T5TVCDT

10732  REP  36  LAST  700         17,2112  4 4674 1          CS    BIT15       RESET SWTOVER FLAG
10733  REP  10  LAST  654         17,2113  7 0105 1          MASK  FLAGWRD9
10734  REP  11  LAST  900         17,2114  54 105 1          TS    FLAGWRD9
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1074  REF  20  LAST  900   17,2115  51=447 1          INDEX  CNTR      PICK UP LEM-OFF,-ON KPRIME
1075  REF   1                17,2116  31=413 0          CAE    EKPRIME
1076                         17,2117  0 0006 1          EXTEND
1077  REF   4  LAST  900   17,2120  7 1644 1          MP     KPRIMEDT  (TVCDT/2, SC.AT B+14CS)
1078  REF 190  LAST  900   17,2121  22 000 1          LXCH   A            SC.AT PI/8    (DIMENSIONLESS)
1079  REF   5  LAST  901   17,2122  53=345 0          DXCH   KPRIMEDT

1080  REF  21  LAST  901   17,2123  51=447 1          INDEX  CNTR      PICK UP LEM-OFF,-ON REPFRAC
1081  REF   2  LAST  676   17,2124  31=423 0          CAE    EREPFRAC
1082  REF   4  LAST  678   17,2125  55=652 0          TS     REPFRAC

1083  REF  14  LAST  575   17,2126  3 7716 0          CAF    NEGONE    PREVENT STROKE TEST UNTIL CALLED
1084  REF   2  LAST  103   17,2127  55=664 0          TS     STRKTIME

1085  REF   1                17,2130  3 4374 0          CAF    NINETEEN  SET VCNTR FOR VARIABLE-GAIN UPDATES IN
1086  REF   4  LAST  678   17,2131  55=653 1          TS     VCNTR           10 SECONDS (TVCEXEC 1/2 SEC RATE)
10862 REF   7  LAST  663   17,2132  55=444 0          TS     V97VCNTR  FOR ENGFAIL (R41) LOGIC

1087  REF   1                17,2133  31=421 1          CAE    ETSWITCH  PREPARE SWITCHOVER COUNTER
1088  REF  80  LAST  900   17,2134  54 001 1          TS     L
1089                         17,2135  6 0000 1          DOUBLE          (COUNTER DECREMENTS EVERY 1/2 SEC)
1090  REF 191  LAST  901   17,2136  22 000 1          LXCH   A        LEM-OFF IN A, LEM-ON IN L
1091  REF  22  LAST  901   17,2137  51=447 1          INDEX  CNTR
1092  REF 192  LAST  901   17,2140  30 000 1          CAE    A
1093  REF  15  LAST  901   17,2141  6 7716 0          AD     NEGONE
1094  REF  23  LAST  901   17,2142  55=447 0          TS     CNTR      CNTR = 2(SWITCHOVER TIME, SEC) -1
1095  REF  16  LAST  690   17,2143  31=425 0  TVCINIT3  CAE    PACTOFF   TRIM VALUES TO TRIM-TRACKERS, OUTPUT
1096  REF   2  LAST  102   17,2144  55=625 0          TS     PDELOFF         TRACKERS, OFFSET-UPDATES, AND
1097  REF   4  LAST  167   17,2145  55=631 0          TS     PCMD            OFFSET-TRACKER FILTERS
1099  REF   3  LAST  655   17,2146  55=621 1          TS     DELPBAR         NOTE, LO-ORDER DELOFF,DELBAR ZEROED

1100  REF   5  LAST  687   17,2147  31=426 0          CAE    YACTOFF
1101  REF   2  LAST  102   17,2150  55=627 1          TS     YDELOFF
1102  REF   2  LAST  102   17,2151  55=632 0          TS     YCMD
1104  REF   3  LAST  655   17,2152  55=623 0          TS     DELYBAR

1111  REF  12  LAST  692   17,2153  4 1501 0  NEEDLEIN  CS     RCSFLAGS  SET BIT 3 FOR INITIALIZATION PASS AND GO
1112  REF  26  LAST  888   17,2154  7 4710 1          MASK   BIT3            TO NEEDLER.  WILL CLEAR FOR TVC DAP
1113  REF  13  LAST  901   17,2155  27=501 0          ADS    RCSFLAGS        (RETURNS AFTER CADR)
1114  REF  33  LAST  900   17,2156  0 4633 0          TC     IBNKCALL
1115  REF   5  LAST  540   17,2157   42404 1          CADR   NEEDLER

1116  REF 157  LAST  899   17,2160  3 4714 1  TVCINIT4  CAF    ZERO      SET TVCPHASE TO INDICATE TVCDAPON-THRU-
1117  REF   3  LAST  652   17,2161  55=654 0          TS     TVCPHASE        NEEDLEIN INITIALIZATION FINISHED.
A1118                                                                     (POSSIBLE TVC-RESTART ENTRY)

1119  REF  18  LAST  736   17,2162  30 032 0          CAE    CDUX      PREPARE ROLL DAP LADDERS
1120  REF   6  LAST  188   17,2163  55=672 1          TS     CGANOW
```

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```
A1121
A1122                                                          ROLL DAPS RE-START UPON A RESTART, BUT
                                                                    RETAIN ORIGINAL CGAD (IGNOVER CDUX)

 11222  REP  32  LAST  827   17,2164  3 4676 1          CAF    BIT13        IF ENGINE IS ALREADY OFF, ENGINOFF HAS
 11223                       17,2165  0 0006 1          EXTEND                   ALREADY ESTABLISHED THE POST-BURN
 11224  REP  27  LAST  783   17,2166  02 011 0          RAND   DSALMOUT         CSMMASS (MASSBACK DOES IT). DONT
 11225                       17,2167  0 0006 1          EXTEND                   TOUCH CSMMASS.  IF ENGINE IS ON,
 11226                       17,2170  1 2173 1          BZF    +3               THEN ITS OK TO DO THE COPYCYCLE
A11227                                                                          EVEN BURNS LESS THAN 0.4SEC ARE AOK

 1123   REP   8  LAST  900   17,2171  31∝662 1          CAE    MASSTMP      COPYCYCLE
 1124   REP  12  LAST  900   17,2172  55∝474 0          TS     CSMMASS

 1125   REP   6  LAST  700   17,2173  3 4731 0    +3    CAF    .5SEC        CALL TVCEXECUTIVE (ROLLDAP CALL, ETC)
 1126   REP  41  LAST  779   17,2174  0 5140 1          TC     WAITLIST
 1127   REP   3  LAST  899   E6,1742                    EBANK= BZERO
 1128   REP   2  LAST  184   17,2175   02660 0          2CADR  TVCEXEC
 1128                       17,2176   34066 0
 1129                       17,2177  0 0006 1          EXTEND
 1130   REP   1              17,2200  3 2210 0          DCA    DAPINIT5     CALL FOR DAPINIT
 1131   REP  13  LAST  900   17,2201  53∝313 0          DXCH   T5LOC
 1132   REP   4  LAST  900   17,2202  31∝635 0          CAE    T5TVCDT      (ALLOW TIME FOR RESTART COMPUTATIONS)
 1133   REP   9  LAST  900   17,2203  54 030 0          TS     TIME5

 1134   REP  29  LAST  900   17,2204  1 5222 1  ENDTVCIN TCF    RESUME
 1135                       17,2205   00101 1  NZERO    DEC    65           MUST BE ODD FOR MRCLEAN

 1136   REP  17  LAST  440      4374           NINETEEN =      VD1

 1137                       17,2206   03720 1  ONETHOU  DEC    1000 B-13    KG/CS B3 TO KG/10SEC B16 CONVERSION

 1138   REP   4  LAST  902   E6,1742                    EBANK= BZERO
 1139   REP   1              17,2207   03111 0  DAPINIT5 2CADR  DAPINIT
 1139   REP   1              17,2210   40066 0
11392   REP   5  LAST  902   E6,1742                    EBANK= BZERO
 1140   REP   1              17,2211   02052 1  INITLOC2 2CADR  TVCINIT1
 1140   REP   1              17,2212   36066 1
```

L TVCEXECUTIVE USER=S PAGE NO. 1 E0 S3

```
R1000   PROGRAM NAME.... TVCEXECUTIVE, CONSISTING OF TVCEXEC, NEEDLEUP, VARGAINS
R1001                    REPCHEK, SWTCHOVR, CG.CORR, STRKUP, TVCEXFIN, ETC.
R1002   LOG SECTION....TVCEXECUTIVE      SUBROUTINE ....DAPCSM
R1003   MOD BY ENGEL                     DATE 23 OCT, 1967

R1004   FUNCTIONAL DESCRIPTION....

R1005       *A SELF-PERPETUATING WAITLIST TASK AT 1/2 SECOND INTERVALS WHICH'
R1006        PREPARES THE ROLL TVC DAP LADDERS
R1007        PREPARES THE ROLL FDAI NEEDLE (FLY-TO  OGA ERROR)
R1008        PREPARES THE ROLL PHASE PLANE  OGAERR  (FLY-FROM  OGA ERROR)
R1009        PREPARES THE TVC ROLLDAP TASK WAITLIST CALL (3 CS DELAY)
R1010        UPDATES THE NEEDLES DISPLAY
R1011        IMPLEMENTS VARIABLE GAINS AND VARIABLE VEHICLE MASS
R1012        PROVIDES FOR SWITCHOVER
R1013        PROVIDES FOR A SINGLE-SHOT THRUST MISALIGNMENT CORRECTION AT SWTOVR
R1014        PROVIDES FOR REPETITIVE THRUST MISALIGNMENT CORRECTIONS FOLLOWING
R1015             SWITCHOVER
R1016        PERFORMS CERTAIN STROKE TEST FUNCTIONS

R1017   CALLING SEQUENCE....

R1018       *TVCEXEC CALLED AS A WAITLIST TASK, IN PARTICULAR BY TVCINIT4 AND BY
R1019        ITSELF, BOTH AT 1/2 SECOND INTERVALS

R1020   NORMAL EXIT MODE.... TASKOVER

R1021   ALARM OR ABORT EXIT MODES.... NONE

R1022   SUBROUTINES CALLED....NEEDLER, S40.15, MASSPROP, TASKOVER, IBNKCALL

R1023   OTHER INTERFACES....

R1024       *TVCRESTART PACKAGE FOR RESTARTS
R1025       *PITCHDAP, YAWDAP FOR VARIABLE GAINS AND ENGINE TRIM ANGLES
R1026       *S40.8 FOR KPRIMEDT AT SWITCHOVER

R1027   ERASABLE INITIALIZATION REQUIRED....

R1028       *SEE TVCDAPON....TVCINIT4
R1029       *VARK AND 1/CONACC (S40.15 OF R03)
R1030       *V68 INITIALIZATION PRIOR TO SWITCHOVER OR FOLLOWING A RESTART
R1031        DURING A STROKE TEST, IF STROKE TEST FUNCTIONS ARE TO BE TESTED
R1032       *PAD LOADS EREPFRAC, ECORFRAC ETC.
R1033       *BITS 15,14 OF FLAGWRD6 (T5 BITS)
R1034       *TVCEXPHS FOR RESTARTS
R1035       *ENGINE-ON BIT (11.13) FOR RESTARTS
R1036       *CDUX, OGAD

R1037   OUTPUT....
```

```
R1038       *ROLL TVC DAP LADDERS, FDAI NEEDLE (AK), AND PHASE PLANE OGAERR
R1039       *VARIABLE GAINS FOR PITCH/YAW AND ROLL TVC DAPS
R1040       *SINGLE-SHOT AND REPETITIVE CORRECTIONS TO ENGINE TRIM ANGLES
R1041        PACTOFF AND YACTOFF
R1042       *CHANGES TO DAP SAMPLE RATES, DAP GAINS, AND STEERING-GAIN SCALING
R1043        AT (LEM-ON) SWITCHOVER
R1044       *STROKER, 4 SECONDS AFTER SWITCHOVER WHEN PRIOR V68, OR 2.5
R1045        SECONDS AFTER RESTART DURING A STROKE TEST

R1046  DEBRIS.... MUCH, BUT SHAREABLE WITH RCS/ENTRY, ALL IN EBANK6
 1047                          16,2660                    BANK    16
 1048  REF   1                 16,2000                    SETLOC  DAPROLL
 1049                          16,2660                    BANK
 1050  REF   6  LAST  902      E6,1742                    EBANK=  BZERO
 1051  REF   1                                             COUNT*  $$/TVCX
 1052  REF  25  LAST  692      16,2660  4 0102 0  TVCEXEC  CS      FLAGWRD6    CHECK FOR TERMINATION (BITS 15,14 READ
 1053  REF  13  LAST  692      16,2661  7 4105 0           MASK    .OCT60000       10 FROM TVCDAPON TO RCSDAPON)
 1054                          16,2662  0 0006 1           EXTEND
 1055  REF   1                 16,2663  6 3142 0           BZMF    TVCEXFIN    TERMINATE

 1056  REF   7  LAST  902      16,2664  3 4731 0           CAF     .5SEC       W.L. CALL TO PERPETUATE TVCEXEC
 1057  REF  42  LAST  902      16,2665  0 5140 1           TC      WAITLIST
 1058  REF   7  LAST  904      E6,1742                    EBANK=  BZERO
 1059  REF   3  LAST  902      16,2666   02660 0          2CADR   TVCEXEC
 1059                          16,2667   34066 0

 1060  REF  19  LAST  901      16,2670  30 032 0  ROLLPREP CAE     CDUX        UPDATE ROLL LADDERS (NO NEED TO RESTART-
 1061  REF   7  LAST  901      16,2671  57∝672 0           XCH     OGANOW          PROJECT, SINCE ROLL DAPS RE-START)
 1062  REF   2  LAST  103      16,2672  57∝673 1           XCH     OGAPAST

 1063  REF   2  LAST  651      16,2673  31∝450 1           CAE     OGAD        PREPARE ROLL FDAI NEEDLE WITH FLY-TO
 1064                          16,2674  0 0006 1           EXTEND                  ERROR (COMMAND - MEASURED)
 1065  REF   8  LAST  904      16,2675  21∝672 1           MSU     OGANOW
 1066  REF  12  LAST  539      16,2676  55∝476 1           TS      AK          FLY-TO OGA ERROR, SC.AT B-1 REVS

 1067                          16,2677  0 0006 1           EXTEND              PREPARE ROLL DAP PHASE PLANE  OGAERR
 1068  REF   2  LAST  688      16,2700  7 7705 0           MP      -BIT14
 1069  REF   1                 16,2701  55∝674 1           TS      OGAERR      PHASE-PLANE (FLY-FROM) OGAERROR,
A1070                                                                               SC.AT B+0 REVS

 1071  REF  27  LAST  779      16,2702  3 6214 0           CAF     THREE       SET UP ROLL DAP TASK (ALLOW SOME TIME)
 1072  REF  43  LAST  904      16,2703  0 5140 1           TC      WAITLIST
 1073  REF   8  LAST  904      E6,1742                    EBANK=  BZERO
 1074  REF   1                 16,2704   03313 0          2CADR   ROLLDAP
 1074  REF   1                 16,2705   34066 0
 1075  REF  34  LAST  901      16,2706  0 4633 0  NEEDLEUP TC      IBNKCALL    DO A NEEDLES UPDATE (RETURNS AFTER CADR)
 1076  REF   6  LAST  901      16,2707   42404 1           CADR    NEEDLER         (NEEDLES RESTARTS ITSELF)
```

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1077  REF  33  LAST  902   16,2710  3 4676 1  VARGAINS CAF    BIT13      CHECK ENGINE-ON BIT TO INHIBIT VARIABLE
1078                       16,2711  0 0006 1            EXTEND             GAINS AND MASS IF ENGINE OFF
1079  REF  28  LAST  902   16,2712  02 011 0            RAND   DSALMOUT   CHANNEL 11
1080  REF 193  LAST  901   16,2713  10 000 0            CCS    A
1081                       16,2714  1 2720 1            TCF    +4             ON , SO OK TO UPDATE GAINS AND MASS
1082  REF  37  LAST  782   16,2715  3 4711 1      +5    CAF    TWO            OFF, SO BYPASS MASS/GAIN UPDATES,
10821 REF   3  LAST  652   16,2716  55-661 0            TS     TVCEXPHS             ALSO ENTRY FROM CCS BELOW WITH
10822 REF   1              16,2717  1 2750 0            TCF    SWT/COR              VCNTR = -0 (V97 R40 ENGFAIL)

10823 REF   5  LAST  901   16,2720  11-653 1            CCS    VCNTR          TEST FOR GAIN UPDATE TIME
10824                      16,2721  1 2725 1            TCF    +4                   NOT YET
10825 REF   1              16,2722  1 2731 1            TCF    GAINCHNG             NOW
108252                     16,2723  1 2723 1            TCF    +0                   NOT USED
108253 REF  1              16,2724  1 2715 1            TCF    VARGAINS +5          NO, LOTHRUST (S40.8 R40)

