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Revised Page
20 May 1960
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DISCOVERER
SYSTEM TEST DIRECTIVE

Contrac[redacted]

Approved:
[redacted] Manager
Systems Operations
Satellite Systems

Approved:
[redacted]
Colonel, USAF
Chairman, STWG

Notice of Missing Page(s)

Pages A-1-2, A-3-36, A-5-4, A-5-30, and A-7-32 of the original document were blank and unnumbered.

Notice of Page Substitution

Appendix A

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

NOTICE

An extensive Appendix A Tab is required for Discoverer XII to cover the major changes that resulted from the decision to fly a diagnostic capsule and increase the detection capability of the Recovery Force. Some information contained in this basic text may be revised in Appendix A to reflect operational changes made after this publication.

An extensive Appendix A Tab is also required for each of the flight vehicles after Discoverer XII because the recovery and post-recovery operations sections have not been included in this basic text. This has been done because the Recovery Force configuration for subsequent flights may be revised again as significant new data are obtained.

FOREWORD

This Discoverer System Test Directive (STD) has been prepared by LMSD Satellite Systems Operations Planning for the System Test Working Group as a requirement of Contract [redacted] Comments should be directed to the System Test Working Group.

The first basic Discoverer STD was dated 10 December 1959. A complete revision, superseding that basic document was published 12 February and partly revised on 7 and 11 March, 1960. This document is a complete revision and supersedes all previously published basic STD material. All of the information and direction contained in this revised document are effective as of 20 May 1960.

Appendix A is made up of Tab sections which are prepared separately for each flight. Information contained in each tab will be effective as of the date appearing on the approval page for the tab, unless otherwise indicated (i.e., a revision page).

CONTENTS

CONTENTS (Continued)

ILLUSTRATIONS

TABLES

[redacted]
Revised Page
20 May 1960

ABBREVIATIONS

Station Code	Station	Teletype Code
[redacted]	[redacted]Tracking Station	[redacted]
STC	Satellite Test Center	ISTC
HCC	Hawaii Control Center	HICK
[redacted]	[redacted]cking Station	[redacted]
	[redacted]racking Station	
PAC	Palo Alto Computer	PALO
T/M Ship	Telemetry Ship	
VCC	Vandenberg Control Center	VAFB
[redacted]	[redacted]racking Station	[redacted]

Miscellaneous

C-W	Continuous Wave
D/F	Direction Finder
DTO	Detailed Test Objectives
ETPD	Estimated Time of Parachute Deployment
ETA	Estimated Time of Arrival
ETT	Estimated Time to Track
FTD	Flight Test Directive
GMT	Greenwich Mean Time
MECO	Main Engine Cutoff
SSB	Single Sideband
SS/D	Subsystem D
T/M	Telemeter, Telemetry
TT	Teletype
VERLORT	Very Long Range Tracker
WPM	Words per Minute
WWV	National Bureau of Standards Radio Station (transmits standard time signals)
H/S	Horizon Scanner

SECTION 1
INTRODUCTION

1.1 APPLICATION

The Discoverer System Test Directive (STD) has been prepared for use in the conduct of tests defined in Discoverer Detailed Test Objectives (DTO), [redacted] as progressively modified by appendices to include successive Discoverer vehicles. The main body of this document is applicable to all flights and will be corrected as required. Specific data for individual flights are presented in appendices tabbed with the appropriate vehicle number. The appendices will be issued chronologically at least 30 days prior to each programmed launch date and will be corrected immediately if changes occur subsequent to their publication.

1.2 SCOPE OF SYSTEM TEST DIRECTIVE

The STD is a plan for the conduct of Discoverer flight operations under the direction of the Satellite Test Center (STC) and is to be implemented as a directive upon the initiation of applicable test operations. It provides a general description of the overall flight program with specific directions for tracking, data recording and transmission, and vehicle command operations required after the vehicle leaves the launch pad. It also details integration of the Recovery Force deployment and operations into the overall system operation.

1.2.1 This document defines the following:

a. Configuration of the Discoverer System tracking, command, control, and communications network

b. Sequence and format of responsibilities and cognizance during system countdown

c. Tracking station prelaunch preparations

d. Mode of operation of [redacted] Tracking Station [redacted] and [redacted] Tracking Station [redacted] equipment during the launch phase

e. Emergency procedures and alternate modes of operation for the launch phase as necessitated by equipment malfunctions

f. Format and sequence for transmitting real-time exit data

g. Mode of operation of equipment for orbital acquisition and tracking

h. Emergency procedures and alternate modes of operation for orbital acquisition and tracking as necessitated by equipment malfunctions

i. Control exercised by the STC over all elements of the system during prelaunch, launch, orbit tracking, and recovery operations

j. Procedures for recovery force assembly, checkout, briefing deployment, and recovery operations

k. Data and report requirements.

1.2.2 Prelaunch and launch pad operations associated with the vehicle and launch pad facilities are purposely treated in generalities in this document. Details of this phase of operations will be presented in the appropriate Discoverer Flight Test Directive (FTD), which is the responsibility of the Flight Test Working Group at Vandenberg Air Force Base (VAFB). Both test directives (STD and FTD) should be prepared using the DTO as a guide and must be in agreement with objectives and general test specifications presented therein.

