

2-216. SUBPROGRAM P02 (ADDØUT). ADDØUT reads the additional outputs requested. The FORTRAN II reference statement is CALL ADDØUT.

a. Inputs. The inputs are the additional inputs requested and read from cards if SENSE switch 5 is ON, or input tape B10 if SENSE switch 5 is OFF. The number of additional outputs is contained in IGENE(3). SW(82) is ØN, if direct print is requested.

b. Outputs. The outputs are the additional outputs stored in IDRES and printed and/or written as indicated.

c. Program Logic. SENSE switch 5 is interrogated. If ON, the additional output is read from a card; if OFF, the input is read from tape B10. INTRØG interrogates SW(82). If ØN, the additional output is printed and written; if ØFF, the additional output is only written. When all the additional outputs have been read and written, the subprogram exits to the user subprogram.

2-217. SUBPROGRAM P74 (MET). MET controls the reading of target latitude and longitude during SIM mode of operation. The FORTRAN II reference statement is CALL MET.

a. Inputs. The input is a card containing latitude and longitude data read into TOLT and TOLN, respectively. If SENSE switch 5 is  $\emptyset N$ , the input is a card; if  $\emptyset FF$ , the input is on tape B10.

b. Outputs. The outputs are the contents of the registers mentioned above which are written and/or printed.

c. Program Logic. SENSE switch 5 is tested to determine if input is read from the card reader or tape B10. If  $\emptyset N$ , the latitude and longitude data is read into TOLT and TOLN from the card reader; if  $\emptyset FF$ , the same information is read from tape. INTR $\emptyset$ G interrogates SW(82) to determine if direct print is requested (SW(82) =  $\emptyset N$ ). If  $\emptyset N$ , this same information is written and printed; if  $\emptyset FF$ , it is only printed. METDTA processes the MET data. The subprogram exits to the user subprogram.

2-218. SUBPROGRAM DO3 (RENTY). RENTRY reads the re-entry data necessary for the Missile System Simulation. The FORTRAN II reference statement is CALL RENTRY (NEND).

a. Inputs. The inputs are on cards if SENSE switch 5 is ON, or on input tape B10 if SENSE switch 5 is OFF. If NEND is one, the indication for SW(32) is to be read, otherwise this is not necessary. SW(82) is ON if direct print is requested. The information is read into the following registers:

COMMON TAG	DIMENSION	ITEM	UNITS
TWDA	2	Current target desired de- tonation altitude	feet
TWAL	2	Current target altitude above geoid	feet
TWGS	2	Current target geoidal separation	feet
IRFSG	2,1,10	Output fuzing parameters for all ten targets	
FRFSG	2,6,10	Fuzing parameter quantization adjustment factors on aim points	sec/ft
SW(32)		If ON, STOP on re-entry to stop at air burst time; if OFF, stop at detonation altitude	

b. Outputs. The outputs are the inputs and the written statement: ERROR IN CLO - SW(32) INPUT CARD NOT 1. or 2.

c. Program Logic. FD DO3

(1) Steps 1-12. SENSE switch 5 is interrogated before each piece of information is read. If ON, the input is on cards; if OFF, the input is on input tape B10. INTRØG interrogates SW(82) to determine if the information is to be printed. This is done before printing any information other than the output error statement which is automatically printed and written. If SW(82) is ØN, the information is printed and written; if ØFF, the information is only written. The information for TWDA, TWAL, TWGS, IRFSG, and FRFSG is read, written, and duplexed. The input argument is examined. If other than one, the subprogram exits to the user subprogram; if one, the indication for the setting of SW(32) is read.

(2) Steps 13-22. IFLAG is set to identification integer 1673. The indication of SW(32) is printed and examined for a one or two. If a one, SW(32) is set ØN; if a two, the switch is set ØFF. The subprogram exits to the user subprogram. If neither one nor two is indicated, the output error statement is written. The subprogram exits to HALT for manual intervention.