10826 REF   3  LAST  678   16,2725  55-663 1      +4    TS     VCNTRIMP       PROTECT VCNTR AND
10827 REF  13  LAST  902   16,2726  31-474 1            CAE    CSMMASS        CSMMASS DURING AN IMPULSIVE BURN
10828 REF   9  LAST  902   16,2727  55-662 0            TS     MASSIMP
10829 REF   1              16,2730  1 2741 0            TCF    EXECCOPY

1085  REF  35  LAST  904   16,2731  0 4633 0  GAINCHNG  TC     IBNKCALL   UPDATE IXX, IAVG, IAVG/TLX
1086  REF   1              16,2732   13243 0            CADR   FIXCW      MASSPROP ENTRY  (ALREADY INITIALIZED)
1087  REF   2  LAST  900   16,2733  0 3145 1            TC     S40.15     UPDATE 1/CONACC, VARK
1089  REF   3  LAST  900   16,2734  4 1647 1            CS     TENMDOT    UPDATE MASS FOR NEXT 10 SEC. OF BURN
1090  REF  14  LAST  905   16,2735  6 1474 1            AD     CSMMASS
1091  REF  10  LAST  905   16,2736  55-662 0            TS     MASSIMP    KG B+16

1092  REF   2  LAST  901   16,2737  3 4374 0            CAF    NINETEEN   RESET THE VARIABLE-GAIN UPDATE COUNTER
1093  REF   4  LAST  905   16,2740  55-663 1  NOUPDATE  TS     VCNTRIMP   (COUNTDOWN, FROM VARGAINS +1)

1094  REF   4  LAST  905   16,2741  25-661 1  EXECCOPY  INCR   TVCEXPHS   RESTART-PROTECT THE COPYCYCLE          (1)

1095  REF  11  LAST  905   16,2742  31-662 1            CAE    MASSIMP    CSMMASS KG B+16
1096  REF  15  LAST  905   16,2743  55-474 0            TS     CSMMASS

1097  REF   5  LAST  905   16,2744  31-663 0            CAE    VCNTRIMP   VCNTR
1098  REF   6  LAST  905   16,2745  55-653 1            TS     VCNTR
10982 REF   8  LAST  901   16,2746  55-444 0            TS     V97VCNTR   FOR ENGFAIL (R41) MASS UPDATES AT SPSOFF

1099  REF   5  LAST  905   16,2747  25-661 1            INCR   TVCEXPHS   COPYCYCLE OVER                          (2)

1100  REF  24  LAST  901   16,2750  11-447 0  SWT/COR   CCS    CNTR       CHECK FOR SWITCHOVER/CG CORRECTION
1101                       16,2751  1 2755 0            TCF    +4             NOT YET
1102  REF   1              16,2752  1 2773 1            TCF    SWTCHOVR       NOW
1103  REF   1              16,2753  1 2761 1            TCF    REPCHEK        PRIOR SWITCHOVER (OR NONE)
1104  REF   2  LAST  905   16,2754  1 2773 1            TCF    SWTCHOVR       NOW (1/2 SEC SWITCHOVER, ONLY)

1105  REF   2  LAST  103   16,2755  55-707 1      +4    TS     CNTRIMP    COUNT DOWN
1106  REF  14  LAST  848   16,2756  3 4716 0            CAF    SEVEN      SETUP TVCEXPHS FOR ENTRY AT CNTRCOPY
1107  REF   6  LAST  905   16,2757  55-661 0            TS     TVCEXPHS
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1108  REP   1                16,2760  1 3122 1            TCF   CNTRCOPY

1109  REP   5  LAST  901     16,2761  31-652 1  REPCHEK   CAE   REPFRAC      CHECK FOR REPETITIVE UPDATES
1110                          16,2762  0 0006 1            EXTEND
1111                          16,2763  6 2770 0            BZMF  +5                 NO   (NEG OR +-ZERO)
1112  REP   2  LAST  100     16,2764  55-448 1            TS    TEMPDAP +1         YES, SET UP CORRECTION FRACTION
1113  REP  22  LAST  891     16,2765  3 4715 0            CAF   FIVE                    ADVANCE TVCEXPHS
1114  REP   7  LAST  905     16,2766  55-681 0            TS    TVCEXPHS
1115  REP   1                16,2767  1 3053 0            TCF   CORSETUP

1116  REP   1                16,2770  3 4707 0     +5     CAF   EIGHT
1117  REP   8  LAST  906     16,2771  55-661 0            TS    TVCEXPHS
1118  REP   1                16,2772  1 3125 0            TCF   STRKUP

1119  REP  34  LAST  905     16,2773  3 4676 1  SWTCHOVR  CAF   BIT13        CHECK ENGINE-ON BIT, NOT PERMITTING
1120                          16,2774  0 0006 1            EXTEND                 SWITCHOVER DURING ENGINE-SHUTDOWN
1121  REP  29  LAST  905     16,2775  02 011 0            RAND  DSALMOUT           TAILOFF
1122  REP 194  LAST  905     16,2776  10 000 0            CCS   A
1123                          16,2777  1 3001 1            TCF   +2            OK TO SWITCHOVER
1124  REP   2  LAST  904     16,3000  1 3142 1            TCF   TVCEXPIN       DONT SWITCHOVER, TERMINATE

11242 REP  12  LAST  900     16,3001  4 0105 1            CS    FLAGWRD9       SET SWITCHOVER FLAG (SWTOVER) FOR DWNLNK
11243 REP  37  LAST  900     16,3002  7 4674 1            MASK  BIT15                AND POST-BURN TRIM UPDATES (SEE
11244 REP  13  LAST  906     16,3003  26 105 1            ADS   FLAGWRD9               ..BESTTRIM.. (P40-P47))

1125  REP  61  LAST  900     16,3004  31-466 1            CAE   DAPDATR1       SWITCHOVER....CHECK FOR LEM-OFF/ON
1126  REP  35  LAST  906     16,3005  7 4676 0            MASK  BIT13          (NOTE, SHOWS LEM-OFF)
1127                          16,3006  0 0006 1            EXTEND
1128  REP   1                16,3007  1 3013 1            BZF   GAINDOWN       LEM-ON....FULL SWITCHOVER/CG.CORRECTION

1129  REP  10  LAST  848     16,3010  3 4710 0            CAF   FOUR           LEM-OFF....NO SWITCHOVER, JUST CG.CORR.
1130  REP   9  LAST  906     16,3011  55-661 0            TS    TVCEXPHS
1131  REP   1                16,3012  1 3050 0            TCF   TEMPSET

1132  REP   2  LAST  900     16,3013  31-420 0  GAINDOWN  CAE   ETVCDT/2       LEM-ON.... DROP GAIN BY (OLDTVCDT/8CS)SQ
1133                          16,3014  0 0006 1            EXTEND
1134  REP  33  LAST  888     16,3015  7 4706 0            MP    BIT5
1135  REP 195  LAST  906     16,3016  22 000 1            LXCH  A
1136                          16,3017  0 0006 1            EXTEND
1137  REP 196  LAST  906     16,3020  7 0000 0            MP    A
1138  REP 197  LAST  906     16,3021  22 000 1            LXCH  A              (TVCDT/8CS)SQD, SC.AT B+2

1139                          16,3022  0 0006 1            EXTEND               PREPARE NEW GAIN CONSTANT
1140  REP   3  LAST  900     16,3023  7 1646 0            MP    KTLX/I
1141                          16,3024  20 001 1            DDOUBL
1142                          16,3025  20 001 1            DDOUBL
1143  REP   2  LAST  103     16,3026  55-702 1            TS    TKTLX/I        (FOR COPYCYCLE)

1144  REP  10  LAST  906     16,3027  25-661 1  SWTCOPY   INCR  TVCEXPHS       RESTART-PROTECT THE COPYCYCLE        (3)
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1145  REP  1                16,3030  3 7677 0          CAF    OCT37774     LEM-ON ONLY..... T5 TIMER
1146  REP  5  LAST  902      16,3031  55=635 1          TS     T5TVCDT

1150  REP  2  LAST  901      16,3032  31=414 1          CAE    EKPRIME +1   PREPARE KPRIMEDT FOR 80MS DAP, USING
1151                         16,3033  6 0000 1          DOUBLE
1152                         16,3034  6 0000 1          DOUBLE
1153  REP  6  LAST  901      16,3035  55=644 1          TS     KPRIMEDT          (KPRIMEDT+1 IS ZERO)

A1154                                                                        SCALING OF OMEGAC HAS CHANGED, BUT NO
A1155                                                                            CHANGE OF REGISTERS.  RATE COMMANDS
A1156                                                                            ARE LOW BY  (OLD TVCDT)/80,  UNTIL
A1157                                                                            NEXT S40.8 COMPUTATION, WHICH USES
A1158                                                                            THE NEW  KPRIMEDT.

1159  REP  3  LAST  906      16,3036  31=702 0          CAE    TKTLX/I      GAIN CONSTANT
1160  REP  4  LAST  906      16,3037  55=646 0          TS     KTLX/I

11602 REP  3  LAST  905      16,3040  0 3154 1          TC     S40.15 +7    UPDATE VARK (ONLY, NO CHANGE 1/CONACC)

1161  REP  3  LAST  245      16,3041  11=614 1  STRKCALL CCS    STROKER      CHECK STROKER FOR VERB 68 INDICATION
1162                         16,3042  1 3047 0          TCF    +5                STROKE TEST IN PROGRESS (80MS DAP)
1163                         16,3043  1 3047 0          TCF    +4                +0 SAYS NO VERB 68 YET
1164                         16,3044  1 3047 0          TCF    +3                STROKE TEST IN PROGRESS (80MS DAP)
1165  REP  2  LAST  906      16,3045  3 4707 0          CAF    EIGHT             -0 SAYS PRIOR VERB68, SO START
1166  REP  3  LAST  901      16,3046  55=664 0          TS     STRKTIME               STROKE TEST IN 4 SECONDS

1167  REP  11 LAST  906      16,3047  25=661 1    +543  INCR   TVCEXPHS      COPYCYCLE OVER (SWTCHOVR ENTRY NEXT) (4)

1168  REP  1                16,3050  31=422 1  TEMPSET  CAE    ECORFRAC          SET UP CORRECTION FRACTION
1169  REP  3  LAST  906      16,3051  55=446 1          TS     TEMPDAP +1

1170  REP  12 LAST  907      16,3052  25=661 1          INCR   TVCEXPHS      ENTRY FROM REPCHECK AT NEXT LOCATION (5)

1171  REP  62 LAST  906      16,3053  31=466 1  CORSETUP CAE    DAPDATR1     CHECK FOR LEM-OFF/ON
1172  REP  36 LAST  906      16,3054  7 4676 0          MASK   BIT13         (NOTE, SHOWS LEM-OFF)
1173                         16,3055  0 0006 1          EXTEND
1174                         16,3056  1 3060 0          BZF    +2            LEM IS ON,  PICK UP   TEMPDAP+1
1175  REP  4  LAST  907      16,3057  31=446 0          CAE    TEMPDAP +1    LEM IS OFF, PICK UP 2(TEMPDAP+1)
1176  REP  5  LAST  907      16,3060  6 1446 0          AD     TEMPDAP +1
1177  REP  6  LAST  907      16,3061  55=445 1          TS     TEMPDAP       CG_CORR USES TEMPDAP

1178  REP  16 LAST  901      16,3062  3 7716 0          CAF    NEGONE        SET UP FOR CNTR = -1 (SWTCHOVR DONE)
1179  REP  3  LAST  905      16,3063  55=707 1          TS     CNTRIMP            (COPYCYCLE AT  .CNTRCOPY. )

1180                         16,3064  0 0006 1  CG_CORR  EXTEND               PITCH TRIM-TRACKER CORRECTION
1181  REP  3  LAST  901      16,3065  3 1626 1          DCA    PDELOFF
1182  REP  2  LAST  103      16,3066  53=704 1          DXCH   PACTIMP
1183  REP  17 LAST  901      16,3067  4 1425 1          CS     PACTOFF
1184  REP  4  LAST  901      16,3070  6 1621 0          AD     DELPBAR
1185                         16,3071  0 0006 1          EXTEND
```

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1186  REF  7  LAST  907   16,3072  7 1445 1          MP      TEMPDAP
1187                      16,3073  20 001 1          DDOUBL
1188                      16,3074  20 001 1          DDOUBL
1189  REF  3  LAST  907   16,3075  21«704 1          DAS     PACTIMP

1190                      16,3076  0 0006 1          EXTEND
1191  REF  3  LAST  901   16,3077  3 1630 0          DCA     YDELOFF
1192  REF  2  LAST  103   16,3100  53«706 0          DXCH    YACTIMP
1193  REF  6  LAST  901   16,3101  4 1426 1          CS      YACTOFF
1194  REF  4  LAST  901   16,3102  6 1623 1          AD      DELYBAR
1195                      16,3103  0 0006 1          EXTEND
1196  REF  8  LAST  908   16,3104  7 1445 1          MP      TEMPDAP
1197                      16,3105  20 001 1          DDOUBL
1198                      16,3106  20 001 1          DDOUBL
1199  REF  3  LAST  908   16,3107  21«706 0          DAS     YACTIMP

1200  REF  13 LAST  907   16,3110  25«661 1  CORCOPY  INCR    TVCEXPHS    RESTART-PROTECT THE COPYCYCLE        (6)

1201                      16,3111  0 0006 1          EXTEND                TRIM-ESTIMATES, AND
1202  REF  4  LAST  908   16,3112  3 1704 0          DCA     PACTIMP
1203  REF  18 LAST  907   16,3113  55«425 1          TS      PACTOFF             TRIMS
1204  REF  4  LAST  907   16,3114  53«626 0          DXCH    PDELOFF

1205                      16,3115  0 0006 1          EXTEND
1206  REF  4  LAST  908   16,3116  3 1706 1          DCA     YACTIMP
1207  REF  7  LAST  908   16,3117  55«426 1          TS      YACTOFF
1208  REF  4  LAST  908   16,3120  53«630 1          DXCH    YDELOFF

1209  REF  14 LAST  908   16,3121  25«661 1          INCR    TVCEXPHS    COPYCYCLE OVER (SWT/COR ENTRY NEXT)  (7)

1210  REF  4  LAST  907   16,3122  31«707 0  CNTRCOPY CAE     CNTRIMP     UPDATE CNTR (RESTARTS OK, FOLLOWS CPYCY)
1211  REF  25 LAST  905   16,3123  55«447 0          TS      CNTR

1212  REF  15 LAST  908   16,3124  25«661 1          INCR    TVCEXPHS    ENTRY FROM REPCHECK AT NEXT LOCATION (8)

1213  REF  4  LAST  907   16,3125  11«664 0  STRKUP   CCS     STRKTIME    CHECK STROKE TEST START TIME
1214                      16,3126  1 3131 0          TCF     +3                IN 4SEC DELAY AFTER SWITCHOVER
1215  REF  1              16,3127  1 3133 1          TCF     STRKNOW           START STROKE TEST NOW....
1216  REF  3  LAST  906   16,3130  1 3142 1          TCF     TVCEXFIN          NO STROKE TEST REQUEST YET

1217  REF  2  LAST  103   16,3131  55«710 1          TS      STRKTIMP    COUNT DOWN
1218  REF  1              16,3132  1 3137 0          TCF     STRKTCPY

1219  REF  5  LAST  552   16,3133  31«412 1  STRKNOW  CAE     ESTROKER    START THE STROKE TEST NOW....
1220  REF  4  LAST  907   16,3134  55«614 1          TS      STROKER
1221  REF  17 LAST  907   16,3135  3 7716 0          CAF     NEGONE      KILL THE STROKE TEST CALL
1222  REF  3  LAST  908   16,3136  55«710 1          TS      STRKTIMP

1223  REF  16 LAST  908   16,3137  25«661 1  STRKTCPY INCR    TVCEXPHS    RESTART-PROTECT THE COPYCYCLE        (9)
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1224  REF   4  LAST  908   16,3140  31=710 0          CAE   STRKTIMP
1225  REF   5  LAST  908   16,3141  55=664 0          TS    STRKTIME

1226  REF 158  LAST  901   16,3142  3 4714 1  TVCEXPIN CAF   ZERO       RESET TVCEXPHS
1227  REF  17  LAST  908   16,3143  55=661 0          TS    TVCEXPHS

1228  REF  45  LAST  787   16,3144  1 5213 0          TCF   TASKOVER     OVER AND OUT
```

```
P1229  NAME     S40.15 INERTIA COMPUTATIONS
 1230  REF  2  LAST  103   E6,1650                          EBANK= 1/CONACC

 1231  REF  3  LAST  691   16,3145  31=470 0  S40.15  CAE     IXX          COMPUTE 1/CONACC (RACC)....IXX SC.AT
 1232                      16,3146  0 0006 1          EXTEND                    B+20  KG M SQD
 1233  REF  1              16,3147  7 3164 0          MP      2PI/M        2PI/M, SC.AT  1/(B+8 N M)
 1234                      16,3150  20 001 1          DDOUBL
 1235                      16,3151  20 001 1          DDOUBL
 1236                      16,3152  20 001 1          DDOUBL
 1237  REF  3  LAST  910   16,3153  55=650 1          TS      1/CONACC     SC.AT  B+9  SEC SQD / REV

 1243  REF  5  LAST  907   16,3154  31=648 1    +7    CAE     KTLX/I       COMPUTE VARK, SCALING IN THE KTLX/I FOR
 1244                      16,3155  0 0006 1          EXTEND                    LM-OFF,ON.  ENTRY FROM SWITCHOVER
 1245  REF  1              16,3156  7 1472 0          MP      IAVG/TLX          SCALED AT B+2  SECONDS-SQUARED
 1246                      16,3157  20 001 1          DDOUBL                    SCALING
 1247                      16,3160  20 001 1          DDOUBL
 1248                      16,3161  20 001 1          DDOUBL
 1249  REF  3  LAST  104   16,3162  55=651 0          TS      VARK             LEM-OFF KPGEN3(0) OR LEM-ON VARK(0)

 1250  REF 178  LAST  842   16,3163  0 0002 0          TC      Q

 1251                      16,3164   33074 1  2PI/M    DEC     .00331017 B+8  2PI/M, SC.AT 1/(B+8 N M)
```

L TVCMASSPROP USER=S PAGE NO. 1 E0 S3

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R1000   PROGRAM NAME....MASSPROP
R1001   LOG SECTION....TVCMASSPROP      PROGRAMMER...MELANSON (ENGEL, SCHLUNDT)
R1002   FUNCTIONAL DESCRIPTION'

R1003       MASSPROP OPERATES IN TWO MODES'(1)IF LEM MASS OR CONFIGURATION ARE UPDATED (MASSPROP DOES NOT TEST
R1005   FOR THIS) THE ENTIRE PROGRAM MUST BE RUN THROUGH, BREAKPOINT VALUES AND DERIVATIVES OF THE OUTPUTS WITH
R1007   RESPECT TO CSM MASS BEING CALCULATED PRIOR TO CALCULATION OF THE OUTPUTS. (2)OTHERWISE, THE OUTPUTS CAN BE
R1009   CALCULATED USING PREVIOUSLY COMPUTED BREAKPOINT VALUES AND DERIVATIVES.