1.3 AUTHENTICATION

The STD is reviewed and approved by the System Test Working Group and the 6594th Test Wing (Satellite) (ARDC) before publication. DTO, STD, and FTD together comprise the approved operational procedures for the conduct of each test.

1.4 RELEASE OF INFORMATION

All official information released by LMSD concerning flight operations will be presented to the Air Force System Test Controller by the LMSD System Test Director. The Air Force System Test Controller will provide this information to Headquarters, AFBMD. The release of information concerning flight operations will be made in accordance with the current AFBMD Implementation Plan.

1.5 LAUNCH NOTIFICATION

Launch notification messages are prepared and disseminated by the 6594th Test Wing (Satellite) (ARDC) to all appropriate activities. These messages are the receiving activities' official notification of the final approved launch date and time.

SECTION 2
FLIGHT INFORMATION

2.1 OBJECTIVES

The primary objectives of the Discoverer System flights will be the demonstration of orbit capability, cognizance and control of satellite equipment during orbit, and air or surface recovery of a re-entry nose capsule for direct examination. A Discoverer Vehicle consists of Discoverer Booster (Thor), and Discoverer Satellite (Agena orbital stage plus Discoverer payload). The Discoverer payload will consist of either a GFE capsule for advanced engineering tests, a Mark II biomedical capsule for studies involving small primates, GRD instrumentation, or a substitute diagnostic capsule to obtain comprehensive environmental data at the orbiting altitude. A detailed discussion of the test objectives is included in the DTO.

2.2 LAUNCH DATA

2.2.1 Launch data are shown in Table A2-1 of Appendix A, the applicable Tab. (A numbered tab will be prepared for each flight.)

2.2.2 Pads 4 and 5 of launch complex SM-75-3 at Vandenberg Air Force Base have been designated for use in Discoverer Program IIA. The Discoverer Vehicle will complete its roll program to the desired launch azimuth before initiating the pitch program ten seconds after liftoff. Immediately following separation a -5 degree yaw maneuver will align the Discoverer Satellite with the Discoverer Vehicle coast velocity vector to increase the resultant velocity at satellite burnout.

2.2.3 In order to achieve the desired orbit, an automatic system will be used to determine the required orbital boost engine ignition time and velocity-to-be-gained correction. The Reeves guidance computer, at [redacted] Tracking Station, samples the VERLORT tracking data at two predetermined times after booster separation and from these data automatically determines and displays the time-to-fire correction (Command 5) duration and the velocity-to-be-gained correction (Command 6) duration. If the displayed values are unrealistic, the computer operator will disable the automatic system and transmit nominal values which are set into a back-up control panel prior to launch.

2.2.4 The satellite orbital programmer, which is started by the Subsystem D timer at booster separation, will apply a SS/D timer brake voltage at the predetermined time and stop the timer (delay engine firing sequence) for the nominal duration listed in Table A2-1 of Appendix A. Vehicle receipt of Command 6 is required for early termination of the timer hold applied by the orbital programmer.

2.3. NOMINAL ORBIT DATA

2.3.1 Nominal orbit data are tabulated in Table A2-1 of Appendix A, and maps of nominal orbit tracks are presented in Figures A2-1 through A2-6 of Appendix A. An orbit (a pass or a revolution) pass is defined as that portion of the path of the vehicle between consecutive northbound crossings of the equatorial plane (ascending node) with Orbit One beginning at the first northbound crossing. Nominal acquisition ranges for an assumed 1000-sm tracking station reception are shown on the orbit charts. Acquisition times determined from the nominal ephemeris and line of sight range are presented in Table A2-2.

2.4 ORBIT OPERATIONS PROGRAMMING

2.4.1 Orbit operations are programmed primarily by the orbital programmer. This programmer operates from a prepunched tape program to turn on the radar beacon transponder and telemetry transmitting equipment within possible reception range of tracking stations and to turn this equipment off at other times to conserve battery power. The orbital programmer also controls the tape reset mechanism enabling and disabling functions and payload functions as programmed. Midway in the recovery pass, the orbital programmer restarts the SS/D timer (which was turned off at the end of the launch phase). The SS/D timer then controls vehicle reorientation operations and sequences the nose capsule separation and initiation of the capsule re-entry operations.

2.4.2 The orbital programmer will be adjustable by ground commands transmitted via the S-band radar link during flight. Commands will dictate the number and direction of discrete step changes in programmer cyclic rate to effect matching of cycles to the Discoverer Satellite orbit period. A reset command will also be used to shift the tape program instantaneously to preselected and programmed reset index points corresponding to specified reset latitudes.

2.4.3 The heart of the timer is a 35mm mylar tape driven past a row of 13 electrical contact brushes at a controlled linear rate of movement. Perforations spaced in the tape permit electrical contacts to be made which position relays according to a planned program of events. Twelve of the contact brush circuits position six relays either up or down. The thirteenth contact is used only to provide alternate re-entry sequence initiation if the alternate re-entry circuit has been selected. The minimum on-or-off duration for one function is 30 seconds with a positioning accuracy of ±10 seconds.

