$$P = XDEW(K-3) \cdot A + XDEW(K+1) \cdot B + XDEW(K+5) \cdot AA + XDEW(K+9) \cdot BB \quad (20)$$

$$Y = XDEW(K-2) \cdot A + XDEW(K+2) \cdot B + XDEW(K+6) \cdot AA + XDEW(K+10) \cdot BB \quad (21)$$

$$R = XDEW(K-1) \cdot A + XDEW(K+3) \cdot B + XDEW(K+7) \cdot AA + XDEW(K+1) \cdot BB \quad (22)$$

$$XV(1) = XDEW(799) - GSYNC(1) - FTFSP(1) - GC\O DT(1,1) \quad (23)$$

$$XV(2) = XDEW(799) - GSYNC(2) - FTFSP(2) - GC\O DT(2,1) \quad (24)$$

$$XV(1) = FQUIB(1) \cdot 1.025 \quad (25)$$

$$XV(1) = XDEW(800) - GSYNC(1) - FTFSP(1) - GC\O DT(1,2) \quad (26)$$

$$XV(2) = XDEW(800) - GSYNC(2) - FTFSP(2) - GC\O DT(2,2) \quad (27)$$

2-264. SUBPROGRAM G28 (PITCH). PITCH performs simplex pitch computations. The FORTRAN II reference statement is CALL PITCH.

a. Inputs. The inputs are as follows:

COMMON TAG	ITEM		UNITS
XDEW(554)	U_y^{k-1}	Aged upon entry	pure no.
XDEW(558)	U_z^{k-1}		pure no.
XDEW(562)	$\dot{\theta}_{nl}^{k-1}$		rad/cy
XDEW(566)	V_{DR}^{k-1}		ft/sec
XDEW(246)	$\ddot{Y}_g^k$		ft/sec-cy
XDEW(250)	$\ddot{Z}_g^k$		ft/sec-cy
XDEW(694)	t^k		cycles
XC(52)	C_{26}		rad/cy
XC(54)	C_{27}		rad/cy
XM(4)	M_2		
.	.		
.	.		
XM(60)	M_{30}		
XS(160)	S_{80}		cycles
XS(162)	S_{81}		rad/cy
XS(164)	S_{82}		quanta/rad

b. <u>Outputs</u>. The outputs are as follows:

COMMON TAG	ITEM	UNITS
XDEW(554)	U_y^{k}	pure no.
XDEW(556)	U_y^{k-1}	pure no.
XDEW(558)	U_z^{k}	pure no.
XDEW(560)	U_z^{k-1}	pure no.
XDEW(561) XDEW(562)	$\dot{\Theta}_{nl}^{k}$	rad/cy
XDEW(564)	$\dot{\Theta}_{nl}^{k-1}$	rad/cy
XDEW(566)	V_{DR}^{k}	ft/sec
XDEW(568)	V_{DR}^{k-1}	ft/sec
XDEW(570)	$\dot{\Theta}_{Ng}^{k}$	rad/cy
XDEW(572)	a_{DR}^{k}	ft/sec-cy
XDEW(573) XDEW(574)	$\dot{\Theta}_{N}^{k}$	quanta/cy
XDEW(576)	I^{k}	ft/sec
XDEW(578)	$\dot{I}^{k}$	ft/sec-cy
XDEW(580)	A^{k}	cycles
XDEW(582)	$(I/U_y)^{k}$	pure no.

c. Program Logic. IFLAG is set to identification integer 728. Items U_y, U_z, V_{dr}, $\dot{\theta}_N$ are aged. The attitude reference vectors are computed as follows:

$$U_y^k = U_y^{k-1} - U_z^{k-1} (\dot{\theta}_{n1}^{k-1} - C_{26})$$

$$U_z^k = U_z^{k-1} + U_y^{k-1} (\dot{\theta}_{n1}^{k-1} - C_{26})$$

$$(1/U_y)^k = 1/U_y^k$$

The dead-reckoned acceleration depends on the value of t^k.

If $t^k > 0$	M_5	M_9	M_{13}	M_{17}	M_{21}
set $I^k = M_2$	M_6	M_{10}	M_{14}	M_{18}	M_{22}
set $\dot{I}^k = M_3$	M_7	M_{11}	M_{15}	M_{19}	M_{23}
set $A^k = M_4$	M_8	M_{12}	M_{16}	M_{20}	M_{24}

$$a_{DR}^k = (I^k + \dot{I}^k t^k)/(A^k - t^k)$$

The dead-reckoned velocity and the gravity turn rate are computed as follows:

$$V_{DR}^k = V_{DR}^{k-1} + A_{DR}^k + \ddot{Y}_g^k U_y^k + \ddot{Z}_g^k U_z^k$$

$$\dot{\theta}_{Ng}^k = \left[(\ddot{Z}_g^k U_y^k - \ddot{Y}_g^k U_z^k)/(V_{Dr}^k)\right] - C_{26}$$

The desired turning rate $\dot{\theta}_{N1}$ in inertial space and the incremental orders $\dot{\theta}_N$ to be transmitted depend on the value of t^k.