R10095  CALLING SEQUENCES

R1010      IF LEM MASS OR CONFIGURATION HAS BEEN UPDATED, TRANSFER TO MASSPROP, OTHERWISE TRANSFER TO PIXCW.
R1012           L     TC     BANKCALL OR IBNKCALL
R1013           L+1   CADR   MASSPROP
R1014                 OR
R1015           L+1   CADR   PIXCW

R1016           L+2   RETURNS VIA Q

R1017   CALLED   IN PARTICULAR BY DONOUN47 (JOB) AND TVCEXECUTIVE (TASK)

R1019   JOBS OR TASKS INITIATED - NONE

R1020   SUBROUTINES CALLED - NONE

R1021   ERASABLE INITIALIZATION REQUIRED

R1022       LEMMASS MUST CONTAIN LEM MASS SCALED AT B+16 IN KILOGRAMS
R1023       CSMMASS MUST CONTAIN CSM MASS SCALED AT B+16 IN KILOGRAMS

R1024       DAPDATR1 MUST BE SET TO INDICATE VEHICLE CONFIGURATION.
R10241              BITS (15,14,13)  =  ( 0 , 0 , 1 )    LEM OFF
R102411                                 ( 0 , 1 , 0 )    LEM ON (ASCNT,DSCNT)
R102412                                 ( 1 , 1 , 0 )    LEM ON (ASCNT ONLY)
R1025   ALARMS - NONE

R1026   EXIT -   TC     Q

R1027   OUTPUTS'

R1028       (1)IXX, SINGLE PRECISION SCALED AT B+20 IN KG-M SQ.
R1029       (2)IAVG, SINGLE PRECISION SCALED AT B+20 IN KG-M SQ.
R1030       (3)IAVG/TLX, SINGLE PRECISION, SCALED AT B+2 SEC-SQD
R1031       THEY ARE STORED IN CONSECUTIVE REGISTERS IXX0, IXX1, IXX2

R10311      CONVERSION FACTOR ' (SLUG-FTSQ) = 0.737562 (KG-MSQ)
```

```
R1032   OUTPUTS ARE CALCULATED AS FOLLOWS '

R1033    (1) IF LEM DOCKED, LEMMASS IS FIRST ELIMINATED AS A PARAMETER

R1034        VARST0 = INTVALUE0 + LEMMASS(SLOPEVAL0)      IXX      BREAKPOINT VALUE
R1036        VARST1 = INTVALUE1 + LEMMASS(SLOPEVAL1)      IAVG     BREAKPOINT VALUE
R1038        VARST2 = INTVALUE2 + LEMMASS(SLOPEVAL2)      IAVG/TLX BREAKPOINT VALUE

R1040        VARST3 = INTVALUE3 + LEMMASS(SLOPEVAL3)      IAVG/TLX SLOPE FOR CSMMASS δ 33956 LBS ( SPS δ 10000 LBS)
R1042        VARST4 = INTVALUE4 + LEMMASS(SLOPEVAL4)      IAVG     SLOPE FOR CSMMASS δ 33956 LBS ( SPS δ 10000 LBS)

R1044        VARST5 = INTVALUE5 + LEMMASS(SLOPEVAL5)      IXX      SLOPE FOR ALL VALUES OF CSMMASS

R1046        VARST6 = INTVALUE6 + LEMMASS(SLOPEVAL6)      IAVG     SLOPE FOR CSMMASS ± 33956 LBS ( SPS ± 10000 LBS)
R1048        VARST7 = INTVALUE7 + LEMMASS(SLOPEVAL7)      IAVG/TLX SLOPE FOR CSMMASS ± 33956 LBS ( SPS ± 10000 LBS)

R1050        VARST8 = INTVALUE8 + LEMMASS(SLOPEVAL8)      IAVG     DECREMENT TO BRKPT VALUE WHEN LEM DSCNT STAGE OFF
R1052        VARST9 = INTVALUE9 + LEMMASS(SLOPEVAL9)      IAVG/TLX DECREMENT TO BRKPT VALUE WHEN LEM DSCNT STAGE OFF
R1054    (2) IF LEM NOT DOCKED

R1055        VARST0 = NOLEMVAL0    WHERE THE MEANING AND SCALING OF VARST0
R1056           .          .       TO VARST9 ARE THE SAME AS GIVEN ABOVE
R1057           .          .
R1058           .          .       NOTE... FOR THIS CASE, VARST8,9 HAVE NO
R1059        VARST9 = NOLEMVAL9    MEANING (THEY ARE COMPUTED BUT NOT USED)
R1060    (3) THE FINAL OUTPUT CALCULATIONS ARE THEN DONE

R1061        IXX0 =  VARST0 + (CSMMASS + NEGBPW)VARST5          IXX

R1062        IXX1 =  VARST1 + (CSMMASS + NEGBPW)VARST(4 OR 6)   IAVG

R1063        IXX2 =  VARST2 + (CSMMASS + NEGBPW)VARST(3 OR 7)   IAVG/TLX
R1064   THE DATA USED CAME FROM CSM/LM SPACECRAFT OPERATIONAL DATA BOOK.
R10641       VOL. 3, NASA DOCUMENT SNA-8-D-027 (MARCH 1968)

R1065   PERTINENT MASS DATA '          CSM WEIGHT  (FULL)  64100 LBS.
R1066                                              (EMPTY) 23956 LBS
R1067                                 LEM WEIGHT  (FULL)  32000 LBS
R1068                                             (EMPTY) 14116 LBS

R10681  (WEIGHTS ARE FROM AMENDMENT ∫1 (APRIL 24,1968) TO ABOVE DATA BOOK)
```

```
1069                        25,3766                         BANK    25
1070  REF  1                05,2000                         SETLOC  DAPMASS
1071                        05,3207                         BANK
1072  REF  9  LAST  904     E6,1742                         EBANK=  BZERO
1073  REF  1                                                COUNT*  $$/MASP
1074  REF  2  LAST  439     05,3207  3 4334 1  MASSPROP     CAF     NINE        MASSPROP USES TVC/RCS INTERUPT TEMPS
1075  REF  2  LAST  101     05,3210  55«506 1               TS      PHI333      SET UP TEN PASSES

1076  REF  63 LAST  907     05,3211  31«466 1  LEMTEST      CAE     DAPDATR1    DETERMINE LEM STATUS
1077  REF  37 LAST  907     05,3212  7 4676 0               MASK    BIT13
1078                        05,3213  0 0006 1               EXTEND
1079  REF  1                05,3214  1 3220 0               BZF     LEMYES

1080  REF  3  LAST  913     05,3215  51«506 0  LEMNO        INDEX   PHI333      LEM NOT ATTACHED
1081  REF  1                05,3216  3 3304 0               CAF     NOLEMVAL
1082  REF  1                05,3217  1 3230 1               TCF     STOINST

1083  REF  5  LAST  274     05,3220  31«473 0  LEMYES       CAE     LEMMASS     LEM IS ATTACHED
1084                        05,3221  6 0000 1               DOUBLE
1085                        05,3222  0 0006 1               EXTEND
1086  REF  4  LAST  913     05,3223  5 1506 0               INDEX   PHI333
1087  REF  1                05,3224  7 3326 1               MP      SLOPEVAL
1088                        05,3225  20 001 1               DDOUBL
1089  REF  5  LAST  913     05,3226  51«506 0               INDEX   PHI333
1090  REF  1                05,3227  6 3314 1               AD      INTVALUE

1091  REF  6  LAST  913     05,3230  51«506 0  STOINST      INDEX   PHI333      STORAGE INST BEGIN HERE
1092  REF  3  LAST  101     05,3231  55«511 1               TS      VARST0
1093  REF  7  LAST  913     05,3232  11«506 1               CCS     PHI333      ARE ALL TEN PASSES COMPLETED
1094  REF  5  LAST  900     05,3233  1 3210 0               TCF     MASSPROP +1 NO - GO DECREMENT PHI333

1098  REF  64 LAST  913     05,3234  11«466 0  DXTEST       CCS     DAPDATR1    IF NEG, BIT15 IS 1, LEM DSCNT STAGE OFF
1099  REF  2  LAST  905     05,3235  1 3243 0               TCF     FIXCW
1100  REF  3  LAST  913     05,3236  1 3243 0               TCF     FIXCW
1101  REF  4  LAST  913     05,3237  53«522 1              DXCH    VARST0 +8D
1102  REF  5  LAST  913     05,3240  21«513 0              DAS     VARST0 +1
1103  REF  1                05,3241  3 3341 1               CA      DXITFIX
1104  REF  6  LAST  913     05,3242  27«520 0              ADS     VARST0 +7

1105  REF  35 LAST  900     05,3243  3 4711 1  FIXCW       CAF     BIT2        COMPUTATION PHASE BEGINS HERE.  SET UP
1106  REF  8  LAST  913     05,3244  55«506 1               TS      PHI333      THREE PASSES
1107  REF  2  LAST  101     05,3245  55«507 0               TS      PSI333

1108  REF  16 LAST  905     05,3246  31«474 1               CAE     CSMMASS     GET DELTA CSM WEIGHT - SIGN DETERMINES
1109  REF  1                05,3247  6 3340 0               AD      NEGBPW      SLOPE LOCATIONS.
1110                        05,3250  6 0000 1               DOUBLE
1111  REF  2  LAST  101     05,3251  55«510 0               TS      TEMP333
```

```
1112                          05,3252  0 0006 1            EXTEND
1113  REP   1                05,3253  6 3256 0            BZMF    PEGGY       DETERMINE CORRECT SLOPE
1114  REP   3  LAST  316     05,3254  3 7715 0            CAF     NEG2
1115  REP   9  LAST  913     05,3255  55,506 1            TS      PHI333

1116  REP  10  LAST  914     05,3256  51,506 0  PEGGY     INDEX   PHI333      ALL IS READY - CALCULATE OUTPUTS NOW
1117  REP   1                05,3257  31,516 1            CAE     VARST5      GET SLOPE
1118                          05,3260  0 0006 1            EXTEND
1119  REP   3  LAST  913     05,3261  7 1510 0            MP      TEMP333     MULT BY DELTA CSM WEIGHT
1120                          05,3262  6 0000 1            DOUBLE
1121  REP   3  LAST  913     05,3263  51,507 1            INDEX   PSI333
1122  REP   7  LAST  913     05,3264  6 1511 0            AD      VARST0      ADD BREAKPOINT VALUE
1123  REP   4  LAST  914     05,3265  51,507 1            INDEX   PSI333
1124  REP   4  LAST  910     05,3266  55,470 1            TS      IXX         ****** OUTPUTS (IXX0, IXX1, IXX2) ******
1125  REP   5  LAST  914     05,3267  11,507 0            CCS     PSI333      BOOKKEEPING - MASSPROP FINISHED OR NOT
1126  REP   1                05,3270  1 3300 0            TCF     BOKKEP2     NO - GO TAKE CARE OF INDEXING REGISTERS

1127  REP  65  LAST  913     05,3271  31,466 1            CAE     DAPDATR1    UPDATE WEIGHT/G
1128  REP  45  LAST  900     05,3272  7 4675 0            MASK    BIT14
1129  REP 198  LAST  906     05,3273  10 000 0            CCS     A
1130  REP   6  LAST  913     05,3274  3 1473 0            CA      LEMMASS
1131  REP  17  LAST  913     05,3275  6 1474 1            AD      CSMMASS
1132  REP   9  LAST  849     05,3276  55,475 1            TS      WEIGHT/G    SCALED AT B+16 IN KILOGRAMS
1133  REP 179  LAST  910     05,3277  0 0002 0  ENDMASSP  TC      Q

1134  REP   6  LAST  914     05,3300  55,507 0  BOKKEP2   TS      PSI333      REDUCE PSI BY ONE
1135                          05,3301  0 0006 1            EXTEND
1136  REP  11  LAST  914     05,3302  27,506 1            DIM     PHI333
1137  REP   2  LAST  914     05,3303  1 3256 1            TCF     PEGGY
```

```
1138                05,3304  00616 0  NOLEMVAL DEC     25445. B-20
1139                05,3305  02526 1           DEC     87450. B-20
1140                05,3306  02352 1           DEC     .30715 B-2
1141                05,3307  01471 1           DEC     1.22877 E-5 B+12
1142                05,3310  00834 0           DEC     1.6098 B-6
1143                05,3311  00612 1           DEC     1.54 B-6
1144                05,3312  03706 0           DEC     7.77177 B-6
1145                05,3313  04425 0           DEC     3.46458 E-5 B+12

1146                05,3314  00644 1  INTVALUE DEC     26850 B-20
1147                05,3315  03710 1           DEC     127518 B-20
1148                05,3316  04246 0           DEC     .54059 B-2
1149                05,3317  02011 0           DEC     .153964 E-4 B+12
1150                05,3320  77501 0           DEC     -.742923 B-6
1151                05,3321  00612 1           DEC     1.5398 B-6
1152                05,3322  04656 0           DEC     9.68 B-6
1153                05,3323  10372 0           DEC     .647625 E-4 B+12
1154                05,3324  77126 1           DEC     -27228. B-20
1155                05,3325  76261 0           DEC     -.206476 B-2

1156                05,3326  00767 1  SLOPEVAL DEC     1.96307 B-6
1157                05,3327  15624 0           DEC     27.5774 B-6
1158                05,3330  03054 0           DEC     2.3548 E-5 B+12
1159                05,3331  04532 1           DEC     2.1777 E-9 B+26
1160                05,3332  10433 1           DEC     1.044 E-3 B+8
1161                05,3333  00000 1           DEC     0
1162                05,3334  22070 0           DEC     2.21068 E-3 B+8
1163                05,3335  03204 1           DEC     1.5166 E-9 B+26
1164                05,3336  77266 0           DEC     -1.284 B-6
1165                05,3337  02476 0           DEC     2. E-5 B+12