2.4.4 A synchronous motor drives the program tape sprocket drum through suitable reduction gears. Motor speed, and hence tape linear speed, is controlled as a function of the variable frequency output of a tuneable oscillator. The oscillator is tuned by positioning two 10-position (decade) stepping switches which connect graded resistors into the oscillator circuitry. The second stepping switch moves one step for each revolution (10 steps) of the first stepping switch, thus providing 99 steps. Each step varies the programmer cycle period by 10-2/3 seconds with the total period adjustable from 89.6 to 107.2 minutes. With the orbital programmer cyclic period set to match the satellite orbit period, the tape will travel exactly 4.8 inches during each complete orbit.

2.4.5 The orbital programmer provides the position of the increase/decrease switch and the period setting in the programmer to the ground station via telemetry. The increase position indicates that step commands will increase the period setting. The existing period setting in the orbital programmer is telemetered both as a function of the position of the two stepping switches and as a function of the input frequency to the synchronous motor driving the tape. The frequency data will be automatically converted to seconds and presented on a frequency counter remote display at the command console, while the stepping switch positions will be converted to the number of step adjustments set in the programmer and displayed in nixie lights on the command console. The period setting can be determined in units of seconds, or minutes and seconds, by using Table 2-1 if the number of step adjustments or the stepping switch positions are known. The motor input frequency corresponding to each period setting is also listed. The programmer setting at launch is listed in Table A2-1 of Appendix A. The increase/decrease switch will be in the decrease position.

2.4.6 A definite relationship between program tape position and terrestrial latitude is required for proper spacing of readout periods and initiation of the recovery sequence. Correction of tape misalignment will be provided by a reset function. Tape index points are predetermined for selected reset latitudes. An indexing disc will be clutched into the gear train at reset enable, 16 degrees latitude (approximately four minutes) ahead of the index

Table 2-1

PROGRAMMER SETTING CONVERSION CHART

			10-SECOND SWITCH POSITION										
			0	1	2	3	4	5	6	7	8	9	
			STEP ADJUSTMENT										
			0	1	2	3	4	5	6	7	8	9	
			VOLTAGE										
100-SECOND SWITCH POSITION	**STEP ADJUSTMENT**	**VOLTAGE**	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	
0	0	0.5	5376 89m36s 428.57	5387 89m47s 427.70	5397 89m57s 426.72	5408 90m8s 426.03	5419 90m19s 425.19	5429 90m29s 424.36	5440 90m40s 423.52	5451 90m51s 422.70	5461 91m1s 421.87	5472 91m12s 421.05	sec min, sec cps
1	10	1.0	5483 91m23s 420.23	5493 91m33s 419.41	5504 91m44s 418.60	5515 91m55s 417.79	5526 92m6s 416.98	5536 92m16s 416.18	5547 92m27s 415.38	5557 92m37s 414.58	5568 92m48s 413.79	5579 92m59s 413.00	sec min, sec cps
2	20	1.5	5589 93m9s 412.21	5600 93m20s 411.42	5611 93m31s 410.62	5621 93m41s 409.86	5632 93m52s 409.09	5643 94m3s 408.31	5653 94m13s 407.54	5664 94m24s 406.77	5675 94m35s 406.01	5685 94m45s 405.25	sec min, sec cps
3	30	2.0	5696 94m56s 404.49	5707 95m7s 403.73	5717 95m17s 402.98	5728 95m28s 402.23	5739 95m39s 401.48	5749 95m49s 400.74	5760 96m0s 400.00	5771 96m11s 399.26	5781 96m21s 398.52	5792 96m32s 397.79	sec min, sec cps
4	40	2.5	5803 96m43s 397.05	5813 96m53s 396.33	5824 97m4s 395.60	5835 97m15s 394.86	5845 97m25s 394.16	5856 97m36s 393.44	5867 97m47s 392.72	5877 97m57s 392.01	5888 98m8s 391.30	5899 98m19s 390.59	sec min, sec cps
5	50	3.0	5909 98m29s 389.89	5920 98m40s 389.18	5931 98m51s 388.48	5941 99m1s 387.79	5952 99m12s 387.09	5963 99m23s 386.40	5973 99m33s 385.71	5984 99m44s 385.02	5995 99m55s 384.34	6005 100m5s 383.65	sec min, sec cps
6	60	3.5	6016 100m16s 382.97	6027 100m27s 382.30	6037 100m37s 381.62	6048 100m48s 380.95	6059 100m59s 380.28	6069 101m9s 379.61	6080 101m20s 378.94	6091 101m31s 378.28	6101 101m41s 377.62	6112 101m52s 376.96	sec min, sec cps
7	70	4.0	6123 102m3s 376.30	6133 102m13s 375.65	6144 102m24s 375.00	6155 102m35s 374.35	6165 102m45s 373.70	6176 102m56s 373.05	6187 103m7s 372.41	6197 103m17s 371.77	6208 103m28s 371.13	6219 103m39s 370.49	sec min, sec cps
8	80	4.5	6229 103m49s 369.86	6240 104m0s 369.23	6251 104m11s 368.60	6261 104m21s 367.97	6272 104m32s 367.35	6283 104m43s 366.72	6293 104m53s 366.10	6304 105m4s 365.48	6315 105m15s 364.86	6325 105m25s 364.24	sec min, sec cps
9	90	5.0	6336 105m36s 363.63	6347 105m47s 363.02	6357 105m57s 362.41	6368 106m8s 361.80	6379 106m19s 361.20	6389 106m29s 360.60	6400 106m40s 360.00	6411 106m51s 359.40	6421 107m1s 358.80	6432 107m12s 358.20	sec min, sec cps