If t^k is greater than	set $\dot{\theta}_{nl}^{k}$ equal to	set $\dot{\theta}_{N}^{k}$ equal to
0	$\dot{\theta}_{Ng}^{k}$	$S_{82}\ (\dot{\theta}_{nl}^{k} - M_{29} + C_{27})$
S_{80}	$\dot{\theta}_{Ng}^{k}$	$S_{82}\ (\dot{\theta}_{nl}^{k} - M_{29})$
M_{25}	$\dot{\theta}_{Ng}^{k}$	$S_{82}\ (\dot{\theta}_{nl}^{k} - M_{30})$
M_{26}	M_{30}	0
M_{27}	0	0
M_{28}	S_{81}	$S_{82}\ (\dot{\theta}_{nl}^{k})$

The output values of $\dot{\theta}_{nl}^{k}$ and $\dot{\theta}_{N}^{k}$ are duplexed. CUTIE is stepped by one and control is returned to the user subprogram.

2-265. SUBPROGRAM G45 (PRCSØ). PRCSØ processes steering orders. The FORTRAN II reference statement is CALL PRCSØ.

a. Inputs. The inputs are as follows:

COMMON TAG	SYMBOL		UNITS
XDEW(668)	θ_A^{k-1}	Aged upon entry	quanta
XDEW(672)	θ_B^{k-1}	Aged upon entry	quanta
XDEW(682)	Ψ_A^{k-1}	Aged upon entry	quanta
XDEW(686)	Ψ_B^{k-1}		quanta
XDEW(230)	$\dot{\theta}_1^k$		quanta/cy
XDEW(232)	$\dot{\Psi}_1^k$		quanta/cy
XDEW(574)	$\dot{\theta}_N^k$		quanta/cy
XDEW(660)	$\dot{\Psi}_N^k$		quanta/cy
XC(86)	C_{43}		quanta/cy
XC(88)	C_{44}		quanta/cy
XS(264)	S_{132}		quanta

b. Outputs. The outputs are as follows:

COMMON TAG	SYMBOL	UNITS
XDEW(662)	$\dot{\theta}_2^k$	quanta/cy
XDEW(664)	$\dot{\theta}_3^k$	quanta/cy
XDEW(666)	$\dot{\theta}_4^k$	quanta/cy
XDEW(668)	θ_A^k	quanta

COMMON TAG	SYMBOL	UNITS
XDEW(670)	θ_A^{k-1}	quanta
XDEW(672)	θ_B^{k}	quanta
XDEW(674)	θ_B^{k-1}	quanta
XDEW(676)	$\dot{\Psi}_2^{k}$	quanta/cy
XDEW(678)	$\dot{\Psi}_3^{k}$	quanta/cy
XDEW(680)	$\dot{\Psi}_4^{k}$	quanta/cy
XDEW(682)	Ψ_A^{k}	quanta
XDEW(684)	Ψ_A^{k-1}	quanta
XDEW(686)	Ψ_B^{k}	quanta
XDEW(688)	Ψ_B^{k-1}	quanta
XDEW(710)	$\sum \dot{\theta}_2^{k}$	quanta
XDEW(712)	$\sum \dot{\Psi}_2^{k}$	quanta

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c. Program Logic.

(1) Items θ_A, θ_B, Ψ_A, and Ψ_B are aged. Subprogram PRCSØ performs the following expressions to process steering orders:

$\dot{\theta}_2^{k} = \dot{\theta}_1^{k}$ if $\left|\dot{\theta}_1^{k}\right| < C_{43}$

$\dot{\theta}_2^{k} = (\text{Sign } \dot{\theta}_1^{k})C_{43}$ if otherwise

$\dot{\Psi}_2^{k} = \dot{\Psi}_1^{k}$ if $\left|\dot{\Psi}_1^{k}\right| < C_{43}$

$\dot{\Psi}_2^{k} = (\text{Sign } \dot{\Psi}_1^{k})C_{43}$ if otherwise

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$$\Theta_A{}^k = (\Theta_A{}^{k-1} + \dot\Theta_2{}^k) \qquad \text{if } \left|\Theta_A{}^{k-1} + \dot\Theta_2{}^k\right| < S_{132}$$

$$\Theta_A{}^k = \left[\text{Sign}(\Theta_A{}^{k-1} + \dot\Theta_2{}^k)\right] S_{132} \quad \text{if otherwise}$$

$$\Psi_A{}^k = (\Psi_A{}^{k-1} + \dot\Psi_2{}^k) \qquad \text{if } \left|\Psi_A{}^{k-1} + \dot\Psi_2{}^k\right| < S_{132}$$

$$\Psi_A{}^k = \left[\text{Sign}(\Psi_A{}^{k-1} + \Psi_2{}^k)\right] S_{132} \quad \text{if otherwise}$$

$$\dot\Theta_3{}^k = (\Theta_A{}^k - \Theta_B{}^{k-1} + \dot\Theta_N{}^k) \qquad \text{if } \left|\Theta_A{}^k - \Theta_B{}^{k-1} + \dot\Theta_N{}^k\right| < C_{44}$$

$$\dot\Theta_3{}^k = \left[\text{Sign}(\Theta_A{}^k - \Theta_A{}^{k-1} + \Theta_N{}^k)\right] C_{44} \quad \text{if otherwise}$$

$$\dot\Psi_3{}^k = (\Psi_A{}^k - \Psi_B{}^{k-1} - + \dot\Psi_N{}^k) \qquad \text{if } \left|\Psi_A{}^k - \Psi_B{}^{k-1} + \dot\Psi_N{}^k\right| < C_{44}$$

$$\dot\Psi_3{}^k = \left[\text{Sign}(\Psi_A{}^k - \Psi_B{}^{k-1} + \dot\Psi_N{}^k)\right] C_{44} \quad \text{if otherwise}$$

