Battelle
Columbus Laboratories

Report

FINAL REPORT

on

IGOS IMPROVEMENTS FOR SEASAT
(Report No. BCL-OA-TFR-79-2)

by

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FOREWORD

The study reported herein was carried out by Battelle's Columbus Laboratories for the NASA Office of Space and Terrestrial Applications, as a task under Contract No. NASw-2800. The work was done under the general supervision of Dr. A. C. Robinson, Battelle's manager for the contract. Task monitor in the Office of Space and Terrestrial Applications was Mr. S. Walter McCandless, and the technical monitor at Langley Research Center was Mr. Ken Hughes.

IGOS IMPROVEMENTS FOR SEASAT

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The objective of Task 28 was to modify Battelle's Interactive Graphics Orbit Selection (IGOS) computer program to assist in the planning and evaluation of the Seasat-A Scatterometer System (SASS) flight program.

Battelle's IGOS program was an integral part of the early Seasat-A planning at NASA's Office of Applications and the Jet Propulsion Laboratory. IGOS enabled the planners to perform efficient evaluations of the tradeoffs between several mission requirements and to communicate their results to the user community in simple, easy to understand displays.

To meet the planning needs of the LaRC Seasat-A Scatterometer team, the following features/modifications were implemented in IGOS under Task 28:

(1) Display and specification of time increments in orbital passes represented by the cross-hatching of ground swaths

(2) Addition of pass number annotations on the horizontal axis of the STPLNG and STPTOD plots

(3) Modification of the sensor model to include more than two swaths associated with a single sensor to approximate the SASS cell pattern

(4) Inclusion of down range and cross-track swath geometry to display the characteristic skewed SASS pattern

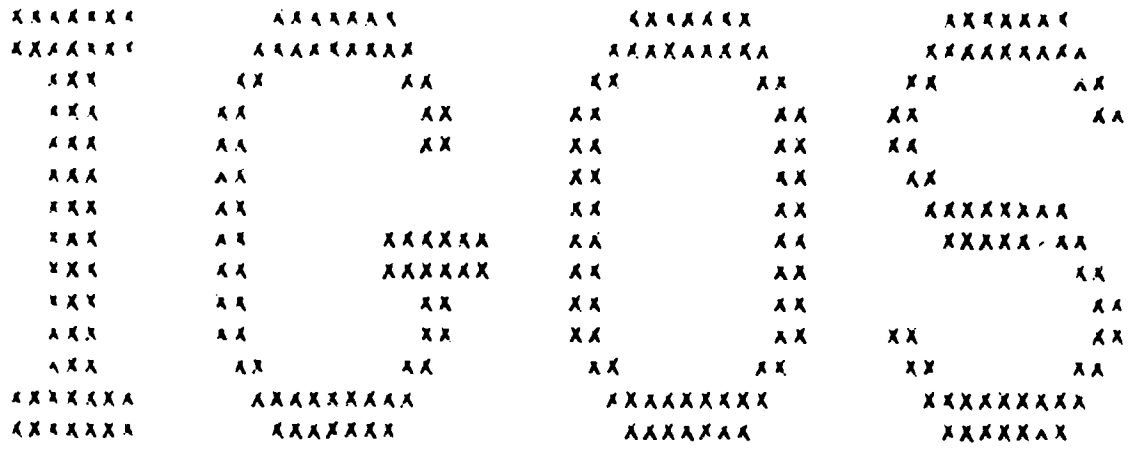
(5) Addition of a swath schedule to allow the display of the SASS mode changes and to calibrate gaps

(6) Development of a set of commands to generate the detailed swath data from sensor characteristics and orbit/earth motion.

Several new IGOS commands were implemented in the program to perform the new SSAS features during June through October 1978. The new commands (SITE, DEFMOD, SHWMOD, DEFSKD, SHWSKD, STEP and MPASS) were documented in the IGOS User's Manual, and new manuals were distributed to the members of the

scatterometer team. After the new features became operational, the NASA/LaRC scatterometer team exercised the modified IGOS program in the remaining months of Task 28 as an aid in their evaluation of the Seasat experimental data. A copy of the IGOS User's Manual, as modified during this Task 28 study, has been reproduced as the Appendix to this report.

The IGOS program continues to be operational on Battelle's CDC 6400 and can be accessed by Tektronix graphics terminals at Battelle, NASA Headquarters, JPL, GSFC and LaRC. Its capabilities continue to be enhanced through other NASA-funded Battelle contracts.



I N T E R A C T I V E G R A P H I C S

O R B I T S E L E C T I O N

B A T T E L L E C O L U M B U S L A B O R A T O R I E S

IF THE AUDIO TONE IS NOT HEARD, THE BATTELLE COMPUTER MAY BE MOMENTARILY UNAVAILABLE. A RECORDED STATUS MESSAGE MAY BE HEARD BY DIALING

BELL
(AREA CODE 614) 424-5555

FTS
976-5555

HELP WITH INOS MAY BE OBTAINED BY CALLING BATTELLE

	BELL	FTS
FRED REA	(614) 424-5101	976-5101
JANICE HAMAKE	(614) 424-5113	976-5113
JERRY PITTENGER	(614) 424-5099	976-5099
DAVE RIPPERT	(614) 424-5120	976-5120

IGOS IS AN INTERACTIVE GRAPHICS PROGRAM AVAILABLE TO REMOTE USERS VIA ARPANET OR FTS TELEPHONE LINES. THE PROGRAM IS DESIGNED AS AN AID TO PRELIMINARY MISSION DESIGN.

IGOS GENERATES ORBIT SELECTION PLOTS WHICH IDENTIFY THOSE ORBITS WHICH SATISFY MISSION REQUIREMENTS SPECIFIED BY THE USER.

ORBIT ANALYSIS COMMANDS MAY THEN BE USED TO DISPLAY THE DETAILS OF PARTICULAR ORBITS SELECTED FROM THE ORBIT SELECTION PLOT. OR ORBITS ARBITRARILY DEFINED BY THE USER.

ALL FEATURES HAVE BEEN DESIGNED TO INCLUDE INTERNALLY STORED DATA AND EFFICIENT CALCULATIONS. WHILE THIS HAS NECESSITATED SOME MATHEMATICAL APPROXIMATIONS. IT PERMITS RAPID EVALUATION OF MISSION ALTERNATIVES. IGOS IS. THEREFORE. AN AUTOMATED HANDBOOK FOR PRELIMINARY MISSION ANALYSIS AND NOT A SUBSTITUTE FOR DETAILED FINAL ANALYSIS.

THIS USERS MANUAL DESCRIBES ACCESS TO THE IGOS PROGRAM. IGOS OPERATION. AND THE DETAILS OF EACH IGOS COMMAND.

AN ALPHABETIC INDEX IS INCLUDED ON THE LAST PAGE OF THIS MANUAL

THE BATTELLE INTERACTIVE COMPUTER SYSTEM MAY BE ACCESSED BY TELEPHONE LINES AT THE FOLLOWING NUMBERS.

	300 BAUD	1200 BAUD(VADIC MODEM)
BELL	(614)424-5450	(614)424-5450
FTS	976-5450	976-5450

WHEN A STEADY AUDIO TONE IS HEARD PLACE THE CALLING DATA SET IN THE DATA MODE. THE TERMINAL WILL THEN DISPLAY THE BATTELLE COMPUTER REQUEST TO LOGIN. RESPOND BY TYPING LOGIN (CARRIAGE RETURN). THE COMPUTER WILL THEN REQUEST YOUR USER NAME AND PASS WORD FOR ACCESS TO THE SYSTEM. WHEN SUCCESSFUL LOGIN IS COMPLETE THE SYSTEM WILL RESPOND WITH COMMAND-.

BATTELLE MAY ALSO BE REACHED BY THE TYMNET DATA COMMUNICATIONS SERVICE. TYMNET MAINTAINS LOCAL PHONE NUMBERS IN MANY MAJOR METROPOLITAN AREAS. THIS AVOIDS LONG DISTANCE PHONE CHARGES BUT RESULTS IN A TYMNET SERVICE CHARGE ON ALL ACCESS TIME. PLEASE CONTACT BATTELLE FOR DETAILS.

EXAMPLE LOGIN-

```
BATTELLE INTERCOM  4.5
DATE  04/09/76
TIME  14.40.23

PLEASE LOGIN
LOGIN (CR)
ENTER USER NAME-JANICE (CR)
********** ENTER PASSWORD-
04/09/76    LOGGED IN AT  14.41.53
            WITH USER-ID FV
            EQUIP/PORT 75/005
COMMAND-
```

IF NO AUDIO TONE IS HEARD. SEE HELP LATER IN THE MANUAL. AFTER LOGGING IN PROCEED TO BEGIN FOR FURTHER INSTRUCTIONS.

AFTER LOGIN THE IGOS PROGRAM IS OBTAINED BY TYPING-

ATTACH,PROFIL,ID=IGOS (CR)

THE OPERATING SYSTEM WILL RESPOND WITH COMMAND- TO BEGIN IGOS EXECUTION ENTER-

BEGIN,IGOS (CR)

(CR) INDICATES STRIKING THE CARRIAGE RETURN KEY. A (CR) TRANSMITS ALL COMMANDS AS DISPLAYED ON THE SCREEN TO THE COMPUTER. PRIOR TO (CR) TYPING ERRORS MAY BE CORRECTED BY USING THE BACKSPACE KEY AND OVER-TYPING THE ERRONEOUS CHARACTERS AND COMPLETING THE ENTRY.

IGOS EXECUTION HAS BEGUN WHEN THE COMPUTER ASKS-

WHAT KIND OF TERMINAL ARE YOU USING?

ENTER THE APPROPRIATE CODE AND (CR) FOR TERMINAL IDENTIFICATION.

CODE =	IF TERMINAL =
T4010	TEKTRONIX 4010
T4012	TEKTRONIX 4012 OR 4013
T4014	TEKTRONIX 4014 OR 4015

WHEN USING A TERMINAL WITH AN APL KEYBOARD, BE SURE TO SET IT FOR ASCII (SEE TERMINAL INSTRUCTIONS) AND USE THE ASCII KEY LABELS.

AFTER SUCCESSFUL TERMINAL IDENTIFICATION THE COMPUTER RESPONDS WITH-

```
WELCOME TO I G O S
SESSION=**/**/**      ******            (THE DATE IS **/**/** AND
ENTER EXERCISE NAME (40 CH. MAXIMUM)--   ****** IS THE TIME IN HR
                                          MIN SEC)
```

ANY REMARKS ENTERED WILL APPEAR AS A SUBTITLE ON ALL IGOS PLOTS GENERATED DURING THE SESSION. THE COMPUTER IS READY FOR THE FIRST IGOS COMMAND AFTER IT RESPONDS WITH

```
EA,TIME ****
--
```

-- INDICATES THE PROGRAM IS WAITING FOR THE NEXT COMMAND. ON SOME TERMINALS AN AUDIO TONE (BEEP) IS ALSO PRODUCED. FOR A LIST OF ALL CURRENT IGOS COMMANDS ENTER LIST.ALL. THE LIST GROUPS THE COMMANDS BY IGOS MODES.

FOR INSTRUCTIONS ON ENTERING A COMMAND ENTER COMMAND?
FOR A DISCUSSION OF IGOS MODES ENTER MODES?
FOR A DISCUSSION OF THE PAGE WARNING ENTER PAGE?
FOR A DISCUSSION OF ERROR MESSAGES ENTER ERRORS?

IF THE AUDIO TONE IS NOT HEARD, THE BATTELLE COMPUTER MAY BE MOMENTARILY UNAVAILABLE. A RECORDED STATUS MESSAGE MAY BE HEARD BY DIALING

BELL
(AREA CODE 614) 424-5555

FTS
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IGDS COMMANDS ARE USED TO INITIATE PROGRAM FEATURES AND SUPPLY OR CHANGE DATA ASSOCIATED WITH THAT FEATURE. COMMANDS ARE ENTERED IN THE FORM

NAME,ARG1,ARG2,---,ARGN EXAMPLE-ORBSEL,100,250,10,110

THE NAME SPECIFIES THE COMMAND AND THE ARGUMENTS DEFINE THE DATA. THE ARGUMENT VALUES ARE RETAINED AND WILL BE USED IN FUTURE EXECUTIONS OF THE COMMAND. IF ONLY A FEW ARGUMENTS ARE TO BE CHANGED NULL OR BLANK FIELDS MAY BE USED TO SKIP ARGUMENTS. AN ALPHABETIC CODE IS ALSO ASSOCIATED WITH EACH COMMAND ARGUMENT. FOR EXAMPLE THE CODES FOR THE ORBSEL ARGUMENTS ARE XMIN,XMAX,DIMIN,DIMAX. TO AVOID HAVING TO ENTER MANY BLANK FIELDS THE FORM CODE,VALUE OR CODE=VALUE CAN BE USED. FOR EXAMPLE THE FOLLOWING ARE EQUIVALENT

ORBSEL, , ,30,90
ORBSEL,,,30,90
ORBSEL,DIMIN=30,DIMAX,90
ORBSEL,DIMAX,90,DIMIN,30
ORBSEL,DIMIN,30,,90

THE NUMERICAL VALUES OF THE ARGUMENTS MUST BE ENTERED IN A FLOATING POINT FORMAT WITH THE DECIMAL POINT OPTIONAL. THE EXPONENTIAL FORMAT IS NOT ACCEPTABLE.

EXAMPLES

VALID			INVALID		
100	100.	100.00	1.E2	1.0E02	0.1E3
.01	-.01	1000000	1.E-2	-1.E-2	1.E6

FOR A LIST OF THE ARGUMENT CODES, CURRENT VALUES, UNITS, AND ALLOWABLE RANGE OF DATA FOR ANY COMMAND ENTER LIST,COMMAND EXAMPLE-LIST,ORBSEL

FOR A DISCUSSION OF ANY COMMAND ENTER THE COMMAND FOLLOWED BY A ?. FOR EXAMPLE ORBSEL?

COMMANDS MAY BE CHAINED. THIS MEANS THAT A STRING OF COMMANDS MAY BE GIVEN IN ONE ENTRY. FOR EXAMPLE-

ORBSEL,JPLT,PAD,LIFE,MARK

OR

GNDTRK,MAP,SWATH,A,PASS,SWATH,B,PASS

EACH COMMAND WILL BE EXECUTED IN ORDER WITHOUT FURTHER USER INPUT. EXCEPT FOR PAGE PERMISSION AND CURSOR ADJUSTMENT FOR ZOOM OR MARK. IF AN ERROR IS ENCOUNTERED THE REMAINING COMMANDS ARE IGNORED AND MUST BE RETYPED.

IGDS MODE DESCRIBES THE TYPE OF INFORMATION ON THE SCREEN. EXAMPLES ARE DIALOG,ORBSEL AND GNDTRK. THE DIALOG MODE IS USED FOR DIALOG BETWEEN THE PROGRAM AND THE USER. WHILE IN THE DIALOG MODE VERIFICATION INFORMATION AND ALL ERROR MESSAGES WILL BE DISPLAYED. THE OTHER MODES ASSUME A PLOT IS BEING GENERATED AND ONLY SELECTIVE ERROR OR INFORMATIVE MESSAGES ARE ISSUED IN THE LOWER LEFT CORNER OF THE SCREEN. THE DIALOG MODE IS INITIATED BY ENTERING THE COMMAND DIALOG OR ANY COMMAND ASSOCIATED WITH THAT MODE, OR BY REQUESTING A TEACH (?) MESSAGE. THE OTHER MODES ARE INITIATED BY ENTERING A COMMAND OF THE SAME NAME. COMMANDS ASSOCIATED WITH THESE MODES WILL NOT BE EXECUTED UNLESS THE MODE HAS BEEN INITIATED. WHEN A COMMAND IS ENTERED THAT WILL INITIATE A MODE, A PAGE WARNING IS ISSUED PRIOR TO ERASING THE SCREEN. FOR A DISCUSSION OF THE PAGE WARNING ENTER PAGE?

IGDS MODES=	DIALOG	ORBSEL	GNDTRK	ORADEF	STPLNG
	TABLE	STPTOD	LAINDW	SAVMIS	STPTRK
	SAINDW	DEPLOY			

THE PAGE WARNING IS ISSUED TO PERMIT THE USER TO OBTAIN A COPY OF THE SCREEN PRIOR TO ITS ERASURE BY THE PROGRAM. TO CONTINUE WITH THE ERASURE ENTER A BLANK. IF A NON BLANK ENTRY IS MADE THE COMMAND REQUIRING THE ERASURE WILL BE DELETED AND A NEW COMMAND REQUESTED.

IGOS DATA CONSISTS OF PERMANENT DATA FILES ON MASS STORAGE DISK, INTERNALLY STORED TABULAR DATA, AND USER INPUTS.

THE PERMANENT DATA FILES CONTAIN EXPENDABLE LAUNCH VEHICLE DATA, WORLD MAP DATA, RADIATION DATA, AND ORBIT DATA.

TABLES ARE USED TO STORE INFORMATION ON TRACKING STATIONS, UPPER STAGE MOTORS, SENSOR GROUND SWATHS, AND LAUNCH WINDOW CONSTRAINTS. THE USER CAN CHANGE THE INITIAL DATA ENTRIES PROVIDED BY THE PROGRAM IN EACH TABLE BY REFERENCING THE APPROPRIATE COMMANDS BELOW.

SUBJECT	DEFINE/CHANGE ENTRY	DISPLAY ENTRIES	USE AS DATA
TRACKING SITES	DEFSIT	SHWSIT	TRKSIT
UPPER STAGE MOTORS	DEFSTG	SHWSTG	STGMEL
LAUNCH WINDOWS	DEFCON	SHWCON	PLTCON
GROUND SWATHS	DEFSWT	SHWSWT	SWATH
SENSOR SWATH MODES	DEFMOD	SHWMOD	
PASS MODE SCHEDULE	DEFSKD	SHWSKD	MPASS

ALL TABULAR DATA CHANGES ARE TEMPORARY UNLESS STORED ON A USER DATA FILE FOR FUTURE REFERENCE.

USER INPUTS ARE COMMAND ARGUMENTS AND USER DATA FILES. USER DATA FILES ARE UNIQUE TO A USERNAME. EACH USER IS ALLOWED 1 FILE FOR STORING LAUNCH WINDOWS AND UP TO 5 FILES FOR STORING THE DATA OF A PARTICULAR WORK SESSION (COMMAND ARGUMENTS AND THE TABULAR DATA MENTIONED ABOVE). TO PERFORM USER DATA FILE MANIPULATIONS, REFERENCE THE APPRIATE COMMANDS BELOW.

DATA FILE	COMMANDS
LAUNCH WINDOWS	SAVWIS, SHWWIS, PURWIS, DRPWIS, GETCON
SESSION DATA	SAVRUN, SHWRUN, PURRUN, GETRUN

THE FOLLOWING ERRORS ARE DETECTED BY IGOS

INVALID COMMAND	THE COMMAND IS NOT IN THE IGOS COMMAND LIST
NOT WITH XXXXX	THE COMMAND IS NOT VALID WITH MODE XXXXX
TOO MANY FIELDS	THE NUMBER OF ARGUMENTS GIVEN EXCEEDS THE NUMBER DEFINED FOR THAT COMMAND
XXXX TOO LARGE	THE VALUE OF XXXX IS ABOVE THE VALID RANGE
XXXX TOO SMALL	THE VALUE OF XXXX IS BELOW THE VALID RANGE
XXXX-INVALID	THE CODE XXXX IS NOT DEFINED FOR THIS COMMAND

LIST.ALL WILL DISPLAY THE MODE REQUIREMENTS

LIST.COMMAND WILL DISPLAY THE ARGUMENT CODES, THEIR CURRENT VALUES, UNITS, AND VALID RANGES.

ADDITIONAL ERROR MESSAGES MAY BE GENERATED BY SPECIFIC IGOS COMMANDS.

ERRORS ARE INDICATED BY A RAPID SERIES OF BEEPS AND THE DISPLAY OF MESSAGE TEXT. IF A PLOT IS ON THE SCREEN THE MESSAGE WILL BE WRITTEN IN THE DIALOG BOX. UNFORTUNATLY, MORE THAN ONE MESSAGE ON THE SAME PLOT WILL RESULT IN OVER WRITING THEM.

AN ACTIVITY LOG IS A RECORD OF AN IGOS WORK SESSION. IT INCLUDES ALL USER INPUTS TO THE PROGRAM FROM THE TERMINAL. DATA ON HOW THE PROGRAM RESPONDS. AND ALL WARNING OR INFORMATIVE MESSAGES ISSUED BY THE PROGRAM. AT THE END OF A WORK SESSION. THE USER HAS THE OPTION OF SENDING A COPY OF THE ACTIVITY LOG TO BATTELLE OR DESTROYING IT (REFERENCE THE END COMMAND).

SINCE ALL INPUTS BECOME A PART OF THE RECORD. THE ACTIVITY LOG IS AN EFFECTIVE WAY TO RELAY ANY DIFFICULTIES ENCOUNTERED WITH THE PROGRAM TO BATTELLE. MESSAGES CAN BE ENTERED ANY TIME THE PROGRAM ISSUES A REQUEST FOR A NEW COMMAND (--). FOR EXAMPLE-

--ANOTHER DID NOT WORK

IF THE PROGRAM ISSUES THE MESSAGE "MODE ERROR". BE SURE TO SEND THE ACTIVITY LOG TO BATTELLE. A PROGRAM ERROR WAS ENCOUNTERED THAT BATTELLE MUST RESOLVE.

EACH OF THE FOLLOWING IGOS COMMANDS IS DISCUSSED IN DETAIL ON THE PAGES INDICATED.