point on the tape, and will remain clutched in until reset disable. Transmission of Command 3, reset, at any time while the disc is clutched in, will rotate the disc to its index position and, through the gear train, will position the tape to its index position for the specified latitude. Upon releasing the clutch at reset disable, the disc is spring-loaded back to its initial position, four minutes before its index point, and is ready to be enabled for another reset point. Reset commands will be given only at the specified latitudes unless large orbital programmer deviations make it necessary to give a reset at a different latitude. This will move the tape closer to the correct relationship before giving another reset command at the proper latitude.

2.4.7 A reset monitor signal is given by a cam and microswitch arrangement on the indexing disc. Initiation and termination of the reset monitor signal mark specific points in the orbital programmer cycle which can be compared from orbit to orbit as a check on programmer period setting. The reset monitor signal is presented as a light on the command console panel and on the shift supervisor's panel.

2.4.8 In general the orbital programmer tape will be punched to provide readout whenever the vehicle is within reception range of any of the tracking stations during the first 41 orbits. A graphical presentation of the programmer sequencing is shown in Figure A2-7 of Appendix A. This illustrates beacon and telemetry plate voltage turn-on and turn-off, reset enabling and disabling, location of the reset point, and duration of the reset monitor signal as a function of the terrestrial latitude and orbital pass number. This sequence will be adhered to if the orbital programmer period is set to match the orbit period and the programmer relationship to the terrestrial latitude is maintained by reset commands.

2.4.9 The Discoverer Satellite will be equipped with an alternate re-entry initiation circuit which will provide re-entry on Passes 15, 16, or 18, depending upon the time of transmission of the alternate ground command. Commands 5 and 6, which are used for making engine firing corrections during the ascent phase, will provide control of the re-entry selection during the re-entry phase. Separation will be programmed to provide recovery at the same latitude as the normal re-entry on Pass 17.

2.5 IN-FLIGHT COMMAND CAPABILITIES

2.5.1 Ground commands for the orbital programmer adjustment are summarized as:

a. Command 1 (increase/decrease period) changes the direction of the 10-2/3-second-increment period adjustment switch. By changing direction of the switch it will be in either the increase or decrease position which will affect the programmer period correspondingly.

   Command 1 does not select the direction; it merely throws the switch to the opposite direction. This command will be issued to change the direction of the increase/decrease switch only if necessary, as determined by telemetry data or command history. The switch position is presented on the vehicle command panel as either an increase or decrease light. The switch will be maintained in the decrease position for telemetry calibration by oscillograph observers.

b. Command 2 (step) provides a 10-2/3-second change in programmer period in the direction dictated by the increase/decrease switch.

c. Command 3 (reset) repositions the program tape to predetermined locations corresponding to selected latitude positions. This command will not be given if the reset monitor signal is received at the desired time.

2.5.2 The ground command for the payload function selector adjustment when an AET payload is carried will be:

a. Command 4 (payload function selector) will step the selector through 11 positions. The issuance of one command advances the selector one position. To obtain a lower setting it is necessary to advance the selector through positions 10, 11, 1, 2, etc.

b. The selector setting is transmitted from the vehicle to the tracking stations by means of a 4-bit Gray code.

c. The execution of each Command 4 will be verified by command tone receipt verification via telemetry, and telemetry indication that the payload function selector setting has advanced one position. The number of commands transmitted will be limited to the number required to correct the setting, assuming that all the commands are received. Following transmission of the number of commands directed, the results will be evaluated and an additional command directed, if necessary.

2.5.3 Ground commands for Discoverer Satellite engine control during the launch phase are:

a. Command 5 (time-to-fire correction) will delay initiation of the engine firing sequence by disengaging the timer clutch for the duration of the signal. Duration of the delay-fire correction is calculated and automatically transmitted by the Reeves guidance computer based on launch trajectory information. A nominal airborne delay will be achieved by the orbital programmer in the satellite if no ground commands are transmitted. If the validity of the computer computation is questioned, a nominal ground command will be sent to provide a more accurate delay than the nominal airborne delay.

b. Command 6 (velocity-to-be-gained correction) will be transmitted immediately following the Command 5 delay-fire. Duration of the command may be from 1 to 25 seconds where each second of command duration will reduce the velocity-to-be-gained setting in the guidance integrator by approximately 50 ft/sec. Command 6 must be transmitted immediately following termination of Command 5 in order to override the orbital programmer hold of the SS/D timer. Failure to send Command 6 following Command 5 would result in continued hold by the orbital programmer until its programmed hold period has been completed. The earliest possible engine firing time is achieved by transmission of Command 6 at the time when Command 5 would normally be initiated.