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$$\dot\Theta_4{}^k = \left[\text{SIGNF } (\dot\Theta_3{}^k)\right] \left[\text{INTF } (\left|\dot\Theta_3{}^k\right| + 0.5)\right]$$

$$\dot\Psi_4{}^k = \left[\text{SIGNF } (\dot\Psi_3{}^k)\right] \left[\text{INTF } (\left|\dot\Psi_3{}^k\right| + 0.5)\right]$$

(2) The transmitted deviation rate is computed as follows:

$$\Theta_B{}^k = \Theta_B{}^{k-1} + \dot\Theta_4{}^k - \dot\Theta_N{}^k$$

$$\Psi_B{}^k = \Psi_B{}^{k-1} + \dot\Psi_4{}^k - \dot\Psi_N{}^k$$

(3) CUTIE is stepped by one and control is returned to the user subprogram.

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2-266. SUBPROGRAM P09 (RADSIM). RADSIM, in conjunction with DP, converts periodic missile position data from the flight simulator subprogram, expressed in an inertial earth-centered rectangular coordinate system, into corresponding missile position data, expressed in the spherical coordinate system of the guidance radar, for use by the ground guidance simulator subprogram.

a. Inputs. The inputs are as follows:

COMMON TAG	DIMENSION	ITEM	UNITS
FSPP4	2,3	Missile position	feet
FTM4	2	Time since liftoff	seconds

b. Outputs. The outputs are as follows:

COMMON TAG	DIMENSION	ITEM	UNITS
GDAE4	2,3	D,A,E simulated radar data	D_1,A_1,E_1

The values of D, A, and E are stored in registers XD, XA, and XE for input to the guidance simulator.

c. Program Logic. FD P09. DP converts one set of missile position data from inertial rectangular coordinates into earth-fixed radar coordinates. A tolerance limit test is made for the missile velocity. If either the D or FTM4 values appear unreasonable, IFLAG is set to identification integer 1609 and the subprogram exits to RLLBCK for return to the previous check point. If both the D and FTM4 values appear reasonable, the D, A. and E values are placed in registers XD, XA, and XE for use by the guidance simulator and control is returned to the user subprogram.

2-267. SUBPROGRAM G46 (SGSEP). SGSEP performs signal separation. The FORTRAN II reference statement is CALL SGSEP.

a. Inputs.. The inputs are as follows:

COMMON TAG	SYMBOL	UNITS
XDEW(666)	$\dot{\theta}_4^k$	quanta/cy
XDEW(680)	$\dot{\Psi}_4^k$	quanta/cy
SW(44)	Switch 44	

b. Outputs. The outputs are as follows:

COMMON TAG	SYMBOL	UNITS
XSTOR(1), XSTOR(2)	$\dot{\theta}_a$	quanta
XSTOR(3), XSTOR(4)	$\dot{\theta}_b$	quanta
XSTOR(5), XSTOR(6)	$\dot{\theta}_c$	quanta
XSTOR(7), XSTOR(8)	$\dot{\theta}_d$	quanta
XSTOR(9), XSTOR(10)	$\dot{\Psi}_a$	quanta
XSTOR(11), XSTOR(12)	$\dot{\Psi}_b$	quanta
XSTOR(13), XSTOR(14)	$\dot{\Psi}_c$	quanta
XSTOR(15), XSTOR(16)	$\dot{\Psi}_d$	quanta

c. Program Logic. IFLAG is set to identification integer 746. The following expressions are performed if SW(44) is ØN:

$$\dot{\Psi}_a = \dot{\Psi}_b = \dot{\Psi}_c = \dot{\Psi}_d = 0$$

$\dot{\theta}_a = \dot{\theta}_4,\ \dot{\theta}_b = \dot{\theta}_c = \theta_d = 0$ if $|\dot{\theta}_4| \leq 10$

$\dot{\theta}_a = (\text{Sign}\ \dot{\theta}_4)\ 10$ if $10\ |\dot{\theta}_4| \leq 20$

$\left.\begin{array}{l} \dot{\theta}_b = (\text{Sign}\ \dot{\theta}_4)(|\dot{\theta}_4| - 10) \\ \dot{\theta}_c = \dot{\theta}_d = 0 \end{array}\right\}$

$\left.\begin{array}{l} \dot{\theta}_a = \dot{\theta}_b = (\text{Sign}\ \dot{\theta}_4)\ 10 \\ \dot{\theta}_c = (\text{Sign}\ \dot{\theta}_4)(|\dot{\theta}_4| - 20) \\ \dot{\theta}_d = 0 \end{array}\right\}$ if $20 < |\dot{\theta}_4| \leq 30$

$\left.\begin{array}{l} \dot{\theta}_a = \dot{\theta}_b = \dot{\theta}_c = (\text{Sign}\ \dot{\theta}_4) 10) \\ \dot{\theta}_d = (\text{Sign}\ \dot{\theta}_4)(\ |\dot{\theta}_4| - 30)) \end{array}\right\}$ if $30 < |\dot{\theta}_4|$