SUMMARY CONTINUED ON NEXT PAGE

PAGE IGOS COMMAND

51 ORBSHW-SHOWS ORBITS
52 ORBGET-SELECTS AN ORBIT
53 LAUNCH-DEFINES THE LAUNCH SITE FOR BEGINNING AN ORBIT
54 SITE-REFERENCE SITE ORBIT UPDATING
55 SUNANG-DEFINES SUN ANGLE REQUIREMENT
56 SWATH-SELECTS A GROUND SWATH
57 SHWSWT-SHOWS SENSOR GROUND SWATH DATA
58 DEFSWT-DEFINES SENSOR GROUND SWATH DATA
59 DEFMOD-DEFINES A SENSOR SWATH MODE GROUND TRACE
60 SHWMOD-SHOWS SENSOR SWATH MODE DATA
61 DEFSKD-DEFINES A SENSOR SWATH MODE SCHEDULE
62 SHWSKD-SHOWS THE SENSOR SWATH MODE SCHEDULE

63 GNDTRK-GROUND TRACK DISPLAY
64 MAP-DRAWS AN EARTH MAP BACKGROUND
65 PASS-DRAWS ORBIT PASSES ON THE GROUND TRACK PLOT
66 MPASS-DRAWS ORBIT PASSES WITH SCHEDULED SENSOR SWATH MODES
67 STEP-DEFINES THE TIME BETWEEN MPASS CROSSHATCHING
68 TRACK-DEFINES TRACKING STATION REQUIREMENT
69 TRKSIT-DRAWS THE TRACKING SITE MASKS ON THE GROUND TRACK PLOT
70 SHWSIT-SHOWS THE DATA FOR A CLASS OF TRACKING SITES
71 DEFSIT-DEFINES NEW TRACKING SITE DATA OR CHANGES EXISTING SITE DATA

72 STPTRK-PRODUCES AN ORBIT TRACKING STATION COVERAGE PLOT
73 DEFEXP-DEFINES A NEW EXPERIMENT SITE OR CHANGES EXISTING SITE DATA
74 SHWEXP-SHOWS EXPERIMENT SITE DATA
75 EXPSIT-DRAWS AN EXPERIMENT SITE ON THE GROUND TRACK PLOT
76 DRWLNG-DEFINES, ON THE GNDTRK DISPLAY, A STPLNG RANGE
77 DRWTOD-DEFINES, ON THE GNDTRK OR STPLNG DISPLAYS, A STPTOD LOCATION

78 STPLNG-PRODUCES THE ORBIT STEP LONGITUDE COVERAGE PLOT

79 STPTOD-PRODUCES THE ORBIT STEP TIME OF DAY COVERAGE PLOT

80 DEPLOY-SHUTTLE PAYLOAD DEPLOYMENT DISPLAY
81 FLON-FINAL ORBIT LONGITUDE OF NODE PLACEMENT

82 LWINDW-LAUNCH WINDOW DISPLAY (ASCENDING NODE VS DAY OF YEAR)

83 SWINDW-LAUNCH WINDOW DISPLAY (LAUNCH TIME VERSUS DAY OF THE YEAR)
84 TRNSFR-DEFINE THE TRANSFER ORBIT

SUMMARY CONTINUED ON NEXT PAGE

LIST-LISTS THE IGOS COMMANDS AND THEIR ARGUMENTS

THE COMMAND LIST.NAME WILL LIST THE ARGUMENTS. CURRENT VALUES. UNITS. AND VALID RANGES OF THE COMMAND NAMED.

LIST.ALL WILL PRODUCE A PAGE LISTING THE IGOS COMMANDS GROUPED BY SCREEN MODE.

EXAMPLE- LIST.ORBSET WILL LIST THE CURRENT VALUES. UNITS. AND VALID RANGES OF THE ORBSET COMMAND ARGUMENTS.

COMMAND LIST IS VALID IN ALL MODES.

LIST WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) COMAND	ALL	ALPHABETIC

DIALOG-INITIATES THE DIALOG MODE

COMMAND DIALOG IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A DIALOG PLOT.

NO ARGUMENTS

UNITS-DEFINES INPUT AND OUTPUT UNITS (NM OR KM)

THE INPUT UNITS OPTION CONTROLS INTERPRETATION OF THE ARGUMENT VALUES PERTAINING TO LINEAL QUANTITIES. THE INPUT OPTION MAY BE CHANGED DURING AN EXERCISE TO FACILITATE EXTRACTING DATA FROM SOURCES WITH INCOMPATITIBLE UNITS.

THE OUTPUT UNITS OPTION MAY BE USED TO EXPRESS THE RESULTS IN THE DESIRED UNITS.

EXAMPLE- UNITS.NM.KM WILL CAUSE THE PROGRAM TO INTERPRET ALL LINEAL INPUT DATA IN NM AND TO DISPLAY RESULTS IN KM.

COMMAND UNITS IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) INPUT	NM	ALPHABETIC
(2) OUTPUT	NM	ALPHABETIC

YEAR-DEFINES THE CALENDAR YEAR

YEAR DEFINES THE SPECIFIC CALENDAR YEAR FOR ESTABLISHING THE SUN/EARTH GEOMETRY AND THE TIME OF VERNAL EQUINOX. LEAP YEAR ADJUSTMENT IS MADE AND THE DATES OF LEGAL HOLIDAYS ARE COMPUTED. THESE ARE OF INTEREST WHEN USING THE LWINDW OR SWINDW PLOTS.

EXAMPLE- YEAR.1981

COMMAND YEAR IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) YEAR	1.9810E+03	1.9000E+03 TO 2.1000E+03

TABLE-DISPLAYS ALL COMMANDS USED DURING THE MOST RECENT PLOT

WHILE MANY COMMANDS USED TO ENHANCE AN IGOS PLOT MAKE ANNOTATIONS ON THE PLOT. SOME DO NOT. TO ENSURE AN ACCURATE RECORD OF IGOS COMMANDS AND THEIR ARGUMENT VALUES USE THE TABLE COMMAND . THIS WILL DISPLAY EACH COMMAND AND ITS ARGUMENT VALUES FOR THE MOST RECENT PLOT. IF THE TABLE IS DESIRED. IT MUST BE REQUESTED BEFORE BEGINNING A NEW PLOT.

COMMAND TABLE IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A TABLE PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL

NO ARGUMENTS

RESET-RESETS ALL DATA TO DEFAULT VALUES

COMMAND RESET IS VALID IN ALL MODES.

NO ARGUMENTS

SHWRUN-SHOWS A USER'S CATALOGED DATA FILES

THE SHWRUN COMMAND LISTS ALL IGOS RUN DATA FILES CURRENTLY CATALOGED. CYCLE NUMBERS AND RUN IDENTIFICATIONS TO DESCRIBE THE FILES ARE PRINTED.

COMMAND SHWRUN IS VALID IN ALL MODES.

SHWRUN WILL ERASE THE SCREEN

NO ARGUMENTS

SAVRUN-SAVES THE CURRENT IGOS DATA

THE COMMAND SAVRUN CREATES AND CATALOGS A DATA FILE TO STORE THE CURRENT VALUES OF COMMAND ARGUMENTS AND IGOS FEATURES DURING AN IGOS RUN. THIS ALLOWS A USER TO REFERENCE A SET OF INFORMATION, SUCH AS SENSOR SWATHS, ORBITAL PARAMETERS, AND TRACKING SITES, WITHOUT HAVING TO RE-ENTER THE DATA VALUES. TO REFERENCE A CATALOGED DATA SET, SEE THE COMMAND SETRUN.

UP TO FIVE DATA FILES CAN BE SAVED AT ONE TIME. STORAGE COSTS ARE CHARGED TO THE USER AT APPROXIMATELY 25 CENTS /FILE/DAY. THE ARGUMENT IS THE NUMBER OF DAYS THE FILE IS TO BE CATALOGED. EACH DATA FILE IS ASSIGNED A CYCLE NUMBER AND IS DESCRIBED BY THE DATE AND THE SUBTITLE OF THE IGOS PLOTS DURING THE SESSION IT WAS CREATED.

EXAMPLE- SAVRUN,3 WILL SAVE AND CATALOG THE CURRENT IGOS DATA ON A USER DATA FILE FOR 3 DAYS.

COMMAND SAVRUN IS VALID IN ALL MODES.

SAVRUN WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE .
(1) NDAYS	7.0000E+00 DAYS	.E+00 TO 9.9900E+02

SETRUN-RESETS ALL DATA FROM A USER DATA FILE

THE COMMAND SETRUN WILL RESET ALL DATA VALUES FROM A CATALOGED USER DATA FILE. THE ARGUMENT IS THE CYCLE NUMBER OF THE FILE TO BE USED IN SETTING THE NEW VALUES.

EXAMPLE- SETRUN.2 WILL SET ALL DATA TO THE VALUES STORED ON THE FILE ASSIGNED CYCLE 2.

COMMAND SETRUN IS VALID IN ALL MODES.

SETRUN WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) ICY	1.0000E+00	1.0000E+00 TO 5.0000E+00

PURRUN-DESTROYS A USER'S CATALOGED DATA FILE

THE COMMAND PURRUN WILL DESTROY A USER'S SAVED DATA FILE CREATED BY THE COMMAND SAVRUN. THE ARGUMENT IS THE CYCLE NUMBER OF THE FILE TO BE PURGED. THE RUN IDENTIFICATION OF THE DATA FILE TO BE ELIMINATED IS PRINTED AND THE FOLLOWING VERIFICATION CHECK IS ISSUED.

IS THIS RUN TO BE DESTROYED?(Y/N)

A Y RESPONSE (YES) WILL DESTROY THE FILE. N WILL ABORT THE PURGE COMMAND.

EXAMPLE- PURRUN.3 COMBINED WITH A Y RESPONSE TO THE VERIFICATION CHECK WILL DESTROY THE DATA FILE ASSIGNED CYCLE 3.

COMMAND PURRUN IS VALID IN ALL MODES.

PURRUN WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) ICY	.E+00	1.0000E+00 TO 5.0000E+00

CHARGE-ESTIMATES THE CURRENT IGOS SESSION COSTS

THE CHARGE COMMAND WILL ESTIMATE THE CURRENT IGOS COMPUTER COSTS. ALSO PROVIDED ARE SECONDS EXECUTION TIME, NUMBER OF CHARACTERS TRANSMITTED, AND TERMINAL CONNECT TIME.

COMMAND CHARGE IS VALID IN ALL MODES.

CHARGE WILL ERASE THE SCREEN

NO ARGUMENTS

END-ENDS IGOS EXECUTION AND RETURNS CONTROL TO OPERATING SYSTEM

BEFORE CONTROL RETURNS TO THE OPERATING SYSTEM, THE COMPUTER ASKS-

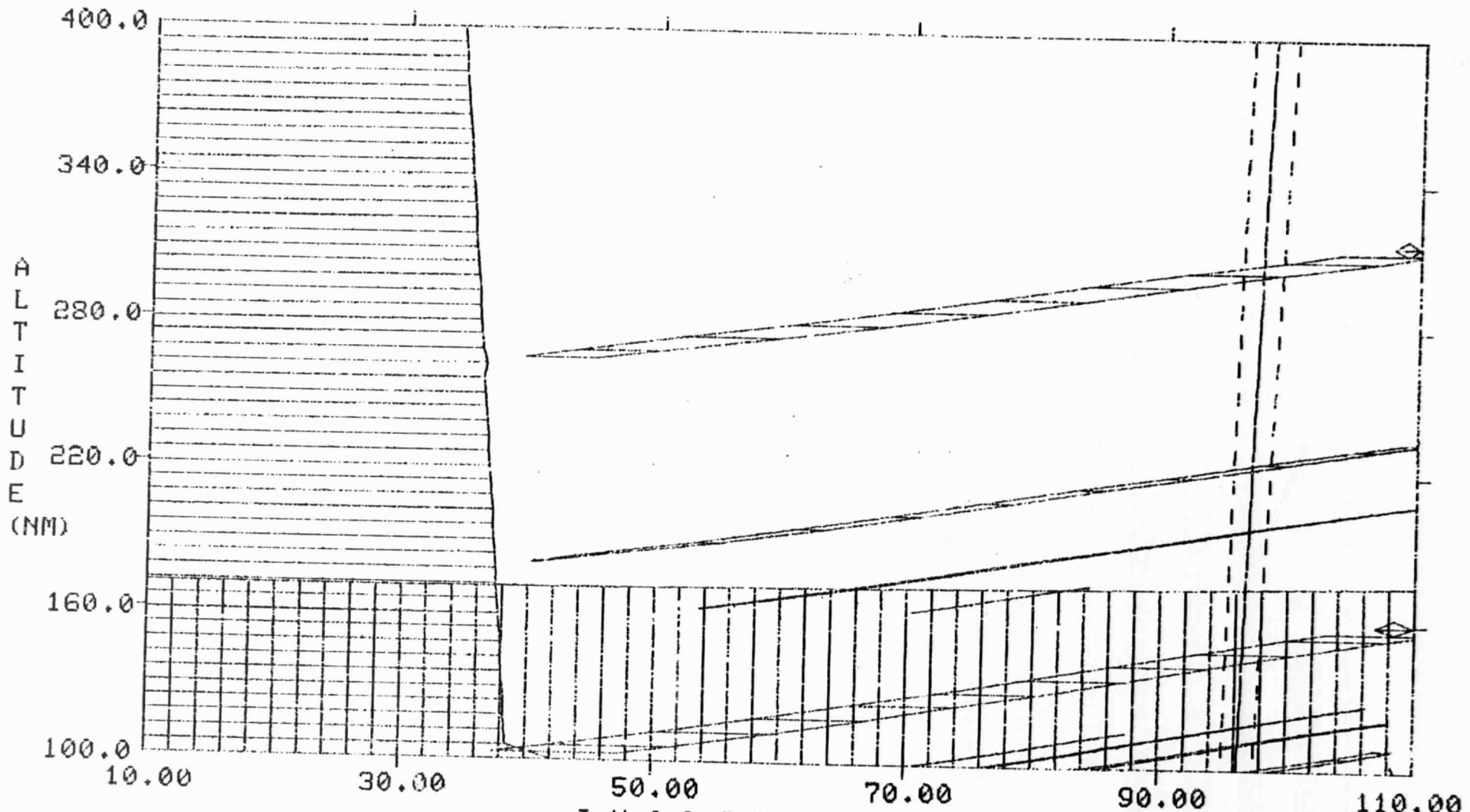
DO YOU WANT BATTELLE TO RECEIVE A COPY OF THE ACTIVITY LOG?(Y/N)

A Y RESPONSE (YES) AUTOMATICALLY ROUTES A COPY OF THE ACTIVITY LOG TO BATTELLE. N RESULTS IN NO DAYFILE. NOW THE OPERATING SYSTEM HAS CONTROL.

COMMAND END IS VALID IN ALL MODES.

END WILL ERASE THE SCREEN

NO ARGUMENTS



COVERAGE DATA SENSOR DATA

	LATTITUDES	DAYS	NO.SAT.
1	30.0- 40.0	35	1

MAXRNG	MINELE	F.O.V.	ANGRES	LINRES	SUN-ORBIT PRECESSION DEG	DAYS
1000.0	30.0	40.0	0.1	10.0	.	5.
					1.0	5.

ORBSEL PLOT WITH SUN, COV, AND LIFE COMMANDS

ORBSEL-ORBIT SELECTION (ALTITUDE VS INCLINATION)

THE ORBIT SELECTION PLOT USES THE SCREEN AS A DESIGN SPACE. ORBITS ARE PRESUMED TO BE CIRCULAR WITH THE HORIZONTAL AXIS REPRESENTING INCLINATION AND THE VERTICAL AXIS REPRESENTING ALTITUDE. ANY POINT ON THE PLOT IS A PARTICULAR CIRCULAR ORBIT. VARIOUS COMMANDS MAY BE USED TO INDICATE THOSE ORBITS WHICH DO NOT MEET THE MISSION DESIGN REQUIREMENTS.

THE ARGUMENTS ARE
- HMIN= THE MINIMUM ALTITUDE
- HMAX= THE MAXIMUM ALTITUDE
- DIMIN= THE MINIMUM INCLINATION
- DIMAX= THE MAXIMUM INCLINATION

EXAMPLE- ORBSEL,300,800,50,120 WILL CREATE AN ORBIT DESIGN SPACE FOR CIRCULAR ORBITS IN THE 300 TO 800 (NM OR KM) ALTITUDE RANGE WITH INCLINATIONS BETWEEN 50 AND 120 DEGREES.

COMMAND ORBSEL IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A ORBSEL PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT.

VEH	PLD	QPLT	HC	LABEL	
SUN	RAD	HR	DECAY	ZOOM	MARK
COV	STSREL	LIFE	HL		

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) HMIN	1.0000E+02 NM, 1.8520E+02 KM	.E+00 TO 1.0000E+20
(2) HMAX	2.5000E+02 NM, 4.6300E+02 KM	.E+00 TO 1.0000E+20
(3) DIMIN	1.0000E+01 DEG	.E+00 TO 1.8000E+02
(4) DIMAX	1.1000E+02 DEG	.E+00 TO 1.8000E+02

SUN-DRAWS SUN SYNCHRONOUS CONTOURS

THREE DASHED LINES ARE DRAWN. THEY REPRESENT ORBITS WHOSE SUN-ORBIT PRECESSION RATE ARE -OMEGA. ZERO. AND +OMEGA.

OMEGA IS THE ANGULAR RATE (DEGREES/DAY) GIVEN BY THE ARGUMENTS.

EXAMPLE-SUN.1.30 WILL DRAW THE-1/30.0. AND +1/30 DEGREES/DAY LINES.

COMMAND SUN IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE		
(1) DEG	.E+00	DEG	.E+00	TO	1.0000E+20
(2) DAYS	.E+00	DAYS	.E+00	TO	1.0000E+20

QPLT-DRAWS THE CONTOURS OF A SPECIFIED ORBIT Q

Q IS THE RATIO OF SATELLITE MEAN ANGULAR RATE TO THE ORBIT PLANE ANGULAR RATE RELATIVE TO THE EARTH. Q IS USUALLY EXPRESSED IN THE FOLLOWING FORM

$$Q=I+NP/ND$$

WHERE I, NP, AND ND ARE INTEGERS. THE FIRST TWO QPLT ARGUMENTS ARE NP AND ND. AN ORBIT WILL REPEAT OBSERVATIONS OF THE SAME EARTH SITES EVERY ND DAYS OR I*ND+NP PASSES. THE THIRD QPLT ARGUMENT, GAP, IS PROVIDED TO ALLOW SPECIFICATION OF A SMALL GAP DISTANCE. IF GAP IS NON-ZERO, THE Q PLOTTED WILL REPRESENT ORBITS WHICH AFTER ND DAYS MISS AN EXACT REPEAT BY THE GAP DISTANCE.

QPLT WILL DRAW CONTOURS OF EQUAL Q FOR ALL VALUES OF I WHICH FALL ON THE CURRENT ORBSEL PLOT. IF A NON-INTEGER NP IS SPECIFIED ALL VALUES WHICH ARE PRIME TO ND WILL ALSO BE PLOTTED.

EXAMPLE-QPLT,27,81.0 WILL PLOT LOCII OF I+1/3
QPLT,.1,4,0 WILL PLOT LOCII OF I+1/4, I+3/4
QPLT,1,2,20 WILL PLOT LOCII OF Q FOR 2 DAY REPETITION WITHIN 20 NM

COMMAND QPLT IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE		
(1) NP	.E+00	PASSES	.E+00	TO	1.0000E+20
(2) ND	.E+00	DAYS	.E+00	TO	1.0000E+20
(3) GAP	.E+00 NM,	.E+00 KM	-1.0000E+20	TO	1.0000E+20

RAD-DRAWS THE OUTLINE OF THOSE ORBITS WHICH HAVE EXCESS RADIATION

THE COMMAND RAD OUTLINES THOSE ORBITS ON THE ORBSEL PLOT WITH EXCESSIVE RADIATION EXPOSURE. THE ARGUMENTS DEFINE THE RADIATION SPECIFICATIONS AS FOLLOWS-

CMAL = DENSITY OF ALUMINUM SHIELD (GM/CM2)
FLUM = MAXIMUM FLUENCE
DAYS = NUMBER OF DAYS FOR ALLOWABLE FLUENCE

DUE TO THE SIZE OF THE NUMBER, FLUM IS ENTERED AS FOLLOWS-
XX.XXEYY IS ENTERED AS XX.XX*100.YY-2
12.40E12 IS ENTERED AS 1240.10
11.71E13 IS ENTERED AS 1171.11

THE OUTLINED AREAS MAY BE CROSS HATCHED USING THE HR COMMAND.

NOTE-THE RAD DATA DOES NOT CORRECTLY REPRESENT THE TOP OF THE BELTS. RAD IS VALID FOR LOW (.LT. 900 NM) ORBITS ONLY.

EXAMPLE- RAD,,.01,1250.11,40 WILL OUTLINE THOSE ORBITS ON THE ORBSEL PLOT WHERE THE RADIATION EXPOSURE FOR A SPACECRAFT WITH A .01 GM/CM2 ALUMINUM SHIELDING EXCEEDS 12.5 E13 EQUIVALENT 1-MEV ELECTRON FLUENCE FOR 40 DAYS.

COMMAND RAD IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) CMAL	1.0000E-02 GM/CM2	1.0000E-20 TO 1.0000E+20
(2) FLUM	5.1200E+00	1.0000E-20 TO 1.0000E+20
(3) DAYS	3.0000E+01 DAYS	1.0000E-20 TO 1.0000E+20

HR-DRAWS VERTICAL HATCHES IN THE EXCESS RADIATION OUTLINES

THE OUTLINES GENERATED BY THE RAD COMMAND ARE STORED AS 51 DISCRETE INCLINATION STRIPS. CROSS HATCHES ARE LINES DRAWN AT THE 51 INCLINATIONS. THE ARGUMENTS CONTROL WHICH INCLINATIONS WILL BE HATCHED.