1166                05,3340  70364 1  NEGHPW   DEC     -15402.17 B-16
1167                05,3341  75420 0  DXITFIX  DEC*    -1.88275 E-5 B+12*
```

R1000 NAME....TVCRESTART PACKAGE, CONSISTING OF REDOTVC, ENABL1, 2, CMDSOUT, PHSCHK2, ETC.
R1002 LOG SECTION....TVCRESTART PACKAGE SUBROUTINE....DAPCSM
R1003 MOD BY ENGEL DATE....19 OCT, 1967

R1004 FUNCTIONAL DESCRIPTION....

R1005 *RESTART-PROOFS THE TVC DAPS, INCLUDING PITCHDAP, YAWDAP,
R1006 TVCEXECUTIVE, ROLL DAP, TVCINIT4, TVCDAPON, AND STROKE TEST
R1007 *TVC RESTARTS RECEIVE SPECIAL CONSIDERATION IN SEVERAL AREAS.
R1008 RESTART DOWN-TIME IS IMPORTANT BECAUSE OF THE TRANSIENTS INTRODUCED
R1009 BY THE THRUST VECTOR RETURN TO THE ACTUATOR MECHANICAL NULLS
R1010 FOLLOWING TVC- AND OPTICS-ERROR-COUNTER-DISENABLES (CHANNEL 12).
R1011 TVC USES A MIXTURE OF WAITLIST, T5, T6, AND JOB CALLS. THERE IS
R1012 FILTER MEMORY (UP TO 7TH ORDER) TO BE PROTECTED IF WILD TRANSIENTS
R1013 ARE TO BE AVOIDED. SEVERAL COUNTERS ARE INVOLVED FOR TIMING TVC
R1014 EVENTS SUCH AS SWITCHOVER AND STROKE TEST STARTUPS AND RE-STARTUPS.
R1015 THE TVC GAINS ARE DECREMENTED. THE GIMBAL TRIM ESTIMATORS AND THE
R1016 BODY AXIS ATTITUDE ERROR INTEGRATORS INVOLVE DIGITAL SUMMATION.
R1017 DIGITAL DIFFERENTIATORS ARE INVOLVED IN THE BODY AXIS RATE ESTIMA-
R1018 TIONS AND IN THE OUTPUTTING OF ACTUATOR COMMANDS. THERE IS AN
R1019 OFFSET-TRACKER-FILTER TO PROTECT. ETC., ETC.
R1020 *THOSE QUANTITIES WHICH MUST BE PROTECTED ARE STORED IN TEMPORARY
R1021 REGISTERS AS THEY ARE COMPUTED, FOR UPDATING THE REAL REGISTERS
R1022 DURING COPYCYCLES.
R1023 *THE SEVERAL COPYCYCLES ARE EACH PROTECTED BY PHASE POINTS AT THEIR
R1024 BEGINNING AND AT THEIR TERMINATION. THE PHASE POINTS ARE SIMPLY
R1025 ..INCR.. INSTRUCTIONS, EITHER ..INCR TVCEXPHS.. FOR COPYCYCLES
R1026 IN THE TVCEXECUTIVE, OR ..INCR TVCPHASE.. FOR THE PITCH AND YAW
R1027 COPYCYCLES. INDEXING ON EACH OF THESE POINTERS THEN PERMITS A
R1028 RETURN TO THE APPROPRIATE RESTART POINTS.
R1029 *IF A RESTART OCCURS DURING EITHER COPYCYCLE, THAT COPYCYCLE IS
R1030 COMPLETED. THEN THE NORMAL TVCINIT4....DAPINIT....PITCHDAP STARTUP
R1031 SEQUENCE IS CALLED UPON TO GET THINGS GOING AGAIN.
R1032 *TVC-ENABLE AND OPTICS-ERROR-COUNTER ENABLE MUST BE SET ASAP
R1033 (ALLOWING FOR PROCEDURAL DELAYS). THEN THE ENGINES ARE COMMANDED
R1034 TO THE P,YACTCMD TRIM VALUES. THE DAPS ARE THEN READY TO GO ON THE
R1035 AIR, WITH THE REGULAR STARTUP SEQUENCE, EITHER AT MRCLEAN FOR A
R1036 COMPLETE INITIALIZATION OR AT TVCINIT4 FOR A PARTIAL INITIALIZATION
R1037 *FOR RESTARTS PRIOR TO THE SETTING OF THE T5 BITS IN IGNOVER THE
R1038 PRE40.6 SECTION OF S40.6 TAKES CARE OF RE-ESTABLISHING TRIMS.
R1039 *IF A RESTART OCCURS DURING THE TVCEXEC....TVCEXFIN SEQUENCE THE
R1040 COMPUTATIONS WILL BE COMPLETED, STARTING AT THE APPROPRIATE RESTART
R1041 POINT, AFTER THE DAPS ARE READY TO GO ON THE AIR.
R1042 *IF A RESTART OCCURS PRIOR TO TVCINIT4 (TVCPHASE = -1) E.G. DURING
R1043 THE EARLY DAP INITIALIZATION PHASE, THE DAP STARTUP SEQUENCE IS
R1044 ENTERED AT MRCLEAN FOR A FULL INITIALIZATION.
R1045 *RESTARTS ARE NOT CRITICAL TO THE ROLL DAP PERFORMANCE; HENCE THE
R1046 THE ROLL DAP IS MERELY RESTARTED.
R1050 *RESTARTS DURING A STROKE TEST (STROKER IS NON-ZERO) WILL CAUSE THE
R1051 STROKE TEST TO BE TERMINATED. A NEW V68 ENTRY WILL BE REQUIRED

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R1052          TO GET IT GOING AGAIN (NO AUTOMATIC RESTART).
R1054         *REDOTVC IS REACHED FOLLOWING ANY RESTART WHICH FINDS THE T5 BITS
R1055          (BITS 15,14 OF FLAGWRD6) SET FOR TVC. IGNOVER PREPARES TVCPHASE =-1
R1056          AND TVC EXPHS = 0 JUST BEFORE SETTING THESE BITS, JUST BEFORE
R1057          MAKING THE T5 CALL TO TVCDAPON.  T.V.N.G. TAKES OVER THE T5 CLOCK
R1058          TO CALL RCSUP/RCSDAPON WHICH RESETS THE T5 BITS(FOR RCS) ON A
R1059          NORMAL SHUTDOWN.

R1060   CALLING SEQUENCE....T5, IN PARTICULAR BY ELRSKIP OF FRESH START/RESTART

R1061   NORMAL EXIT MODES....RESUME, NOQRSM, POSTJUMP (TO TVCINIT4 OR MRCLEAN)

R1062   ALARM OR ABORT EXIT MODES....NONE

R1063   SUBROUTINES CALLED....

R1064          *PCOPY+1, YCOPY+1 (PITCH AND YAW COPYCYCLES)
R1065          *ENABLE1,2, CMDSOUT (RE-ESTABLISH ACTUATOR TRIMS)
R1067          *MRCLEAN OR TVCINIT4 (TVCDAP INITIALIZATIONS)
R1068          *EXRSTRT AND TVCEXECUTIVE PHASE POINTS 1 THRU 9
R1069          *WAITLIST, IBNKCALL, POSTJUMP, ISWCALL

R1070   OTHER INTERFACES....IGNOVER AND RCSDAPON (T5 BITS), ELRSKIP (CALLS IT)

R1071   ERASABLE INITIALIZATION REQUIRED....

R1072          *T5 BITS, TVCPHASE, TVCEXPHS
R1073          *TVC DAP VARIABLES
R1074          *OPERATIONS PERFORMED BY REDOTVC ARE BASED ON THE ASSUMPTION THAT
R1075           THE TVC DAPS ARE RUNNING NORMALLY

R1076   OUTPUT....

R1077          *PITCH AND YAW TVC DAP COPYCYCLES COMPLETED IF INTERUPTED
R1078          *TVCEXECUTIVE COMPLETED IF INTERUPTED
R1079          *STROKE TEST TERMINATED IF INTERRUPTED
R1080          *ACTUATOR TRIMS RE-ESTABLISHED (ACTUATORS BACK ON THE AIR)
R1081          *TVC DAP INITIALIZATION AS REQUIRED
R1082          *ALL TVC DAP OPERATIONS ON THE AIR

R1083   DERIS....TVC TEMPORARIES IN EBANK6
 1084                          16,3165                 BANK    16
 1085   REP   2  LAST  904    16,2000                 SETLOC  DAPROLL
 1086                          16,3165                 BANK
 1087   REP   4  LAST  901    E6,1654                 EBANK=  TVCPHASE

 1088   REP   1                                       COUNT*  $$/RSRT
 1089   REP   9  LAST  900    16,3165  22 016 0  REDOTVC  LXCH  BANKRUPT      TVC RESTART PACKAGE
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```
1090                        16,3166  0 0006 1            EXTEND
1091  REF   9  LAST  900    16,3167  22 012 1            QXCH   QRUPT       (  ..TCR..  IN  ..PINCOPY..  )

1092  REF  16  LAST  909    16,3170  11=661 0  EXECPHS    CCS    TVCEXPHS    CHECK TVCEXECUTIVE PHASE
1093                        16,3171  1 3173 0            TCF    +2               MUST RESTART TVCEXECUTIVE
1094  REF   1               16,3172  1 3177 1            TCF    TVCDAPHS         NO NEED TO RESTART TVCEXECUTIVE

1095  REF   3  LAST  913    16,3173  3 4334 1            CAF    NINE        9CS DELAY TO FORCE EXRSTRT TO OCCUR
1096  REF  44  LAST  904    16,3174  0 5140 1            TC     WAITLIST         BEFORE PITCHDAP, AFTER CMDSOUT
1097  REF  19  LAST  918    E6,1661                      EBANK= TVCEXPHS
1098  REF   1               16,3175   03271 0           2CADR  EXRSTRT
1098  REF   1               16,3176   34066 0

1099  REF   2  LAST  133    16,3177  4 7700 0  TVCDAPHS  CS     OCT37776    CHECK BITS 15 AND 1 OF TVCPHASE TO SEE
1100  REF   5  LAST  917    16,3200  7 1654 0            MASK   TVCPHASE         DAP RESTART LOCATION  (-1,1,2,3)
1101  REF 199  LAST  914    16,3201  10 000 0            CCS    A
1102  REF   1               16,3202  1 3256 1            TCF    PINCOPY          FINISH THE COPYCYCLE FIRST
1103  REF   1               16,3203  1 3205 1            TCF    ENABL1           JUST PREPARE THE OUTCOUNTERS AND GO
1104  REF   1               16,3204  1 3262 0            TCF    TRIM/CMD         (RE-)DO P,YCMD INITIALIZATION FIRST
1105  REF  24  LAST  611    16,3205  3 4703 1  ENABL1    CAF    BIT8        TVC ENABLE, FOLLOWED BY 40 MS (MIN) WAIT
11052 REF  24  LAST  840    16,3206  6 4700 1            AD     BIT11            OPTICS DAC DISENGAGE TOO
1106                        16,3207  0 0006 1            EXTEND           (ENABL1 ENTRIES..+0,- CCS, PINCOPY)
1107  REF  31  LAST  690    16,3210  05 012 1            WOR    CHAN12
1108  REF   1               16,3211  3 3275 1            CAF    TVCADDR     WAIT,  CALLING ENABL2  (BBCON THERE)
1109  REF  14  LAST  902    16,3212  55=312 1            TS     T5LOC
1110  REF   2  LAST  918    16,3213  3 3301 0            CAF    TVCADDR +4       60MS  (TVCEXADR)
1111  REF  10  LAST  902    16,3214  54 030 0            TS     TIME5

1112  REF  30  LAST  902    16,3215  1 5222 1            TCF    RESUME
1113  REF  10  LAST  917    16,3216  22 016 0  ENABL2    LXCH   BANKRUPT      CONTINUE PREPARATION OF OUTCOUNTERS

1114  REF  36  LAST  913    16,3217  3 4711 1            CAF    BIT2        OPTICS ERROR CNTR ENABLE, 4MS MIN WAIT
1115                        16,3220  0 0006 1            EXTEND
1116  REF  32  LAST  918    16,3221  05 012 1            WOR    CHAN12
1117  REF   3  LAST  918    16,3222  3 3277 0            CAF    TVCADDR +2  WAIT, CALLING CMDSOUT (BBCON THERE)
1118  REF  15  LAST  918    16,3223  55=312 1            TS     T5LOC
1119  REF   3  LAST  918    16,3224  3 7700 1            CAF    OCT37776         20MS
1120  REF  11  LAST  918    16,3225  54 030 0            TS     TIME5

1121  REF   2  LAST  188    16,3226  1 5224 1            TCF    NOORSM
1122  REF  11  LAST  918    16,3227  22 016 0  CMDSOUT    LXCH   BANKRUPT      CONTINUE PREPARATION OF OUTCOUNTERS
1123                        16,3230  0 0006 1            EXTEND
1124  REF  10  LAST  918    16,3231  22 012 1            QXCH   QRUPT
```

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1125  REF 159  LAST 909  16,3232  4 4714 0          CS    ZERO      MOST RECENT ACTUATOR COMMANDS
1126  REF   5  LAST 901  16,3233  6 1631 1          AD    PCMD      (AVOID +0)
1127  REF   3  LAST 687  16,3234  54 054 1          TS    TVCPITCH
1128  REF 160  LAST 919  16,3235  4 4714 0          CS    ZERO
1129  REF   3  LAST 901  16,3236  6 1632 1          AD    YCMD
1130  REF   2  LAST 687  16,3237  54 053 0          TS    TVCYAW

1131  REF   3  LAST 687  16,3240  3 4755 1          CAF   PRIO6     RELEASE THE COUNTERS (BITS 11,12)
1132                     16,3241  0 0006 1          EXTEND
1133  REF   7  LAST 687  16,3242  05 014 1          WOR   CHAN14

1138  REF   6  LAST 918  16,3243  4 1654 0  PHSCHK2 CS    TVCPHASE  CHECK TVCPHASE AGAIN
1139                     16,3244  0 0006 1          EXTEND
1140                     16,3245  6 3250 0          BZMF  +3
1141  REF  48  LAST 828  16,3246  0 4574 0          TC    POSTJUMP      IF NEGATIVE, RESTART AT MRCLEAN
1142  REF   2  LAST 899  16,3247  36033 1           CADR  MRCLEAN           FOR FULL INITIALIZATION

11421 REF   5  LAST 908  16,3250  11-614 1  CHKSTRK CCS   STROKER  CHECK FOR STROKE TEST IN PROGRESS
11422 REF   1            16,3251  1 3266 1          TCF   TSTINITJ  YES, KILL IT
11423                    16,3252  1 3254 0          TCF   +2        NO, PROCEED
11424 REF   2  LAST 919  16,3253  1 3266 1          TCF   TSTINITJ  YES, KILL IT

1143  REF  49  LAST 919  16,3254  0 4574 0    +4    TC    POSTJUMP      IF POSITIVE OR ZERO, RESTART AT
1144  REF   1            16,3255  36160 0          CADR  TVCINIT4          TVCINIT4 (ZEROS TVCPHASE, AND
A1145                                                                     CALLS TVC DAPS)
1146  REF   7  LAST 919  16,3256  51-654 1  FINCOPY INDEX TVCPHASE  PICK UP THE APPROPRIATE COPYCYCLE
1147  REF   1            16,3257  3 3275 1          CAF   TVCCADR
1148  REF   1            16,3260  0 4637 1          TCR   ISWCALL   RE-ENTER THE COPYCYCLE, RETURN AT END
1149  REF   2  LAST 918  16,3261  1 3205 1          TCF   ENABL1    NOW PREPARE THE OUTCOUNTERS
1150                     16,3262  0 0006 1  TRIM/CMD EXTEND         TVCDAPON INITIALIZATION NOT COMPLETED,
1151  REF  19  LAST 908  16,3263  3 1426 0          DCA   PACTOFF       EG. P,YCMD MAY NOT BE SET.  SET...
1152  REF   6  LAST 919  16,3264  53-632 0          DXCH  PCMD
1153  REF   3  LAST 919  16,3265  1 3205 1          TCF   ENABL1    NOW PREPARE THE OUTCOUNTERS
1154  REF 161  LAST 919  16,3266  3 4714 1  TSTINITJ CAF  ZERO      DISABLE STROKE TEST (-0 SHOWS PRIOR V68)
1155  REF   6  LAST 919  16,3267  55-614 1          TS    STROKER   (+0 MEANS NEW V68 REQUIRED FOR STARTUP)
11552 REF   1            16,3270  1 3254 0          TCF   CHKSTRK +4