The following expressions are per if SW(44) is ØFF:

$\left.\begin{array}{l} \dot{\theta}_a = \dot{\theta}_b = \dot{\theta}_c = \dot{\theta}_d = 0 \\ \dot{\Psi}_a = \dot{\Psi}_b = (\text{Sign}\ \dot{\Psi}_4)\ 10 \end{array}\right\}$ if $|\dot{\Psi}_4| > 20$

$\left.\begin{array}{l} \dot{\Psi}_c = (\text{Sign}\ \dot{\Psi}_4)\ 10 \\ \dot{\Psi}_d = (\text{Sign}\ \dot{\Psi}_4)(|\dot{\Psi}_4| - 30) \end{array}\right\}$ if $|\dot{\Psi}_4| > 30$

$\left.\begin{array}{l} \dot{\Psi}_c = (\text{Sign}\ \dot{\Psi}_4)(\dot{\Psi}_4 - 20) \\ \dot{\Psi}_d = 0 \end{array}\right\}$ if otherwise

$\left.\begin{array}{l} \dot{\Psi}_a = \dot{\Psi}_b = \dot{\Psi}_c = \dot{\Psi}_d = 0 \\ \dot{\theta}_a = \dot{\theta}_b = (\text{Sign}\ \dot{\theta}_4)\ 10 \end{array}\right\}$ if $|\dot{\Psi}_4| \leq 20$ and $|\dot{\theta}_4| > 20$

$$\left.\begin{aligned}\dot{\Theta}_c &= (\text{Sign } \dot{\Theta}_4)\ 10 \\ \dot{\Theta}_d &= (\text{Sign } \dot{\Theta}_4)(\left|\dot{\Theta}_4\right| - 30)\end{aligned}\right\} \quad \text{if } \left|\dot{\Theta}_4\right| > 30$$

$$\left.\begin{aligned}\dot{\Theta}_c &= (\text{Sign } \dot{\Theta}_4)(\left|\dot{\Theta}_4\right| - 20 \\ \dot{\Theta}_d &= 0\end{aligned}\right\} \quad \text{if otherwise}$$

$$\dot{\Theta}_a = \dot{\Theta}_b = \dot{\Psi}_c = \dot{\Psi}_d = 0 \quad \text{if } \left|\dot{\Psi}_4\right| \leq 20 \text{ and } \left|\dot{\Theta}_4\right| \leq 20$$

$$\left.\begin{aligned}\dot{\Psi}_a &= (\text{Sign } \dot{\Psi}_4)\ 10 \\ \dot{\Psi}_b &= (\text{Sign } \dot{\Psi}_4)(\left|\dot{\Psi}_4\right| - 10)\end{aligned}\right\} \quad \text{if } \left|\dot{\Psi}_4\right| > 10$$

$$\dot{\Psi}_a = \dot{\Psi}_4 = \dot{\Psi}_b = 0 \quad \text{if otherwise}$$

$$\left.\begin{aligned}\dot{\Theta}_c &= (\text{Sign } \dot{\Theta}_4)\ 10 \\ \dot{\Theta}_d &= (\text{Sign } \dot{\Theta}_4)(\left|\dot{\Theta}_4\right| - 10)\end{aligned}\right\} \quad \text{if } \left|\dot{\Theta}_4\right| > 10$$

$$\dot{\Theta}_c = \dot{\Theta}_4, \quad \dot{\Theta}_d = 0 \quad \text{if otherwise}$$

CUTIE is stepped by one and control is returned to the user subprogram.

2-268. SUBPROGRAM G01 (SQDEW). SQDEW forms various one-step square root approximations. The FORTRAN II reference statement is CALL SQDEW (D, B, B1).

a. Inputs. The inputs are the D and B parameters. D is the quantity whose square root is desired. B is the computed square root from the previous cycle.

b. Outputs. The output is the parameter B1 which is the square root of the parameter D.

c. Program Logic.

(1) IFLAG is set to identification integer 701. If D is negative, SQDEW exits to NEGSQR. If D is not negative, the expression used is

$$B1 = \frac{1}{2}\left(|B| + \frac{D}{|B|}\right)$$

(2) CUTIE is stepped by one and control is returned to the user subprogram.

2-269. SUBPROGRAM G26 (STEER). STEER computes steering filters and gain adjustment. The FORTRAN II reference statement is CALL STEER.

a. Inputs. The inputs are as follows:

COMMON TAG	SYMBOL	UNITS
XDEW(48)	τ_c^k	pure no.
XDEW(69)	$\bar{\epsilon}_{\dot{z}}^{k}$	ft/sec
XDEW(71)	$\bar{\epsilon}_{\dot{z}}^{k-1}$	ft/sec
XDEW(72)	$\bar{\epsilon}_{\dot{z}}^{k-1}$	ft/sec
XDEW(73)	$\bar{\epsilon}_{\dot{z}}^{k-2}$	ft/sec
XDEW(74)	$\bar{\epsilon}_{\dot{z}}^{k-2}$	ft/sec
XDEW(76)	$\bar{\epsilon}_{\dot{z}}^{k-3}$	ft/sec
XDEW(77)	$\bar{\epsilon}_{\dot{c}}^{k}$	ft/sec
XDEW(78)	$\bar{\epsilon}_{\dot{c}}^{k}$	ft/sec
XDEW(79)	$\bar{\epsilon}_{\dot{c}}^{k-1}$	ft/sec
XDEW(80)	$\bar{\epsilon}_{\dot{c}}^{k-1}$	ft/sec
XDEW(81)	$\bar{\epsilon}_{\dot{c}}^{k-2}$	ft/sec
XDEW(82)	$\bar{\epsilon}_{\dot{c}}^{k-2}$	ft/sec
XDEW(84)	$\bar{\epsilon}_{\dot{c}}^{k-3}$	ft/sec
XDEW(175)	Y_M^{k-1}	
XDEW(183)	X_3^{k-1}	
XDEW(493)	$\bar{\epsilon}_{\dot{c}}^{k}$	ft/sec