2-219. SUBPROGRAM P72 (SBALM). SBALM controls the ballistic or re-entry phase of simulation. The FORTRAN II reference statement is CALL SBAIM.

a. Inputs. The inputs are on cards if SENSE switch 5 is ON, or on input tape B10 if SENSE switch 5 is OFF. The information is read into the following registers except LLIX, GDELT, SW(82), and SW(87) which were previously set.

COMMON TAG	DIMENSION	ITEM	UNITS
FSPPS	2,3	Current missile position vector	feet
FSPVL	2,3	Current missile velocity vector	ft/sec
FMASS	2	Current missile mass	slugs
FTFSP	2	Current time of flight since liftoff	seconds
LLIX	1	Number of output intervals per integration interval	integer
GDELT	2,3	Length of output intervals	seconds
IGENE(3)		Number of additional outputs requested	
IGENE(4)		End point of simulation	
SW(9)		If <del>ON</del> , RSD <del>ORE</del> is requested to perform data recordings	
SW(20)		If <del>OFF</del> , omit D term in gravity computations	
SW(21)		If <del>OFF</del> , omit J term in gravity computations	

COMMON TAG	DIMENSION	ITEM	UNITS
SW(32)		If 0N, 0L00P on re-entry to stop at air burst time; if 0FF, stop at detonation altitude	
SW(41)		If 0N, use MET data; if 0FF, use standard atmosphere	
SW(54)		If 0N, booster shell impact point to be determined	
SW(82)		If 0N, direct print requested	
SW(87)		If 0N, ballistic phase of simulation requested	

b. Outputs. The outputs are as follows:

COMMON TAG	DIMENSION	ITEM	UNITS
FTMFL	2,2	Current time of flight since liftoff - double precision	seconds
FDPMS	2,2	Current missile mass - double precision	slugs
FBKPS	2,2,3	Current missile position vector - double precision	feet
FBKVL	2,2,3	Current missile velocity vector - double precision	ft/sec
LIX	1	Number of output intervals per integration interval	integer
FLIX	2	Floating point form of LIX	integer
LSEQ	1	Flight stage and sub-stage indicator for normal sequencing	integer

COMMON TAG	DIMENSION	ITEM	UNITS
LAG	1	RK local stop counter	integer
FDELT	2	Length of output interval	seconds
SW(4)		If $\emptyset N$ , a special interrupt time of flight simulation is requested in FSPEC	
SW(5)		If $\emptyset N$ , an interrupt has occurred based on an altitude criterion	
SW(6)		If $\emptyset N$ , an interrupt has occurred based on a special interrupt time criterion	
SW(7)		If $\emptyset N$ , an interrupt has occurred based on a normal sequence time criterion	
SW(8)		If $\emptyset N$ , monitor radar slew rate A during early portion of booster flight	
SW(10)		If $\emptyset N$ , RSD $\emptyset$ RE to be initialized for data recordings of a new target	
SW(11)		If $\emptyset N$ , RSD $\emptyset$ RE to conclude data recording of current target	
SW(22)		If $\emptyset N$ , FSIMLC to be initialized for starting a new flight simulation	
SW(23)		If $\emptyset N$ , RADSIM to be initialized for starting a new flight simulation	
SW(24)		If $\emptyset N$ , powered phase of guided flight simulation in progress	
SW(25)		If $\emptyset N$ , FSIMLC to interrupt on propellant exhaustion	
SW(26)		If $\emptyset N$ , FSIMLC to interrupt on time of flight	