EXAMPLE- HR,1,1 WILL HATCH EVERY INCLINATION STARTING AT THE FIRST.

HR,4,3 WILL HATCH EVERY THIRD INCLINATION STARTING WITH THE FOURTH

COMMAND HR IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) START	1.0000E+00 LINES	1.0000E+00 TO 1.0000E+01
(2) STEP	1.0000E+00 LINES	1.0000E+00 TO 1.0000E+01

DECAY-PLOTS THE ORBIT DECAY AND LAUNCH VEHICLE INJECTION ERRORS

COMMAND DECAY PRODUCES ORBIT DECAY AND LAUNCH VEHICLE INJECTION DISPERSIONS (SCOUT ONLY) ON THE ORBSEL PLOT.

THE ARGUMENTS ARE-

ALT = ALTITUDE OF INJECTION (NM OR KM)
DI = INCLINATION OF INJECTION (DEGREES)
BC = BALLISTIC COEFFICIENT (KG/M2)
LYR = LAUNCH YEAR (EXAMPLE-1976)
YRS = TIME IN YEARS FOR DECAY

THE FIRST TWO ARGUMENTS MAY BE SET BY THE SELECT COMMAND TO MATCH A MARK ON AN ORBSEL PLOT.

EXAMPLE- DECAY,160.,35.5,220.,1977.2 WILL DISPLAY THE 2 YEAR ORBITAL DECAY OF A SPACECRAFT WITH A BALLISTIC COEFFICIENT OF 220 KG/M2 INJECTED IN 1977 INTO A 160 (NM OR KM) CIRCULAR ORBIT WITH 35.5 DEGREES INCLINATION.

COMMAND DECAY IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) ALT	1.7500E+02 NM, 3.2410E+02 KM	.E+00 TO 1.0000E+20
(2) DI	3.7000E+01 DEG	.E+00 TO 1.8000E+02
(3) BC	2.2000E+02 KG/M2	1.0000E-20 TO 1.0000E+20
(4) LYR	1.9760E+03 CAL YR	1.0000E-20 TO 1.0000E+20
(5) YRS	1.0000E+00 YRS	1.0000E-20 TO 1.0000E+20

LIFE-OUTLINES THOSE ORBITS WITH A MINIMUM LIFE LENGTH

THE COMMAND LIFE OUTLINES THOSE ORBITS ON THE ORBSEL PLOT WITH A MINIMUM LIFE LENGTH MAINTAINED BY A GIVEN DELTA V.

THE ARGUMENTS ARE-
- BC = BALLISTIC COEFFICIENT (KG/M2)
- LYR = LAUNCH YEAR (EXAMPLE-1976)
- DV = DELTA V (FT/SEC)
- YRS = LIFE LENGTH (YRS)

EXAMPLE- LIFE,220.,1976.,300,2. PLOTS THOSE ORBITS WITH A TWO YEAR LIFE LENGTH MAINTAINED BY 300 FT/SEC FOR A 1976 LAUNCH WITH A BALLISTIC COEFFICIENT OF 220 KG/M2.

THE OUTLINED AREAS MAY BE CROSS HATCHED USING THE HL COMMAND.

COMMAND LIFE IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) BC	2.2000E+02 KG/M2	.E+00 TO 1.0000E+20
(2) LYR	1.9760E+03 YR	.E+00 TO 1.0000E+20
(3) DV	3.0000E+02 DV	.E+00 TO 1.0000E+20
(4) YRS	2.0000E+00 YR	.E+00 TO 1.0000E+20

HL-CROSS HATCHES THE ORBITS WITH INSUFFICIENT LIFE LENGTH.

THE OUTLINES GENERATED BY THE LIFE COMMAND ARE STORED AS 51 DISCRETE INCLINATION STRIPS. CROSS HATCHES ARE LINES DRAWN AT THE 51 INCLINATIONS.

THE ARGUMENTS CONTROL WHICH INCLINATIONS WILL BE HATCHED.

EXAMPLE- HL.1.1 WILL HATCH EVERY INCLINATION STARTING AT THE FIRST.

EXAMPLE- HL.2.4 WILL HATCH EVERY FOURTH INCLINATION STARTING WITH THE SECOND.

COMMAND HL IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) IH1	1.0000E+00 LINES	1.0000E+00 TO 1.0000E+01
(2) IH2	1.0000E+00 LINES	1.0000E+00 TO 1.0000E+01

COV-THE IGOS COVERAGE MODEL TO NOTE ORBITS WITH INSUFFICIENT COVERAGE

THE COVERAGE MODEL OUTLINES THOSE ORBITS ON THE ORBSEL PLOT WHICH DO NOT VIEW ALL POINTS IN THE LATITUDE RANGE, LAT1,-LAT2, AT LEAST ONCE IN THE SPECIFIED NUMBER OF DAYS. VIEWING IS DEFINED BY THE IGOS SENSOR MODEL WHOSE DATA IS ENTERED WITH THE COMMAND SENSOR. AN ARGUMENT, NSATS, IS PROVIDED TO SPECIFY THE NUMBER OF SATELLITES. FOR MULTIPLE SATELLITES IT IS ASSUMED THAT THE ORBIT PLANES ARE POSITIONED SO THAT THE GROUND SWATH LIE EXACTLY ADJACENT.

EXAMPLE-COV,0,60,30 WILL OUTLINE THOSE ORBITS THAT DO NOT VIEW ALL PORTIONS OF THE EARTH BETWEEN LATS 0 AND 60 DEGREES AT LEAST ONCE EVERY 30 DAYS.

THE OUTLINED AREAS MAY BE CROSS HATCHED USING THE HC COMMAND.

COMMAND COV IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) LAT1	3.5000E+01 DEG	-9.0000E+01 TO 9.0000E+01
(2) LAT2	3.5000E+01 DEG	-9.0000E+01 TO 9.0000E+01
(3) DAYS	3.0000E+01 DAYS	1.0000E-20 TO 1.0000E+20
(4) NSATS	1.0000E+00 NO.	-1.0000E+01 TO 1.0000E+01

HC-CROSS HATCHES THE FORBIDDEN ORBITS IN THE COVERAGE PLOT

THE OUTLINES GENERATED BY THE COV COMMAND ARE STORED AS 51 DISCRETE ALTITUDE STRIPS. CROSS HATCHES ARE LINES DRAWN AT THE 51 ALTITUDES.

THE ARGUMENTS CONTROL WHICH ALTITUDES WILL BE HATCHED.

EXAMPLE-HC,1,1 WILL HATCH EVERY ALTITUDE STARTING AT THE FIRST.

EXAMPLE-HC,2,3 WILL HATCH EVERY THIRD ALTITUDE STARTING WITH THE 2ND.

COMMAND HC IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) START	1.0000E+00 LINES	1.0000E+00 TO 1.0000E+01
(2) STEP	1.0000E+00 LINES	1.0000E+00 TO 1.0000E+01

SENSOR-DEFINES DATA FOR THE IGOS SENSOR MODEL

THE IGOS SENSOR MODEL COMPUTES A NADIR CENTERED CIRCLE OF GROUND AREA VIEWED BASED ON THE MOST RESTRICTIVE OF THE FOLLOWING LIMITATIONS DEFINED BY THE ARGUMENTS.

RNG= MAXIMUM SLANT RANGE (NM OR KM)
ELE= MINIMUM ELEVATION ABOVE THE HORIZON (DEGREE)
FOV= MAXIMUM SENSOR FIELD OF VIEW (HALF CONE ANGLE -DEGREE)
ARES/LRES= MINIMUM RESOLUTION (APPARENT ANGLE/ SURFACE DISTANCE)
(DEGREE / NM OR KM)

FOR EXAMPLE. SENSOR,1200,40,40,,1,10 ESTABLISHES A SENSOR MODEL FOR THE MOST RESTRICTIVE OF A 1200 (NM OR KM) MAXIMUM SLANT RANGE. A 40 DEGREE MINIMUM ELEVATION ABOVE THE HORIZON. A 40 DEGREE MAXIMUM HALF CONE ANGLE FOR THE SENSOR FIELD OF VIEW. AND A MINIMUM RESOLUTION OF .1 DEGREE APPARENT ANGLE EQUALS 10 (NM OR KM) IN SURFACE DISTANCE.

THE CIRCLE SIZE VARIES WITH ORBIT ALTITUDE. TO BYPASS THE SENSOR MODEL AND REQUEST USE OF A SPECIFIC SWATH WIDTH USE THE COMMAND SWATH. SEE DEFSWT FOR HOW TO ENTER AN ARBITRARY SWATH WIDTH.

COMMAND SENSOR IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) RNG	1.2000E+03 NM. 2.2224E+03 KM	1.0000E-20 TO 1.0000E+20
(2) ELE	4.0000E+01 DEG	1.0000E-20 TO 1.0000E+20
(3) FOV	4.0000E+01 DEG	1.0000E-20 TO 1.0000E+20
(4) ARES	1.0000E-01 DEG	1.0000E-20 TO 1.0000E+20
(5) LRES	1.0000E+01 NM. 1.8520E+01 KM	1.0000E-20 TO 1.0000E+20

VEH-SELECTS AN EXPENDABLE LAUNCH VEHICLE

THIS COMMAND GENERATES AN INTERNALLY STORED TABLE OF PAYLOAD WEIGHT VERSUS ALTITUDE AND INCLINATION FOR THE SPECIFIED VEHICLE. THE VEHICLE NAME AND THE RANGE OF WEIGHTS FOR THE CURRENT ORBSEL PLOT ARE DISPLAYED IN THE UPPER LEFT CORNER OF THE PLOT. EQUI-PAYLOAD CONTOURS MAY THEN BE ADDED TO THE PLOT USING THE COMMAND PLD.

THE VEHICLE IS SELECTED BY THE FOLLOWING CODES AS THE FIRST ARGUMENT.

1=SCOUT-D
2=DELTA-2910
3=DELTA-2610
4=DELTA-2310
5=SCOUT-F

THE REMAINING 5 ARGUMENTS ARE USED TO SPECIFY THE LAUNCH SITES. IF THE ARGUMENTS ARE ALL BLANK THE CALCULATIONS WILL BE MADE ASSUMING A LAUNCH FROM THE SITE NORMALLY USED BY THE VEHICLE WHICH PRODUCES THE GREATEST PAYLOAD TO EACH ORBIT. IF ANY SITE IS SPECIFIED. ONLY THOSE SITES ARE CONSIDERED.

THE FOLLOWING SITES MAY BE SPECIFIED.

ETR=EASTERN TEST RANGE
WTR=WESTERN TEST RANGE
WAL-N=WALLOPS ISLAND(NORTHERN AZIMUTHS)
WAL-S=WALLOPS ISLAND(SOUTHERN AZIMUTHS)
SAN MARC=SAN MARCO ISLAND

BLANKS MUST BE ENTERED BY TYPING THE WORD BLANK. (IGOS SKIPS BLANKS)

EXAMPLE-VEH,2,BLANK,BLANK,BLANK,BLANK WILL ASSUME A DELTA FROM EITHER ETR OR WTR.

EXAMPLE-VEH,1,WAL-N,WAL-S,WTR WILL ASSUME A SCOUT BUT WILL ELIMINATE SAN MARCO LAUNCHES.

COMMAND VEH IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) IV	1.0000E+00	1.0000E+00 TO 1.0000E+20
(2) LS1	ALPHABETIC	
(3) LS2	ALPHABETIC	
(4) LS3	ALPHABETIC	
(5) LS4	ALPHABETIC	
(6) LS5	ALPHABETIC	

STSREL-DEFINES AN ORBITER PARKING ORBIT AND UPPER STAGE MOTORS

STSREL IS USED TO DEFINE THE RELEASE FROM THE SHUTTLE AND THE SET OF UPPER STAGE SOLID MOTORS TO MAKE A TWO BURN TRANSFER TO ANY ORBIT ON THE ORBSEL PLOT.

HREL =THE PARKING ORBIT ALTITUDE
IREL =THE PARKING ORBIT INCLINATION
N1 =THE NUMBER OF FIRST BURN MOTORS
NAME1=THE NAME OF THE FIRST BURN MOTORS
N2 =THE NUMBER OF SECOND BURN MOTORS
NAME2=THE NAME OF THE SECOND BURN MOTORS

AFTER STSREL THE PLD COMMAND MAY BE USED TO DRAW PAYLOAD CONTOURS ON THE ORBSEL PLOT.

MOTOR DATA ARE OBTAINED FROM A TABLE WHICH MAY BE DISPLAYED WITH THE SHWSTG COMMAND AND ALTERED WITH THE DEFSTG COMMAND.

THE PERFORMANCE AND SIZE CALCULATIONS ASSUME CONFIGURATIONS AS FOLLOWS

N1=N2=1. TANDEM
STAGE2 IN FRONT OF STAGE1. THE EMPTY STAGE1 IS JETTISONED PRIOR TO BURNING STAGE2.
LENGTH=LEN1+LEN2
DIAMETER=MAX(DIA1,DIA2)

N1 OR N2 NOT EQUAL TO 1. CLUSTER
MOTORS ARRANGED IN A CIRCULAR CLUSTER TO MINIMIZE OUTSIDE DIAMETER. THE EMPTY FIRST BURN CASES ARE NOT JETTISONED PRIOR TO THE SECOND BURN.
LENGTH=MAX(LEN1,LEN2)

* * * * * * * * * WARNING * * * * * * * * * * * * * * * * *

THIS IS A PRELIMINARY FORM OF UPPER STAGE ANALYSIS. IT IS NOT INTENDED FOR MISSION PLANNING.

COMMAND STSREL IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) HREL	1.6000E+02 NM. 2.9632E+02 KM	.E+00 TO 1.0000E+05
(2) IREL	2.8500E+01 DEG	.E+00 TO 1.8000E+02
(3) N1	1.0000E+00	1.0000E+00 TO 2.0000E+01
(4) NAME1	CASTOR ALPHABETIC	
(5) N2	1.0000E+00	1.0000E+00 TO 2.0000E+01
(6) NAME2	STAR30 ALPHABETIC	

SHWSTG-SHOWS THE CURRENT UPPER STAGE MOTOR DATA

DISPLAYS THE CURRENT UPPER STAGE MOTOR DATA. THESE DATA ARE INITIALLY SET FOR SEVERAL COMMON SOLID MOTORS. THE DATA MAY BE MODIFIED OR MOTORS ADDED USING THE DEFSTG COMMAND.

COMMAND SHWSTG IS VALID IN ALL MODES.

SHWSTG WILL ERASE THE SCREEN

NO ARGUMENTS

DEFSTG-DEFINES OR CHANGES UPPER STAGE MOTOR DATA

AN UPPER STAGE MOTOR IS DEFINED BY ENTERING THE APPROPRIATE DATA FOR THE FOLLOWING ARGUMENTS-

NAME = MOTOR NAME
WF = FUEL WEIGHT (LBS)
WI = INERT WEIGHT (LBS)
ISP = SPECIFIC IMPULSE (SEC)
LEN = LENGTH (INCHES)
DIA = DIAMETER (INCHES)

THE FIRST ARGUMENT, THE MOTOR NAME, DETERMINES IF UPPER STAGE MOTOR DATA IS BEING DEFINED OR CHANGED. IF IT MATCHES A PREVIOUSLY DEFINED MOTOR NAME THE REMAINING ARGUMENTS ARE SUBSTITUTED IN THE TABLE. IF IT DOES NOT MATCH AN EXISTING MOTOR, THE ARGUMENTS ARE USED TO DEFINE A NEW MOTOR.

A MAXIMUM OF TEN MOTORS CAN BE DEFINED.

EXAMPLE- DEFSTG,HIGH,800,85,295,50,30 DEFINES AN UPPER STAGE MOTOR, HIGH, WITH 800 POUNDS OF FUEL, AN INERT WEIGHT OF 85 POUNDS, AN ISP OF 295 SECONDS THAT IS 50 INCHES LONG AND 30 INCHES IN DIAMETER.

COMMAND DEFSTG IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE		
(1) NAME	DEMO	ALPHABETIC			
(2) WF	1.0000E+03	LBS	1.0000E+00	TO	1.0000E+05
(3) WI	1.0000E+02	LBS	1.0000E+00	TO	1.0000E+06
(4) ISP	2.9000E+02	SEC	.E+00	TO	5.0000E+02
(5) LEN	6.6000E+01	IN	.E+00	TO	7.2000E+02
(6) DIA	3.6000E+01	IN	.E+00	TO	1.8000E+02

PLD-DRAWS A LAUNCH VEHICLE PAYLOAD CONTOUR

THIS COMMAND WILL DRAW A CONTOUR OF THOSE ORBITS TO WHICH THE SPECIFIED VEHICLE CAN DELIVER A PARTICULAR PAYLOAD WEIGHT.

NO PLOT WILL BE PRODUCED IF THE ARGUMENT VALUE IS BEYOND THE VEHICLE CAPABILITY OR IF NO VEHICLE HAS BEEN SPECIFIED FOR THE CURRENT ORBSEL PLOT.

THE VEHICLE MUST BE DEFINED USING EITHER VEH (EXPENDABLE) OR STSREL (SHUTTLE+UPPER STAGES) AFTER STARTING EACH ORBSEL PLOT AND PRIOR TO USING PLD.

EXAMPLE- PLD,300 WILL DRAW THE 300 POUND PAYLOAD CONTOUR FOR THE CURRENT VEHICLE ON THE ORBSEL PLOT.

COMMAND PLD IS VALID IN MODES ORBSEL

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE	
(1) PLD	.E+00	LBS	.E+00	TO 1.0000E+20

LABEL-PERMITS TYPING INFORMATION ON THE SCREEN (TEKTRONIX ONLY)

THE COMMAND WILL CAUSE THE CROSS HAIRS TO APPEAR ON THE SCREEN. THESE MAY BE MOVED USING THE TERMINAL THUMB WHEELS TO POSITION THEIR INTERSECTION AT THE LOCATION OF THE DESIRED LABEL. A BLANK SHOULD THEN BE TRANSMITTED. THE CHARACTER CURSOR WILL THEN APPEAR AND THE KEY BOARD USED TO TYPE ONTO THE SCREEN. WHEN A CARRIAGE RETURN IS TRANSMITTED THE CROSS HAIRS WILL REAPPEAR. THEY MAY BE REPOSITIONED FOR ADDITIONAL LABELING. OR MOVED TO THE BOTTOM OF THE PLOT TO END THE LABELING PROCESS.

COMMAND LABEL	IS VALID IN MODES				
	ORBSEL	GNDTRK	ORBDEF	STPLNG	TABLE
	STPTOD	LWINDW	SAVMIS	STPTRK	SWINDW
	DEPLOY				

NO ARGUMENTS

ZOOM-USES THE CURSOR TO ZOOM IN ON A PLOT REGION (TEKTRONIX ONLY)

THE CROSS HAIRS ARE USED TO DEFINE A PORTION OF THE PLOT FOR EXPANSION TO ACHIEVE BETTER CLARITY.

1. THE CROSS HAIRS WILL APPEAR ON THE SCREEN. POSITION THEM WITH THEIR INTERSECTION AT A CORNER OF THE DESIRED REGION.

2. TRANSMIT A BLANK

3. THE PROGRAM WILL DRAW A PAIR OF LINES AT THE CROSS HAIR LOCATIONS.

4. REPOSITION THE CROSS HAIRS WITH THEIR INTERSECTION AT THE OPPOSITE CORNER OF THE DESIRED REGION.

5. TRANSMIT A BLANK

6. THE PROGRAM WILL DRAW A SECOND PAIR OF LINES. THE DESIGNATED AREA IS NOW OUTLINED ON THE PLOT.

7. ARGUMENTS ARE SET TO PRODUCE THE EXPANDED PLOT ON A SUBSEQUENT COMMAND. THE PROGRAM WILL REQUEST THE NEXT IGOS COMMAND.

COMMAND ZOOM IS VALID IN MODES ORBSEL GNDTRK STPLNG
STPTOD LWINDW STPTRK SWINDW

NO ARGUMENTS

MARK-MARKS WITH THE CURSOR A POINT FOR LATER REFERENCE(TEKTRONIX ONLY)

THE COMMAND MARK WILL CAUSE THE CROSS HAIRS TO APPEAR ON THE SCREEN. THEY MAY THEN BE POSITIONED WITH THEIR INTERSECTION AT THE DESIRED ORBIT (POINT) ON THE ORBSEL PLOT. A BLANK IS THEN TRANSMITTED. THE PROGRAM WILL DRAW A CROSS AT THE INTERSECTION AND ASSIGN A LETTER TO THE MARK. LATER REFERENCE MAY BE MADE TO THESE ORBITS USING THE COMMAND SELECT.

UP TO FIFTEEN MARKS MAY BE MADE ON ORBSEL PLOTS DURING ONE IGOS SESSION (A THROUGH O). THEIR COORDINATES ARE SAVED UNTIL PROGRAM TERMINATION.

DUE TO THE FINITE RESOLUTION OF THE TERMINAL SCREEN, MORE PRECISE MARKS MAY BE MADE BY EXPANDING THE ORBSEL PLOT SCALES, USING THE ZOOM COMMAND, PRIOR TO MAKING THE MARKS.