2.5.4 The ground commands for selecting the recovery pass will be:

a. Command 5 (alternate re-entry selector) will select the alternate recovery sequence at any time following the launch injection phase. Re-entry will occur on Pass 15 if Command 5 is transmitted before the separation initiation point on that pass; on Pass 16 if the command is sent between the separation initiation point on Passes 15 and 16; and on Pass 18 if Command 5 is transmitted between Passes 16 and 17.

b. Command 6 (normal re-entry) will select the normal re-entry circuit providing re-entry on Pass 17 and will negate Command 5 at any time unless the re-entry sequence has already been initiated. If neither Command 5 nor 6 is sent, normal re-entry will occur on Pass 17.

2.6 RE-ENTRY AND RECOVERY

2.6.1 Each flight operation will include a programmed recovery of a Discoverer Satellite re-entry capsule. Description of the re-entry capsule and recovery aids is contained in the DTO. Recovery will be made in the air with a surface recovery backup for the air recovery method.

2.6.2 At the appropriate time during the recovery pass, the orbital programmer will restart the SS/D timer which will in turn initiate the re-entry sequence. This sequence is discussed in detail in Appendix A.

SECTION 3
CONFIGURATION

3.1 GROUND SYSTEM INFORMATION

3.1.1 The operational structure is headed by the Satellite Test Center located at Sunnyvale, California.

3.1.2 Two UNIVAC Scientific 1103AF large-scale digital computers in Palo Also will, at the direction of the STC, convert binary tracking data to an ephemeris, issue acquisition data to tracking stations for subsequent passes, and predict the recovery area.

3.1.3 Stations reporting directly or indirectly to the STC will be:

a. Vandenberg Control Center (VCC), Vandenberg AFB, California, which will control blockhouse launch operations, the downrange telemetry ship, and during the launch phase, stations b and c (below)

b. [redacted]

c. [redacted]

d. [redacted]

e. [redacted]

f. Hawaii Control Center, Hickam AFB, Oahu Island, Hawaii

g. Downrange Telemetry Ship -- for location on a given operation see Table A2-1 of Appendix A.

h. Re-entry Telemetry Ship -- for location on a given operation see Table A2-1 of Appendix A

3.2 SATELLITE TEST CENTER (STC)

3.2.1 The STC will be provided with the following equipment:

a. Communication console with switches for alternate voice/ 100-wpm teletype (TT) circuits, with voice conference provisions

b. Ampex tape recorder for recording all voice communications

c. Sixty-wpm teletype equipment, including encrypting and monitor equipment

d. Status boards for presenting weather data, status of the complete communications system, equipment status at each facility, and status of data processing and dissemination

e. Large wall-mounted polar map with a transparent overlay for manually plotting the tracking data as received; the overlay can be rotated and will be adjusted to approximate the orbit for following passes

f. Two television cameras with controls and monitor located in the Test Director's console; one camera is directed at the plotting board to present updated satellite position information; the second television camera is directed at the teletype receiver so that teletype messages may also be presented in the observation room

g. System Test Controller hot lines to AFBMD, VCC, and the blockhouse.

3.3 VANDENBERG CONTROL CENTER (VCC)

3.3.1 The VCC, located in the LMSD administration building at VAFB, will be equipped as the communications and command link between the STC and each of the following launch stations:

a. Blockhouse
b. [redacted]racking Station
c. [redacted]racking Station [redacted]uxiliary)
d. Downrange Telemetry Ship
e. Re-entry Telemetry Ship
f. VAFB Range Safety Office
g. PMR Control (through [redacted]ice link)
h. Optical Tracking Sites

3.3.2 The VCC will have the following equipment to perform its control functions:

a. Communications control console
b. Termination equipment for 60-wpm teletype (with secure capability)
c. Communications switchboard
d. Two back-lighted status boards

3.4 TRACKING STATIONS

3.4.1 Operating equipment at the tracking stations will include the following major items:

a. VERLORT radar
b. TLM-18 self-tracking antenna for telemetry and Doppler range signals[redacted] and[redacted] only)
c. Tri-helix antenna for telemetry and Doppler range signals
d. Mark 51 optical tracker [redacted] only)
e. Master timing system referenced to W W V
f. Reeves orbit computer
g. Acquisition programmer
h. Telemetry signal recording equipment
i. Decommutation equipment for real-time presentation of commutated telemetry data
j. Dual-arm vertical plotboards (three at [redacted] two (each) at [redacted] and [redacted] one at [redacted] for presentation of tracking coordinates
k. Transmitting and receiving equipment for interstation exchange of radar tracking data via leased land lines [redacted] an[redacted] only)
l. Teletype transmitting, receiving and conversation equipment for two-way transmission of radar tracking and acquisition data between tracking stations and the Palo Alto Computer
m. Single side-band (SSB) radio at VCC, [redacted] the Downrange Telemetry Ship, and the Re-entry Telemetry Ship.