COMMON TAG	SYMBOL	UNITS
XDEW(494)	$\bar{\epsilon}_{\dot{c}}^{k}$	ft/sec
XDEW(513)	$\epsilon_{\dot{z}}^{k}$	ft/sec
XDEW(514)	$\epsilon_{\dot{z}}^{k}$	ft/sec
XDEW(533)	$\dot{\theta}_{o}^{k}$	quanta ft/sec^2 cy
XDEW(534)	$\dot{\theta}_{o}^{k}$	quanta ft/sec^2 cy
XDEW(535)	$\dot{\theta}_{o}^{k-1}$	quanta ft/sec^2 cy
XDEW(536)	$\dot{\theta}_{o}^{k-1}$	quanta ft/sec^2 cy
XDEW(537)	$\dot{\theta}_{o}^{k-2}$	quanta ft/sec^2 cy
XDEW(539)	$\dot{\theta}_{o}^{k-3}$	quanta ft/sec^2 cy
XDEW(540)	$\dot{\theta}_{o}^{k-3}$	quanta ft/sec^2 cy
XDEW(541)	$\dot{\gamma}_{o}^{k}$	quanta ft/sec^2 cy
XDEW(542)	$\dot{\gamma}_{o}^{k}$	quanta ft/sec^2 cy
XDEW(543)	$\dot{\gamma}_{o}^{k-1}$	quanta ft/sec^2 cy
XDEW(544)	$\dot{\gamma}_{o}^{k-1}$	quanta ft/sec^2 cy
XDEW(545)	$\dot{\gamma}_{o}^{k-2}$	quanta ft/sec^2 cy
XDEW(546)	$\dot{\gamma}_{o}^{k-2}$	quanta ft/sec^2 cy
XDEW(547)	$\dot{\gamma}_{o}^{k-3}$	quanta ft/sec^2 cy
XDEW(695)	t_{s}^{k}	cycle
XDEW(696)	t_{s}^{k}	cycle
XC(61)	C_{31}	
XC(62)	C_{31}	

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COMMON TAG	SYMBOL	UNITS
XC(63)	C_{32}	
XC(65)	C_{33}	
XC(67)	C_{34}	
XC(69)	C_{35}	
XC(71)	C_{36}	
XC(73)	C_{37}	
XC(78)	C_{39}	
XS(155)	S_{78}	ft/sec
XS(156)	S_{78}	ft/sec

b. <u>Outputs</u>. The outputs are as follows:

COMMON TAG	SYMBOL	UNITS
XDEW(47)	$\tau_c'^{k}$	pure no.
XDEW(69)	$\bar{\epsilon}^{k}$	ft/sec
XDEW(70)	$\bar{\epsilon}_{\dot z}^{k}$	ft/sec
XDEW(71)	$\bar{\epsilon}_{\dot z}^{k}$	ft/sec
XDEW(72)	$\bar{\epsilon}_{\dot z}^{k-1}$	ft/sec
XDEW(73)	$\bar{\epsilon}_{\dot z}^{k-2}$	ft/sec
XDEW(74)	$\bar{\epsilon}_{\dot z}^{k-2}$	ft/sec
XDEW(75)	$\bar{\epsilon}_{\dot z}^{k-2}$	ft/sec
XDEW(76)	$\bar{\epsilon}_{\dot z}^{k-3}$	ft/sec
XDEW(77)	$\bar{\epsilon}_{\dot c}^{k}$	ft/sec

COMMON TAG	SYMBOL	UNITS
XDEW(78)	$\bar{\dot{\epsilon}}_c^{\,k}$	ft/sec
XDEW(79)	$\bar{\dot{\epsilon}}_c^{\,k}$	ft/sec
XDEW(80)	$\bar{\dot{\epsilon}}_c^{\,k-1}$	ft/sec
XDEW(81)	$\bar{\dot{\epsilon}}_c^{\,k-1}$	ft/sec
XDEW(82)	$\bar{\dot{\epsilon}}_c^{\,k-2}$	ft/sec
XDEW(83)	$\bar{\dot{\epsilon}}_c^{\,k-3}$	ft/sec
XDEW(84)	$\bar{\dot{\epsilon}}_c^{\,k-3}$	ft/sec
XDEW(230)	$\dot{\theta}_1^{\,k}$	quanta/cy
XDEW(232)	$\dot{\psi}_1^{\,k}$	quanta/cy
XDEW(493)	$\bar{\dot{\epsilon}}_c^{\,k}$	ft/sec
XDEW(513)	$\dot{\epsilon}_z^{\,k}$	ft/sec
XDEW(533)	$\dot{\theta}_o^{\,k}$	quanta ft/sec^2 cy
XDEW(534)	$\dot{\theta}_o^{\,k}$	quanta ft/sec^2 cy
XDEW(535)	$\dot{\theta}_o^{\,k}$	quanta ft/sec^2 cy
XDEW(536)	$\dot{\theta}_o^{\,k-1}$	quanta ft/sec^2 cy
XDEW(537)	$\dot{\theta}_o^{\,k-2}$	quanta ft/sec^2 cy
XDEW(538)	$\dot{\theta}_o^{\,k-2}$	quanta ft/sec^2 cy
XDEW(539)	$\dot{\theta}_o^{\,k-3}$	quanta ft/sec^2 cy
XDEW(540)	$\dot{\theta}_o^{\,k-3}$	quanta ft/sec^2 cy
XDEW(541)	$\dot{\psi}_o^{\,k}$	quanta ft/sec^2 cy
XDEW(542)	$\dot{\psi}_o^{\,k}$	quanta ft/sec^2 cy
XDEW(543)	$\dot{\psi}_o^{\,k-1}$	quanta ft/sec^2 cy