COMMON TAG	DIMENSION	ITEM	UNITS
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SW(27)		If $\emptyset N$ , FSIMLC to interrupt on altitude during ascent	
SW(28)		If $\emptyset N$ , FSIMLC to interrupt on altitude during descent	
SW(29)		If $\emptyset N$ , FSIMLC to interrupt on other end criterion	
SW(30)		If $\emptyset N$ , FSIMLC to compute a previously interrupted simulation interval	
SW(34)		If $\emptyset N$ , WNDTRP to use launch area MET data; if $\emptyset FF$ , impact area	
SW(35)		If $\emptyset N$ , PRSDEN to compute standard atmospheric pressure; if $\emptyset FF$ , density	
SW(36)		If $\emptyset N$ , booster stage simulation in progress	
SW(37)		If $\emptyset N$ , sustainer stage simulation in progress	
SW(38)		If $\emptyset N$ , vernier stage simulation in progress	
SW(39)		If $\emptyset N$ , ballistic stage simulation in progress	
SW(40)		If $\emptyset N$ , re-entry stage simulation in progress	
SW(58)		If $\emptyset N$ , R3D $\emptyset$ RE to record data from GGDSIM	
SW(87)		If $\emptyset N$ , ballistic phase simulation requested	
SW(88)		If $\emptyset N$ , re-entry phase of simulation requested	
SW(131)		If $\emptyset N$ , SWAP to call CL $\emptyset\emptyset$ P	
SW(132)		If $\emptyset N$ , SWAP to call $\emptyset L\emptyset\emptyset$ P	
SW(159)		If $\emptyset FF$ , skip ballistic simulation	



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COMMON TAG	DIMENSION	ITEM	UNITS
SW(160)		If OFF, skip re-entry simulation	

All the inputs read are written plus the following statements:

- a. BEGINNING BAL PHASE OF SIM
- b. BEGINNING REN PHASE OF SIM
- c. ERROR IN BALLISTIC CONTROL CARD SW NOT 1, OR 2
- d. ERROR IN BAL CONTROL CARD-IGENE(3) NOT BETWEEN 0 and 40
- e. ERROR IN BAL CONTROL CARD-IGENE(4) NOT 10 OR 11
- f. ENDING BAL-REN PHASE OF SIMULATION

c. Program Logic. FD P72

(1) Steps 1-20. SAVE<sup>4</sup> establishes the subprogram return path. SW(10) and SW(132) are set ON. SW(22)-SW(30), SW(34)-SW(40), SW(4)-SW(9), SW(11), SW(58), SW(159), SW(160), and SW(131) are set OFF. INTR~~OG~~ interrogates SW(87) to determine if ballistic phase of simulation is requested. If ON, statement a is printed and written; otherwise statement b is printed and written. SENSE switch 5 is interrogated before each new input is read. If ON, input is on cards; if OFF, input is on tape B10. Before each printout, except error statements, INTR~~OG~~ interrogates SW(82) to determine if direct print is requested. If ON, the statement is printed and written; otherwise the statement is only written. The indications for the settings of SW(9), SW(20),

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SW(21), SW(32), SW(41), and SW(54) and IGENE(3) and IGENE(4) are read and written. Each switch is examined in sequence for a one or a two. If a one, the switch is set  $\emptyset N$ ; if a two, the switch is set  $\emptyset FF$ . The subprogram continues at step 20. If neither one nor two is indicated, statement c is printed and written. The subprogram exits to HALT for manual intervention.

(2) Steps 21-25. If IGENE(3) is negative or greater than 40, statement d is printed and written, and the subprogram exits to HALT for manual intervention. If IGENE(3) is valid, IGENE(4) is examined. If IGENE(4) is 10 (simulation from liftoff to re-entry) or 11 (simulation from liftoff to impact), control is transferred to step 26. If IGENE(4) is invalid, statement e is printed and written. The subprogram exits to HALT for manual intervention.

(3) Steps 26-46. RENTRY reads the re-entry data. INTR~~OG~~ interrogates SW(41) to determine if MET data or standard atmospheric conditions are to be used. If  $\emptyset N$ , MET reads the MET data cards. INITAL initializes the flight simulation. If IGENE(3) is not zero, ADD~~OUT~~ reads the additional outputs requested. The input containing FSPPS, RSPVL, PMASS, and FTFSP are read, written, and duplexed. These inputs are stored in their respective double precision registers. If the re-entry phase of simulation is requested (SW(87)  $\emptyset FF$ ), LSEQ is set to 10 (ballistic flight), SW(159) is set  $\emptyset FF$ , and SW(160) is set  $\emptyset N$ . Con-

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trol is transferred to step 47. If ballistic phase of simulation is requested (SW(87)  $\emptyset$ N), LAG is set to five, LSEQ to 10, and SW(28), SW(39), and SW(159) are set  $\emptyset$ N. If IGENE(4) is 11, SW(160) is set  $\emptyset$ N.