3.4.2 Functional capabilities of the tracking station configurations will include:

a. Radar digital data recording on punched teletype tape in normal binary code format

b. Plotboard presentation of radar analog data in XY and YZ, coordinated with time marks (X east, Y north, Z vertical)

c. Doppler data frequency recording on punched teletype tape in binary code format

d. Telemetry data recording on magnetic tape

e. Real-time readout of vehicle command verifications, timer adjustment parameters, payload conditions, and, in the case of launch stations, booster main engine burnout, orbit engine ignition and cutoff (by combustion chamber pressure or longitudinal acceleration data)

f. Positioning of all antennas toward the predicted satellite position until acquisition by means of the acquisition programmer and the acquisition data provided by the computer at Palo Alto

g. Carry-over capability during temporary loss of tracking by the Reeves computer (orbit tracking)

h. Radar command capability for adjusting engine fire time and duration of engine burning [redacted] only), for adjusting orbital programmer cycles which control airborne beacon and telemetry equipment, for adjusting the time of the recovery sequence of operations, and for commanding payload functions.

i. Capability of inter-slaving antennas on each station and, in the case of [redacted] and [redacted] interstation antenna slaving functions

j. Recording on punched teletype tape, in normal binary code format, of digital angle data from TLM-18 tracking where a TLM-18 tracker is provided

k. TLM-18 (where provided) analog data plotting in polar coordinates

l. Sixty-wpm teletype and 100-wpm teletype or voice communications for transmission and reception of data and intelligence

m. At [redacted] only, a Reeves guidance computer will utilize radar analog data to automatically compute time-to-fire and velocity-to-be-gained correction commands and will automatically transmit these commands to the Discoverer Satellite. A manual backup system will provide for transmission of nominal commands as a backup to the guidance computer.

3.5 RE-ENTRY TELEMETRY SHIP (PVT. JOE E. MANN)

3.5.1 The Re-entry Telemetry Ship equipment will include:

a. Two tri-helix and one single-helix antenna
b. Complete analog FM/FM ground station
c. Two tape recorders for T/M data
d. SSB radio for ship-to-shore communication
e. UHF radio for ship-to-aircraft communication
f. Equipment for air pickup of magnetic tape data
g. Doppler data receiving and recording equipment
h. Decommutator rack (single channel capability)
i. Teletype equipment.

3.6 DOWNRANGE TELEMETRY SHIP (KING COUNTY)

3.6.1 The Downrange Telemetry Ship equipment will include:

a. Two single-helix antennas
b. T/M receiving equipment
c. Two tape recorders for T/M data
d. SSB radio for ship-to-VCC communication
e. UHF radio for ship-to-aircraft communication
f. Equipment for air pick-up of magnetic tape data
g. Doppler data receiving and recording equipment
h. Teletype equipment
i. Two 6-pen recorders

3.7 HAWAIIAN CONTROL CENTER (HCC) AND RECOVERY FORCE

3.7.1 The HCC at Hickam Air Force Base, Hawaii, will control recovery operations in the Hawaiian area. Maps, charts, and status boards are provided to present a complete and accurate status of all phases of the recovery operation. Communication equipment is also provided for continuous communications between the STC and HCC, and the recovery forces during operational periods. Technical assistance to the Recovery Test Controller will be provided by the LMSD Recovery Test Director.

3.7.2 The basic Recovey Force for the recovery operation will consist of the elements listed below plus required supporting personnel, supplies, and services. Deployment deviations will be directed by the HCC if all of the elements are not available. The HCC will notify the STC if the Recovery Force is reduced below the level considered by the HCC to be necessary for successful recovery operations. Endurance stated for the air elements is the flight time available for performing recovery and search operations. Recovery Force elements are:

a. Four RC-121 aircraft equipped with APS-20 surveillance radar and APS-45 height finder radar. Range of the RC-121 is approximately 3040 nm at 190 knots true airspeed with an endurance of approximately 16.0 hours.

b. Nine C-119 aircraft equipped with Model 80C air pick-up equipment and a 64-degree forward sector coverage direction-finder (D/F) system to home on the capsule beacon. By using their auxiliary fuel tanks the C-119J aircraft can travel a distance of 2240 nm at 160 knots true airspeed with a resultant endurance of approximately 14.0 hours.

c. Two WV-2 aircraft (if available) with frequency interference control (FIC) equipment, D/F equipment, and telemetry receiving and recording equipment. Range of the WV-2 is approximately 2300 nm at 190 knots true airspeed with an endurance of approximately 12.0 hours.

d. Two victory ships, USNS Haiti and Dalton (Victory), with two HRS-3 helicopters, telemetry receiving and recording equipment, and 350-degree D/F equipment on board each ship. The victory ships have top speed in advance of 15 knots and sufficient supplies for 50 days on station. The HRS-3 helicopters will have an operating range of 90 nm (two aircraft operation, visual flight rules conditions, visual or radar contact and control) with 30 minutes of loiter time under ideal conditions and necessary equipment for effecting water recovery of the re-entry capsule. The primary mission of the helicopters is to extend the visual acquisition and surface recovery range of the victory ships. Each ship will be provided with necessary equipment for handling and storing the re-entry capsule. If operating singly, the helicopters will remain within visual range of the recovery ships for maximum safety since they do not carry D/F equipment. Both ships will be equipped to provide winds aloft weather data.