COMMAND MARK IS VALID IN MODES ORBSEL

NO ARGUMENTS

SELECT-SELECTS A PREDEFINED MARK

SELECT REQUIRES PRIOR USE OF THE COMMAND MARK. (MARK READS THE POSITION OF CROSSHAIRS ON AN ORBSEL PLOT TO DEFINE AND LABEL AN ORBIT--SEE MARK) SELECT CHOOSES AN ORBIT DEFINED BY THE MARK COMMAND ON A PREVIOUS ORBSEL PLOT FOR FURTHER ANALYSIS. THE COMMAND ENTERS THE APPROPRIATE ALTITUDE AND INCLINATION OF THE ORBIT SELECTED IN THE ARGUMENT LIST FOR THE COMMANDS ORBDEF. ORBSET AND DECAY. THIS AVOIDS HAVING TO READ THE COORDINATES ON THE ORBSEL PLOT AND TYPE THEM AS ARGUMENTS.

EXAMPLE- SELECT.A CAUSES THE ALTITUDE AND INCLINATION ASSOCIATED WITH THE ORBIT LABELED A BY MARK ON A PREVIOUS ORBSEL PLOT TO BE ENTERED AS ORBDEF ARGUMENTS.

THE ARGUMENT TOL IS NOT USED.

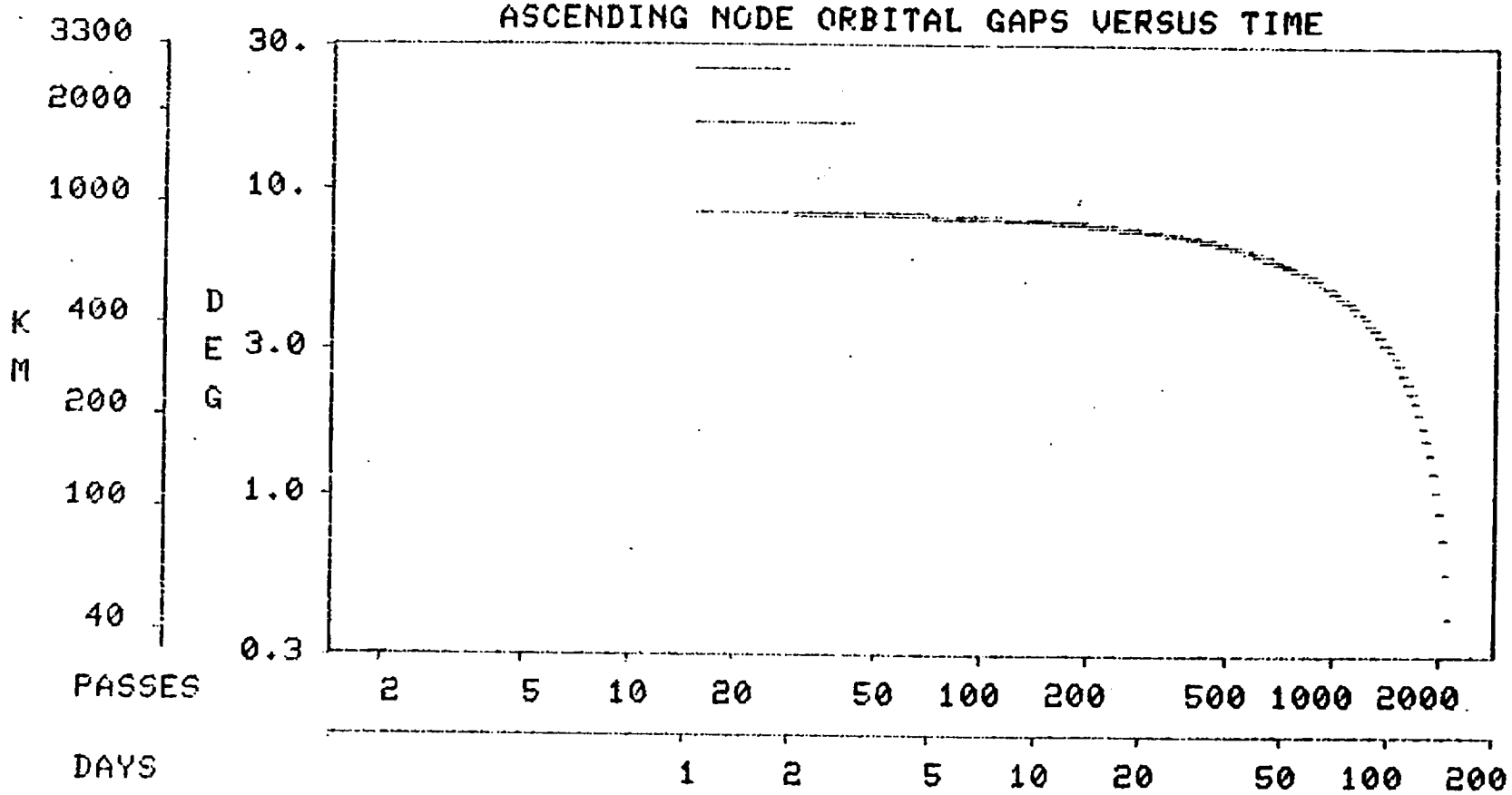
COMMAND SELECT IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) MARK	A ALPHABETIC	
(2) TOL	.E+00 OHMS	-1.0000E+20 TO 1.0000E+20

790.174 BY 790.174(KM),INC.=108.00,L-N= 263.6,A-P= 144.0,LAUNCH=135D 0H 0M 0S
SUN ANGLE=180.0 SENSOR = -696.3 TO 696.3 (KM)

PERIOD(MIN),KEPLERIAN=100.6666, NODAL=100.7466, APSIDAL=100.7128 Q=14.3355068

RELATIVE MOTION	NODE-INERTIAL	NODE-EARTH	NODE-SUN	PERIGEE-NODE
DEG/NODAL PERIOD	0.14315	-25.11247	-0.0742	-0.12103
DEG/DAY	2.04605	-358.93957	-1.0604	-1.72991



ORBDEF PLOT

ORBDEF-ORBIT DEFINITION WITH OUTPUT

AN ORBIT IS DEFINED BY ENTERING THE FOLLOWING 6 ORBITAL ELEMENTS

1 APOGEE
2 PERIGEE
3 INCLINATION
4 LONGITUDE OF ASCENDING NODE
5 ARGUMENT OF PERIGEE
6 TIME OF PERIGEE (RELATIVE TO 00 GMT JAN1)

FOR CONVENIENCE, IF THE PERIGEE IS SET TO ZERO, A CIRCULAR ORBIT WILL BE ASSUMED.

THE TIME OF PERIGEE IS ENTERED IN DAYS,HOURS,MINUTES,SECONDS AS A SINGLE DECIMAL NUMBER. FOR EXAMPLE, 43 DAYS, 13 HOURS, 55 MINUTES, AND 0 SECONDS WOULD BE ENTERED AS 43135500. TIME OF PERIGEE IS REFERENCED TO THE FIRST ASCENDING NODE WRT PERIGEE PRECESSION.

THE FIRST THREE ARGUMENTS MAY BE SET BY THE COMMAND SELECT TO MATCH A MARK ON AN ORBSEL PLOT.

THE LAUNCH COMMAND MAY BE USED PRIOR TO ORBDEF TO AVOID CUMBERSOME ENTRY OF THE LAST THREE ORBITAL ELEMENTS. THEY ARE THEN COMPUTED TO PLACE THE PERIGEE DIRECTLY OVER THE LAUNCH SITE AT LAUNCH TIME.

AFTER ENTERING ORBDEF FURTHER STUDY OF THE ORBIT MAY BE MADE WITH THE COMMANDS STPLNG, SYPTOD, OR GNDTRK.

OPTIONAL DATA THAT CAN BE REQUESTED WITH THIS COMMAND INCLUDES

1. RELATIVE MOTION OF THE NODE WRT EARTH, WRT SUN AND INERTIAL IN DEGREES/NODAL PERIOD AND DEGREES/DAY
2. RELATIVE MOTION OF PERIGEE WRT NODE IN DEGREES/NODAL PERIOD AND DEGREES/DAY.
3. PLOT OF DISTANCE BETWEEN ASCENDING NODES VERSUS TIME. DISTANCE IS MEASURED IN NM OR KM AND DEGREES AND TIME IS IN DAYS AND ORBITAL PASSES.

THE PROGRAM WILL ASK: MORE ORBITAL INFO?(Y/N)
A Y RESPONSE (YES) WILL DISPLAY THE ADDITIONAL DATA. N RESULTS IN NO OPTIONAL INFORMATION.

EXAMPLE- ORBDEF,700.,200.,30 DEFINES A 700 BY 200 (NM OR KM) ELLIPTICAL ORBIT WITH 30 DEGREES INCLINATION.

COMMAND ORBDEF IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A ORBDEF PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) APG	1.6000E+02 NM, 2.9632E+02 KM	.E+00 TO 1.0000E+20
" PER	.E+00 NM, .E+00 KM	.E+00 TO 1.0000E+20
(3) INC	2.8500E+01 DEG	.E+00 TO 1.8000E+02
(4) LON	.E+00 DEG	-3.6000E+02 TO 3.6000E+02
(5) ARP	.E+00 DEG	-3.6000E+02 TO 3.6000E+02
(6) TOP	.E+00 DHMS	-1.0000E+20 TO 1.0000E+20

ORBSET-ORBIT DEFINITION WITHOUT OUTPUT

ORBSET IS THE SAME AS ORBDEF. BUT NO OUTPUT IS PRODUCED. FOR MORE INFORMATION SEE THE COMMAND ORBDEF.

COMMAND ORBSET IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE
(1) APG	1.6000E+02 NM,	2.9632E+02 KM	.E+00 TO 1.0000E+20
(2) PER	.E+00 NM,	.E+00 KM	.E+00 TO 1.0000E+20
(3) INC	2.8500E+01 DEG		.E+00 TO 1.8000E+02
(4) LON	.E+00 DEG		-3.6000E+02 TO 3.6000E+02
(5) ARP	.E+00 DEG		-3.6000E+02 TO 3.6000E+02
(6) TOP	.E+00 OHMS		-1.0000E+20 TO 1.0000E+20

ORBSMA-ORBIT DEFINITION USING A,E AND ASCENDING NODE TIME

AN ORBIT IS DEFINED BY ENTERING THE FOLLOWING 6 ORBITAL ELEMENTS:

1 SEMIMAJOR AXIS
2 ECCENTRICITY
3 INCLINATION
4 LONGITUDE OF THE ASCENDING NODE
5 ARGUMENT OF PERIGEE
6 TIME OF THE FIRST ASCENDING NODE (RELATIVE TO 00 GMT JAN1)

THE TIME OF THE FIRST ASCENDING NODE IS ENTERED IN DAYS,HOURS,MINUTES, SECONDS AS A SINGLE DECIMAL NUMBER. FOR EXAMPLE, 47 DAYS, 5 HOURS, 33 MINUTES, AND 15 SECONDS WOULD BE ENTERED AS 47053315.

FOR EXAMPLE: ORBSMA,300,,.01,28 DEFINES AN ORBIT WITH 28 DEGREES INCLINATION, AN ECCENTRICITY OF 0.01 AND A SEMIMAJOR AXIS OF 300 NM.

AN ORBIT CAN ALSO BE DEFINED USING AN ALTERNATE ORBITAL ELEMENT SET BY REFERENCING THE COMMANDS ORBDEF OR ORBSET.

COMMAND ORBSMA IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE
(1) SMA	1.5000E+02 NM, 2.7780E+02 KM		.E+00 TO 1.0000E+20
(2) ECC	.E+00		.E+00 TO 1.0000E+00
(3) INC	2.8500E+01 DEG		.E+00 TO 1.8000E+02
(4) LON	.E+00	DEG	-3.6000E+02 TO 3.6000E+02
(5) ARP	.E+00	DEG	-3.6000E+02 TO 3.6000E+02
(6) TAN	.E+00	DHMS	-1.0000E+20 TO 1.0000E+20

ORBSHW-SHOWS ORBITS

THE ORBITAL ELEMENTS OF USEFUL ORBITS TO IGOS USERS ARE STORED ON A GENERAL ACCESS DATA FILE. THE ORBSHW COMMAND LISTS DESCRIPTIONS OF THESE ORBITS, WHICH MAY BE REFERENCED USING THE COMMAND ORBGET. FOR ADDITIONS TO THE FILE, CALL BATTELLE.

COMMAND ORBSHW IS VALID IN ALL MODES.

ORBSHW WILL ERASE THE SCREEN

NO ARGUMENTS

ORBGET-SELECTS AN ORBIT

THE COMMAND ORBGET IS USED TO REFERENCE A PARTICULAR ORBIT FROM THE ORBIT DATA FILE FOR PROGRAM USE. THE ARGUMENT IS THE IDENTIFICATION CODE OF THE DESIRED ORBIT.

A LIST OF AVAILABLE ORBIT DESCRIPTIONS AND THEIR IDENTIFICATION CODES MAY BE OBTAINED USING THE ORBSHW COMMAND.

EXAMPLE- ORBGET.1 REQUESTS THE FIRST ORBIT OF THE ORBIT DATA FILE FOR PROGRAM USE.

COMMAND ORBGET IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) CODE	1.0000E+00	1.0000E+00 TO 2.5000E+01

LAUNCH-DEFINES THE LAUNCH SITE FOR BEGINNING AN ORBIT

LAUNCH DEFINES THE LAUNCH SITE AND TIME TO DEFINE THE ORBIT LONGITUDE OF NODES. ARGUMENT OF PERIGEE. AND TIME OF PERIGEE.

LAUNCH SITE OPTIONS ARE

ETR=EASTERN TEST RANGE
WTR=WESTERN TEST RANGE
WAL-N=WALLOPS ISLAND(NORTHERN AZIMUTHS)
WAL-S=WALLOPS ISLAND(SOUTHERN AZIMUTHS)
SAN MARC=SAN MARCO ISLAND

TIME IS ENTERED IN DAYS OF THE YEAR AND GMT HOURS.

EXAMPLE-LAUNCH.WTR,15,22

THIS IS A LAUNCH FROM WTR ON JAN 15 AT 22 HOURS GMT.

COMMAND LAUNCH IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE	AND UNITS	VALID RANGE
(1) LSITE	NONE	ALPHABETIC	
(2) DAY	.E+00	DAYS	.E+00 TO 3.6600E+02
(3) TIME	.E+00	HRS	.E+00 TO 2.4000E+01

SITE-REFERENCE SITE ORBIT UPDATING

THE SITE COMMAND UPDATES ORBITAL PARAMETERS TO REFLECT THE PASSAGE OF A SPACECRAFT OVER SOME REFERENCE SITE AT A SPECIFIC TIME.

THE ARGUMENTS ARE-

LNG=LONGITUDE OF THE REFERENCE SITE (DEGREES)
LAT=LATITUDE OF THE REFERENCE SITE (DEGREES)
GMT=TIME OF SPACECRAFT PASSAGE OVER THE SITE
(RELATIVE TO 00 GMT JAN1. +/-DDHHMMSS)
ARP=ARGUMENT OF PERIGEE (DEGREES)

THE TIME OF PASSAGE IS ENTERED IN DAYS.HOURS.MINUTES.SECONDS AS A SINGLE DECIMAL NUMBER. THE SIGN OF THE TIME DETERMINES WHETHER THE PASSAGE IS TO THE NORTH (POSITIVE) OR TO THE SOUTH (NEGATIVE) OVER THE SITE.

EXAMPLE: SITE.150.20.125053015.90 SPECIFIES A NORTH PASSAGE OVER 150 DEGREES LONGITUDE AND 20 DEGREES LATITUDE ON DAY 125 OF THE YEAR AT 5 HOURS. 30 MINUTES AND 15 SECONDS GMT. THE ARGUMENT OF PERIGEE IS 90 DEGREES.

THE ARGUMENTS ARE USED TO CALCULATE THE CURRENT LONGITUDE OF THE ASCENDING NODE. TIME OF PERIGEE. AND THE ARGUMENT OF PERIGEE. TO UPDATE THE APOGEE. PERIGEE OR INCLINATION OF THE ORBIT REFERENCE THE COMMANDS ORBDEF. ORBSET OR ORBSMA.

COMMAND SITE IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE	AND UNITS	VALID RANGE
(1) LNG	.E+00	DEG	-3.6000E+02 TO 3.6000E+02
(2) LAT	.E+00	DEG	-9.0000E+01 TO 9.0000E+01
(3) GMT	.E+00	DHMS	-1.0000E+20 TO 1.0000E+20
(4) ARP	.E+00	DEG	-3.6000E+02 TO 3.6000E+02

SUNANG-DEFINES SUN ANGLE REQUIREMENT

THE SUN ANGLE IS THE ANGLE BETWEEN THE EARTH-SUN AND EARTH-SATELLITE VECTORS. WHEN THE SUB-SATELLITE POINT IS AT LOCAL NOON THE SUN ANGLE IS ZERO. AT LOCAL MIDNIGHT THE ANGLE IS 180.

THE VALUE LIMITS THE LOCAL LIGHTING CONDITIONS FOR PORTIONS OF THE EARTH CONSIDERED VIEWED IN THE OUTPUT FROM THE PASS AND STPLNG COMMANDS.

EXAMPLE- SUNANG,90 REQUIRES THE SUN-EARTH-SATELLITE ANGLE TO BE LESS THAN OR EQUAL TO 90 DEGREES FOR ALL PLOTTING WITH THE PASS AND STPLNG COMMANDS.

COMMAND SUNANG IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) ANG	1.8000E+02 DEG	1.0000E+00 TO 1.8000E+02

SWATH-SELECTS A GROUND SWATH

THE COMMAND SWATH IS USED TO REFERENCE A PARTICULAR SENSOR GROUND SWATH FOR PROGRAM USE.

THE FIRST ARGUMENT IS THE ALPHABETIC NAME OF THE SENSOR GROUND SWATH SELECTED. A LIST OF AVAILABLE SENSOR GROUND SWATHS MAY BE OBTAINED USING THE COMMAND SHWSWT. THE NAME SENSOR WILL FORCE USE OF THE IGOS SENSOR MODEL.

THE SECOND ARGUMENT DEFINES OR CHANGES THE SUN ANGLE REQUIREMENT. THE ANGLE BETWEEN THE EARTH-SUN AND EARTH-SATELLITE VECTORS IN DEGREES. FOR MORE INFORMATION, SEE THE COMMAND SUNANG. SUN ANGLE IS OPTIONAL.

EXAMPLE-

```
SWATH,SINGLE,70    REQUESTS THE SENSOR GROUND SWATH, SINGLE,
                   AND A 70 DEGREE SUNANGLE REQUIREMENT.
```

COMMAND SWATH IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) NAME	SENSOR ALPHABETIC	
(2) SUNANG	1.8000E+02 DEG	1.0000E+00 TO 1.8000E+02

SHWSWT-SHOWS SENSOR GROUND SWATH DATA

THE COMMAND SHWSWT LISTS THE SENSOR GROUND SWATH DATA FOR ALL SWATHS THAT MAY BE REFERENCED USING THE COMMAND SWATH. EACH SWATH WAS PREVIOUSLY DEFINED WITH THE COMMAND DEFSWT.

COMMAND SHWSWT IS VALID IN ALL MODES.

SHWSWT WILL ERASE THE SCREEN

NO ARGUMENTS

DEFSWT-DEFINES SENSOR GROUND SWATH DATA

A SENSOR GROUND SWATH IS DEFINED BY ENTERING AN ALPHABETIC NAME AND TWO OR FOUR DISTANCES RELATIVE TO THE SUB-SATELLITE CENTER LINE (POSITIVE=LEFT). EACH PAIR OF DISTANCES DEFINES THE START AND STOP OF A SWATH. FOR EXAMPLE-

DEFSWT,SINGLE,-100,100,0,0 DEFINES A SWATH NAMED SINGLE WHICH EXTENDS 100 NM OR KM ON EITHER SIDE OF THE CENTER LINE.

DEFSWT,DOUBLE,-700,-300,400,800 DEFINES A SWATH NAMED DOUBLE WHICH EXTENDS FROM 300 TO 700 ON THE LEFT AND FROM 400 TO 800 ON THE RIGHT.

THE SWATH NAME AND GROUND SWATH DATA ARE SAVED FOR LATER REFERENCE. UP TO TEN SENSOR GROUND SWATHS MAY BE DEFINED. REFERENCE TO A PARTICULAR SENSOR MAY BE MADE USING THE COMMAND SWATH.

THE UNITS (NM OR KM) ARE DETERMINED BY THE SELECTED UNITS OPTION.

WHEN USED WITH AN ELLIPTICAL ORBIT THE SWATH IS ASSUMED PROPORTIONAL TO THE ALTITUDE WITH THE DEFINED VALUES AT THE AVERAGE ALTITUDE.

THE NAME SENSOR IS RESERVED FOR THE IGOS SENSOR MODEL AND THE ARGUMENT VALUES WILL BE IGNORED.

TO UPDATE GROUND SWATH DATA RE-ENTER THE APPROPRIATE SENSOR NAME FOLLOWED BY THE NEW DATA IN A SECOND DEFSWT COMMAND.

COMMAND DEFSWT IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS				VALID RANGE		
(1) NAME	ALPHABETIC						
(2) X1	.E+00	NM,	.E+00	KM	-1.0000E+20	TO	1.0000E+20
(3) X2	.E+00	NM,	.E+00	KM	-1.0000E+20	TO	1.0000E+20
(4) X3	.E+00	NM,	.E+00	KM	-1.0000E+20	TO	1.0000E+20
(5) X4	.E+00	NM,	.E+00	KM	-1.0000E+20	TO	1.0000E+20

DEFMOD-DEFINES A SENSOR SWATH MODE GROUND TRACE

A SENSOR MODE IS DEFINED BY ENTERING AN ALPHABETIC NAME AND THE START AND STOP LOCATIONS OF UP TO TWO VIEWING BANDS RELATIVE TO THE SATELLITE NADIR USING CROSSTRACK AND DOWN RANGE GEOMETRY.