(4) Steps 47-57. SWAP controls the time sharing of subprograms in core and a complete simulation. WRITE writes the outputs according to the ballistic phase requested. INTR $\emptyset$ G interrogates SW(87) to determine if ballistic phase is requested. If  $\emptyset$ N, SW(87) is set  $\emptyset$ FF; if  $\emptyset$ FF, SW(88) is set  $\emptyset$ FF. Statement f is written. The subprogram exits to RTRN4 for return to the user subprogram.

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2-220. SUBPROGRAM P75 (SCLØM). SCLØM controls closed-loop simulation. The FORTRAN II reference statement is CALL SCLØM.

a. Inputs. The input is the setting of the direct print indicator SW(82).

b. Outputs. The outputs are the following switches:

COMMON TAG	ITEM (switch in ØN state)
SW(43)	Suppress $\epsilon_{co}$ maximum initial value gate logic
SW(44)	Suppress yaw steering
SW(55)	IIP or fuel exhaustion impact point is determined
SW(54)	Booster shell impact point is determined
SW(60)	TEST checks GGDSIM outputs; if ØFF, test only P counter
SW(62)	TEST checks outputs of GGDSIM to CLØØP; if ØFF, test other outputs of GGDSIM
SW(63)	TEST checks entire XDEW, XSTØR, and XC arrays; if ØFF, test only selected outputs
SW(64)	Compute time to go in GGDSIM
SW(86)	Closed loop simulation requested
SW(131)	SWAP calls CLØØP
SW(132)	SWAP calls ØLØØP
SW(133)	Open loop guidance is used (TAA control)
SW(159)	Perform ballistic simulation
SW(160)	Perform re-entry simulation

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The following printed and/or written statements are also outputs:

- a. BEGINNING CLO PHASE OF SIM
- b. ERROR IN CLO CONTROL CARD
- c. ENDING CLO PHASE OF MSS

c. Program Logic. PD P75

(1) Steps 1-8. SAVE<sup>4</sup> establishes the subprogram return path. Statement a is printed and written. TC~~ON~~ST reads the input containing switch indications, IGENE(3) and IGENE(4), and the T constants. SW(131) is set ~~ON~~, and SW(132) and SW(133) are set ~~OFF~~. If IGENE(4) is nine (simulation from liftoff to re-entry vehicle separation), control is transferred to step 13. If IGENE(4) is 10 or 11, control is transferred to step 9. If IGENE(4) does not equal any of these, it is invalid. Statement b is printed and written and the subprogram exits to HALT for manual intervention.

(2) Steps 9-12. SW(137) and SW(149) are set ~~ON~~, and SW(160) is set ~~OFF~~. If IGENE(4) is 10 (simulation from liftoff to re-entry), control is transferred to step 13. If IGENE(4) is 11 (simulation is from liftoff to impact), SW(160) is set ~~ON~~ and RENTRY reads the impact data.

(3) Steps 13-28. If IGENE(3) is greater than zero (indicating additional outputs are requested), ADD~~OUT~~ reads the outputs requested. INTR~~OG~~ interrogates SW(41) to

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determine if MET data is to be used. If  $\emptyset N$ , MET reads the MET cards. INITAL initializes for flight simulation. SW(43), SW(62), and SW(64) are set  $\emptyset N$ ; SW(44), SW(54), SW(55), SW(60), and SW(63) are set  $\emptyset PP$ . SWAP controls the time sharing of subprograms in core and a complete simulation. WRITE writes the output. IFLAG is set to identification integer 1675. INTR $\emptyset G$  interrogates SW(82) to determine if direct print is requested. If  $\emptyset N$ , statement c is printed and written; if  $\emptyset PP$ , statement c is only written. SW(86) is set  $\emptyset PP$ . The subprogram exits to RTRN4 for return to the user subprogram.