3.8 COMMUNICATIONS

3.8.1 The interstation communications consist primarily of 60-wpm teletype and 100-wpm alternate voice/teletype. The 60-wpm teletype is used to transmit or receive acquisition and command messages, Doppler calibration, weather and equipment status reports, performance and command summaries, and general information messages and instructions. The 60-wpm teletype is maintained in the conference mode. The 100-wpm teletype is used to transmit or receive acquisition programs, TLM-18 analog data, Doppler data, and VERLORT data. The 100-wpm alternate voice line is used for all voice communications, including reporting of real-time readouts during active passes. The STC controls the status of the 100-wpm circuit and selects either the 100-wpm teletype or voice, conference net, or individual station communications.

3.8.2 A voice lease-line, which can be connected to the conference net, links the System Test Controller with AFBMD, VCC and the blockhouse.

3.8.3 A Schematic of the interstation communication network is presented in Figure 3-1.

3.8.4 A complete discussion of the Recovery Force communications system is contained in [redacted] and in the [redacted]

3.9 TRANSMISSION FREQUENCIES

3.9.1 Transmission frequencies of the satellite S-band beacon transponder, the satellite telemeter transmitter, the satellite C-W acquisition beacon, the recovery capsule telemeter transmitter, and the recovery capsule beacon transmitter are listed below. If additional transmission frequencies are used on a particular flight, they will be specified in Appendix A for that flight.

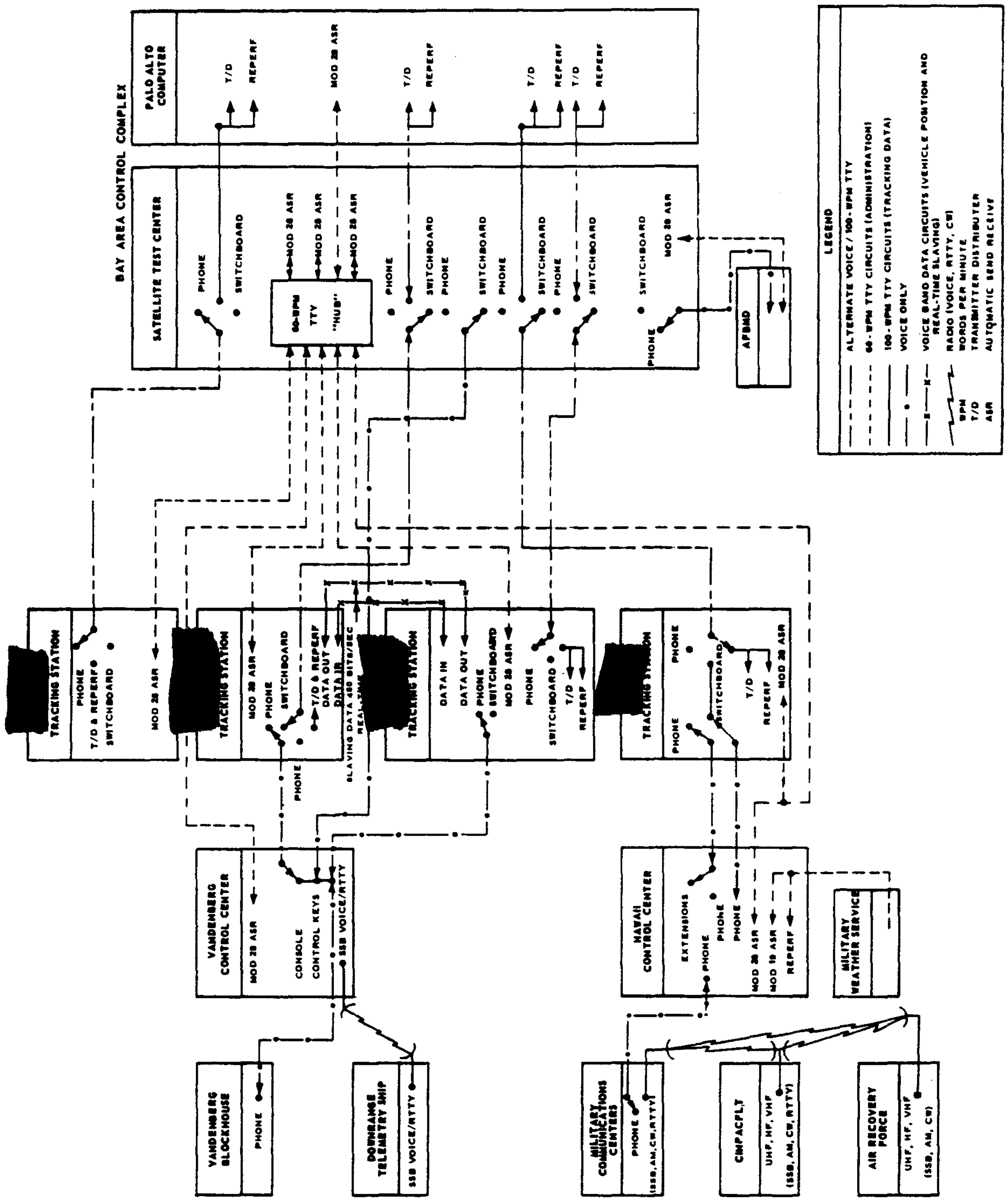


Figure 3-1 Communication Network Schematic

Satellite transponder receiver	2850 mc
Satellite transponder transmitter	2920 mc
Satellite telemeter transmitter	237.8 mc
Satellite C-W acquisition transmitter	232.4 mc
Recovery capsule telemeter transmitter	228.2 mc
Recovery capsule acquisition transmitter	235 mc ± 12 mc