1161  REF  20  LAST 918  16,3271  51-661 1  EXRSTRT INDEX TVCEXPHS  TVCEXECUTIVE RESTARTS....GO TO
1162  REF   1            16,3272  3 3301 0          CAF   TVCEXADR      APPROPRIATE RESTART POINT
1163  REF 200  LAST 918  16,3273  50 000 1          INDEX A
1164                     16,3274  1 0000 0          TCF   0
```

R1165 TVC RESTART TABLES.... ORDER IS REQUIRED. HI-ORDER WORDS ONLY, OF 2CADRS, SINCE BBCON IS ALREADY THERE.

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1167  REF  2 LAST 919  16,3275          TVCADDR =      TVCCADR          TABLE OF CADRS, UNUSED LOCS FOR GENADRS
1168  REF  1           16,3275 03216 1  TVCCADR GENADR ENABL2          (FOR T5 CALL, UNUSED TABLE LOC)
1169  REF  1           16,3276 40561 1    +1   CADR   PCOPY +1        PITCH COPYCYCLE
1170  REF  1           16,3277 03227 0    +2   GENADR CMDSOUT         (FOR T5 CALL, UNUSED TABLE LOC)
1171  REF  1           16,3300 41037 0    +3   CADR   YCOPY +1        YAW COPYCYCLE
1172                   16,3301 37772 1  TVCEXADR OCT    37772          (UNUSED TABLE LOC, FILL WITH 60MS, T5)
1173  REF  2 LAST 905  16,3302 02742 1    +1   GENADR EXECCOPY +1     TVCEXECUTIVE RESTART POINTS (ORDERED)
1174  REF  2 LAST 905  16,3303 02750 1    +2   GENADR SWT/COR
1175  REF  1           16,3304 03030 1    +3   GENADR SWTCOPY +1
1176  REF  2 LAST 906  16,3305 03050 1    +4   GENADR TEMPSET
1177  REF  2 LAST 906  16,3306 03053 1    +5   GENADR CORSETUP
1178  REF  1           16,3307 03111 0    +6   GENADR CORCOPY +1
1179  REF  2 LAST 906  16,3310 03122 0    +7   GENADR CNTRCOPY
1180  REF  2 LAST 906  16,3311 03125 1    +8D  GENADR STRKUP
1181  REF  2 LAST 906  16,3312 03140 1    +9D  GENADR STRKTCPY +1
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L TVCDAPS USER=S PAGE NO. 1 E0 S3

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R1000   PROGRAM NAME....TVCDAP, CONSISTING OF PITCHDAP, YAWDAP, ETC.
R1001   LOG SECTION....TVCDAP          SUBROUTINE....DAPCSM
R1002   MOD BY ENGEL                  DATE....27 OCT, 1967

R1003   FUNCTIONAL DESCRIPTION....

R1004         SELF-PERPETUATING T5 TASKS WHICH GENERATE THE COMMAND SIGNALS
R1005         FOR THE PITCH AND YAW SPS GIMBAL ACTUATORS DURING TVC (SPS) BURNS,
R1006         IN RESPONSE TO BODY-AXIS RATE COMMANDS FROM CROSS-PRODUCT STEERING
R1007         (S40.8).  IF NO STEERING (IMPULSIVE BURNS) MAINTAINS ATTITUDE-HOLD
R1008         ABOUT THE REFERENCE (INITIAL) DIRECTIONS (ZERO RATE COMMANDS).

R1009         THE PITCH AND YAW LOOPS ARE SEPARATE, BUT STRUCTURED IDENTICALLY.
R1010         EACH ATTITUDE-RATE LOOP INCLUDES GIMBAL ANGLE RATE DERIVATION,
R1011         GIMBAL/BODY AXIS TRANSFORMATION, BODY-AXIS ATTITUDE ERROR
R1012         INTEGRATION WITH ERROR LIMITING, THE CSM/LEM FILTER  OR THE BRANCH
R1013         POINTS FOR THE CSM-ALONE (GEN3DAP) FILTER,  OUTPUT LIMITER,
R1014         CG-OFFSET TRACKER FILTER, AND THE CG-TRACKER MINOR LOOP.

R1015         THE DAPS ARE CYCLIC, CALLING EACH OTHER AT 1/2  THE DAP SAMPLE
R1016         TIME, AS DETERMINED BY T5TVCDT.  THE ACTUATOR COMMANDS ARE
R1017         REGENERATED AS ANALOG VOLTAGES BY THE OPTICS ERROR COUNTERS, WHICH
R1018         TRANSMIT THE SIGNAL TO THE ACTUATOR SERVOS WHEN THERE IS PROPER CDU
R1019         MODING.

R1020         REFERENCES FOR THE CSM/LEM FILTER DESIGN INCLUDE R503 BY  STUBBS
R1021         (MIT IL OCT 1965) AND SGA MEMO R26-65 BY MARTIN (MIT IL OCT 1965).
R1022         REFERENCES FOR THE CSM FILTER DESIGN (SEE GEN3DAP) INCLUDE R533 BY
R1023         LU  (MIT IL JUNE 1966).

R1024         OPERATIONAL ASPECTS OF THE INTEGRATED CONTROL PACKAGE, WITH DESIGN-
R1025         NOMINAL PARAMETER VALUES ARE DISCUSSED IN AG R336-67 BY ENGEL
R1026         (MIT IL OCT 1967) AND SGA MEMO R18-67 BY SCHLUNDT (MIT IL OCT 1967)

R1027   CALLING SEQUENCE.... (TYPICALLY)

R1028         T5 CALL OF TVCDAPON (P40-P47) BY IGNOVER (P40-P47)
R1029         T5 CALL OF DAPINIT BY TVCINIT4 (P40-P47)
R1030         T5 CALL OF DAPINIT BY DAPINIT
R1031         T5 CALL OF PITCHDAP BY DAPINIT
R1032         T5 CALL OF YAWDAP BY PITCHDAP
R1033         T5 CALL OF PITCHDAP BY YAWDAP
R1034                 ETC.
R1035         (AUTOMATIC SEQUENCING FROM TVCDAPON)

R1036   NORMAL EXIT MODE....RESUME

R1037   ALARM OR ABORT EXIT MODES....NONE

R1038   SUBROUTINES CALLED....
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R1039           HACK FOR STROKE TEST (V68) WAVEFORM GENERATION
R1040           NP0-, NP1-, NY0-, AND NY1NODE FOR GEN3DAP (LEM-OFF) FILTERS
R1041           PCOPY, YCOPY FOR COPY-CYCLES (USED ALSO BY TVC RESTART PACKAGE)
R1042           DAPINIT FOR INITIAL CDUS FOR RATE MEASUREMENTS
R1043           ERRORLIM, ACTLIM FOR INPUT (ATTITUDE-ERROR INTEGRATION) AND
R1044                OUTPUT (ACTUATOR COMMAND) LIMITING, COMMON TO PITCH AND
R1045                YAW DAPS
R1046           OPTVARK, NSUM, DSUM FOR CSM/LEM FILTER OPERATIONS, COMMON TO
R1047                PITCH AND YAW DAPS
R1048           RESUME

R1049   OTHER INTERFACES....

R1050       S40.8 CROSS-PRODUCT STEERING FOR BODY AXIS RATE COMMANDS OMEGAY,ZC
R1051       S40.15 FOR THE INITIAL DAP GAINS KP/KPDN (LEM-ON) OR KPGEN3 (-OFF)
R1052       TVCEXECUTIVE FOR VARIABLE DAP GAINS, FILTER SAMPLE-RATE CHANGE AND
R1053           GAIN REDUCTION AT LEM-ON SWITCHOVER, SINGLE-SHOT CG. ESTIMATION
R1054           AT SWITCHOVER AND REPETITIVE CG ESTIMATION AFTER SWITCHOVER.
R1055       TVCRESTART PACKAGE FOR TVC RESTART PROTECTION.

R1056   ERASABLE INITIALIZATION REQUIRED....

R1057       29 PAD-LOAD ERASABLES ESTROKER.....EREPFRAC +1
R1058       KP/KPDN (KPGEN3) AS IN S40.15 (R03)
R1059       CONFIGURATION BITS (14, 13) OF DAPDATR1 AS IN R03
R1060       ENGINE-ON BIT (11.13) FOR RESTARTS
R1061       TVCPHASE FOR RESTARTS (SEE IGNOVER, AND TVCINIT4)
R1062       T5 BITS (15,14 OF FLAGWRD6) FOR RESTARTS
R1063       MISCELLANEOUS VARIABLES SET UP OR COMPUTED BY TVCDAPON....TVCINIT4,
R1064            INCLUDING THE ZEROING OF 64 TEMPORARIES BY MRCLEAN
R1065       CDUX,Y,Z AND SINCDUX.... COSCDUX AS PREPARED BY CDUTRIG1 (WITH
R1066           UPDATES EVERY 1/2 SECOND)
R1067       ALSO G+N PRIMARY, TVC ENABLE, AND OPTICS ERROR COUNTER ENABLE
R1068           UNLESS BENCH-TESTING.

R1069   OUTPUT....

R1070       TVCPITCH AND TVCYAW WITH COUNTER RELEASE (11.14 AND 11.13 INCREMEN-
R1071           TAL COMMANDS TO OPTICS ERROR COUNTERS), FILTER NODES, BODY-
R1072           AXIS ATTITUDE ERROR INTEGRATOR, TOTAL ACTUATOR COMMANDS,
R1073           OPPSET-TRACKER-FILTER OUTPUTS, ETC.
R1074   DEBRIS....

R1075       MUCH, SHAREABLE WITH RCS/ENTRY, IN EBANK6 ONLY
 1076                       17,2213                 BANK   17
 1077   REF  1              20,2000                 SETLOC DAPS2
 1078                       20,2327                 BANK
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1079    REF  10  LAST  913   E6,1742          EBANK= BZERO
1080    REF  1                                COUNT* $$/DAPS
```

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P1081   PITCH TVCDAP STARTS HERE....(INCORPORATES CSM/LEM DAP FILTER,  MODOR DESIGN)
 1083   REF  12  LAST  918   20,2327  22 016 0  PITCHDAP LXCH   BANKRUPT      T5 ENTRY,  NORMAL OR VIA DAPINIT
 1084                        20,2330  0 0006 1           EXTEND
 1085   REF  11  LAST  918   20,2331  22 012 1           QXCH   QRUPT

 1086   REF   1              20,2332  3 3420 1           CAF    YAWT5         SET UP T5 CALL FOR YAW AUTOPILOT (LOW-
 1087   REF  16  LAST  918   20,2333  55'312 1           TS     T5LOC               ORDER PART OF 2CADR ALREADY THERE)
 1088   REF   6  LAST  907   20,2334  31'635 0           CAE    T5TVCDT
 1089   REF  12  LAST  918   20,2335  54 030 0           TS     TIM25

 1090   REF   7  LAST  919   20,2336  11'614 1  PSTROKER CCS    STROKER       (STRKFLG)  CHECK FOR STROKE TEST
 1091   REF   1              20,2337  0 3506 1           TC     HACK          TEST-START  OR  TEST-IN-PROGRESS
 1092                        20,2340  1 2342 1           TCF    +2            NO-TEST
 1093   REF   2  LAST  924   20,2341  0 3506 1           TC     HACK          TEST-IN-PROGRESS

 1094   REF   9  LAST  736   20,2342  30 033 1  PCDUDOTS CAE    CDUY          COMPUTE CDUYDOT
 1095   REF   2  LAST  103   20,2343  57'655 0           XCH    PCDUYPST            FOR PITCH AUTOPILOT
 1096                        20,2344  0 0006 1           EXTEND
 1097   REF   3  LAST  924   20,2345  21'655 1           MSU    PCDUYPST
10971   REF   1              20,2346  0 2547 0           TCR    RLIMTEST            RATE TEST
 1098   REF   2  LAST  103   20,2347  55'657 0           TS     MCDUYDOT            (MINUS,  SC.AT  1/2TVCDT REVS/SEC)

 1099   REF  12  LAST  736   20,2350  30 034 0           CAE    CDUZ          COMPUTE CDUZDOT
 1100   REF   2  LAST  103   20,2351  57'656 0           XCH    PCDUZPST            FOR PITCH AUTOPILOT
 1101                        20,2352  0 0006 1           EXTEND
 1102   REF   3  LAST  924   20,2353  21'656 1           MSU    PCDUZPST
11021   REF   2  LAST  924   20,2354  0 2547 0           TCR    RLIMTEST            RATE TEST
 1103   REF   2  LAST  103   20,2355  55'660 1           TS     MCDUZDOT            (MINUS,  SC.AT  1/2TVCDT REVS/SEC)

 1104                        20,2356  0 0006 1  PINTEGRL EXTEND                 COMPUTE INTEGRAL OF BODY-AXIS PITCH-RATE
 1105   REF   2  LAST  102   20,2357  3 1616 1           DCA    PERRB               ERROR, SC.AT B-1 REVS
 1106   REF   6  LAST  104   20,2360  53'743 1           DXCH   ERRBTMP

 1107                        20,2361  0 0006 1           EXTEND
 1108   REF   2  LAST  899   20,2362  3 1530 0           DCA    OMEGAYC
 1109   REF   7  LAST  924   20,2363  21'743 1           DAS    ERRBTMP

 1110   REF   5  LAST  718   20,2364  4 0746 0           CS     COSCDUZ       PREPARE BODY-AXIS PITCH RATE, OMEGAYB
 1111                        20,2365  0 0006 1           EXTEND
 1112   REF   5  LAST  718   20,2366  7 0750 1           MP     COSCDUX
 1113                        20,2367  20 001 1           DDOUBL
 1114                        20,2370  0 0006 1           EXTEND
 1115   REF   3  LAST  924   20,2371  7 1657 0           MP     MCDUYDOT
 1116                        20,2372  20 001 1           DDOUBL
 1117   REF   1              20,2373  53'536 1           DXCH   OMEGAYB

 1118   REF   3  LAST  924   20,2374  4 1660 1           CS     MCDUZDOT
 1119                        20,2375  0 0006 1           EXTEND
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1120  REF   5  LAST  718   20,2376  7 0742 1          MP     SINCDUX
1121                       20,2377  20 001 1          DDOUBL
1122  REF   2  LAST  924   20,2400  21'536 1          DAS    OMEGAYB      (COMPLETED OMEGAYB, SC.AT 1/2TVCDT REVS)

1123                       20,2401  0 0006 1          EXTEND               PICK UP -OMEGAYB (SIGN CHNG, INTEGRATE)
1124  REF   3  LAST  925   20,2402  4 1536 1          DCS    OMEGAYB
1125  REF   8  LAST  924   20,2403  21'743 1          DAS    ERRBTMP

1126  REF   1             20,2404  0 3126 1  PERORLIM TCR    ERRORLIM     PITCH BODY-AXIS-ERROR  INPUT LIMITER

1127  REF  66  LAST  914   20,2405  31'466 1  P1FILJMP CAE    DAPDATR1     CHECK FOR LEM-ON/-OFF
1128  REF  46  LAST  914   20,2406  7 4675 0          MASK   BIT14        (BIT 14 INDICATES LEM IS ON)
1129  REF 201  LAST  919   20,2407  10 000 0          CCS    A
1130                       20,2410  1 2413 1          TCF    +3           USE LEM-ON FILTER
1131  REF  50  LAST  919   20,2411  0 4574 0          TC     POSTJUMP     USE LEM-OFF (GEN3DAP) FILTER
1132  REF   1             20,2412  36213 1           CADR   NPONODE

1133                       20,2413  0 0006 1  PFORWARD EXTEND              LEM-ON FILTER COMPUTATIONS.
1134  REF   3  LAST  104   20,2414  4 1544 1          DCS    PDSUM        DENOMINATOR TERMS, SC.AT B+0 SPASCREVS
1135  REF   1             20,2415  53'745 1          DXCH   JZERO

1136  REF   9  LAST  925   20,2416  31'742 1          CAE    ERRBTMP      INPUT ERROR,  SC.AT B-1 REVS
1137  REF   3  LAST  104   20,2417  6 1541 0          AD     PNSUM        NUMERATOR TERMS, SC.AT B-1 REVS
1138                       20,2420  0 0006 1          EXTEND
1139  REF   1             20,2421  7 4727 0          MP     KPDN         KPDN, SC.AT B+1 SPASCREV
1140  REF   2  LAST  925   20,2422  21'745 1          DAS    JZERO
1141  REF   4  LAST  925   20,2423  31'542 0          CAE    PNSUM +1
1142                       20,2424  0 0006 1          EXTEND
1143  REF   2  LAST  925   20,2425  7 4727 0          MP     KPDN
1144  REF   3  LAST  925   20,2426  27'745 1          ADS    JZERO +1
1145  REF  81  LAST  901   20,2427  54 001 1          TS     L
1146                       20,2430  1 2432 1          TCF    +2
1147  REF   4  LAST  925   20,2431  27'744 0          ADS    JZERO        (SC.AT B+0 SPASCREV), (JZERO = CMDIMP)

1148                       20,2432  0 0006 1  JZSTORE EXTEND               PREPARE JZERO FOR DENOMINATOR LADDER
1149  REF   5  LAST  925   20,2433  3 1745 0          DCA    JZERO             SC.AT B+0 SPASCREV
1150                       20,2434  20 001 1          DDOUBL
1151                       20,2435  20 001 1          DDOUBL
1152                       20,2436  20 001 1          DDOUBL
1153  REF   3  LAST  105   20,2437  53'727 0          DXCH   J1TMP             SC.AT B-3 SPASCREV

1154  REF   1             20,2440  0 3141 0  OPTVARKP TCR    OPTVARK      PITCH VARIABLE-GAIN PACKAGE

1155                       20,2441  0 0006 1  POFFSET EXTEND               SIGN CHANGE IN FORWARD LOOP
1156  REF   6  LAST  105   20,2442  4 1745 1          DCS    CMDIMP            (GEN3DAP RETURNS AT POFFSET)
1157  REF   7  LAST  925   20,2443  53'745 1          DXCH   CMDIMP
1158                       20,2444  0 0006 1          EXTEND               ADD IN DOUBLE-PRECISION CG OFFSETS
1159  REF   5  LAST  908   20,2445  3 1626 1          DCA    PDELOFF
1160  REF   8  LAST  925   20,2446  21'745 1          DAS    CMDIMP
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1161  BEF   9  LAST  925   20,2447  31"745 0  PROUND   CAE    CMDTMP +1     ROUND UP FOR OUTPUT
1162                       20,2450  6 0000 1           DOUBLE
1163  BEF  82  LAST  925   20,2451  54 001 1           TS     L
1164  BEF 162  LAST  919   20,2452  3 4714 1           CAF    ZERO
1165  BEF  10  LAST  926   20,2453  6 1744 1           AD     CMDTMP