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2-221. SUBPROGRAM P70 (SIDRM). SIDRM controls the ideal-earth simulation. The FORTRAN II reference statement is  
CALL SIDRM.

a. Inputs. The input is on cards if SENSE switch 5 is ON, or on input tape B10 if SENSE switch 5 is OFF. If SW (82) is ON, direct print is requested. An integer indicating the number of Herget solutions to be performed plus the information to be contained in the following registers is read:

COMMON TAG	DIMENSION	ITEM	UNITS
GCØPS	2,3	Starting point position vector for Herget computations	feet
GCØVL	2,3	Starting point velocity vector for Herget computations	ft/sec
GCØTM	2	Starting point time of flight since liftoff for Herget computations	seconds
GTAPR	2	Stopping point radius vector magnitude for Herget computations	feet
SW(69)		If ON, aim point on same side of apogee as launch pad	

b. Outputs. The output is SW(89) (ideal-earth simulation) set OFF, and the inputs. The following printed and/or written statements are also outputs:

a. BEGINNING IDR PHASE OF SIM

b. HERGET END POINT DATA RUN \_\_\_\_\_



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- c. ERROR IN IDR CONTROL CARD-SW(69) NOT 1 or 2.
- d. POSITION X = \_\_\_\_\_, Y = \_\_\_\_\_, Z = \_\_\_\_\_ FEET
- e. VELOCITY X = \_\_\_\_\_, Y = \_\_\_\_\_, Z = \_\_\_\_\_ FEET/SEC
- f. TIME BALLISTIC = \_\_\_\_\_, TOTAL = \_\_\_\_\_ SECONDS
- g. LATITUDE GEOGRAPHIC = \_\_\_\_\_, GEOCENTRIC = \_\_\_\_\_ DEGREES
- h. LONGITUDE = \_\_\_\_\_ DEGREES GTPPS (2,3) = Z  
= \_\_\_\_\_ FEET
1. ENDING IDEAL EARTH TRAJECTORY SECTION OF SIM

c. Program Logic. PD P70.

(1) Steps 1-10. SW(9) is set OFF and ICOUNT is set to zero. IFLAG is set to identification integer 1670. SENSE switch 5 is interrogated before each new impact is read in. If ON, the card containing the number of Herget solutions to be performed is read; if OFF, this information is read from tape B10. INTRIG examines SW(82) before each printout (except indications of error conditions) for a direct print request. If ON, the number of Herget solutions is printed and written. If OFF, this information is only written. Statement a is printed and written.

(2) Steps 11-21. ICOUNT is stepped by one. The indication for SW(69) and GCOPS, GCØVL, GTAPR, and GCØTM are read. Output statement b and the input just read are written. If the switch indication is a one, SW(69) is set ON; if a two, SW(69) is set OFF. Control is transferred to step 22. If neither one nor two is indicated, statement c is

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printed and written. The subprogram exits to HALT for manual intervention.

(3) Steps 22-31. The contents of the above registers are duplexed. HERGET computes the Herget solution of the impact point. IFLAG is set to identification integer 1670. Output statements d through h are written. If any further Herget solutions are computed, control is transferred to step 11. Otherwise SW(89) is set OFF and output statement 1 is printed and written. The subprogram exits to the user subprogram.

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2-222. SUBPROGRAM P71 (SIMNT). SIMNT examines the simulation switches to determine the phase of simulation requested and selects the corresponding subprogram to perform this phase. The FORTRAN II reference statement is CALL SIMNT.

a. Inputs. The inputs are IGENE (3), which will be a positive integer if tape B3 is not to be used for RSD, and the following switches:

COMMON TAG	ITEM (switch in ON state)
SW(82)	Direct print indicator
SW(86)	Closed loop simulation requested
SW(87)	Ballistic phase simulation requested
SW(88)	Re-entry phase simulation requested
SW(89)	Ideal-earth simulation requested
SW(90)	Series simulation requested
SW(135)	Open loop option in CLØØP

b. Outputs. The outputs are the following printed and written statements:

- a. ERROR - CONTROL REACHED SIMNT WITH ALL MSS SWITCHES OFF
- b. EXTRA OUTPUTS ON TAPE B3 - THIS TAPE CAN NOT BE USED FOR RSD
- c. TAPE B3 IS AN RSD TAPE

c. Program Logic. FD P71

(1) Steps 1-34. SAVE4 establishes the subprogram return path. Before each switch is interrogated, IFLAG is set to identification integer 1671. After returning from the appropriate subprogram, IGENE(1) is stepped by one. IGENE(2) is stepped by IGENE(3) except when ideal-earth simulation is requested. IGENE(7) is set to zero if series or open loop phase is requested, or set to one if ideal-earth simulation is requested. Each switch is interrogated in sequence by INTRQG until an ON condition occurs, at which time a subprogram is called to perform the indicated phase of simulation. After the IGENE registers have been stepped, the subprogram continues at step 35.