THE ARGUMENTS ARE AS FOLLOWS-

NAME=NAME OF SENSOR MODE
CRS1=CROSS TRACK DISTANCE FROM THE NADIR TO THE START OF BAND 1 COVERAGE (NM OR KM)
DWN1=DOWN RANGE DISTANCE FROM THE NADIR TO THE START OF BAND 1 COVERAGE (NM OR KM)
CRS2=CROSS TRACK DISTANCE FROM THE NADIR TO THE END OF BAND 1 COVERAGE (NM OR KM)
DWN2=DOWN RANGE DISTANCE FROM THE NADIR TO THE END OF BAND 1 COVERAGE (NM OR KM)
CRS3,DWN3,CRS4,DWN4= SIMILAR ARGUMENTS TO DEFINE BAND 2 COVERAGE

POSITIVE DISTANCES ARE TO THE LEFT OF THE SATELLITE AND IN THE DIRECTION OF THE SATELLITE"S MOTION. UP TO 10 SENSOR SWATH MODES CAN BE DEFINED. FOR EXAMPLE-

DEFMOD,SINGLE,0,0,-100,100 DEFINES A SWATH MODE, SINGLE, WITH ONE BAND VIEWING TO THE RIGHT AND TO THE FRONT OF THE SPACECRAFT AT 45 DEGREES FROM THE NADIR TO 100 NM CROSSTRACK AND DOWNRANGE.

THE SWATH MODE NAME AND ASSOCIATED DATA ARE SAVED FOR LATER REFERENCE BY THE COMMAND DEFSKD TO SCHEDULE SENSOR VIEWING TIMES.

THE UNITS (NM OR KM) ARE DETERMINED BY THE SELECTED UNITS OPTION.

WHEN USED WITH AN ELLIPTICAL ORBIT THE SENSOR COVERAGE IS ASSUMED PROPORTIONAL TO THE ALTITUDE, WITH THE DATA ENTERED DEFINED FOR THE AVERAGE ALTITUDE.

TO UPDATE SWATH MODE DATA RE-ENTER THE APPROPRIATE SENSOR NAME FOLLOWED BY THE NEW DATA IN A SECOND DEFMOD COMMAND.

COMMAND DEFMOD IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS				VALID RANGE	
(1) NAME	ALPHABETIC					
(2) CRS1	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20
(3) DWN1	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20
(4) CRS2	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20
(5) DWN2	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20
(6) CRS3	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20
(7) DWN3	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20
(8) CRS4	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20
(9) DWN4	.E+00	NM,	.E+00	KM	-1.0000E+20 TO	1.0000E+20

SHWMOD-SHOWS SENSOR SWATH MODE DATA

THE SHWMOD COMMAND LISTS THE SENSOR MODE DATA FOR ALL SENSOR MODES THAT MAY BE REFERENCED USING THE COMMAND DEFSKD. EACH MODE WAS PREVIOUSLY DEFINED WITH THE COMMAND DEFMOD.

COMMAND SHWMOD IS VALID IN ALL MODES.

SHWMOD WILL ERASE THE SCREEN

NO ARGUMENTS

DEFSKD-DEFINES A SENSOR SWATH MODE SCHEDULE

THE DEFSKD COMMAND SCHEDULES SENSOR MODE OPERATIONS DURING AN ORBITAL PASS. THE FOUR ARGUMENTS ARE AS FOLLOWS:

CODE = SCHEDULE CODE
NAME = SENSOR MODE NAME
TIME1= TIME FROM THE ASCENDING NODE TO BEGIN OPERATION (MIN)
TIME2= TIME FROM THE ASCENDING NODE TO END OPERATION (MIN)

FOR EXAMPLE: DEFSKD,1,SINGLE,0,20 SCHEDULES THE SENSOR SWATH MODE, SINGLE, TO BE OPERATIONAL THE FIRST 20 MINUTES FOLLOWING EACH ASCENDING NODE CROSSING.

SENSOR MODES SCHEDULED FOR OPERATION MUST BE PREVIOUSLY DEFINED USING THE DEFMOD COMMAND. A SENSOR MODE CAN BE SCHEDULED FOR MORE THAN ONE TIME PERIOD DURING AN ORBITAL PASS BY REPEATED USE OF THE DEFSKD COMMAND.

UP TO 20 TIME PERIODS MAY BE DEFINED DURING AN ORBITAL PASS TO SCHEDULE VARIOUS SENSOR MODE OPERATIONS.

TO MODIFY SCHEDULE DATA, ENTER A DEFSKD COMMAND WITH THE APPROPRIATE SCHEDULE CODE FOR THE DATA TO BE CHANGED, AND THE NEW DATA.

COMMAND DEFSKD IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE		
(1) CODE	1.0000E+00		1.0000E+00	TO	2.0000E+01
(2) NAME		ALPHABETIC			
(3) TIME1	.E+00	MIN	.E+00	TO	1.0000E+20
(4) TIME2	.E+00	MIN	.E+00	TO	1.0000E+20

SHWSKD-SHOWS THE SENSOR SWATH MODE SCHEDULE

THE SHWSKD COMMAND LISTS THE CURRENT SENSOR MODE SCHEDULE REFERENCED BY THE MPASS COMMAND IN PLOTTING ORBITAL PASSES WITH MULTIPLE SENSOR OPERATIONS DURING ONE ORBITAL PASS.

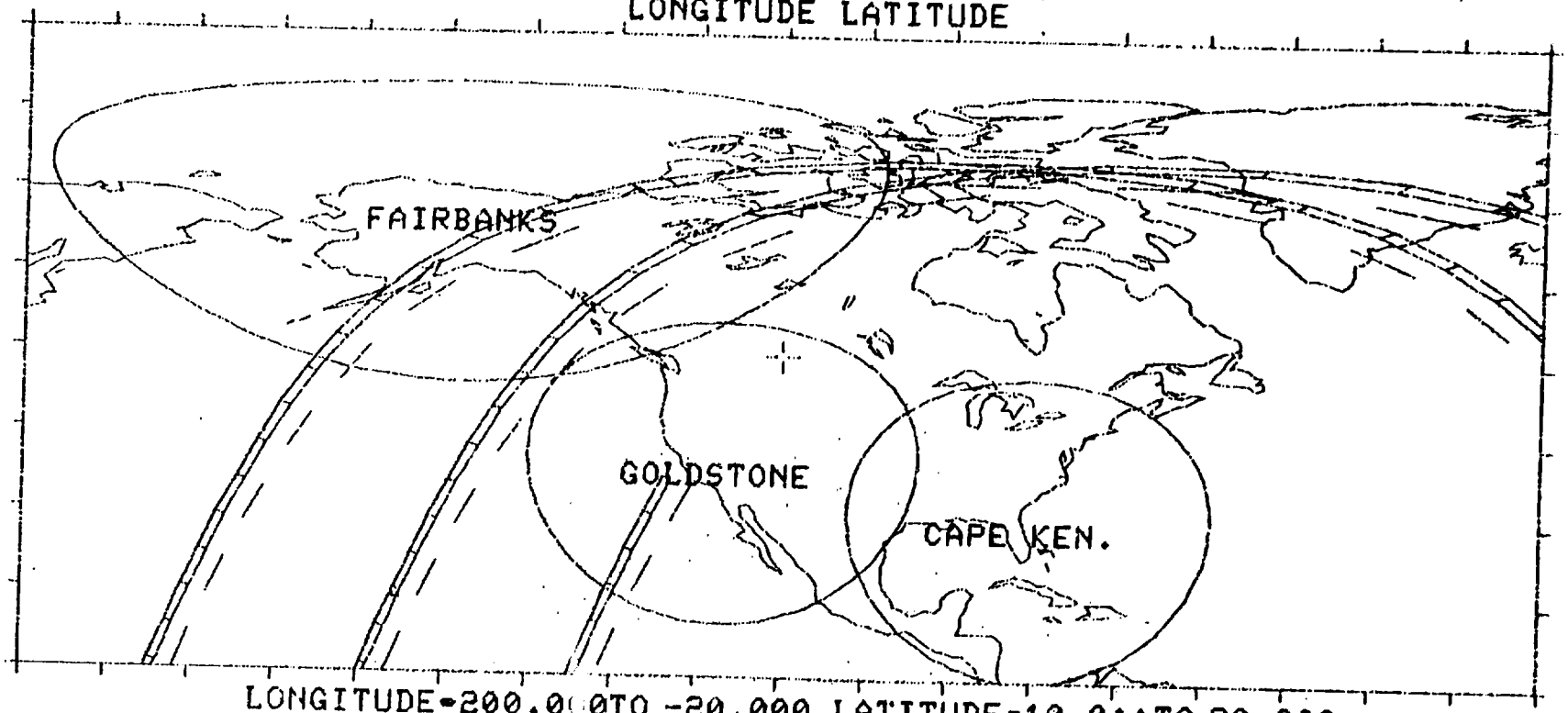
TO DEFINE A SCHEDULE ENTRY. REFERENCE THE DEFSKD COMMAND.

COMMAND SHWSKD IS VALID IN ALL MODES.

SHWSKD WILL ERASE THE SCREEN

NO ARGUMENTS

790.174 BY 790.174(KM),INC.=108.00,L-N= 263.6,A-P= 144.0,LAUNCH=135D 0H 0M 0S
SUN ANGLE=180.0 SAR = -330.0 TO -230.0 (KM)



ON MAP

DAYS

10 20 30 40 50 60

100 200 300 400 500 600 700 800 900

REQUESTED PASSES

GNDTRK PLOT WITH MAP, TRKSIT, AND PASS COMMANDS

GNDTRK-GROUND TRACK DISPLAY

THE GROUND TRACK PLOT IS A MAP OF A PORTION OF THE EARTHS SURFACE. THE ARGUMENTS DEFINE THE REGION OF INTEREST, THE RESOLUTION OF THE WORLD MAP THAT MAY BE ADDED TO THE PLOT, AND THE PLOT PROJECTION.

LNG1,LNG2= THE LONGITUDE RANGE
LAT1,LAT2= THE LATITUDE RANGE
FINE= THE DISTANCE BETWEEN THE CLOSEST MAP POINTS TO BE PLOTTED DIVIDED INTO THE MAP WIDTH. FINE=0 WILL SKIP ALL MAP POINTS AND SAVE EXECUTION TIME.
PRJ= THE PROJECTION OPTION
THE PROJECTION OPTIONS ARE
LL=LATITUDE-LONGITUDE
M=MERCATOR
PN=POLAR ABOUT THE NORTH POLE
PS=POLAR ABOUT THE SOUTH POLE

EXAMPLE- GNDTRK,-180,180,-90,90,100,LL WILL PRODUCE A LNG-LAT PLOT OF THE ENTIRE EARTH WITH A REASONABLE NUMBER OF POINTS ON THE MAP.

IF ORBIT GROUND TRACKS ARE TO BE PLOTTED USING THE PASS COMMAND AN ORBDEF, ORBSET OR ORBSMA COMMAND MUST BE ENTERED PRIOR TO PLOTTING PASSES TO DEFINE THE ORBIT OF INTEREST.

COMMAND GNDTRK IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A GNDTRK PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL MAP PASS ZOOM TRKSIT DR*LNG DR*TOD EXPSIT MPASS

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) LNG1	-1.8000E+02 DEG	-3.6000E+02 TO 1.8000E+02
(2) LNG2	1.8000E+02 DEG	-1.8000E+02 TO 3.6000E+02
(3) LAT1	-8.0000E+01 DEG	-9.0000E+01 TO 9.0000E+01
(4) LAT2	8.0000E+01 DEG	-9.0000E+01 TO 9.0000E+01
(5) FINE	1.0000E+02	.E+00 TO 1.0000E+03
(6) PRJ	LL ALPHABETIC	

MAP-DRAWS AN EARTH MAP BACKGROUND

THE MAP DATA CONSIST OF 10000 DATA POINTS. WHEN THE GNDTRK COMMAND IS GIVEN A SUBSET OF THE DATA IS COPIED TO A SCRATCH FILE. THE SCRATCH FILE CONSISTS OF THOSE POINTS WHICH LIE ON THE PORTION OF THE EARTH BEING DISPLAYED. AND FURTHER APART THAN A MINIMUM DISTANCE. THE MINIMUM DISTANCE IS THE WIDTH OF THE PLOT DIVIDED BY THE FINENESS. IF THE FINENESS WAS SET TO ZERO NO SCRATCH FILE IS WRITTEN AND NO MAPS CAN BE DRAWN.

COMMAND MAP IS VALID IN MODES GNDTRK

NO ARGUMENTS

PASS-DRAWS ORBIT PASSES ON THE GROUND TRACK PLOT

THE ARGUMENTS ARE USED TO CONTROL WHICH PASSES ARE PLOTTED AND HOW THE SENSOR SWATH IS REPRESENTED.

EXAMPLE-PASS,1,3,7

THIS WILL DRAW PASSES 1,2, AND 3 WITH A TYPE 7 SWATH PLOT. THE FIRST PASS BEGINS AT LAUNCH AND ENDS WITH THE FIRST ASCENDING EQUATORIAL CROSSING. SEVERAL PASS PLOTS MAY BE SUPERIMPOSED. FOR EXAMPLE PASS,1,5,7 AND PASS,6,10,7 WILL GIVE THE SAME PLOT AS PASS,1,10,7

THE SWATH CODES ARE 1-7 AND 9-15

1=SOLID CENTERLINE ONLY
2=SWATH EDGES ONLY
3=EDGES AND DASHED CENTERLINE
4=CROSS HATCHES ONLY
5=CROSS HATCHES AND SOLID CENTERLINE
6=CROSS HATCHES AND EDGES
7=CROSS HATCHES+EDGES+DASHED CENTERLINE

SWATH CODES 1 THRU 7 SUPPRESS PASS LABELING. TO REQUEST A PLOT TYPE WITH PASS NUMBERS ADD 8 TO THE CODES 1 THRU 7 EXCLUDING 4 (FOR 9 THRU 11 AND 13 THRU 15).

EXAMPLE- PASS,1,2,10 WILL DRAW AND NUMBER PASSES 1 AND 2 SHOWING ONLY SWATH EDGES.

IF A SUN ANGLE LESS THAN 180 DEG. HAS BEEN SPECIFIED, ONLY THE PORTION OF THE SWATH WITH ADEQUATE ILLUMINATION WILL BE PLOTTED.

IF A TRACKING STATION IS SPECIFIED WITH THE TRACK COMMAND, THE EARTH COVERAGE DISPLAYED IS LIMITED TO TIMES WHEN THE SITE CAN VIEW THE SPACECRAFT.

PASS REQUIRES PRIOR USE OF THE ORBDEF, ORBSET OR ORBSMA COMMAND.

COMMAND PASS IS VALID IN MODES GNDTRK

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) FIRST	1.0000E+00 PASSES	.E+00 TO 1.0000E+04
(2) LAST	1.0000E+00 PASSES	.E+00 TO 1.0000E+04
(3) CODE	2.0000E+00	.E+00 TO 1.5000E+01

MPASS-DRAWS ORBIT PASSES WITH SCHEDULED SENSOR SWATH MODES

THE MPASS COMMAND PLOTS ORBITAL PASSES ON THE GROUND TRACK DISPLAY WHERE ONE OR MORE SENSOR SWATH MODES ARE OPERATIONAL DURING A SINGLE PASS. THE ARGUMENTS CONTROL WHICH PASSES ARE PLOTTED AND HOW THE SENSOR MODES ARE REPRESENTED.

EXAMPLE: MPASS,2,4,7 WILL DRAW PASSES 2,3, AND 4 USING A TYPE 7 SENSOR MODE PLOT.

THE SENSOR MODE PLOT CODES ARE 1-7 AND 9-15. REFERENCE THE PASS COMMAND FOR A DESCRIPTION OF HOW EACH CODE REPRESENTS A SENSOR.

ALL ORBITAL PASSES BEGIN AT THE ASCENDING NODE. SEVERAL MODE PASS PLOTS MAY BE SUPERIMPOSED. FOR EXAMPLE, MPASS,1,5,7 AND MPASS,6,10,7 WILL GIVE THE SAME PLOT AS MPASS,1,10,7.

MPASS REQUIRES THE PRIOR USE OF THE ORBDEF, ORBSET OR ORBSMA COMMANDS TO DEFINE THE ORBIT. SENSOR MODES AND A SCHEDULE OF OPERATION TIMES MUST ALSO BE PREVIOUSLY DEFINED WITH DEFMOD AND DEFSKD COMMANDS.

TO DEFINE THE TIME BETWEEN CROSSHATCHES ON THE PASS PLOTS REFERENCE THE TIME COMMAND.

COMMAND MPASS IS VALID IN MODES GNDTRK

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE		
(1) FIRST	1.0000E+00 PASSES	.E+00	TO	1.0000E+04	
(2) LAST	1.0000E+00 PASSES	.E+00	TO	1.0000E+04	
(3) CODE	2.0000E+00	.E+00	TO	1.5000E+01	

STEP-DEFINES THE TIME BETWEEN MPASS CROSSHATCHING

THE STEP COMMAND DEFINES THE TIME BETWEEN CROSSHATCHES PLOTTED BY THE MPASS COMMAND IN REPRESENTING SENSOR MODE COVERAGE. THE ARGUMENT IS THE TIME INTERVAL IN MINUTES.

FOR EXAMPLE: STEP.15 WILL CAUSE CROSSHATCHING TO OCCUR EVERY 15 MINUTES THROUGHOUT THE ORBITAL PASSES PLOTTED BY MPASS.

COMMAND STEP IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) TIME	.E+00 MIN	.E+00 TO 1.4400E+03

TRACK-DEFINES TRACKING STATION REQUIREMENT

THE TRACK COMMAND DEFINES A TRACKING STATION REQUIREMENT. A RESTRICTION OF EARTH COVERAGE TO TIMES WHEN A SPSCECRAFT IS IN VIEW OF A PARTICULAR TRACKING SITE.

THE ARGUMENT IS THE TRACKING STATION OF INTEREST. SPECIFING A SITE WILL LIMIT THE OUTPUT FROM THE PASS COMMAND.

EXAMPLE- TRACK.QUITO WILL RESTRICT THE PLOTTING OF ORBITAL PASSES TO WHEN THE SPACECRAFT IS VIEWED BY QUITO.

COMMAND TRACK IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) SITE	NONE ALPHABETIC	

TRKSIT-DRAWS THE TRACKING SITE MASKS ON THE GROUND TRACK PLOT

THE TRACKING SITE MASKS ARE CIRCLES WITH RADII COMPUTED FROM THE ORBIT AVERAGE (SMA) ALTITUDE, THE SITE ALTITUDE, AND THE MINIMUM ELEVATION ANGLE ABOVE THE LOCAL HORIZON.

THE SITES ARE GROUPED BY CLASSES. ALL SITES WITHIN A CLASS ARE PLOTTED AT THE SAME TIME. UP TO FOUR CLASSES MAY BE PLOTTED WITH EACH TRKSIT COMMAND.

EXAMPLE-TRKSIT,2 PLOTS ALL CLASS 2 SITES

EXAMPLE-TRKSIT,4,3,1 PLOTS CLASS 1,3, AND 4 SITES.

COMMAND TRKSIT IS VALID IN MODES GNDTRK

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE		
(1) CODE1	.E+00	.E+00	TO	1.0000E+01
(2) CODE2	.E+00	.E+00	TO	1.0000E+01
(3) CODE3	.E+00	.E+00	TO	1.0000E+01
(4) CODE4	.E+00	.E+00	TO	1.0000E+01

SHWSIT-SHOWS THE DATA FOR A CLASS OF TRACKING SITES

THE SHWSIT COMMAND LISTS THE TRACKING SITE DATA FOR ALL SITES IN THE CLASS SPECIFIED BY THE ARGUMENT. A ZERO ARGUMENT WILL DISPLAY ALL TRACKING SITE DATA.

EXAMPLE- SHWSIT,1 WILL DISPLAY THE DATA FOR THE TRACKING STATIONS IN CLASS 1.

COMMAND SHWSIT IS VALID IN ALL MODES.

SHWSIT WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) CODE	.E+00	.E+00 TO 1.0000E+01

DEFSIT-DEFINES NEW TRACKING SITE DATA OR CHANGES EXISTING SITE DATA

A TRACKING SITE IS DEFINED BY ENTERING THE APPROPRIATE DATA FOR THE FOLLOWING ARGUMENTS-

NAME = TRACKING SITE NAME
CODE = CLASS NUMBER
LNG = LONGITUDE (DEGREES)
LAT = LATITUDE (DEGREES)
ELE = MINIMUM ELEVATION ANGLE (DEGREES)
ALT = ALTITUDE (NM OR KM)

THE SITE NAME DETERMINES IF A TRACKING STATION IS BEING DEFINED OR CHANGED. IF THE NAME MATCHES AN EXISTING SITE NAME THE COMMAND WILL CHANGE THE DATA ASSOCIATED WITH THE SITE. IF THE NAME DOES NOT MATCH THAT OF AN EXISTING SITE, A NEW SITE IS CREATED WITH DATA PROVIDED IN THE ARGUMENT LIST.

WHEN THE DATA FOR AN EXISTING SITE IS TO BE CHANGED, ZERO ARGUMENTS WILL CAUSE THE CORRESPONDING DATA TO REMAIN UNCHANGED.