COMMON TAG	SYMBOL	UNITS
XDEW(544)	$\dot{\Psi}_o^{k-1}$	quanta ft/sec^2 cy
XDEW(545)	$\dot{\Psi}_o^{k-2}$	quanta ft/sec^2 cy
XDEW(546)	$\dot{\Psi}_o^{k-2}$	quanta ft/sec^2 cy
XDEW(547)	$\dot{\Psi}_o^{k-2}$	quanta ft/sec^2 cy
XDEW(548)	$\dot{\Psi}_o^{k-3}$	quanta ft/sec^2 cy
XDEW(229)	$\dot{\theta}_1^{k}$	quanta/cy
XDEW(231)	$\dot{\Psi}_1^{k}$	quanta/cy

c. Program Logic. IPLAG is set to identification integer 726. Steering filters and gain adjustment are computed by the following expressions:

$$\text{if } \tau_c^k \geq 0, \text{ or } \epsilon_{\dot{z}} \geq S_{78}, \text{ or } \epsilon_{\dot{c}}^k \geq S_{78}$$

$$\dot{\theta}_o^k = \dot{\Psi}_o^k = 0$$

$$\text{if } \tau_c^k < 0, \ \epsilon_{\dot{z}}^k < S_{78}, \text{ and } \epsilon_{\dot{c}}^k < S_{78}$$

$$\dot{\theta}_o^k = C_{31} \epsilon_{\dot{z}}^k + \sum_{i=1}^{3} C_{(31+i)} \bar{\epsilon}_{\dot{z}}^{k-i} + \sum_{i=1}^{3} C_{(34+i)} \dot{\theta}_o^{k-1}$$

$$\dot{\Psi}_o^k = C_{31} \epsilon_{\dot{c}}^k + \sum_{i=1}^{3} C_{(31+i)} \bar{\epsilon}_{\dot{c}}^{k-i} + \sum_{i=1}^{3} C_{(34+i)} \dot{\Psi}_o^{k-1}$$

$$\bar{\epsilon}_{\dot{z}}^k = \epsilon_{\dot{z}}^k$$

$$\bar{\epsilon}_{\dot{c}}^k = \epsilon_{\dot{c}}^k$$

Items $\bar{\epsilon}_{\dot{z}}$, $\bar{\epsilon}_{\dot{c}}$, $\dot{\theta}_o$, $\dot{\psi}_o$ are aged. In all cases

$$\dot{\theta}_1^{\,k} = (C_{38} - C_{39}\, t_s^{\,k})\, \dot{\theta}_o^{\,k}$$

$$\psi_1^{\,k} = (C_{38} - C_{39}\, t_s^{\,k})\, \dot{\psi}_o^{\,k}$$

CUTIE is stepped by one and control is returned to the user subprogram.

2-270. SUBPROGRAM G02 (STUP1). STUP1 sets up the guidance site constants G(1-10) and the core constants C(1-14); sets switches SW(45), SW(46), SW(48), SW(49), SW(52), and SW(61) to position ØFF; and clears the V counter. The FORTRAN II reference statement is CALL STUP1.

a. Inputs. The inputs are the guidance site constants G(1-16) in register XGI(1-32), the target constants T(1-14) in register XT(1-28), and system constants S_{125} and S_{126} in registers XS(500) and XS(352).

b. Outputs. The outputs are the guidance site constants G(1-16) in registers XG(1-24); the core constants C(1-14) in register XC(1-28); the initialized V counter; the settings of switches SW(45), SW(46), SW(48), SW(49), SW(52), SW(53), and SW(61); the q substage cycle counter NFLAG(4); and the M subphase counter NFLAG(2).

c. Program Logic. IFLAG is set to identification integer 702. STUP1 sets up the guidance site constants G(1-10) and sets the duplexed core constants C(1-14) equal to the corresponding target constants T(1-14). Core constant C_8 is set to the difference ($G116-T_8$). If the absolute value of C_8 is greater than S_{125}, C_8 is set equal to the difference C_8 - (sign C_8) S_{126}; otherwise subphase counter M, substage cycle counter q, and counter V are set to zero and switches SW(49), SW(52), SW(53), SW(45), SW(46), SW(61) are set ØFF. CUTIE is stepped by one and control is returned to the user subprogram.