SWITCH	SUBPROGRAM CALLED	SIMULATION PHASE
SW(86)	SCLQM (P75)	Closed loop
SW(87)	SBALM (P72)	Ballistic
SW(88)	SBALM (P72)	Re-entry
SW(89)	SIDRM (P70)	Ideal earth
SW(90)	SPERM (P77)	Series
SW(135)	SOPNM (P73)	Open loop option

If SW(135) is OFF, IGENE(1) is examined to determine if a phase of simulation had previously been performed. If IGENE(1) is greater than zero, the subprogram continues at step 35. Otherwise output statement a is printed and written. The subprogram exits to HALT for manual intervention.

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(2) Steps 35-41. If IGENE(7) is one, control is transferred to step 42, otherwise IGENE(2) is examined.

If IGENE(2) is zero (indicating no additional outputs have been requested), control is transferred to step 43. If IGENE(2) is greater than zero, IFLAG is set to identification integer 1671 and INTRØG interrogates SW(82). If ØN, output statement b is printed and written. Otherwise this statement is only written.

(3) Step 42. The subprogram exits to RTRN4 for return to the user subprogram.

(4) Steps 43-47. IFLAG is set to identification integer 1671 and INTRØG interrogates SW(82). If ØN, output statement c is printed and written. Otherwise this statement is only written. The subprogram continues at step 42.

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2-223. SUBPROGRAM P73 (SØPNM). SØPNM controls open loop simulation. The FORTRAN II reference statement is CALL SØPNM.

a. Inputs. The inputs are on cards if SENSE switch 5 is ON, or on input tape B10 if SENSE switch 5 is OFF. If SW(82) is ON, direct print is requested. The information is read into the following registers:

COMMON TAG	DIMENSION	ITEM	UNITS
ITPYR	1	Number of turning rate cards	integer
XDEW(799)	1	Time of sustainer engine cutoff	seconds
XDEW(800)	1	Time of vernier engine cutoff	seconds
FQUIB	2	Powered flight integration interval	seconds
XDEW	250	Open-loop turning rate table of the following format: time, pitch, yaw, and roll turning rates	
IGENE(3)	1	Number of additional outputs requested	integer
IGENE(4)	1	Simulation end point	integer

b. Outputs. The outputs are the following switches:

COMMON TAG	ITEM (switch in ON state)
SW(43)	Suppress $\epsilon_{\dot{c}_0}$ maximum initial value gate logic
SW(44)	Suppress yaw steering

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COMMON  
TAG

ITEM  
(switch in ON state)

SW(54)	Booster shell impact point is determined
SW(55)	IIP or fuel exhaustion impact point is determined
SW(58)	RSDØRE records data from GGDSIM
SW(60)	TEST checks GGDSIM outputs; if ØFF, test only P counter
SW(62)	TEST checks only outputs of GGDSIM to CLØØP; if ØFF, test other outputs of GGDSIM
SW(63)	TEST checks entire XDEW, XSTØR, XC arrays: if ØFF, test only selected outputs
SW(64)	Compute time to go in GGDSIM
SW(131)	SWAP calls CLØØP
SW(132)	SWAP calls ØLØØP
SW(133)	Use open-loop guidance
SW(135)	Request OPN phase of simulation
SW(159)	Perform ballistic simulation
SW(160)	Perform re-entry simulation

The inputs (that are read) plus the following statements are written and/or printed:

- a. BEGINNING OPN PHASE OF SIM
  - b. ERROR IN OPN CONTROL CARD, IGENE(4) NOT 9, 10, or 11
  - c. ENDING OPN PHASE OF MSS
- c. Program Logic. FD P73