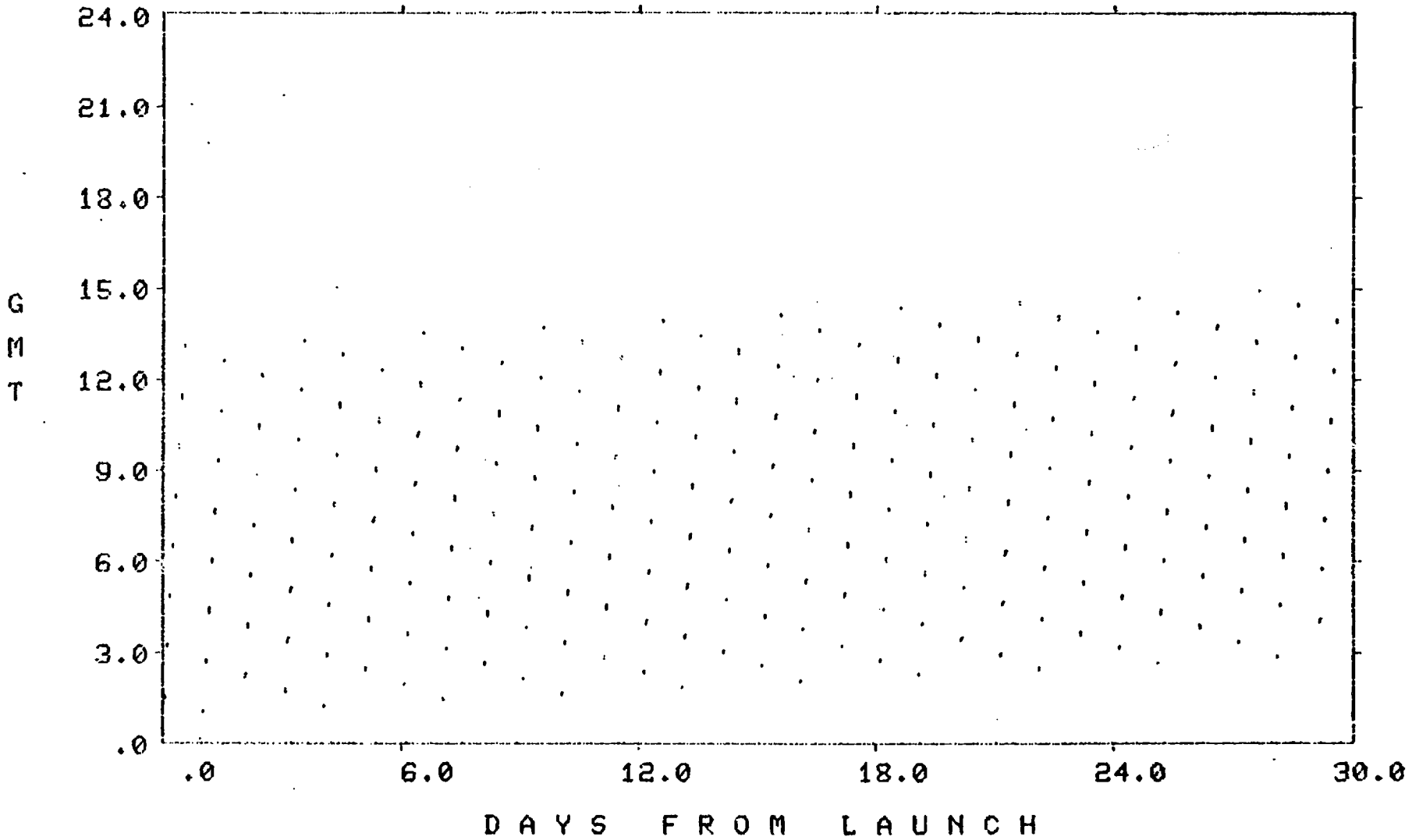
EXAMPLE-DEFSIT,FAIRBANKS,3,0,0,20,0 WILL CHANGE FAIRBANKS TO A CLASS 3 SITE WITH A MINIMUM ELEVATION ANGLE OF 20 DEG. THE LAT,LONG AND ALT WILL NOT BE CHANGED.

COMMAND DEFSIT IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE
(1) NAME		ALPHABETIC	
(2) CODE	1.0000E+00		1.0000E+00 TO 1.0000E+01
(3) LNG	.E+00	DEG	-3.6000E+02 TO 3.6000E+02
(4) LAT	.E+00	DEG	-9.0000E+01 TO 9.0000E+01
(5) ELE	.E+00	DEG	.E+00 TO 9.0000E+01
(6) ALT	.E+00 NM,	.E+00 KM	-1.0000E+20 TO 1.0000E+20

790.174 BY 790.174(KM),INC.=108.00,L-N= 263.6,A-P= 144.0,LAUNCH=135D 0H 0M 0S

FAIRBANKS VIEWING SCHEDULE



STPTRK PLOT

STPTRK-PRODUCES AN ORBIT TRACKING STATION COVERAGE PLOT

A TRACKING STATION COVERAGE PLOT IS A GRAPH OF THE VIEWING SCHEDULE FOR A SATELLITE IN ORBIT BY A PARTICULAR TRACKING STATION IN GMT TIME OF DAY VERSUS TIME IN DAYS FROM LAUNCH. THE ARGUMENTS DEFINE THE TIMES OF INTEREST.

DAY1,DAY2 = TIME PERIOD (DAYS FROM LAUNCH)
GMT1,GMT2 = TIME OF DAY RANGE (GREENWICH MEAN TIME HOURS, 0-24)
EXAMPLE- GMT1=10,GMT2=15 IS 10 AM TO 3 PM

SITE = TRACKING STATION

EXAMPLE- STPTRK,0,6,0,12,QUITO WILL PRODUCE A MORNING SATELLITE VIEWING SCHEDULE FROM THE TRACKING STATION, QUITO FOR THE FIRST WEEK AFTER LAUNCH.

THE COMMAND ORBDEF OR ORBSET MUST BE ENTERED PRIOR TO THE COMMAND STPTRK TO DEFINE THE SATELLITE ORBIT.

STPTRK IS VALID ONLY FOR CIRCULAR ORBITS.

COMMAND STPTRK IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A STPTRK PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL ZOOM

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) DAY1	.E+00 DAYS	.E+00 TO 3.6500E+02
(2) DAY2	1.0000E+01 DAYS	.E+00 TO 3.6500E+02
(3) GMT1	.E+00 HRS	.E+00 TO 2.4000E+01
(4) GMT2	2.4000E+01 HRS	.E+00 TO 2.4000E+01
(5) SITE	ALPHABETIC	

DEFEXP-DEFINES A NEW EXPERIMENT SITE OR CHANGES EXISTING SITE DATA

AN EXPERIMENT SITE IS A SPECIFIC LOCATION OR AREA DEFINED BY ENTERING UP TO TEN LONGITUDE-LATITUDE PAIRS TO DESCRIBE THE SITE. THE ARGUMENT IS THE NAME OF THE EXPERIMENT SITE. IF THE NAME MATCHES AN EXISTING SITE NAME THE COMMAND WILL CHANGE THE DATA ASSOCIATED WITH THAT SITE. OTHERWISE A NEW EXPERIMENT SITE IS CREATED.

THE LONGITUDE-LATITUDE COORDINATES ARE INPUTED EITHER MANUALLY OR BY POSITIONING THE CROSSHAIRS CURSOR ON THE GROUND TRACK DISPLAY. IF AN AREA IS BEING DEFINED, THE PROGRAM RETURNS TO THE STARTING LOCATION TO COMPLETE THE DEFINITION AND INSURE A CLOSED REGION.

COORDINATES WHEN INPUTED MANUALLY ARE GIVEN ONE AT A TIME ON REQUEST AS NOTED IN THE FOLLOWING EXAMPLE.

LONGITUDE,LATITUDE= -- -150.45

LONGITUDES MUST BE BETWEEN -360 AND 360 DEGREES AND LATITUDES BETWEEN -90 AND 90 DEGREES. WHEN ALL COORDINATES HAVE BEEN ENTERED, ENTER "STOP" TO TERMINATE THE DEFINITION PROCESS.

ON THE GROUND TRACK DISPLAY THE CROSSHAIRS CURSOR IS ILLUMINATED TO INPUT COORDINATES. POSITION THEIR INTERSECTION AT THE DESIRED LONGITUDE AND LATITUDE AND THEN ENTER A BLANK. THE CROSSHAIRS WILL CONTINUE TO REAPPEAR FOR REPOSITIONING AND ADDITIONAL DEFINING UNTIL THE POSITIONING THE CROSSHAIRS CURSOR ON THE GROUND TRACK DISPLAY. IF AN AREA IS BEING DEFINED, THE PROGRAM RETURNS TO THE STARTING LOCATION TO COMPLETE THE DEFINITION AND INSURE A CLOSED REGION.

COORDINATES WHEN INPUTED MANUALLY ARE GIVEN ONE AT A TIME ON REQUEST AS NOTED IN THE FOLLOWING EXAMPLE.

LONGITUDE,LATITUDE= -- -150.45

LONGITUDES MUST BE BETWEEN -360 AND 360 DEGREES AND LATITUDES BETWEEN -90 AND 90 DEGREES. WHEN ALL COORDINATES HAVE BEEN ENTERED, ENTER "STOP" TO TERMINATE THE DEFINITION PROCESS.

ON THE GROUND TRACK DISPLAY THE CROSSHAIRS CURSOR IS ILLUMINATED TO INPUT COORDINATES. POSITION THEIR INTERSECTION AT THE DESIRED LONGITUDE AND LATITUDE AND THEN ENTER A BLANK. THE CROSSHAIRS WILL CONTINUE TO REAPPEAR FOR REPOSITIONING AND ADDITIONAL DEFINING UNTIL THE CROSSHAIRS ARE MOVED TO THE BOTTOM OF THE TERMINAL SCREEN TO END THE DEFINITION PROCESS.

COMMAND DEFEXP IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) NAME	ALPHABETIC	

SHWEXP-SHOWS EXPERIMENT SITE DATA

THE SHWEXP COMMAND LISTS EXPERIMENT SITE DATA FOR THE SITES SPECIFIED BY THE ARGUMENT.

FOR EXAMPLE-

SHWEXP.ALL WILL LIST ALL THE EXPERIMENT SITES DEFINED AND THEIR RESPECTIVE LONGITUDE AND LATITUDE RANGES.

SHWEXP.OHIO WILL DISPLAY THE LONGITUDE-LATITUDE COORDINATES DEFINING THE EXPERIMENT SITE. OHIO.

COMMAND SHWEXP IS VALID IN ALL MODES.

SHWEXP WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) NAME	ALL	ALPHABETIC

EXPSIT-DRAWS AN EXPERIMENT SITE ON THE GROUND TRACK PLOT

THE EXPSIT COMMAND DRAWS EXPERIMENT SITES ON THE GROUND TRACK DISPLAY. AN EXPERIMENT SITE IS AN AREA OR LOCATION OF INTEREST SUCH AS A STATE OR A CITY.

THE ARGUMENT IS THE NAME OF THE EXPERIMENT SITE TO BE PLOTTED.

EXAMPLE- EXPSIT.BATTELLE WILL PLOT THE EXPERIMENT SITE BATTELLE ON THE GROUND TRACK DISPLAY.

TO DEFINE AN EXPERIMENT SITE REFERENCE THE COMMAND DEFEXP.

COMMAND EXPSIT IS VALID IN MODES GNDTRK

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) NAME	ALPHABETIC	

DRWLNG-DEFINES. ON THE GNDTRK DISPLAY. A STPLNG RANGE

DRWLNG MAY BE USED TO DEFINE VALUES AND DRAW ON THE SCREEN THE RANGE OF LONGITUDES AT A GIVEN LATITUDE FOR THE STPLNG COVERAGE DISPLAY. ITS OPERATION IS AS FOLLOWS

1. THE CROSSHAIR CURSORS ARE ILLUMINATED.

2. THE USER POSITIONS THEIR INTERSECTION AT ONE END OF THE LONGITUDE RANGE AT THE DESIRED LATITUDE.

3. ENTER A BLANK.

4. A VERTICAL TICK IS DRAWN AND THE CROSSHAIRS ARE RE-ILLUMINATED.

5. POSITION THE X CURSOR (VERTICAL CROSSHAIR) AT THE OTHER END OF THE DESIRED LONGITUDE RANGE.

6. ENTER A BLANK.

7. A SECOND VERTICAL TICK AND A HORIZONTAL LINE WILL BE DRAWN. THE PROGRAM WILL THEN REQUEST THE NEXT IGOS COMMAND.

A SUBSEQUENT STPLNG COMMAND WILL PRODUCE A COVERAGE PLOT FOR THE RANGE SHOWN ON THE SCREEN. NOTE. DRWLNG SETS ONLY LNG1. LNG2. AND LAT. THE REMAINING STPLNG ARGUMENTS ARE UNAFFECTED.

COMMAND DRWLNG IS VALID IN MODES GNDTRK

NO ARGUMENTS

DR*TOD-DEFINES* ON THE GNDTRK OR STPLNG DISPLAYS* A STPTOD LOCATION

DR*TOD MAY BE USED TO DEFINE THE REFERENCE LATITUDE AND LONGITUDE FOR A STPTOD DISPLAY. ITS OPERATION IS AS FOLLOWS-

1. THE CROSSHAIR CURSORS ARE ILLUMINATED.

2. IF ON THE GNDTRK DISPLAY* THE USER POSITIONS THEIR INTERSECTION AT THE DESIRED LATITUDE AND LONGITUDE.

3. IF ON THE STPLNG DISPLAY* THE USER POSITIONS THE HORIZONTAL CROSSHAIR AT THE DESIRED LONGITUDE. NOTE-LATITUDE IS ALREADY DEFINED.

4. ENTER A BLANK.

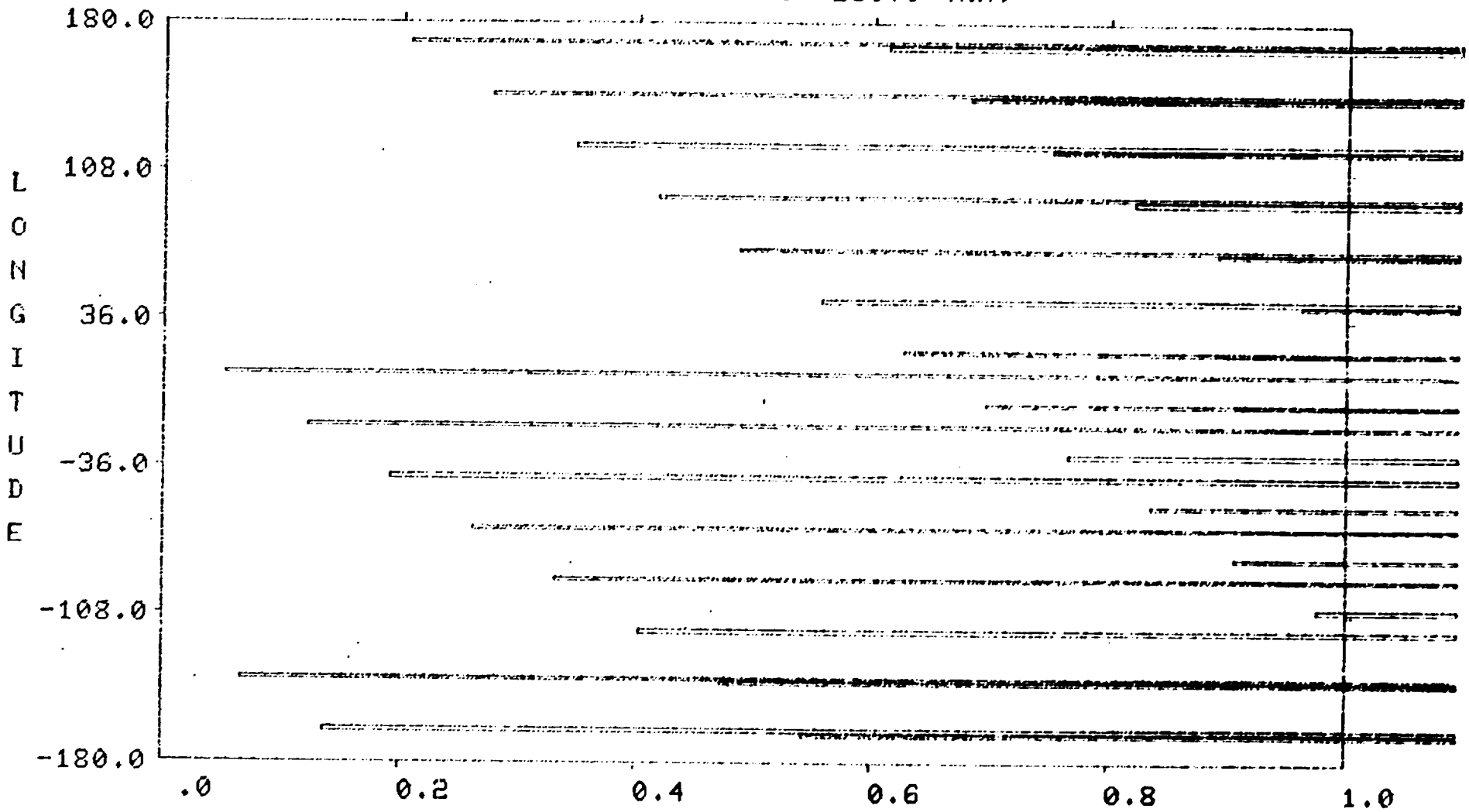
5. A CROSS WILL APPEAR AT THE LOCATION SELECTED ON THE GNDTRK DISPLAY. A HORIZONTAL DASHED LINE AT THE SELECTED LONGITUDE WILL APPEAR ACROSS THE STPLNG DISPLAY. THE PROGRAM WILL THEN REQUEST THE NEXT IGOS COMMAND.

A SUBSEQUENT STPTOD COMMAND WILL PRODUCE A COVERAGE PLOT FOR THE LOCATION REFERENCED ON THE SCREEN. NOTE* DR*TOD SETS ONLY LNG AND LAT. IF ON THE STPLNG DISPLAY* DAY1 AND DAY2 ARE ALSO ASSIGNED VALUES. THE REMAINING STPTOD ARGUMENTS ARE UNAFFECTED.

COMMAND DR*TOD IS VALID IN MODES GNDTRK STPLNG

NO ARGUMENTS

790.174 BY 790.174(KM),INC.=108.00,L-N= 263.6,A-P= 144.0,LAUNCH=135D 0H 0M 0S
SUN ANGLE=180.0 SAR = -330.0 TO -230.0 (KM)



LATITUDE 50.00
SWATH AT THIS LATITUDE = 175.5, 175.5 (KM)

STPLNG PLOT

STPLNG-PRODUCES THE ORBIT STEP LONGITUDE COVERAGE PLOT

A LONGITUDE COVERAGE PLOT IS A GRAPH OF SATELLITE COVERAGE OF A PARTICULAR RANGE OF LONGITUDES AT A SPECIFIC LATITUDE VERSUS TIME IN DAYS FROM LAUNCH. THE ARGUMENTS DEFINE THE REGION OF INTEREST. THREE GRAPHICAL REPRESENTATIONS ARE AVAILABLE THRU THE PLOT OPTION.

DAY1,DAY2= TIME PERIOD (DAYS FROM LAUNCH)
LNG1,LNG2= THE LONGITUDE RANGE (DEGREES)
LAT= LATITUDE (DEGREES)
LY= THE PLOT OPTION
THE PLOT OPTIONS ARE-
LONG= PLOTS LONGITUDE COVERAGE VERSUS TIME
LNG= PLOTS LONG OPTION AND CUMULATIVE LONGITUDE COVERAGE LIVE FOR DEFINED TIME PERIOD.
LNGBB= PLOTS LONG AND LNG OPTIONS USING A BAR GRAPH REPRESENTATION

FOR EXAMPLE-
STPLNG,10,40,-50,120,0,LONG WILL PRODUCE A SATELLITE COVERAGE PLOT FOR DAY 10 THRU DAY 40 AFTER LAUNCH OF LONGITUDES -50 TO 120 DEGREES AT THE EQUATOR

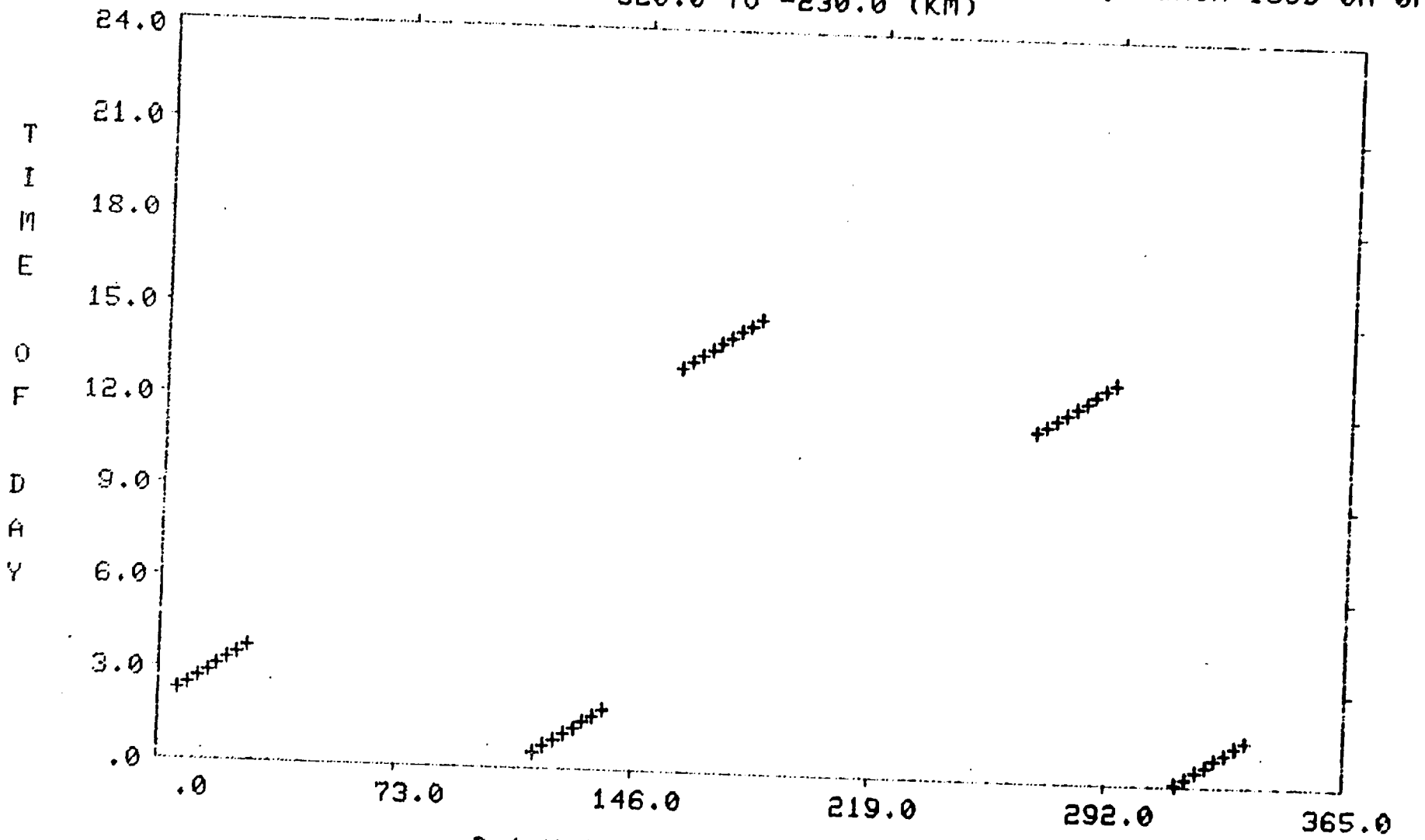
THE COMMAND ORBDEF, ORBSET OR ORBSMA MUST BE ENTERED PRIOR TO THE COMMAND STPLNG TO DEFINE THE SATELLITE ORBIT.