2-271. SUBPROGRAM G03 (STUP2). STUP2 sets up initial target position, components of earth rotation, coordinate translation constants, and coordinate conversion constants. The FORTRAN II reference statement is CALL STUP2.

a. Inputs. The inputs are as follows:

COMMON TAG	ITEM		UNITS
XC(2)	C_1	Core constants	feet
XC(4)	C_2		degrees
XC(6)	C_3		degrees
XC(20)	C_{10}		seconds
XC(22)	C_{11}		degrees
XC(24)	C_{12}		degrees
XG(2)	G_1	Guidance constants	pure no.
XG(4)	G_2		pure no.
XG(6)	G_3		feet
XG(8)	G_4		feet
XS(52)	S_{26}	System constant	rad/sec
FPI(2)	π		radians

b. Outputs. the outputs are as follows:

COMMON TAG	ITEM	UNITS
XDEW(24)	t_f^k	seconds
XDEW(26)	t_f^{k-1}	seconds
XDEW(196)	t_{f1}^k	seconds

COMMON TAG	ITEM	UNITS
XDEW(198)	t_{fl}^{k-1}	seconds
XDEW(200)	X_T^k	feet
XDEW(204)	Y_T^k	feet
XDEW(208)	Z_T^k	feet
XC(32)	C_{16}	rad/sec
XC(34)	C_{17}	rad/sec
XC(36)	C_{18}	rad/sec
XC(38)	C_{19}	feet
XC(40)	C_{20}	feet
XC(42)	C_{21}	feet
XC(48)	C_{24}	pure no.
XC(50)	C_{25}	pure no.
XC(96)	C_{48}	pure no.
XC(98)	C_{49}	pure no.
NFLAG(6)	Cycle counter K	integer

c. Program Logic. IFLAG is set to identification integer 703. The initial target position is computed as follows:

$$X_T^k = X_{R2} \cos C_{11} - Y_{R2} \sin C_{11}$$

$$Y_T^k = Y_{R1} \cos C_{11} + Z_{R2} \sin C_{12}$$

$$Z_T^k = Z_{R2} \cos C_{12} - Y_{R1} \sin C_{12}$$

$$Y_{R3} = C_1 \sin C_{48}$$

$$Z_{R3} = C_1 \cos C_{49} \cos C_3$$

$$X_{R2} = C_1 \cos C_{49} \sin C_3$$

$$Y_{R2} = Y_{R3} G_1 - Z_{R3} G_2$$

$$Z_{R2} = Z_{R3} G_1 + Y_{R3} G_2$$

$$Y_{R1} = Y_{R2} \cos C_{11} + Y_{R2} \sin C_{11}$$

$$t_f^k = t_f^{k-1} = C_{10}$$

$$t_{f1}^k = t_{f1}^{k-1} = C_{10}$$

The components of the earth's rotation are computed as follows:

$$C_{16} = Y_{R2} \sin C_{11}$$

$$C_{17} = Y_{R1} \cos C_{12} + Z_{R2} \sin C_{12}$$

$$C_{18} = Z_{R2} \cos C_{12} - Y_{R1} \sin C_{12}$$

$$Y_{R3} = S_{26}$$

$$Y_{R2} = Y_{R3} G_1$$

$$Z_{R2} = Y_{R3} G_2$$

$$Y_{R1} = Y_{R2} \cos C_{11}$$

The coordinate translation constants are computed as follows:

$$C_{19} = -Y_{R2} \sin C_{11}$$

$$C_{20} = Y_{R1} \cos C_{12} + Z_{R2} \sin C_{12}$$

$$C_{21} = Z_{R2} \cos C_{12} - Y_{R1} \sin C_{12}$$

$$Y_{R3} = G_3$$

$$Z_{R3} = G_4$$

$$Y_{R2} = Y_{R3} G_1 - Z_{R3} G_2$$

$$Z_{R2} = Z_{R3} G_1 + Y_{R3} G_2$$

$$Y_{R1} = Y_{R2} \cos C_{11}$$

Coordinate conversion constants C_{24} and C_{25} are defined as

$$C_{24} = \cos C_{12}$$

$$C_{25} = \sin C_{12}$$

The K cycle counter is cleared. In the preceding expressions, SINE, CØSINE, and RØUND compute the sine and cosine functions, and round the double-precision outputs of SINE and CØSINE to single-precision equivalents. CUTIE is stepped by one and control is returned to the user subprogram.

2-272. SUBPROGRAM G04 (STUP3). STUP3 sets up pitch program constants, initial values of square roots, and other initial values. The FORTRAN II reference statement is CALL STUP3.

a. Inputs. The inputs are as follows:

COMMON TAG	ITEM		UNITS
XC(18)	C_9	Core constants	degrees
XC(22)	C_{11}	Core constants	degrees
XC(24)	C_{12}	Core constants	degree
XC(32)	C_{16}	Core constants	rad/sec
XS(54)	S_{27}	System constants	deg-sec/rad
XS(56)	S_{28}	System constants	ft/sec
XS(58)	S_{29}	System constants	sec/cy
XS(60)	S_{30}	System constants	rad/cy-deg
XS(62)	S_{31}	System constants	$\text{feet}^{-1/2}$
XS(64)	S_{32}	System constants	pure no.
XS(68)	S_{34}	System constants	feet
XS(70)	S_{35}	System constants	feet^2
XS(72)	S_{36}	System constants	ft/sec
XS(74)	S_{37}	System constants	pure no.
XS(76)	S_{38}	System constants	quanta/cy
FPI(2)	π		radians
XS(280)	V_E^{k-1}		ft/sec

b. Outputs. The outputs are as follows:

COMMON TAG	ITEM	UNITS
XDEW(4)	$(1/\sqrt{a})^k$	$feet^{-1/2}$
XDEW(6)	$(1/\sqrt{a})^{k-1}$	$feet^{-1/2}$
XDEW(14)	$(e \sin E_T)^k$	pure no.
XDEW(16)	$(e \sin E_T)^{k-1}$	pure no.
XDEW(48)	$\tau_c^{\ k}$	integer
XDEW(50)	$\tau_c^{\ k-1}$	integer
XDEW(254)	$R_M^{\ k}$	feet
XDEW(256)	$R_M^{\ k-1}$	feet
XDEW(410)	$Y_{DR}^{\ k}$	feet
⋮	⋮	⋮
XDEW(458)	$Y_{DR}^{\ k-24}$	feet
XDEW(554)	$U_y^{\ k}$	pure no.
XDEW(556)	$U_y^{\ k-1}$	pure no.
XDEW(558)	$U_z^{\ k}$	pure no.
XDEW(560)	$U_z^{\ k-1}$	pure no.
XDEW(562)	$\dot{\theta}_{nl}^{\ k}$	rad/cy
XDEW(564)	$\dot{\theta}_{nl}^{\ k-1}$	rad/cy
XDEW(566)	$V_{DR}^{\ k}$	ft/sec
XDEW(568)	$V_{DR}^{\ k-1}$	ft/sec
XDEW(588)	$\dot{Z}_{Wl}^{\ k}$	ft/sec
XDEW(590)	$\dot{Z}_{Wl}^{\ k-1}$	ft/sec
XDEW(624)	$(V_R/V)^k$	pure no.

COMMON TAG	ITEM	UNITS
XDEW(626)	$(V_R/V)^{k-1}$	pure no.
XDEW(628)	V^k	ft/sec
XDEW(630)	V^{k-1}	ft/sec
XDEW(508)	V_E^{k-1}	ft/sec
XDEW(667)	$\dot{\theta}_A^k$	quanta
XDEW(668)	$\dot{\theta}_A^k$	quanta
XDEW(671)	$\dot{\theta}_B^k$	quanta
XDEW(672)	$\dot{\theta}_B^k$	quanta
XDEW(681)	$\dot{\Psi}_A^k$	quanta
XDEW(682)	$\dot{\Psi}_A^k$	quanta
XDEW(685)	$\dot{\Psi}_B^k$	quanta
XDEW(686)	$\dot{\Psi}_B^k$	quanta
XDEW(698)	R_c^k	feet^2
XDEW(700)	R_c^{k-1}	feet^2
XC(52)	C_{26}	rad/cy
XC(54)	C_{27}	rad/cy
XC(88)	C_{44}	quanta/cy
XC(90)	C_{45}	degrees

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c. Program Logic.

(1) Set IFLAG to identification integer 704. The following expressions are performed in sequence to produce the pitch program constants:

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$$U_y^{\,k} = U_y^{\,k-1} = \sin\,(C_9 + C_{12} + S_{27}\,C_{16})$$

$$U_z^{\,k} = U_z^{\,k-1} = \cos\,(C_9 + C_{12} + S_{27}\,C_{16})$$

$$\dot{\theta}_{n1}^{\,k} = \dot{\theta}_{n1}^{\,k-1} = 0$$

$$V_{DR}^{\,k} = V_{DR}^{\,k-1} = S_{28}$$

$$\dot{Z}_{W1}^{\,k} = \dot{Z}_{W1}^{\,k-1} = 0$$

$$C_{26} = S_{29}\,C_{16}$$

$$C_{27} = S_{30}\,C_9$$

The initial values of square roots are as follows:

$$b^k = b^{k-1} = S_{31}$$

$$F^k = F^{k-1} = S_{32}$$

$$R_M^{\,k} = R_M^{\,k-1} = S_{34}$$

$$R_c^{\,k} = R_c^{\,k-1} = S_{35}$$

$$V^k = V^{k-1} = S_{36}$$

$$(V_R/V)^k = (V_R/V)^{k-1} = S_{37}$$

Other initialized values are as follows:

$$C_{44} = S_{38}$$

$$C_{45} = C_{11}$$

$$\tau_c^{\,k} = \tau_c^{\,k-1} = 0$$

$$Y_1^{\,k} = 0$$

$$Y_{DR}^{k} = Y_{DR}^{k-1} = \ldots = Y_{DR}^{k-24} = 0$$

$$\dot{\Theta}_A^{k} = \dot{\Theta}_B^{k} = 0$$

$$\dot{\Psi}_A^{k} = \dot{\Psi}_B^{k} = 0$$

(2) In the preceding expressions, SINE, CØSINE, and RØUND perform the sine and cosine functions and round the double-precision outputs to the single-precision equivalents. If T19 is greater than zero, SW(45) is set ØN; otherwise it it is set ØFF. CUTIE is stepped by one and control is returned to the user subprogram.