1166  BEF   1              20,2454  0 3161 1  PACLIM   TCR    ACTLIM        PITCH ACTUATOR-COMMAND-LIMITER

1167  BEF   7  LAST  919   20,2455  4 1631 0  POUT     CS     PCMD          INCREMENTAL PITCH COMMAND
1168  BEF  11  LAST  926   20,2456  6 1744 1           AD     CMDTMP
1169  BEF   4  LAST  919   20,2457  26 054 1           ADS    TVCPITCH      UPDATE THE ERROR COUNTER (NO RESTART-
A1170                                                                          PROTECT, SINCE ERROR CNTR ZEROED)

1171  BEF  25  LAST  918   20,2460  3 4700 1           CAF    BIT11         BIT FOR TVCPITCH COUNT RELEASE
1172                       20,2461  0 0006 1           EXTEND
1173  BEF   8  LAST  919   20,2462  05 014 1           WOR    CHAN14
1174  BEF  67  LAST  925   20,2463  31"466 1  P2FILJMP CAE    DAPDATR1      CHECK FOR LEM-ON/-OFF
1175  BEF  47  LAST  925   20,2464  7 4675 0           MASK   BIT14         (BIT 14 INDICATES LEM IS ON)
1176  BEF 202  LAST  925   20,2465  10 000 0           CCS    A
1177                       20,2466  1 2471 0           TCF    +3            USE LEM-ON FILTER
1178  BEF  51  LAST  925   20,2467  0 4574 0           TC     POSTJUMP      USE LEM-OFF (GEN3DAP) FILTER
1179  BEF   1              20,2470  36246 1            CADR   NP1NODE
1180  BEF  10  LAST  925   20,2471  31"742 1  BZSTORE  CAE    ERRBTMP       PREPARE BZERO (UPPER WORD OF ERRBTMP)
1181                       20,2472  6 0000 1           DOUBLE                  FOR NUMERATOR LADDER....SC.AT B-1
1182  BEF   3  LAST  105   20,2473  55"717 0           TS     B1TMP                 SC.AT B-2 REVS FOR LADDER
1183                       20,2474  0 0006 1  PNLADDER EXTEND                PREPARE TEMPORARIES, FOR UPDATING PITCH
1184  BEF   2  LAST  101   20,2475  3 1548 1           DCA    B1                  NUMERATOR LADDER
1185  BEF   3  LAST  105   20,2476  53"721 0           DXCH   B2TMP
1186                       20,2477  0 0006 1           EXTEND
1187  BEF   2  LAST  102   20,2500  3 1550 0           DCA    B3
1188  BEF   3  LAST  105   20,2501  53"723 1           DXCH   B4TMP
1189                       20,2502  0 0006 1           EXTEND
1190  BEF   2  LAST  102   20,2503  3 1552 1           DCA    B5
1191  BEF   3  LAST  105   20,2504  53"725 1           DXCH   B6TMP

1192  BEF   1              20,2505  0 3173 1  PNSUMC   TCR    NSUM          PITCH NUMERATOR SUM
1193                       20,2506  0 0006 1  PDLADDER EXTEND                PREPARE TEMPORARIES, FOR UPDATING PITCH
1194  BEF   2  LAST  102   20,2507  3 1554 1           DCA    J1                  DENOMINATOR LADDER
1195  BEF   3  LAST  105   20,2510  53"731 1           DXCH   J2TMP
1196                       20,2511  0 0006 1           EXTEND
1197  BEF   2  LAST  102   20,2512  3 1556 0           DCA    J2
1198  BEF   3  LAST  105   20,2513  53"733 0           DXCH   J3TMP
1199                       20,2514  0 0006 1           EXTEND
1200  BEF   2  LAST  102   20,2515  3 1560 0           DCA    J3
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1201  REF   3  LAST  105   20,2516  53'735 0          DXCH  J4TMP
1202                       20,2517  0 0006 1          EXTEND
1203  REF   3  LAST  104   20,2520  3 1562 1          DCA   J4
1204  REF   4  LAST  105   20,2521  53'737 1          DXCH  J5TMP
1205                       20,2522  0 0006 1          EXTEND
1206  REF   3  LAST  104   20,2523  3 1564 1          DCA   J5
1207  REF   3  LAST  105   20,2524  53'741 0          DXCH  J6TMP

1208  REF   1             20,2525  0 3233 0  PDSUMC   TCR   DSUM          PITCH DENOMINATOR SUM

1209  REF  12  LAST  926   20,2526  31'744 1  DELBARP  CAE   CMDTMP        UPDATE PITCH OFFSET-TRACKER-FILTER
1210                       20,2527  0 0006 1          EXTEND                  (GEN3DAP RETURNS AT  ..DELBARP..  )
1211  REF   1             20,2530  7 3421 1          MP    1-E(-AT)
1212  REF   2  LAST  104   20,2531  53'716 1          DXCH  DELBRTMP
1213  REF   5  LAST  907   20,2532  31'621 0          CAE   DELPBAR
1214                       20,2533  0 0006 1          EXTEND
1215  REF   1             20,2534  7 3422 1          MP    E(-AT)
1216  REF   3  LAST  927   20,2535  21'716 1          DAS   DELBRTMP
1217  REF   6  LAST  927   20,2536  31'622 0          CAE   DELPBAR +1
1218                       20,2537  0 0006 1          EXTEND
1219  REF   2  LAST  927   20,2540  7 3422 1          MP    E(-AT)
1220  REF   4  LAST  927   20,2541  27'716 1          ADS   DELBRTMP +1
1221  REF  83  LAST  926   20,2542  54 001 1          TS    L
1222                       20,2543  1 2545 0          TCF   +2
1223  REF   5  LAST  927   20,2544  27'715 1          ADS   DELBRTMP