AFTER THE AXES ARE DRAWN AND PERIODICALLY THROUGHOUT THE PLOTTING, THE COMPUTER WILL PAUSE. TYPE A BLANK AND A RETURN TO CONTINUE. A NON-BLANK WILL TERMINATE THE PLOT AND ASK FOR A NEW COMMAND.

COMMAND STPLNG IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A STPLNG PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL ZOOM DRWTOD

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) DAY1	1.0000E+00 DAYS	.E+00 TO 1.0000E+20
(2) DAY2	1.1000E+01 DAYS	.E+00 TO 1.0000E+20
(3) LNG1	.E+00 DEG	-3.6000E+02 TO 3.6000E+02
(4) LNG2	3.6000E+02 DEG	-3.6000E+02 TO 3.6000E+02
(5) LAT	.E+00 DEG	-9.0000E+01 TO 9.0000E+01
(6) LY	LONG	ALPHABETIC

790.174 BY 790.174(KM),INC.=108.00,L-N= 263.6,A-P= 144.0,LAUNCH=135D 0H 0M 0S
SAR = -320.0 TO -230.0 (KM)



LATITUDE 50.00LONGITUDE -90.00
SWATH AT THIS LATITUDE = 158.1, 158.1 (KM)

STPTOD PLOT

STPTOD-PRODUCES THE ORBIT STEP TIME OF DAY COVERAGE PLOT

A TIME OF DAY COVERAGE PLOT IS A GRAPH OF LOCAL TIME OF DAY SATELLITE COVERAGE OF A PARTICULAR LONGITUDE AND LATITUDE VERSUS TIME IN DAYS FROM LAUNCH. THE ARGUMENTS DEFINE THE LOCATION AND TIMES OF INTEREST.

DAY1,DAY2= TIME PERIOD (DAYS FROM LAUNCH)
TOD1,TOD2= LOCAL TIME OF DAY RANGE (HOURS 0-24)
EXAMPLE TOD1=3,TOD2=17 IS 3 AM TO 5 PM
LNG= LONGITUDE (DEGREES)
LAT= LATITUDE (DEGREES)

FOR EXAMPLE-
STPTOD,1,366,6,18,-82,28 WILL PRODUCE A PLOT OF SATELLITE COVERAGE FOR ABOUT A YEAR (DAYS 1 THRU 366 AFTER LAUNCH) DURING THE HOURS 6 AM TO 6 PM OF -82 DEGREES LONGITUDE AND 28 DEGREES LATITUDE

THE COMMAND ORBDEF, ORBSET OR ORBSMA MUST BE ENTERED PRIOR TO THE COMMAND STPTOD TO DEFINE THE SATELLITE ORBIT.

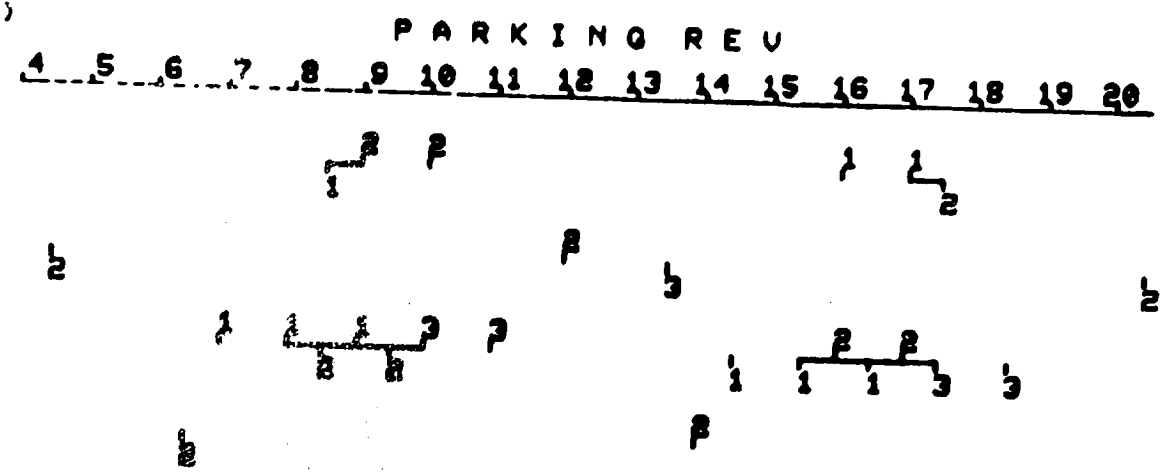
AFTER THE AXES ARE DRAWN AND PERIODICALLY THROUGHOUT THE PLOTTING, THE COMPUTER WILL PAUSE. TYPE A BLANK AND A RETURN TO CONTINUE. A NON-BLANK WILL TERMINATE THE PLOT AND ASK FOR A NEW COMMAND.

COMMAND STPTOD IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A STPTOD PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL ZOOM

ARGUMENT	DEFAULT VALUE	AND UNITS	VALID RANGE		
(1) DAY1	.E+00	DAYS	.E+00	TO	1.0000E+20
(2) DAY2	1.1000E+01	DAYS	.E+00	TO	1.0000E+20
(3) TOD1	.E+00	HRS	.E+00	TO	2.4000E+01
(4) TOD2	2.4000E+01	HRS	.E+00	TO	2.4000E+01
(5) LNG	.E+00	DEG	-3.6000E+02	TO	3.6000E+02
(6) LAT	.E+00	DEG	-9.0000E+01	TO	9.0000E+01

TRANSFER ORBIT INJECTION OPPORTUNITIES

PARKING ORBIT
160 00 BY 160 00(NM)
INC• 28 5



DEPLOY DISPLAY WITH FLON COMMAND

DEPLOY-SHUTTLE PAYLOAD DEPLOYMENT DISPLAY

THE DEPLOYMENT DISPLAY IS A PLOT OF SHUTTLE RELEASE OPPORTUNITIES WHICH SATISFY FINAL ORBIT LONGITUDE OF THE ASCENDING NODE REQUIREMENTS FOR PAYLOADS. ASCENDING AND DESCENDING NODE RELEASES (EXCEPT FOR BIASED BURNS) ARE CONSIDERED DURING THE SHUTTLE PARKING ORBIT. THE ARGUMENTS DEFINE THE RANGE OF POSSIBLE PARKING ORBIT REVOLUTIONS TO BE CONSIDERED FOR DEPLOYMENT.

FOR EXAMPLE: DEPLOY,4,20 DRAWS A DEPLOYMENT DISPLAY FOR INVESTIGATING PAYLOAD RELEASES FROM THE SHUTTLE DURING THE FOURTH THRU THE TWENTIETH PARKING ORBIT REVOLUTIONS.

TO DETERMINE DEPLOYMENT OPPORTUNITIES FOR A SPECIFIC PAYLOAD REFERENCE THE FLON COMMAND.

THE DEPLOY COMMAND REQUIRES PRIOR USE OF THE COMMANDS ORBDEF, ORBSET OR ORBSMA TO DEFINE THE PARKING ORBIT.

COMMAND DEPLOY IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A DEPLOY PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL FLON

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) REV1	1.0000E+00	1.0000E+00 TO 1.5000E+02
(2) REV2	1.0000E+01	1.0000E+00 TO 1.5000E+02

FLON-FINAL ORBIT LONGITUDE OF NODE PLACEMENT

THE FLON COMMAND DETERMINES WHICH SHUTTLE PARKING ORBIT TRANSFER INJECTION AND APOGEE MOTOR BURN OPPORTUNITIES COMBINE TO SATISFY THE FINAL ORBIT ASCENDING NODE PLACEMENT REQUIREMENTS OF A PAYLOAD. THE FIVE ARGUMENTS ARE AS FOLLOWS-

PAYLD = NAME OF PAYLOAD (UP TO 10 CHARACTERS)
APG1 = FIRST APOGEE BURN OPPORTUNITY
APG2 = LAST APOGEE BURN OPPORTUNITY
LON1 = RANGE OF LONGITUDES FOR THE FINAL
LON2 ORBIT ASCENDING NODE (DEG)

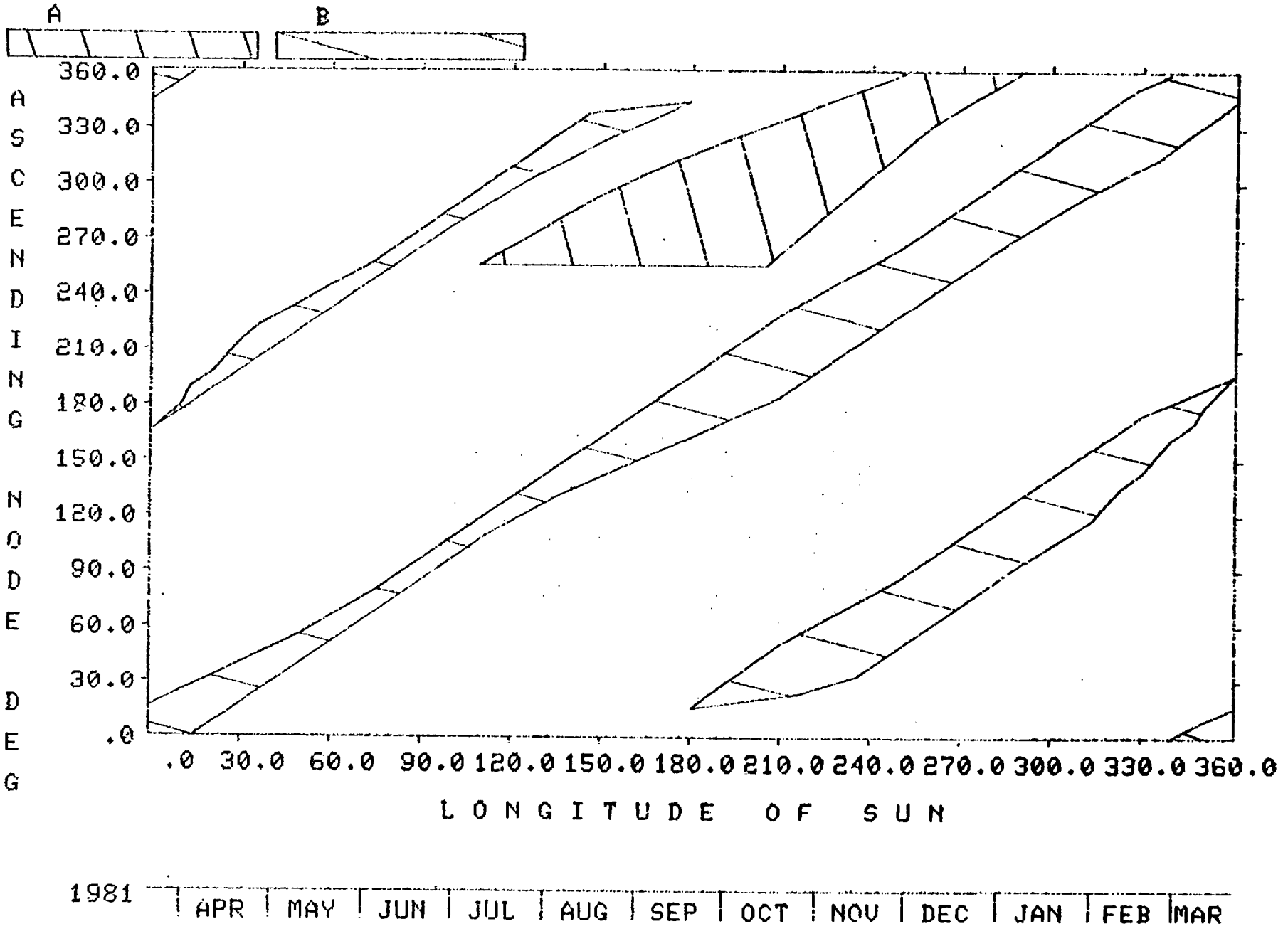
FOR EXAMPLE: FLON,SC1,1,2,50,60 WILL INDICATE THOSE SHUTTLE DEPLOYMENT OPPORTUNITIES FOR WHICH EITHER THE FIRST OR SECOND APOGEE FIRING OPPORTUNITY WOULD PLACE THE FIRST ASCENDING NODE OF THE FINAL ORBIT FOR SC1 BETWEEN 50 AND 60 DEGREES.

ON THE DEPLOYMENT DISPLAY, AN UPWARD (DOWNWARD) TICK INDICATES A SUCCESSFUL NODE PLACEMENT OCCURRED WITH A PERIGEE INJECTION AT OR NEAR AN ASCENDING (DESCENDING) PARKING ORBIT NODE. THE NUMBER NEXT TO THE TICK IS THE FIRST SUCCESSFUL APOGEE BURN OPPORTUNITY ASSOCIATED WITH THAT INJECTION.

FLON REQUIRES PRIOR USE OF THE TRANSFR COMMAND TO DEFINE THE GEOMETRY OF THE PERIGEE AND APOGEE BURNS.

COMMAND FLON IS VALID IN MODES DEPLOY

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE	
(1) PAYLD		ALPHABETIC		
(2) APG1	1.0000E+00		1.0000E+00 TO	1.5000E+01
(3) APG2	1.0000E+00		1.0000E+00 TO	1.5000E+01
(4) LON1	.E+00	DEG	-1.8000E+02 TO	3.6000E+02
(5) LON2	3.6000E+02	DEG	-1.8000E+02 TO	3.6000E+02



LWINDW PLOT WITH DRWMIS COMMAND

LWINDW-LAUNCH WINDOW DISPLAY (ASCENDING NODE VS DAY OF YEAR)

THE LWINDW COMMAND INITIATES A LAUNCH WINDOW DISPLAY WHICH IS A PLOT OF THE RIGHT ASCENSION OF THE ASCENDING NODE VERSUS SOLAR LONGITUDE. THE RANGE OF THE PLOT IS DEFINED BY THE ARGUMENTS AS FOLLOWS-

LNG1,LNG2 = RANGE OF SOLAR LONGITUDE (DEGREES)
NMIN,NMAX = RANGE OF ASCENDING NODE RIGHT ASCENSION (DEGREES)

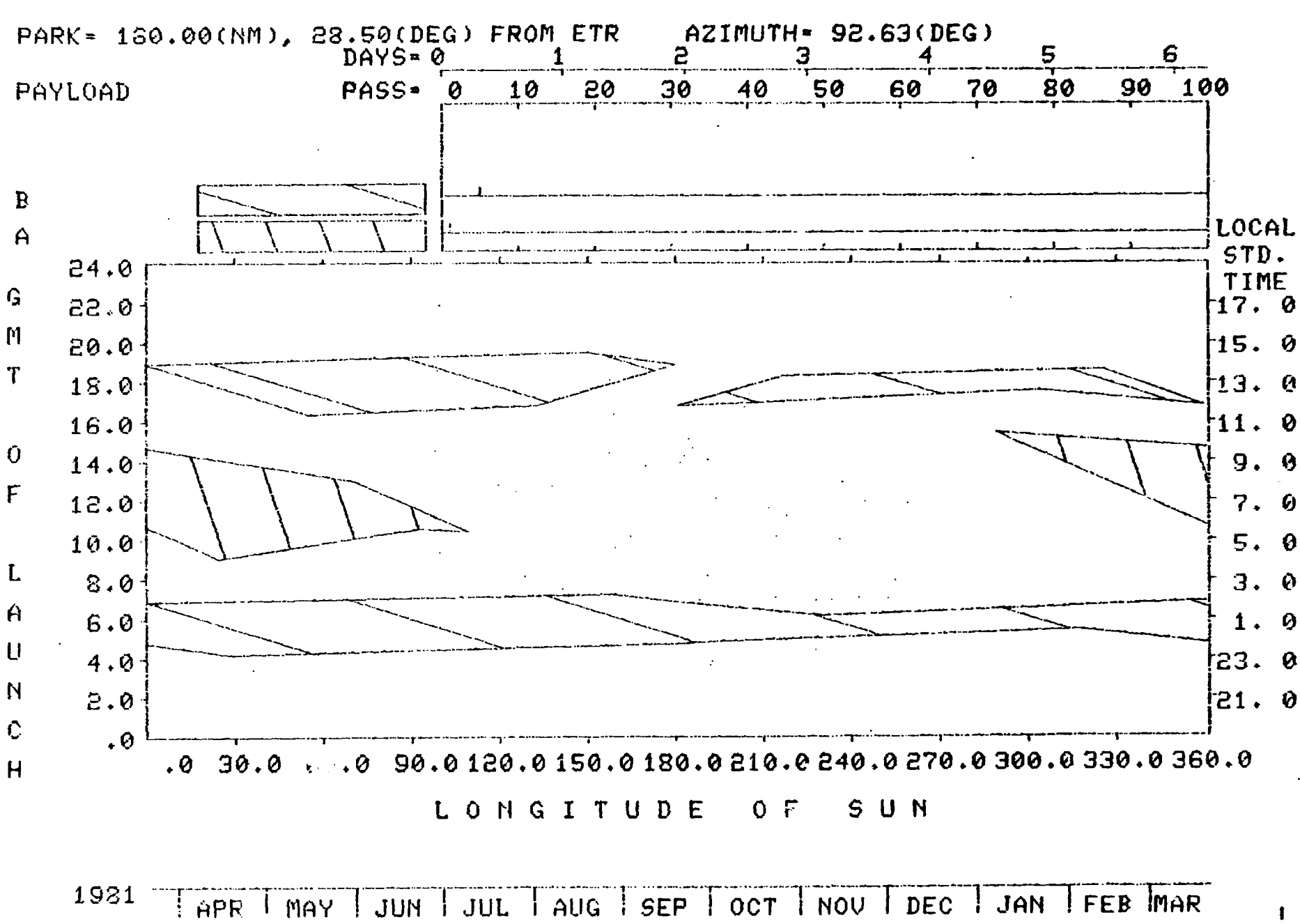
FOR EXAMPLE-
LWINDW,0,180,0,360 PRODUCES A LAUNCH WINDOW DISPLAY FOR SOLAR LONGITUDES 0 TO 180 DEGREES AND ASCENDING NODE RIGHT ASCENSIONS 0 TO 360 DEGREES.

TO DEFINE AND PLOT LAUNCH WINDOW CONSTRAINTS REFERENCE THE COMMANDS MISSN, DEFCON, PLTCON AND SHWCON. REGIONS OF THE DISPLAY WILL BE SHADED TO INDICATE WHICH LAUNCH OPPORTUNITIES SATISFY PARTICULAR SPACECRAFT AND MISSION CONSTRAINTS.

THE X AXIS IS ANNOTATED WITH THE MONTH AND, IF THE SCALE PERMITS, THE DATE AND DAY OF THE WEEK. THE CALANDAR IS BASED ON THE YEAR DEFINED BY THE COMMAND YEAR (DEFAULT=1981).

COMMAND LWINDW IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A LWINDW PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL ZOOM PLTCON LAUSTS DRWMIS

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) LNG1	.E+00 DEG	-3.6000E+02 TO 3.6000E+02
(2) LNG2	3.6000E+02 DEG	-3.6000E+02 TO 3.6000E+02
(3) NMIN	.E+00 DEG	-3.6000E+02 TO 3.6000E+02
(4) NMAX	3.6000E+02 DEG	-3.6000E+02 TO 3.6000E+02



SWINDW PLOT WITH DRWMIS COMMAND

SWINDW-LAUNCH WINDOW DISPLAY (LAUNCH TIME VERSUS DAY OF THE YEAR)

SWINDW IS SIMILAR TO LWINDW EXCEPT THAT THE TIME OF LAUNCH, RATHER THAN LON, IS USED AS THE VERTICAL AXIS. THIS REQUIRES TWO ADDITIONAL ARGUMENTS-

LSITE=LAUNCH SITE (ETR OR WTR)
INS=NORTH OR SOUTH AZIMUTH

THE PARKING ORBIT IS DEFINED USING ORBSET PRIOR TO SWINDW. SWINDW THEN SETS THE PARKING LON AND ARG.PER. SO THAT LATER GNDTRK PLOTS WILL SHOW PASSES STARTING AT THE DESIGNATED SITE.