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(1) Steps 1-23. SAVE4 establishes the subprogram return path. SW(58) is set ON, and output statement a is printed and written. TCNST reads the switch indications and T constants. Before each card is read, SENSE switch 5 is examined. If ON, input is on cards; if OFF, input is on tape B10. Before each printout, except error statements, INTRG interrogates SW(82) to determine if direct print is requested. If ON, the information is printed and written; otherwise the information is only written. The input containing ITPYR, XDEW(799), XDEW(800), and FQUIB is read and written. FQUIB is duplexed. The information containing the time, pitch, yaw, and roll turning rates according to the number stored in ITPYR is read and written. SW(131) is set ON and SW(132) and SW(133) are set OFF. If IGENE(4) is 9 (indicating simulation is from liftoff to re-entry vehicle separation), the subprogram continues at step 28. If IGENE(4) is 10 or 11, the subprogram continues at step 24. If IGENE(4) is invalid, output statement b is written and printed. The subprogram exits to HALT for manual intervention.

(2) Steps 24-27. SW(132) and SW(159) are set ON and SW(160) is set OFF. If IGENE(4) is 11 (simulation from liftoff to impact), SW(160) is set ON. RENTRY reads the re-entry data.

(3) Steps 28-43. If IGENE(3) is greater than zero, ADDOUT reads the additional outputs requested. INTRG interrogates SW(41). If SW(41) is ON, MET data cards are to

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be used and MET reads this information. INITIAL initializes for flight simulation. SW(43), SW(62), and SW(64) are set ON; and SW(44), SW(54), SW(55), SW(60), and SW(63) are set OFF. SWAP controls the time sharing of subprograms in core. WRITE writes the output as determined by the value of IGENE(4). IFLAG is set to identification integer 1673. Output statement c is written. SW(135) and SW(58) are set OFF. The subprogram exits to RTRN4 for return to the user subprogram.

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2-224. SUBPROGRAM P77 (SPERM). SPERM controls a series of simulations. The FORTRAN II reference statement is CALL SPERM.

a. Inputs. The inputs are on cards if SENSE switch 5 is ON, or on input tape B10 if SENSE switch 5 is OFF. If SW(82) is ON, direct print is requested. The information is read into the following registers:

COMMON TAG	DIMENSION	ITEM	UNITS
GSGMA	2,20,1	Sigma levels for missile parameters of current simulation	integer
IGENE(3)		Number of additional outputs requested	
IGENE(4)		End point of simulation	
IGENE(5)		Number of times this section of MSS is run independently	

b. Outputs. The outputs are the following switches:

COMMON TAG	ITEM (switch in ON state)
SW(43)	Suppress $\epsilon_{co}$ maximum initial value gate logic
SW(44)	Suppress yaw steering
SW(54)	Booster shell impact point to be determined
SW(55)	IIP or fuel exhaustion impact point to be determined
SW(60)	TEST checks GGDSIM outputs; if OFF, test only P counter

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COMMON TAG	ITEM (switch in ON state)
SW(62)	TEST checks outputs of GGDSIM to CL <del>OP</del> ; if <del>OP</del> , TEST checks other outputs of GGDSIM
SW(63)	TEST checks XDEW, XST <del>OR</del> , and XC arrays; if <del>OP</del> , TEST checks only selected outputs
SW(64)	Compute time to go in GGDSIM
SW(131)	SWAP to call CL <del>OP</del>
SW(132)	SWAP to call <del>OP</del>
SW(133)	Use open-loop guidance
SW(159)	Perform ballistic simulation
SW(160)	Perform re-entry simulation

The inputs and the following statements are printed and/or written:

- a. BEGINNING PER PHASE OF SIM
- b. ENDING PER PHASE OF MSS
- c. BEGINNING NEW PER SIMULATION
- d. END OF PER SECTION OF SIM

c. Program Logic. FD P77

(1) Steps 1-23. SAVE<sup>4</sup> establishes the subprogram return path. If IGENE(5) is not zero, the subprogram continues at step 42. If IGENE(5) is zero, indicating that this is the initial beginning of the perturbation phase of simulation, statement a is printed and written. Before each input is read, SENSE switch 5 is examined to determine if the input is on cards (SENSE switch 5 ON) or on input tape