1224  REF   2  LAST  920   20,2545  0 2560 0  PCOPYCYC TCR   PCOPY         PITCH COPYCYCLE

1225  REF  31  LAST  918   20,2546  1 5222 1  PDAPEND  TCF   RESUME        PITCH DAP COMPLETED
12251 REF  13  LAST  927   20,2547  55'744 0  RLIMTEST TS    CMDTMP        TEST FOR EXCESSIVE CDU RATES
12261                      20,2550  0 0006 1          EXTEND                  IF CDU DIFFERENCE EXCEEDS 2.33 DEG
12271 REF   1              20,2551  7 3415 0          MP    1/RTLIM         IN ONE SAMPLE PERIOD, SET CDURATE=0
12281                      20,2552  0 0006 1          EXTEND
12291                      20,2553  1 2556 1          BZF   +3
12301 REF 163  LAST  926   20,2554  3 4714 1          CAF   ZERO
12311 REF  14  LAST  927   20,2555  55'744 0          TS    CMDTMP
12321 REF  15  LAST  927   20,2556  31'744 1          CAE   CMDTMP
12331 REF 180  LAST  914   20,2557  0 0002 0          TC    Q
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P12341 PITCH TVCDAP COPYCYCLE SUBROUTINE (CALLED VIA PITCH TVCDAP OR TVC RESTART PACKAGE)

```
 12381  REF   8  LAST  919   20,2560  25'654 1  PCOPY    INCR    TVCPHASE      RESTART-PROTECT THE COPYCYCLE.
A12371                                                                             NOTE POSSIBLE RE-ENTRY FROM RESTART
A12381                                                                             PACKAGE, SHOULD A RESTART OCCUR
A12391                                                                             DURING PITCH COPYCYCLE.

 12401                          20,2561  0 0006 1  NEWB(S)  EXTEND                 UPDATE PITCH NUMERATOR LADDER FROM
 12411  REF   4  LAST  926     20,2562  3 1720 0           DCA     B1TMP           TEMPORARIES
 12421  REF   3  LAST  926     20,2563  53'546 0           DXCH    B1
 12431                          20,2564  0 0006 1           EXTEND
 12441  REF   3  LAST  105     20,2565  3 1722 1           DCA     B3TMP
 12451  REF   3  LAST  926     20,2566  53'550 1           DXCH    B3
 12461                          20,2567  0 0006 1           EXTEND
 12471  REF   3  LAST  105     20,2570  3 1724 1           DCA     B5TMP
 12481  REF   3  LAST  926     20,2571  53'552 0           DXCH    B5

 12491                          20,2572  0 0006 1  NEWJ(S)  EXTEND                 UPDATE PITCH DENOMINATOR LADDER FROM
 12501  REF   4  LAST  925     20,2573  3 1727 1           DCA     J1TMP           TEMPORARIES
 12511  REF   3  LAST  926     20,2574  53'554 0           DXCH    J1
 12521                          20,2575  0 0006 1           EXTEND
 12531  REF   4  LAST  926     20,2576  3 1731 0           DCA     J2TMP
 12541  REF   3  LAST  926     20,2577  53'556 1           DXCH    J2
 12551                          20,2600  0 0006 1           EXTEND
 12561  REF   4  LAST  926     20,2601  3 1733 1           DCA     J3TMP
 12571  REF   3  LAST  926     20,2602  53'560 1           DXCH    J3
 12581                          20,2603  0 0006 1           EXTEND
 12591  REF   4  LAST  927     20,2604  3 1735 1           DCA     J4TMP
 12601  REF   4  LAST  927     20,2605  53'562 0           DXCH    J4
 12611                          20,2606  0 0006 1           EXTEND                 (ALSO NP1TMP,+1 TO NP1,+1)
 12621  REF   5  LAST  927     20,2607  3 1737 0           DCA     J5TMP
 12631  REF   4  LAST  927     20,2610  53'564 0           DXCH    J5

 12641                          20,2611  0 0006 1  PMISC    EXTEND                 MISC....PITCH-RATE-ERROR INTEGRATOR
 12651  REF  11  LAST  926     20,2612  3 1743 0           DCA     ERRBTMP
 12661  REF   3  LAST  540     20,2613  55'477 0           TS      AK1            FOR PITCH NEEDLES, SC.AT B-1 REVS
 12671  REF   3  LAST  924     20,2614  53'616 0           DXCH    PERRB

 12681                          20,2615  0 0006 1           EXTEND                 PITCH NUMERATOR SUM
 12691  REF   4  LAST  104     20,2616  3 1712 1           DCA     NSUMTMP             (ALSO NP2TMP,+1 TO NP2,+1)
 12701  REF   5  LAST  925     20,2617  53'542 1           DXCH    PNSUM

 12711                          20,2620  0 0006 1           EXTEND                 PITCH DENOMINATOR SUM
 12721  REF   4  LAST  104     20,2621  3 1714 1           DCA     DSUMTMP             (ALSO NP3TMP,+1 TO NP3,+1)
 12731  REF   4  LAST  925     20,2622  53'544 1           DXCH    PDSUM

 12741  REF  16  LAST  927     20,2623  31'744 1           CAE     CMDTMP         PITCH ACTUATOR COMMAND
 12751  REF   8  LAST  926     20,2624  55'631 0           TS      PCMD

 12761                          20,2625  0 0006 1           EXTEND                 PITCH OFFSET-TRACKER-FILTER
```

```
12771  REF   6  LAST  927   20,2626  3 1716 0          DCA    DELBRTMP
12781  REF   7  LAST  927   20,2627  53=622 1          DXCH   DELPBAR

12791  REF   9  LAST  928   20,2630  25=654 1          INCR   TVCPHASE      PITCH COPYCYCLE COMPLETED

12801  REF 181  LAST  927   20,2631  0 0002 0          TC     Q
```

```
P12811  YAW   TVCDAP STARTS HERE....(INCORPORATES CSM/LEM DAP FILTER, MODOR DESIGN)
 12831  REF  13  LAST  924   20,2632  22 016 0  YAWDAP   LXCH    BANKRUPT      T5 ENTRY, NORMAL
 12841                       20,2633  0 0006 1           EXTEND
 12851  REF  12  LAST  924   20,2634  22 012 1           QXCH    QRUPT

 12861  REF   1               20,2635  3 3416 1           CAF     PITCHT5       SET UP T5 CALL FOR PITCH AUTOPILOT (LOW-
 12871  REF  17  LAST  924   20,2636  55D312 1           TS      T5LOC              ORDER PART OF 2CADR ALREADY THERE)
 12881  REF   7  LAST  924   20,2637  31D635 0           CAE     T5TVCDT
 12891  REF  13  LAST  924   20,2640  54 030 0           TS      TIME5

 12901  REF   8  LAST  924   20,2641  11D614 1  YSTROKER CCS     STROKER       (STRKFLG) CHECK FOR STROKE TEST
 12911  REF   3  LAST  924   20,2642  0 3506 1           TC      HACK          TEST-START OR TEST-IN-PROGRESS
 12921                       20,2643  1 2645 0           TCF     +2            NO-TEST
 12931  REF   4  LAST  930   20,2644  0 3506 1           TC      HACK          TEST-IN-PROGRESS

A12941                                                                        USE BODY RATES FROM PITCHDAP (PCDUDOTS)

 12951                       20,2645  0 0006 1  YINTEGRL EXTEND                COMPUTE INTEGRAL OF BODY-AXIS YAW-RATE
 12961  REF   2  LAST  102   20,2646  3 1620 1           DCA     YERRB              ERROR, SC.AT B-1 REVS
 12971  REF  12  LAST  928   20,2647  53D743 1           DXCH    ERRBTMP

 12981                       20,2650  0 0006 1           EXTEND
 12991  REF   1               20,2651  3 1532 1           DCA     OMEGAZC
 13001  REF  13  LAST  930   20,2652  21D743 1           DAS     ERRBTMP

 13011  REF   6  LAST  924   20,2653  30 746 1           CAE     COSCDUZ       PREPARE BODY-AXIS YAW-RATE, OMEGAZB
 13021                       20,2654  0 0006 1           EXTEND
 13031  REF   6  LAST  925   20,2655  7 0742 1           MP      SINCDUX
 13041                       20,2656  20 001 1           DDOUBL
 13051                       20,2657  0 0006 1           EXTEND
 13061  REF   4  LAST  924   20,2660  7 1657 0           MP      MCDUYDOT
 13071                       20,2661  20 001 1           DDOUBL
 13081  REF   1               20,2662  53D540 0           DXCH    OMEGAZB

 13091  REF   4  LAST  924   20,2663  4 1660 1           CS      MCDUZDOT
 13101                       20,2664  0 0006 1           EXTEND
 13111  REF   6  LAST  924   20,2665  7 0750 1           MP      COSCDUX
 13121                       20,2666  20 001 1           DDOUBL
 13131  REF   2  LAST  930   20,2667  21D540 0           DAS     OMEGAZB       (COMPLETED OMEGAZB, SC.AT 1/2TVCDT REVS)

 13141                       20,2670  0 0006 1           EXTEND                PICK UP -OMEGAZB (SIGN CHNG, INTEGRATE)
 13151  REF   3  LAST  930   20,2671  4 1540 0           DCS     OMEGAZB
 13161  REF  14  LAST  930   20,2672  21D743 1           DAS     ERRBTMP

 13171  REF   2  LAST  925   20,2673  0 3126 1  YERORLIM TCR     ERRORLIM      YAW  BODY-AXIS-ERROR  INPUT LIMITER

 13181  REF  68  LAST  926   20,2674  31D466 1  Y1FILJMP CAE     DAPDATR1      CHECK FOR LEM-ON/-OFF
 13191  REF  48  LAST  926   20,2675  7 4675 0           MASK    BIT14         (BIT 14 INDICATES LEM IS ON)
```

```
13201  REF 203  LAST  926   20,2676  10 000 0          CCS   A
13211                       20,2677  1 2702 1          TCF   +3          USE LEM-ON FILTER
13221  REF  52  LAST    3   20,2700  0 4574 0          TC    POSTJUMP    USE LEM-OFF (GEN3DAP) FILTER
13231  REF   1              20,2701   38405 0          CADR  NYONODE

13241                       20,2702  0 0006 1 YFORWARD EXTEND            LEM-ON FILTER COMPUTATIONS
13251  REF   3  LAST  104   20,2703  4 1570 0          DCS   YDSUM       DENOMINATOR TERMS, SC.AT B+0 SPASCREVS
13261  REF   1              20,2704  53∝745 1          DXCH  YZERO

13271  REF  15  LAST  930   20,2705  31∝742 1          CAE   ERRBTMP     INPUT ERROR,  SC.AT B-1 REVS
13281  REF   3  LAST  104   20,2706  6 1565 0          AD    YNSUM       NUMERATOR TERMS, SC.AT B-1 REVS
13291                       20,2707  0 0006 1          EXTEND
13301  REF   1              20,2710  7 4727 0          MP    KYDN        KYDN, SC.AT B+1 SPASCREV
13311  REF   2  LAST  931   20,2711  21∝745 1          DAS   YZERO
13321  REF   4  LAST  931   20,2712  31∝566 0          CAE   YNSUM +1
13331                       20,2713  0 0006 1          EXTEND
13341  REF   2  LAST  931   20,2714  7 4727 0          MP    KYDN
13351  REF   3  LAST  931   20,2715  27∝745 1          ADS   YZERO +1
13361  REF  84  LAST  927   20,2716  54 001 1          TS    L
13371                       20,2717  1 2721 0          TCF   +2
13381  REF   4  LAST  931   20,2720  27∝744 0          ADS   YZERO       (SC.AT B+0 SPASCREV), (YZERO = CMDTMP)

13391                       20,2721  0 0006 1 YZSTORE  EXTEND            PREPARE YZERO FOR DENOMINATOR LADDER
13401  REF   5  LAST  931   20,2722  3 1745 0          DCA   YZERO           SC.AT B+0 SPASCREV
13411                       20,2723  20 001 1          DDOUBL
13421                       20,2724  20 001 1          DDOUBL
13431                       20,2725  20 001 1          DDOUBL
13441  REF   1              20,2726  53∝727 0          DXCH  Y1TMP           SC.AT B-3 SPASCREV

13451  REF   2  LAST  925   20,2727  0 3141 0 OPTVARKY TCR   OPTVARK      YAW  VARIABLE-GAIN PACKAGE

13461                       20,2730  0 0006 1 YOFFSET  EXTEND            SIGN CHANGE IN FORWARD LOOP
13471  REF  17  LAST  928   20,2731  4 1745 1          DCS   CMDTMP          (GEN3DAP RETURNS AT YOFFSET)
13481  REF  18  LAST  931   20,2732  53∝745 1          DXCH  CMDTMP
13491                       20,2733  0 0006 1          EXTEND           ADD IN DOUBLE-PRECISION CG OFFSETS
13501  REF   5  LAST  908   20,2734  3 1630 0          DCA   YDELOFF
13511  REF  19  LAST  931   20,2735  21∝745 1          DAS   CMDTMP

13521  REF  20  LAST  931   20,2736  31∝745 0 YROUND   CAE   CMDTMP +1    ROUND UP FOR OUTPUT
13531                       20,2737  6 0000 1          DOUBLE
13541  REF  85  LAST  931   20,2740  54 001 1          TS    L
13551  REF 164  LAST  927   20,2741  3 4714 1          CAF   ZERO
13561  REF  21  LAST  931   20,2742  6 1744 1          AD    CMDTMP

13571  REF   2  LAST  926   20,2743  0 3161 1 YACLIM   TCR   ACTLIM      YAW  ACTUATOR-COMMAND-LIMITER

13581  REF   4  LAST  919   20,2744  4 1632 0 YOUT     CS    YCMD        INCREMENTAL YAW  COMMAND
13591  REF  22  LAST  931   20,2745  6 1744 1          AD    CMDTMP
13601  REF   3  LAST  919   20,2746  26 053 0          ADS   TVCYAW       UPDATE THE ERROR COUNTER (NO RESTART-
A13611                                                                      PROTECT, SINCE ERROR CNTR ZEROED)
```

```
13621 REF  27 LAST  778  20,2747  3 4677 0          CAF   BIT12      BIT FOR TVCYAW COUNT RELEASE
13631                    20,2750  0 0006 1          EXTEND
13641 REF   9 LAST  926  20,2751  05 014 1          WOR   CHAN14
13651 REF  69 LAST  930  20,2752  31∝466 1 Y2FILJMP CAE   DAPDATR1   CHECK FOR LEM-ON/-OFF
13661 REF  49 LAST  930  20,2753  7 4675 0          MASK  BIT14      (BIT 14 INDICATES LEM IS ON)
13671 REF 204 LAST  931  20,2754  10 000 0          CCS   A
13681                    20,2755  1 2760 0          TCF   +3         USE LEM-ON FILTER
13691 REF  53 LAST  931  20,2756  0 4574 0          TC    POSTJUMP   USE LEM-OFF (GEN3DAP) FILTER
13701 REF   1            20,2757   36440 1         CADR  NY1NODE
13711 REF  16 LAST  931  20,2760  31∝742 1 CZSTORE  CAE   ERRBTMP    PREPARE CZERO (UPPER WORD OF ERRBTMP)
13721                    20,2761  6 0000 1          DOUBLE               FOR NUMERATOR LADDER....SC.AT B-1
13731 REF   1            20,2762  55∝717 0          TS    C1TMP              SC.AT B-2 REVS FOR LADDER
13741                    20,2763  0 0006 1 YNLADDER EXTEND   PREPARE TEMPORARIES, FOR UPDATING YAW
13751 REF   2 LAST  102  20,2764  3 1572 0          DCA   C1                 NUMERATOR LADDER
13761 REF   1            20,2765  53∝721 0          DXCH  C2TMP
13771                    20,2766  0 0006 1          EXTEND
13781 REF   2 LAST  102  20,2767  3 1574 0          DCA   C3
13791 REF   1            20,2770  53∝723 1          DXCH  C4TMP
13801                    20,2771  0 0006 1          EXTEND
13811 REF   2 LAST  102  20,2772  3 1576 1          DCA   C5
13821 REF   1            20,2773  53∝725 1          DXCH  C6TMP

13831 REF   2 LAST  926  20,2774  0 3173 1 YNSUMC   TCR   NSUM       YAW  NUMERATOR SUM
13841                    20,2775  0 0006 1 YDLADDER EXTEND   PREPARE TEMPORARIES, FOR UPDATING YAW
13851 REF   2 LAST  102  20,2776  3 1600 0          DCA   Y1               DENOMINATOR LADDER
13861 REF   1            20,2777  53∝731 1          DXCH  Y2TMP
13871                    20,3000  0 0006 1          EXTEND
13881 REF   2 LAST  102  20,3001  3 1602 1          DCA   Y2
13891 REF   1            20,3002  53∝733 0          DXCH  Y3TMP
13901                    20,3003  0 0006 1          EXTEND
13911 REF   2 LAST  102  20,3004  3 1604 1          DCA   Y3
13921 REF   1            20,3005  53∝735 0          DXCH  Y4TMP
13931                    20,3006  0 0006 1          EXTEND
13941 REF   3 LAST  104  20,3007  3 1606 0          DCA   Y4
13951 REF   2 LAST  104  20,3010  53∝737 1          DXCH  Y5TMP
13961                    20,3011  0 0006 1          EXTEND
13971 REF   3 LAST  104  20,3012  3 1610 1          DCA   Y5
13981 REF   1            20,3013  53∝741 0          DXCH  Y6TMP

13991 REF   2 LAST  927  20,3014  0 3233 0 YDSUMC   TCR   DSUM       YAW  DENOMINATOR SUM

14001 REF  23 LAST  931  20,3015  31∝744 1 DELBARY  CAE   CMDTMP     UPDATE YAW  OFFSET-TRACKER-FILTER
14011                    20,3016  0 0006 1          EXTEND               (GEN3DAP RETURNS AT  ..DELBARY..  )
14021 REF   2 LAST  927  20,3017  7 3421 1          MP    1-E(-AT)
```

```
14031 REF   7 LAST  929   20,3020  53'716 1            DXCH  DELBRTMP
14041 REF   5 LAST  908   20,3021  31'623 1            CAE   DELYBAR
14051                     20,3022  0 0006 1            EXTEND
14061 REF   3 LAST  927   20,3023  7 3422 1            MP    E(-AT)
14071 REF   8 LAST  933   20,3024  21'716 1            DAS   DELBRTMP
14081 REF   6 LAST  933   20,3025  31'624 0            CAE   DELYBAR +1
14091                     20,3026  0 0006 1            EXTEND
14101 REF   4 LAST  933   20,3027  7 3422 1            MP    E(-AT)
14111 REF   9 LAST  933   20,3030  27'716 1            ADS   DELBRTMP +1
14121 REF  66 LAST  931   20,3031  54 001 1            TS    L
14131                     20,3032  1 3034 1            TCF   +2
14141 REF  10 LAST  933   20,3033  27'715 1            ADS   DELBRTMP

14151 REF   2 LAST  920   20,3034  0 3036 1  YCOPYCYC  TCR   YCOPY       YAW   COPYCYCLE

14161 REF  32 LAST  927   20,3035  1 5222 1  YDAPEND   TCF   RESUME      YAW   DAP COMPLETED
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P14171  YAW   TVCDAP COPYCYCLE SUBROUTINE (CALLED VIA YAW  TVCDAP OR TVC RESTART PACKAGE)

 14191  REF  10  LAST  929   20,3036  25'654 1  YCOPY    INCR    TVCPHASE      RESTART-PROTECT THE COPYCYCLE.
A14201                                                                          NOTE POSSIBLE RE-ENTRY FROM RESTART
A14211                                                                          PACKAGE, SHOULD A RESTART OCCUR
A14221                                                                          DURING YAW  COPYCYCLE.

 14231                        20,3037  0 0006 1  NEWC(S)  EXTEND                UPDATE YAW  NUMERATOR LADDER FROM
 14241  REF   2  LAST  932   20,3040  3 1720 0           DCA     C1TMP           TEMPORARIES
 14251  REF   3  LAST  932   20,3041  53'572 1           DXCH    C1
 14261                        20,3042  0 0006 1           EXTEND
 14271  REF   1              20,3043  3 1722 1           DCA     C3TMP
 14281  REF   3  LAST  932   20,3044  53'574 1           DXCH    C3
 14291                        20,3045  0 0006 1           EXTEND
 14301  REF   1              20,3046  3 1724 1           DCA     C5TMP
 14311  REF   3  LAST  932   20,3047  53'576 0           DXCH    C5

 14321                        20,3050  0 0006 1  NEWY(S)  EXTEND                UPDATE YAW  DENOMINATOR LADDER FROM
 14331  REF   2  LAST  931   20,3051  3 1727 1           DCA     Y1TMP           TEMPORARIES
 14341  REF   3  LAST  932   20,3052  53'600 1           DXCH    Y1
 14351                        20,3053  0 0006 1           EXTEND
 14361  REF   2  LAST  932   20,3054  3 1731 0           DCA     Y2TMP
 14371  REF   3  LAST  932   20,3055  53'602 0           DXCH    Y2
 14381                        20,3056  0 0006 1           EXTEND
 14391  REF   2  LAST  932   20,3057  3 1733 1           DCA     Y3TMP
 14401  REF   3  LAST  932   20,3060  53'604 0           DXCH    Y3
 14411                        20,3061  0 0006 1           EXTEND
 14421  REF   2  LAST  932   20,3062  3 1735 1           DCA     Y4TMP
 14431  REF   4  LAST  932   20,3063  53'606 1           DXCH    Y4
 14441                        20,3064  0 0006 1           EXTEND                (ALSO NY1TMP,+1 TO NY1,+1)
 14451  REF   3  LAST  932   20,3065  3 1737 0           DCA     Y5TMP
 14461  REF   4  LAST  932   20,3066  53'610 0           DXCH    Y5

 14471                        20,3067  0 0006 1  YMISC    EXTEND                MISC....YAW-RATE-ERROR INTEGRATOR
 14481  REF  17  LAST  932   20,3070  3 1743 0           DCA     ERRBTMP
 14491  REF   3  LAST  540   20,3071  55'500 1           TS      AK2           FOR YAW  NEEDLES, SC.AT B-1 REVS
 14501  REF   3  LAST  930   20,3072  53'620 0           DXCH    YERRB

 14511                        20,3073  0 0006 1           EXTEND                YAW  NUMERATOR SUM
 14521  REF   5  LAST  928   20,3074  3 1712 1           DCA     NSUMTMP             (ALSO NY2TMP,+1 TO NY2,+1)
 14531  REF   5  LAST  931   20,3075  53'566 1           DXCH    YNSUM

 14541                        20,3076  0 0006 1           EXTEND                YAW  DENOMINATOR SUM
 14551  REF   5  LAST  928   20,3077  3 1714 1           DCA     DSUMTMP             (ALSO NY3TMP,+1 TO NY3,+1)
 14561  REF   4  LAST  931   20,3100  53'570 0           DXCH    YDSUM

 14571  REF  24  LAST  932   20,3101  31'744 1           CAE     CMDTMP        YAW  ACTUATOR COMMAND
 14581  REF   5  LAST  931   20,3102  55'632 0           TS      YCMD