A SMALL GRID IS DRAWN AT THE TOP OF THE SCREEN. THIS IS USED TO RECORD PASS NUMBERS PLOTTED WITH THE DRWMIS COMMAND.

COMMAND SWINDW IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A SWINDW PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL ZOOM DRWMIS

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE		
(1) LNG1	.E+00	DEG	-3.6000E+02	TO	3.6000E+02
(2) LNG2	3.6000E+02	DEG	.E+00	TO	3.6000E+02
(3) GMT1	.E+00	HRS	-2.4000E+01	TO	2.4000E+01
(4) GMT2	2.4000E+01	HRS	.E+00	TO	2.4000E+01
(5) LSITE	ETR	ALPHABETIC			
(6) INS	1.0000E+00	1=S,2=N	1.0000E+00	TO	2.0000E+00

TRNSFR-DEFINE THE TRANSFER ORBIT

THE TRNSFR COMMAND DEFINES THE TRANSFER ORBIT AND FINAL ORBIT TO BE USED IN LAUNCH WINDOW CONSTRAINT ANALYSIS. THE ARGUMENTS DETERMINE THE TRANSFER AND FINAL ORBITS AS FOLLOWS-

TAPG=TRANSFER APOGEE ALTITUDE
TPER=TRANSFER PERIGEE ALTITUDE
TINC=TRANSFER INCLINATION
APGNO=NUMBER OF APOGEE PASSAGES TO AKM BURN
FALT=FINAL ORBIT ALTITUDE(CIRCULAR)
FINC=FINAL ORBIT INCLINATION

THE PARKING ORBIT MUST BE PREVIOUSLY SET WITH ORBDEF. ORBSET. ORBSMA OR ORBGET. THE PARKING ORBIT MUST BE CIRCULAR.

THE ABSOLUTE MAGNITUDE OF TAPG.TPER AND TINC ARE USED FOR ALL CALCULATIONS. THE SIGNS HAVE THE FOLLOWING SPECIAL MEANINGS-

TAPG.LT.0=AKM BURN WHEN PASSING DOWN THROUGH FALT
TPER.LT.0=PKM BURN IN DOWN DIRECTION
TINC.LT.0=PKM BURN NEAR ASCENDING PARKING ORBIT NODE

ALSO-

TAPG=0 SETS TAPG=FALT
TPER=0 SETS TPER= PARKING ORBIT ALTITUDE
FALT=0 SETS FALT=19324 NM. GEO-SYNCH ALTITUDE

EXAMPLE- TRNSFR.0.0.27.1.0.0
SETS AN UNBIASED TRANSFER (HOHMAN BURNS) AT 27 DEG. INC. FROM A PKM BURN ON A DESCENDING EQUATORIAL CROSSING TO A GEO-SYNCH EQUATORIAL ORBIT WITH AKM BURN AT THE FIRST APOGEE.

COMMAND TRNSFR IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) TAPG	.E+00 NM. .E+00 KM	-1.0000E+20 TO 1.0000E+20
(2) TPER	.E+00 NM. .E+00 KM	-1.0000E+20 TO 1.0000E+20
(3) TINC	.E+00 DEG	-1.8000E+02 TO 1.8000E+02
(4) APGNO	1.0000E+00	1.0000E+00 TO 9.9000E+01
(5) FALT	.E+00 NM. .E+00 KM	.E+00 TO 1.0000E+20
(6) FINC	.E+00 DEG	-1.8000E+02 TO 1.8000E+02

MISSN-DEFINES OR SELECTS A MISSION

A MISSION IS A GROUP OF TRANSFER ORBIT LAUNCH WINDOW CONSTRAINTS TO BE INVESTIGATED ON THE LAUNCH WINDOW DISPLAY. THE MISSN COMMAND DEFINES A NEW MISSION NAME OR SELECTS AN EXISTING ONE. THE ARGUMENT IS THE NAME OF THE MISSION.

A MISSN COMMAND MUST BE ENTERED PRIOR TO DEFINING OR REQUESTING A PLOT OF LAUNCH WINDOW CONSTRAINTS. (SEE THE DEFCON AND PLTCON COMMANDS.) AFTER A MISSION NAME IS ENTERED, IT IS THE REFERENCE MISSION FOR ALL SUBSEQUENT LAUNCH WINDOW CONSTRAINT MANIPULATIONS UNTIL THE NEXT MISSN COMMAND. FOR EXAMPLE-

MISSN,GE TDRS ESTABLISHES GE TDRS AS THE CURRENT REFERENCE MISSION FOR LAUNCH WINDOW CONSTRAINT DEFINITIONS AND PLOTTING.

COMMAND MISSN IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) NAME	ALPHABETIC	

SHWCON-SHOW LAUNCH WINDOW CONSTRAINT DATA

THE SHWCON COMMAND DISPLAYS CURRENTLY DEFINED TRANSFER ORBIT LAUNCH WINDOW CONSTRAINT DATA. ALL DATA OR LAUNCH WINDOW CONSTRAINTS DEFINED FOR A PARTICULAR MISSION CAN BE SHOWN. THE ARGUMENT IS THE NAME OF THE MISSION. IF ALL IS ENTERED, A TABLE OF ALL LAUNCH WINDOW CONSTRAINT DATA IS DISPLAYED. IF AN EXISTING MISSION NAME IS ENTERED, CONSTRAINTS FOR THAT MISSION ARE LISTED. FOR EXAMPLE-

SHWCON,GE TDRS WILL LIST THE LAUNCH WINDOW CONSTRAINTS ASSOCIATED WITH THE MISSION, GE TDRS.

SHWCON,ALL WILL LIST CONSTRAINT DATA FOR ALL MISSIONS.

COMMAND SHWCON IS VALID IN ALL MODES.

SHWCON WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) NAME	ALL	ALPHABETIC

DEFCON-DEFINES LAUNCH WINDOW CONSTRAINT DATA

LAUNCH WINDOW CONSTRAINTS ARE SOLAR ASPECT ANGLE, EARTH-SPACECRAFT-SUN ANGLE OR ECLIPSE TIME REQUIREMENTS DURING THE TRANSFER ORBIT. ALL CONSTRAINTS ARE GROUPED BY MISSION NAME (SEE THE MISSN COMMAND). THE DEFCON COMMAND DEFINES OR CHANGES LAUNCH WINDOW CONSTRAINT DATA. ITS ARGUMENTS ARE AS FOLLOWS-

ID = CONSTRAINT IDENTIFICATION NUMBER
CONST = CONSTRAINT TYPE CODE
ARG1,ARG2,ARG3 = ARGUMENTS ASSOCIATED WITH THE CONSTRAINT

THE ID IS A UNIQUE REFERENCE NUMBER WITHIN A MISSION. TO ALTER PREVIOUSLY DEFINED CONSTRAINT DATA, THE APPROPRIATE CONSTRAINT ID IS RE-ENTERED FOR THE DEFCON COMMAND.

THE TYPES OF LAUNCH WINDOW CONSTRAINTS AVAILABLE AND THEIR RESPECTIVE CODES AND ARGUMENTS INCLUDE-

CODE	CONSTRAINT TYPE	ARG1		ARG2		ARG3
AKM	APOGEE KICK MOTOR SOLAR ASPECT ANGLE	ANGLE1	TO	ANGLE2		----
PKM	INJECTION SOLAR ASPECT ANGLE	ANGLE1	TO	ANGLE2		----
NORM	ORBIT NORMAL SOLAR ASPECT ANGLE	ANGLE1	TO	ANGLE2		----
SESC	EARTH-S/C-SUN ANGLE	ANGLE1	TO	ANGLE2	AT	TRUE ANOMALY
SHADOW	TIME IN SHADOW (1=PRK,2=XFR)			HOURS		----
LON	TRANSFER ASC.NODE	ANGLE1	TO	ANGLE2		----
LN-LS	A.NODE-SUN LNG.(NOON=12)	HOUR1	TO	HOUR2		

ENTER CONSTRAINT DATA TO DEFINE FORBIDDEN SPACECRAFT CONDITIONS. FOR EXAMPLE-
DEFCON,1,SESC,0,30,150 DEFINES CONSTRAINT NUMBER 1 OF THE CURRENT MISSION AS THE EARTH-SPACECRAFT-SUN ANGLE CAN NOT BE BETWEEN 0 AND 30 DEGREES WHEN THE TRUE ANOMALY IS 150 DEGREES.

A MISSN COMMAND MUST BE ENTERED PRIOR TO A DEFCON COMMAND TO DEFINE THE CURRENT MISSION.

THE CONSTRAINTS FOR A SAVED MISSION MAY BE ENTERED IN THE TABLE USING THE COMMAND GETCON.

COMMAND DEFCON IS VALID IN ALL MODES.

ARGUMENT	DEFAULT VALUE AND UNITS		VALID RANGE	
(1) ID	.E+00		1.0000E+00 TO	2.5000E+01
(2) CONST		ALPHABETIC		
(3) ARG1	.E+00	DEG	.E+00 TO	3.6000E+02
(4) ARG2	.E+00	DEG	.E+00 TO	3.6000E+02
(5) ARG3	.E+00	DEG	.E+00 TO	3.6000E+02

PLTCON-PLOTS LAUNCH WINDOW CONSTRAINTS

THE PLTCON COMMAND PLOTS TRANSFER ORBIT CONSTRAINTS ASSOCIATED WITH THE CURRENT REFERENCE MISSION ON THE LAUNCH WINDOW DISPLAY. UP TO THREE PARTICULAR CONSTRAINTS OR ALL OF A MISSION'S LAUNCH WINDOW CONSTRAINTS CAN BE REQUESTED. THE ARGUMENTS DESCRIBE WHICH CONSTRAINTS ARE PLOTTED AND HOW THEY ARE SHADED.

THE MAGNITUDE OF THE FIRST ARGUMENT, HATCH, IS THE APPROXIMATE NUMBER OF LINES TO BE USED TO SHADE REGIONS. 0 REQUESTS NO SHADING. A POSITIVE (NEGATIVE) VALUE WILL SHADE THE UNSATISFACTORY (SATISFACTORY) LAUNCH OPPORTUNITIES. SHADING THE GOOD LAUNCH OPPORTUNITIES IS RECOMMENDED ONLY IF ALL CONSTRAINTS ARE PLOTTED AT ONCE.

THE LAST THREE ARGUMENTS ARE THE CONSTRAINT IDENTIFICATION NUMBERS (SEE THE DEFCON COMMAND). TO PLOT ALL THE MISSION CONSTRAINTS ENTER AN ID OF 0. FOR EXAMPLE-

PLTCON,-30.0 WILL PLOT ALL LAUNCH WINDOW CONSTRAINTS OF THE CURRENT MISSION AND SHADE THE SATISFACTORY LAUNCH OPPORTUNITIES

PLTCON,40,5,7 WILL PLOT CONSTRAINTS NUMBER 5 AND 7 OF THE CURRENT MISSION AND SHADE THE UNSATISFACTORY LAUNCH OPPORTUNITIES.

A MISSN COMMAND MUST BE ENTERED PRIOR TO A PLTCON COMMAND TO DEFINE THE CURRENT MISSION. PARKING AND TRANSFER ORBITS MUST ALSO BE DEFINED USING ORBSET (OR ORBDEF) AND TRNSFR.

COMMAND PLTCON IS VALID IN MODES LWINDW

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) HATCH	5.0000E+01	-6.0000E+01 TO 6.0000E+01
(2) ID1	1.0000E+00	.E+00 TO 2.5000E+01
(3) ID2	.E+00	.E+00 TO 2.5000E+01
(4) ID3	.E+00	.E+00 TO 2.5000E+01

DRWMIS-DRAWS SAVED MISSION LAUNCH WINDOWS

DRWMIS WILL DRAW AND SHADE THE ACCEPTABLE LAUNCH WINDOW FOR A MISSION WHICH HAS BEEN SAVED USING THE COMMAND SAVMIS.

A LIST OF SAVED MISSIONS MAY BE DISPLAYED BY THE COMMAND SHWMIS.ALL.

EXAMPLE- DRWMIS.I-V WILL DRAW AND SHADE THE I-V LAUNCH WINDOW. I-V IS A USER SAVED LAUNCH WINDOW MISSION.

IF DRWMIS IS USED WITH AN SWINDW PLOT A SECOND ARGUMENT IS REQUIRED. THIS DESIGNATES ON WHICH PARKING ORBIT PASS THE BURN TO THE TRANSFER ORBIT IS MADE. INTEGER PASS NUMBERS INDICATE BURNS NEAR AN ASCENDING EQUATORIAL CROSSING. FRACTIONS NEAR 1/2 INDICATE DESCENDING CROSSINGS. THE SAVED MISSION WINDOW IS ADJUSTED FOR THE PROPER CROSSING DIRECTION. EACH USE OF DRWMIS WILL MAKE AN ANNOTATION ON THE PLOT. IF THE MISSION NAME HAS NOT BEEN PREVIOUSLY USED ON THE PLOT THE MISSION NAME AND A SHADING LEGEND ARE DRAWN. ON SWINDW PLOTS A TICK MARK IS MADE TO INDICATE THE PASS NUMBER. THE DIRECTION OF THE TICK INDICATES THE EQUATORIAL CROSSING (UP OR DOWN) .

EXAMPLES-

DRWMIS,I-V,.5 ASSUMES PKM BURN ON THE FIRST SOUTH EQUATORIAL CROSSING.

DRWMIS,I-V,1.0 ASSUMES PKM BURN ON THE FIRST NORTH CROSSING.

COMMAND DRWMIS IS VALID IN MODES LWINDW SWINDW

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) MISSION	ALL ALPHABETIC	
(2) PASS	1.0000E+00 NO	5.0000E-01 TO 2.0000E+02

LAUSTS-DRAWS AN ORBITER NODE TRACE ON THE LAUNCH WINDOW PLOT

THE LAUSTS COMMAND DEFINES A STS LAUNCH FOR LAUNCH WINDOW CONSTRAINT ANALYSIS. THE ARGUMENTS ARE AS FOLLOWS-

LSITE = LAUNCH SITE CODE
ETR = EASTERN TEST RANGE
WTR = WESTERN TEST RANGE
WAL-N = WALLOPS ISLAND (NORTHERN AZIMUTHS)
WAL-S = WALLOPS ISLAND (SOUTHERN AZIMUTHS)
SAN MARC = SAN MARCO ISLAND
DUR = DURATION (DAYS)
SUNLNG = SOLAR LONGITUDE (DEGREES)
NODLNG = ASCENDING NODE RIGHT ASCENSION (DEGREES)

IF THE VALUES OF SUNLNG AND NODLNG ARE -1. THE CROSSHAIRS CURSOR WILL LIGHT UP. POSITION THE CROSSHAIRS ON THE PLOT TO DEFINE THE SOLAR LONGITUDE AND ASCENDING NODE RIGHT ASCENSION AND TYPE A BLANK FOLLOWED BY A CARRIAGE RETURN.

THE LAUSTS COMMAND WILL DRAW A LINE REPRESENTING THE PARKING ORBIT ASCENDING NODE PRECESSION WITH TIME. IF THE PLOT SCALE IS SMALL ENOUGH, TICK MARKS WILL BE DRAWN AT EACH DISCRETE PKM BURN OPPORTUNITY (ASCENDING OR DESCENDING NODES).

EXAMPLE- LAUSTS,ETR,3,71,5 WILL DRAW THE PARKING ORBIT ASCENDING NODE PRECESSION FOR AN ETR STS LAUNCH FOR 3 DAYS FOR AN INITIAL SOLAR LONGITUDE OF 71 DEGREES AND ASCENDING NODE RIGHT ASCENSION OF 5 DEGREES.

COMMAND LAUSTS IS VALID IN MODES LWINDW

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) LSITE	ETR ALPHABETIC	
(2) DUR	7.0000E+00 DAYS	.E+00 TO 3.6550E+02
(3) SUNLNG	-1.0000E+00 DEG	-1.0000E+00 TO 3.6000E+02
(4) NODLNG	-1.0000E+00 DEG	-1.0000E+00 TO 3.6000E+02

SAVMIS-SAVES MISSIONS FOR LATER WINDOW PLOTTING USING DRVMIS

EACH IGOS USER MAY SAVE UP TO 20 MISSION LAUNCH WINDOWS. IF A USER HAS NO MISSION FILE SAVMIS WILL CREATE ONE. THE USER IS ASKED THE DESIRED RETENTION PERIOD. AT THE END OF THIS PERIOD THE FILE WILL BE PURGED. IF THE USER HAS AN EXISTING FILE, SAVMIS WILL ADD THE MISSION TO IT.

PRIOR TO EXECUTION OF SAVMIS THE COMMANDS ORBSET,TRANSFER,MISSN, AND DEFCON SHOULD BE USED AS IF THE WINDOW WAS TO BE CREATED USING LWINDW AND PLTCON.
EXECUTION OF SAVMIS BEGINS WITH A SCREEN ERASE AND DISPLAY OF THE CONSTRAINTS THAT WILL BE USED TO CREATE THE WINDOW. THE PROGRAM ASKS FOR A BLANK TO VERIFY THE CONSTRAINTS. ANY OTHER CHARACTER WILL ABORT THE SAVE OPERATION.

SAVMIS THEN CONTINUES AS IF LWINDW AND PLTCON HAD BEEN ENTERED. THE WINDOW IS COMPUTED AND DRAWN. A BLANK IS AGAIN USED TO VERIFY THAT THE WINDOW IS TO BE SAVED. BE SURE TO CONFIRM THAT THE CORRECT PARKING AND TRANSFER ORBITS WERE USED IN COMPUTING THE WINDOW.

THE PARKING ORBIT, TRANSFER ORBIT, CONSTRAINTS AND WINDOW DATA ARE THEN WRITTEN ON THE MISSION FILE. THE DATA ARE STORED UNDER THE NAME USED AS AN ARGUMENT WITH SAVMIS.

THE CONSTRAINTS ARE REMOVED FROM THE TABLE. HOWEVER, THEY MAY BE REPLACED USING THE COMMAND GETCON.

EXAMPLE- SAVMIS,TEST WILL SAVE THE PARKING ORBIT, TRANSFER ORBIT, CONSTRAINTS AND LAUNCH WINDOW DATA OF THE CURRENT REFERENCE MISSION ON THE USER MISSION FILE WITH THE NAME TEST.

COMMAND SAVMIS IS VALID IN ALL MODES. IT WILL ERASE THE SCREEN AND INITIATE A SAVMIS PLOT. THE FOLLOWING COMMANDS MAY THEN BE USED TO ENHANCE THE PLOT. LABEL

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) MISSION	UNSET	ALPHABETIC

SHWMIS-SHOWS THE SAVED MISSION WINDOWS

SHWMIS.ALL-SHOWS THE CREATION DATE. DATE OF LAST ADDITION. AND RETENTION PERIOD OF THE USERS MISSION FILE. THE NAMES OF ALL SAVED MISSIONS ARE ALSO SHOWN.

SHWMIS.NAME-SHOWS THE PARKING. TRANSFER ORBIT AND CONSTRAINT DATA FOR THE SAVED MISSION. NAME.

COMMAND SHWMIS IS VALID IN ALL MODES.

SHWMIS WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) MISSION	ALL	ALPHABETIC

PURMIS-PURGES A SAVED MISSION WINDOW

THE NAMED MISSION IS REMOVED FROM THE USERS MISSION FILE. IF THE LAST MISSION ON A FILE IS PURGED, THE FILE IS NOT PURGED. IT REMAINS AS A FILE OF ZERO MISSIONS. TO PURGE A FILE BEFORE THE END OF ITS RETENTION PERIOD CALL BATTELLE.

EXAMPLE- PURMIS.TEST WILL PURGE THE DATA AND LAUNCH WINDOW OF TEST ON THE USER MISSION FILE.

COMMAND PURMIS IS VALID IN ALL MODES.

PURMIS WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) MISSION	ALPHABETIC	

GETCON-PUTS THE SAVED CONSTRAINTS INTO THE TABLE

GETCON MAY BE USED TO MODIFY A SAVED MISSION WINDOW WITHOUT ENTERING EACH CONSTRAINT INDIVIDUALLY.

FOR EXAMPLE, TO MODIFY A SAVED MISSION NAMED TEST

1-GETCON.TEST	MOVES THE CONSTRAINTS TO THE TABLE
2-SHWMIS.TEST	DISPLAYS PARK ORBIT AND CON. DATA
3-MISSN.TEST	MAKES TEST THE CURRENT MISSION
4-ORBSET	IF NEEDED TO SET PARKING ORBIT
5-TRNSFR	IF NEEDED TO SET TRANSFER DATA
6-DEFCON	AS NEEDED TO MOD/ADD CONSTRAINTS
7-PURMIS.TEST	TO PURGE OLD DATA AND WINDOW
8-SAVMIS.TEST	TO SAVE MODIFIED DATA AND WINDOW

THE PURGE WAS NOT DONE UNTIL JUST BEFORE SAVMIS TO MINIMIZE THE CHANCE OF NOT GETTING THE NEW WINDOW SAVED.

IF BOTH THE OLD AND NEW VERSIONS ARE TO BE SAVED, OMIT THE PURMIS AND USE A NEW NAME.

7-SAVMIS.TEST-X

COMMAND GETCON IS VALID IN ALL MODES.

GETCON WILL ERASE THE SCREEN

ARGUMENT	DEFAULT VALUE AND UNITS	VALID RANGE
(1) MISSION	ALL	ALPHABETIC

NO TEACH MESSAGE IS AVAILABLE FOR THESE COMMANDS

MANUAL 1 ARGUMENTS