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B10 (SENSE switch 5 OFF). INTRØG interrogates SW(82) before printing any information other than error information, which is automatically printed and written. If ØN, the information is printed and written; otherwise it is only written. IGENE(5) is read and written. TCØNST reads the indications for the switch settings and the T constants. The GSGMA matrix is read, written, and duplexed. SW(133) is set ØFF; SW(131), SW(132), SW(159), and SW(160) are set ØN. RENTRY reads the re-entry and impact data. If additional outputs are requested (IGENE(3) > 0), ADDØUT reads these outputs.

(2) Steps 24-42. INTRØG interrogates SW(41). If ØN, MET reads the MET data cards. INITIAL initializes the flight simulation. SW(43), SW(62), and SW(64) are set ØN. SW(44), SW(54), SW(55), SW(60), and SW(63) are set ØFF. SWAP controls the time sharing of subprograms in core and the complete simulation. WRITE writes the output, and statement b is written. If this is the last run of this phase (indicated by the setting of IGENE(5)), statement d is written, SW(90) is set ØFF, and the subprogram exits to RTRN4 for return to the user subprogram. If another simulation is to be run, the subprogram exits to RTRN4 for return to the user subprogram which in turn will call this subprogram again.

(3) Steps 43-47. IFLAG is set to identification integer 1677. Statement c is written and control is transferred to step 11 to begin a new perturbation.

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2-225. SUBPROGRAM P79 (TCØNST). TCØNST reads input data for Missile System Simulation. The FORTRAN II reference statement is CALL TCØNST (NEND).

a. Inputs. The inputs are on cards if SENSE switch 5 is ON, or on input tape B10 if SENSE switch 5 is OFF. If NEND is one, the T constants are to be read; otherwise these are not necessary. If SW(82) is ØN, direct print is requested. The information is read into the following registers:

COMMON TAG	ITEM
XT(1,14)	T constants 1-14
XT(1,19)	T19
IGENE(3)	Number of additional outputs requested
IGENE(4)	End point of simulation
SW(8)	If ØN, monitor radar slew rate A during early portion of booster flight
SW(9)	If ØN, RSDØRE requested to perform data recordings
SW(20)	If ØFF, omit D term in gravity computations
SW(21)	If ØFF, omit J term in gravity computations
SW(41)	If ØN, use MET data; if ØFF, use standard atmosphere only
SW(47)	If ØN, suppress noise in RADSIM and PRCSØ

b. Outputs. The outputs are the inputs and the following statements written.

- a. ERROR IN PER CONTROL CARD-SW NOT 1. OR 2.
- b. ERROR IN PER CONTROL CARD-IGENE(3) NOT BETWEEN 0 AND 40

c. Program Logic. FD P79

(1) Steps 1-13. SENSE switch 5 is interrogated before each piece of information is read. If ON, the input is on cards; if OFF, the input is on input tape B10. INTRØG interrogates SW(82) to determine if the information is to be printed. This is done before printing any information other than the two output error statements. These statements are automatically printed and written. If SW(82) is ØN, the information is printed and written; if ØFF, the information is only written. The information indicating the contents of SW(8), SW(9), SW(20), SW(21), SW(41), SW(47), IGENE(3), and IGENE(4) is read and written. The switch indicators are examined in sequence. If an indicator contains a one, the corresponding switch is set ØN; if a two, the switch is set ØFF. Control is transferred to step 14. If neither one nor two is indicated output statement a is written, and the subprogram exits to HALT for manual intervention.

(2) Steps 14-26. IGENE(3) is examined. If negative or greater than 40, output statement b is written. The subprogram exits to HALT for manual intervention. If IGENE(3)

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is valid, the input argument is examined. If other than one, the subprogram exits to the user subprogram; if one, the T constants 1-14 and 19 are read. IFLAG is set to identification integer 1675. The T constants are written and duplexed. The subprogram exits to the user subprogram.

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