 14591                        20,3103  0 0006 1           EXTEND                YAW  OFFSET-TRACKER-FILTER
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14601  REF  11  LAST  933   20,3104  3 1716 0        DCA    DELBRTMP
14611  REF   7  LAST  933   20,3105  53=624 1        DXCH   DELYBAR

14621  REF 165  LAST  931   20,3106  3 4714 1        CAF    ZERO          YAW   COPYCYCLE COMPLETED
14631  REF  11  LAST  934   20,3107  55=654 0        TS     TVCPHASE            RESET TVCPHASE

14641  REF 182  LAST  929   20,3110  0 0002 0        TC     Q
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P14651  SUBROUTINES COMMON TO BOTH PITCH AND YAW DAPS....
R14661  INITIALIZATION PACKAGE FOR CDURATES....

 14671  REF  14  LAST  930   20,3111  22 016 0  DAPINIT  LXCH   BANKRUPT    T5 RUPT ENTRY (CALLED BY TVCINT4)

 14681  REF  18  LAST  908   20,3112  3 7716 0            CAF    NEGONE        SET UP
 14691  REF   8  LAST  930   20,3113  6 1635 0            AD     T5TVCDT       T5 CALL FOR PITCHDAP IN TVCDT SECS
 14701  REF   3  LAST  429   20,3114  6 4674 0            AD     NEGMAX        (T5TVCDT = POSMAX - TVCDT/2 +1)
 14711  REF   9  LAST  936   20,3115  6 1635 0            AD     T5TVCDT
 14721  REF  14  LAST  930   20,3116  54 030 0            TS     TIME5
 14731  REF   2  LAST  930   20,3117  3 3416 1            CAF    PITCHT5       (BBCON ALREADY THERE)
 14741  REF  18  LAST  930   20,3120  55«312 1            TS     T5LOC

 14751  REF  10  LAST  924   20,3121  30 033 1            CAE    CDUY          READ AND STORE CDUS FOR DIFFERENTIATOR
 14761  REF   4  LAST  924   20,3122  55«655 1            TS     PCDUYPST          PAST-VALUES
 14771  REF  13  LAST  924   20,3123  30 034 0            CAE    CDUZ
 14781  REF   4  LAST  924   20,3124  55«656 1            TS     PCDUZPST

 14791  REF   3  LAST  918   20,3125  1 5224 1            TCF    NOQRSM
R14801  BODY-AXIS-ERROR  INPUT LIMITER PACKAGE....

 14811  REF  18  LAST  934   20,3126  31«742 1  ERRORLIM  CAE    ERRBTMP       CHECK FOR INPUT-ERROR LIMIT
 14821                       20,3127  0 0006 1            EXTEND                    CHECKS UPPER WORD ONLY
 14831  REF   1              20,3130  7 4710 1            MP     1/ERRLIM
 14841                       20,3131  0 0006 1            EXTEND
 14851                       20,3132  1 3140 0            BZF    +6
 14861  REF  19  LAST  936   20,3133  11«742 0            CCS    ERRBTMP
 14871  REF   1              20,3134  3 4676 1            CAF    ERRLIM
 14881                       20,3135  1 3137 0            TCF    +2
 14891  REF   2  LAST  936   20,3136  4 4676 0            CS     ERRLIM
 14901  REF  20  LAST  936   20,3137  55«742 0            TS     ERRBTMP       LIMIT WRITES OVER UPPER WORD ONLY

 14911  REF 183  LAST  935   20,3140  0 0002 0            TC     Q
R14921  VARIABLE-GAIN PACKAGE....

 14931  REF  25  LAST  934   20,3141  31«744 1  OPTVARK   CAE    CMDTMP        VARIABLE-GAIN PACKAGE....CMDTMP CONTAINS
 14941                       20,3142  0 0006 1            EXTEND                    JZERO OR YZERO
 14951  REF   4  LAST  910   20,3143  7 1651 0            MP     VARK          VARIABLE-GAIN, SC.AT 4 ASCREV/SPASCREV
 14961  REF  26  LAST  936   20,3144  53«745 1            DXCH   CMDTMP
 14971  REF 205  LAST  932   20,3145  22 000 1            LXCH   A             LO-ORDER WORD OF INPUT CMDTMP
 14981                       20,3146  0 0006 1            EXTEND
 14991  REF   5  LAST  936   20,3147  7 1651 0            MP     VARK
 15001  REF  27  LAST  936   20,3150  27«745 1            ADS    CMDTMP +1
 15011  REF  87  LAST  933   20,3151  54 001 1            TS     L
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 15021                          20,3152  1 3154 0          TCF   +2
 15031  REP  28 LAST  936      20,3153  27'744 0          ADS   CMDIMP

 15041  REP  29 LAST  937      20,3154  53'745 1          DXCH  CMDIMP      FIX UP SCALING
 15051                          20,3155  20 001 1          DDOUBL
 15061                          20,3156  20 001 1          DDOUBL
 15071  REP  30 LAST  937      20,3157  53'745 1          DXCH  CMDIMP

 15081  REP 184 LAST  936      20,3160  0 0002 0          TC    Q
R15091  ACTUATOR-COMMAND LIMITER PACKAGE....

 15101                          20,3161  0 0006 1 ACTLIM   EXTEND            CHECK FOR ACTUATOR COMMAND LIMIT
 15111  REP   1                20,3162  7 3414 1          MP    1/ACTSAT
 15121                          20,3163  0 0006 1          EXTEND
 15131                          20,3164  1 3172 1          BZF   +6
 15141  REP  31 LAST  937      20,3165  11'744 0          CCS   CMDIMP      APPLY LIMITS
 15151  REP   1                20,3166  3 3413 1          CAF   ACTSAT
 15161                          20,3167  1 3171 1          TCF   +2
 15171  REP   2 LAST  937      20,3170  4 3413 0          CS    ACTSAT
 15181  REP  32 LAST  937      20,3171  55'744 0          TS    CMDIMP      LIMITS WRITE OVER CMDIMP

 15191  REP 185 LAST  937      20,3172  0 0002 0          TC    Q
R15201  NUMERATOR-SUM COMPUTATION....

 15211  REP   5 LAST  928      20,3173  31'717 1 NSUM     CAE   B1TMP       PREPARE NUMERATOR SUM, SCALING IS AT
 15221                          20,3174  0 0006 1          EXTEND                B+0 REVS  ( = B+2 X B-2 )
 15231  REP   1                20,3175  7 3423 0          MP    N1
 15241  REP   6 LAST  934      20,3176  53'712 0          DXCH  NSUMIMP

 15251  REP   4 LAST  926      20,3177  31'720 0          CAE   B2TMP
 15261                          20,3200  0 0006 1          EXTEND
 15271  REP   1                20,3201  7 3424 1          MP    N2
 15281  REP   7 LAST  937      20,3202  21'712 0          DAS   NSUMIMP

 15291  REP   4 LAST  928      20,3203  31'721 1          CAE   B3TMP
 15301                          20,3204  0 0006 1          EXTEND
 15311  REP   1                20,3205  7 3425 0          MP    N3
 15321  REP   8 LAST  937      20,3206  21'712 0          DAS   NSUMIMP

 15331  REP   4 LAST  926      20,3207  31'722 1          CAE   B4TMP
 15341                          20,3210  0 0006 1          EXTEND
 15351  REP   1                20,3211  7 3426 0          MP    N4
 15361  REP   9 LAST  937      20,3212  21'712 0          DAS   NSUMIMP

 15371  REP   4 LAST  928      20,3213  31'723 0          CAE   B5TMP
 15381                          20,3214  0 0006 1          EXTEND
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 15391  REF   1                  20,3215  7 3427 1          MP     N5
 15401  REF  10  LAST  937       20,3216  21"712 0          DAS    NSUMIMP

 15411  REF   4  LAST  926       20,3217  31"724 1          CAE    B6TMP
 15421                           20,3220  0 0006 1          EXTEND
 15431  REF   1                  20,3221  7 3430 1          MP     N6
 15441  REF  11  LAST  938       20,3222  21"712 0          DAS    NSUMIMP

 15451  REF   3  LAST  105       20,3223  31"725 0          CAE    B7TMP
 15461                           20,3224  0 0006 1          EXTEND
 15471  REF   1                  20,3225  7 3431 0          MP     N7
 15481  REF  12  LAST  938       20,3226  21"712 0          DAS    NSUMIMP

 15491  REF  13  LAST  938       20,3227  53"712 0  NSUMSC  DXCH   NSUMIMP       FIX UP SCALING (NOW AT B+0 REVS)
 15501                           20,3230  20 001 1          DDOUBL
 15511  REF  14  LAST  938       20,3231  53"712 0          DXCH   NSUMIMP       SC.AT B-1 REV

 15521  REF 186  LAST  937       20,3232  0 0002 0          TC     Q
R15531  DENOMINATOR-SUM COMPUTATION....

 15541  REF   5  LAST  928       20,3233  31"726 0  DSUM    CAE    J1TMP        PREPARE DENOMINATOR SUM, SCALED
 15551                           20,3234  0 0006 1          EXTEND                    AT B+1 SPASCREVS ( = B+4 X B-3 )
 15561  REF   1                  20,3235  7 3432 0          MP     D1                 (J1TMP = J,YZERO,  SC.AT  B-3 REVS)
 15571  REF   6  LAST  934       20,3236  53"714 0          DXCH   DSUMIMP
 15581  REF   6  LAST  938       20,3237  31"726 0          CAE    J1TMP
 15591                           20,3240  0 0006 1          EXTEND
 15601  REF   2  LAST  938       20,3241  7 3433 1          MP     D1 +1
 15611  REF   7  LAST  938       20,3242  27"714 0          ADS    DSUMIMP +1
 15621  REF  88  LAST  936       20,3243  54 001 1          TS     L
 15631                           20,3244  1 3246 0          TCF    +2
 15641  REF   8  LAST  938       20,3245  27"713 1          ADS    DSUMIMP
 15651  REF   7  LAST  938       20,3246  31"727 1          CAE    J1TMP +1
 15661                           20,3247  0 0006 1          EXTEND
 15671  REF   3  LAST  938       20,3250  7 3432 0          MP     D1
 15681  REF   9  LAST  938       20,3251  27"714 0          ADS    DSUMIMP +1
 15691  REF  89  LAST  938       20,3252  54 001 1          TS     L
 15701                           20,3253  1 3255 1          TCF    +2
 15711  REF  10  LAST  938       20,3254  27"713 1          ADS    DSUMIMP

 15721  REF   5  LAST  928       20,3255  31"730 1  D2J2    CAE    J2TMP
 15731                           20,3256  0 0006 1          EXTEND
 15741  REF   1                  20,3257  7 3434 0          MP     D2
 15751  REF  11  LAST  938       20,3260  21"714 0          DAS    DSUMIMP
 15761  REF   6  LAST  938       20,3261  31"730 1          CAE    J2TMP
 15771                           20,3262  0 0006 1          EXTEND
 15781  REF   2  LAST  938       20,3263  7 3435 1          MP     D2 +1
 15791  REF  12  LAST  938       20,3264  27"714 0          ADS    DSUMIMP +1
 15801  REF  90  LAST  938       20,3265  54 001 1          TS     L
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15811                          20,3266  1 3270 0          TCF   +2
15821  REP  13  LAST  938      20,3267  27=713 1          ADS   DSUMTMP
15831  REP   7  LAST  938      20,3270  31=731 0          CAE   J2TMP +1
15841                          20,3271  0 0006 1          EXTEND
15851  REP   3  LAST  938      20,3272  7 3434 0          MP    D2
15861  REP  14  LAST  939      20,3273  27=714 0          ADS   DSUMTMP +1
15871  REP  91  LAST  938      20,3274  54 001 1          TS    L
15881                          20,3275  1 3277 1          TCF   +2
15891  REP  15  LAST  939      20,3276  27=713 1          ADS   DSUMTMP

15901  REP   5  LAST  928      20,3277  31=732 0  D3J3     CAE   J3TMP
15911                          20,3300  0 0006 1          EXTEND
15921  REP   1                 20,3301  7 3436 1          MP    D3
15931  REP  16  LAST  939      20,3302  21=714 0          DAS   DSUMTMP
15941  REP   6  LAST  939      20,3303  31=732 0          CAE   J3TMP
15951                          20,3304  0 0006 1          EXTEND
15961  REP   2  LAST  939      20,3305  7 3437 0          MP    D3 +1
15971  REP  17  LAST  939      20,3306  27=714 0          ADS   DSUMTMP +1
15981  REP  92  LAST  939      20,3307  54 001 1          TS    L
15991                          20,3310  1 3312 0          TCF   +2
16001  REP  18  LAST  939      20,3311  27=713 1          ADS   DSUMTMP
16011  REP   7  LAST  939      20,3312  31=733 1          CAE   J3TMP +1
16021                          20,3313  0 0006 1          EXTEND
16031  REP   3  LAST  939      20,3314  7 3436 1          MP    D3
16041  REP  19  LAST  939      20,3315  27=714 0          ADS   DSUMTMP +1
16051  REP  93  LAST  939      20,3316  54 001 1          TS    L
16061                          20,3317  1 3321 0          TCF   +2
16071  REP  20  LAST  939      20,3320  27=713 1          ADS   DSUMTMP

16081  REP   5  LAST  928      20,3321  31=734 0  D4J4     CAE   J4TMP
16091                          20,3322  0 0006 1          EXTEND
16101  REP   1                 20,3323  7 3440 0          MP    D4
16111  REP  21  LAST  939      20,3324  21=714 0          DAS   DSUMTMP
16121  REP   6  LAST  939      20,3325  31=734 0          CAE   J4TMP
16131                          20,3326  0 0006 1          EXTEND
16141  REP   2  LAST  939      20,3327  7 3441 1          MP    D4 +1
16151  REP  22  LAST  939      20,3330  27=714 0          ADS   DSUMTMP +1
16161  REP  94  LAST  939      20,3331  54 001 1          TS    L
16171                          20,3332  1 3334 1          TCF   +2
16181  REP  23  LAST  939      20,3333  27=713 1          ADS   DSUMTMP
16191  REP   7  LAST  939      20,3334  31=735 1          CAE   J4TMP +1
16201                          20,3335  0 0006 1          EXTEND
16211  REP   3  LAST  939      20,3336  7 3440 0          MP    D4
16221  REP  24  LAST  939      20,3337  27=714 0          ADS   DSUMTMP +1
16231  REP  95  LAST  939      20,3340  54 001 1          TS    L
16241                          20,3341  1 3343 1          TCF   +2
16251  REP  25  LAST  939      20,3342  27=713 1          ADS   DSUMTMP

16261  REP   6  LAST  928      20,3343  31=736 1  D5J5     CAE   J5TMP
16271                          20,3344  0 0006 1          EXTEND
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16281  REF   1                    20,3345  7 3442 1          MP      D5
16291  REF  26  LAST  939         20,3346  21∝714 0          DAS     DSUMIMP
16301  REF   7  LAST  939         20,3347  31∝736 1          CAE     J5TMP
16311                             20,3350  0 0006 1          EXTEND
16321  REF   2  LAST  940         20,3351  7 3443 0          MP      D5 +1
16331  REF  27  LAST  940         20,3352  27∝714 0          ADS     DSUMIMP +1
16341  REF  96  LAST  939         20,3353  54 001 1          TS      L
16351                             20,3354  1 3356 0          TCF     +2
16361  REF  28  LAST  940         20,3355  27∝713 1          ADS     DSUMIMP
16371  REF   8  LAST  940         20,3356  31∝737 0          CAE     J5TMP +1
16381                             20,3357  0 0006 1          EXTEND
16391  REF   3  LAST  940         20,3360  7 3442 1          MP      D5
16401  REF  29  LAST  940         20,3361  27∝714 0          ADS     DSUMIMP +1
16411  REF  97  LAST  940         20,3362  54 001 1          TS      L
16421                             20,3363  1 3365 0          TCF     +2
16431  REF  30  LAST  940         20,3364  27∝713 1          ADS     DSUMIMP

16441  REF   4  LAST  927         20,3365  31∝740 0  D6J6     CAE     J6TMP
16451                             20,3366  0 0006 1          EXTEND
16461  REF   1                    20,3367  7 3444 1          MP      D6
16471  REF  31  LAST  940         20,3370  21∝714 0          DAS     DSUMIMP
16481  REF   5  LAST  940         20,3371  31∝740 0          CAE     J6TMP
16491                             20,3372  0 0006 1          EXTEND
16501  REF   2  LAST  940         20,3373  7 3445 0          MP      D6 +1
16511  REF  32  LAST  940         20,3374  27∝714 0          ADS     DSUMIMP +1
16521  REF  98  LAST  940         20,3375  54 001 1          TS      L
16531                             20,3376  1 3400 1          TCF     +2
16541  REF  33  LAST  940         20,3377  27∝713 1          ADS     DSUMIMP
16551  REF   6  LAST  940         20,3400  31∝741 1          CAE     J6TMP +1
16561                             20,3401  0 0006 1          EXTEND
16571  REF   3  LAST  940         20,3402  7 3444 1          MP      D6
16581  REF  34  LAST  940         20,3403  27∝714 0          ADS     DSUMIMP +1
16591  REF  99  LAST  940         20,3404  54 001 1          TS      L
16601                             20,3405  1 3407 0          TCF     +2
16611  REF  35  LAST  940         20,3406  27∝713 1          ADS     DSUMIMP

16621  REF  36  LAST  940         20,3407  53∝714 0  DSUMSC   DXCH    DSUMIMP      FIX UP SCALING  (NOW AT B+1 SPASCREV)
16631                             20,3410  20 001 1          DDOUBL
16641  REF  37  LAST  940         20,3411  53∝714 0          DXCH    DSUMIMP      SC AT  B+0 SPASCREV

16651  REF 187  LAST  938         20,3412  0 0002 0          TC      Q
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P16661  CONSTANTS FOR AUTOPILOTS
R16671  NOTE....1 ASCREV (ACTUATOR CMD SCALING) = 85.41 ARCSEC/BIT OR 1.07975111 REVS (85.41X16384/3600/360)

R16691          1 SPASCREV (SPECIAL ACTUATOR CMD SCALING) = 1.04620942 REVS

 16711                          20,3413   00375 0  ACTSAT   DEC     253             ACTUATOR LIMIT (6 DEG),  SC.AT 1ASCREV
 16721                          20,3414   00101 1  1/ACTSAT DEC     .0039525692     RECIPROCAL (1/253)

 16731  REF  38  LAST  913        4676             ERRLIM   EQUALS BIT13            FILTER INPUT LIMIT....B-3 REVS (45DEG),
 16741  REF  27  LAST  901        4710             1/ERRLIM EQUALS BIT3                  SC.AT B-1 REV, AND ITS RECIPROCAL

 16751                          20,3415   00115 1  1/RTLIM  DEC     0.004715        .004715(CDUDIF) =0 IF CDUDIF ± 2.33 DEG

 16761  REF  1                     4727             KPDN     =       DEC45           DESIGN-NOMINAL FILTER GAIN, SC.AT B+1
 16771  REF  3   LAST  925        4727             KYDN     =       KPDN                 SPASCREV (FOR DEC45 BITS EXACTLY)
A16781                                                                                      KPDN = .005747 DEG/DEG
A16791                                                                                      SCALED KPDN = DEC45
A16801                                                                                      1SPASCREV = KPDN(B+14)/(2X45)
A16811                                                                                                = 1.04620942 REVS
 16821  REF  1                     20,3416   02327 0  PITCHT5   GENADR PITCHDAP       UPPER WORDS OF T5 2CADRS, LOWER WORDS
 16831  REF  2   LAST  902        20,3417   03111 0  DAPT5     GENADR DAPINIT            (BBCON) ALREADY THERE.  ORDER IS
 16841  REF  1                     20,3420   02632 1  YAWT5     GENADR YAWDAP             REQUIRED.
 16851                          20,3421   00243 1  1-E(-AT) CCT     00243           AT = .01SEC....EITHER(1/A=4SEC, T=40MS),
 16861                          20,3422   37535 0  E(-AT)   CCT     37535                                OR(1/A=8SEC, T=80MS)
 16871                          20,3423   50166 0  N1       DEC     -2.9708385  B-2 NUMERATOR COEFS (CSM/LEM), SC.AT B+2

 16881                          20,3424   31436 1  N2       DEC      3.1947342  B-2

 16891                          20,3425   74561 0  N3       DEC     -0.40962906 B-2

 16901                          20,3426   53277 0  N4       DEC     -2.5780275  B-2

 16911                          20,3427   27550 1  N5       DEC      2.9629319  B-2

 16921                          20,3430   63725 1  N6       DEC     -1.5101470  B-2

 16931                          20,3431   02400 1  N7       DEC      0.31243224 B-2
 16941                          20,3432   66341 1  D1       2DEC    -4.7798977  B-4 DENOMINATOR COEFS (CSM/LEM), SC.AT B+4
 16941                          20,3433   54237 0
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16951                20,3434   22707 1  D2      2DEC     9.4452763  B-4
16951                20,3435   36641 1

16961                20,3436   54220 0  D3      2DEC    -9.8593475  B-4
16961                20,3437   40714 1

16971                20,3440   13344 0  D4      2DEC     5.7231811  B-4
16971                20,3441   21146 1

16981                20,3442   74401 1  D5      2DEC    -1.7484750  B-4
16981                20,3443   61760 1

16991                20,3444   00340 0  D6      2DEC     0.21933335 B-4
16991                20,3445   23073 1
```