SECTION 4
PRELAUNCH OPERATIONS

4.1 GENERAL

4.1.1 Prelaunch procedures for the tracking stations, the STC, and the Palo Alto Computer will be primarily equipment checkout and calibration operations necessary to assure equipment readiness. [redacted], [redacted] in accordance with [redacted] will be used. System operation exercises and data transmission checks will be conducted to verify the proper operation of communications equipment. Flybys of aircraft equipped with beacon and telemeter equipment will be accomplished at the stations to demonstrate operational readiness. Following these operations, a dress rehearsal involving all stations will provide a comprehensive readiness check while improving proficiency of operations. Periodic weather reports will be submitted from various stations and the effect on flight operations will be evaluated by the STC up to the time of launch.

4.1.2 Communication checks and station status checks will be made periodically each day at the discretion of the STC, and are not included as specific items in the countdown. Any change in station status, if a malfunction is involved, with an estimated time required for correction, will be reported immediately by the station.

4.1.3 Countdown times are given in X and T terms where X is launch day (X-2 is the second day before launch); correspondingly, T is launch time (T-2 is two hours preceding scheduled launch). When time in minutes or seconds is significant, T-2 minutes or T-2 seconds is used with the unit in all cases. ETPD is used in the same manner as T, but references the estimated time of parachute deployment rather than launch time.

4.2 SYSTEM COUNTDOWN SEQUENCE

4.2.1 Prior to X-6 day, station equipment will be checked and calibrated so as to be fully qualified for flight operations. Careful attention must be given to the calibration of voltage dials or other indicators used to present the orbital programmer period setting in real time from telemetry data.

4.2.2 System countdown operations will begin on X-6 day. Starting on this day, the STC will conduct checkout exercises which include an operations exercise emphasizing communications and data evaluation proving satisfactory status of teletype conversion, transmission, and reception equipments. Table 4-1 describes the operations and shows the approximate times at which they are scheduled in the prelaunch period. Recovery force prelaunch operations are covered in Section 7 of this report. Times given in this section are approximations, and in many cases will be rescheduled by the STC. Operations involving the STC will be conducted only on an "as-requested" basis from the STC in order that operations of all stations may be properly integrated. The operations and reports indicated are usually minimum requirements and will be supplemented by additional operations and reports requested by the STC as required.

4.2.3 The deviations of the telemetry and acquisition beacon transmitter frequencies from nominal values will be furnished (to the nearest kilocycle) by the [redacted] to the STC via 60-wpm teletype during countdown task 14 for relay from the LMSD Data Evaluation Area (DEA) at the Palo Alto Computer Center (PAC) to Project Space Track.

4.3 LAUNCH CRITERIA

4.3.1 The System Test Controller determines whether a Discoverer Vehicle countdown should be initiated or, when initiated, if the countdown should be continued to launch. In certain cases, definite criteria on which to base these decisions can be established which should not be violated under any circumstances. In other situations, some relaxation of criteria by the System Test Controller may be permissible, depending upon unique circumstances at the time the problem arises. The criteria presented herein are made as definite as possible to minimize the necessity for arriving at hurried judgments under the pressures of a launch operation. Since vehicle readiness-for-launch will be determined by the Launch Controller from the blockhouse, criteria affecting launch complex operations have been omitted from this document, except for instrumentation parameters which are subject to late revisions.

4.3.2 The following items will be considered by the System Test Controller to determine whether launch postponements or holds are required. Each item is discussed separately in the following paragraphs:

a. Weather
b. Range and Support
c. Instrumentation
d. Systems Communications
e. Tracking Station and T/M Ship Readiness
f. Recovery Force Readiness
g. Satellite Test Center Readiness

4.3.3 Weather

a. Launch Area

(1) Surface wind at the launch complex will be monitored and reported as shown in the [redacted] Table 4-1. Critical surface winds for the [redacted] ehicle before ignition of the Discoverer Booster are specified as follows:

Table 4-1
PRELAUNCH SYSTEM COUNTDOWN*

DAY	OPERATIONS
X-6	1. System checkout and flight communications simulation 2. Re-entry telemetry ship enroute to station a. Daily communication schedule for T/M ship and FCC from sailing time to T-24 hours 1830 GMT – Equipment status report 2300 GMT – Position, weather, and equipment status report b. Daily communication schedule for T/M ship an[redacted]r HCC (whichever is closer) from sailing time to T-24 hours 1800 GMT – Equipment status report 2330 GMT – Position, weather, and equipment status report 3. Tracking equipment checkout a. PAC transmits acquisition program and/or message to all stations. b. Stations run preplot and record tracking data in binary code format on teletype tape c. Stations transmit tracking data to PAC for comparison with original program
X-5	1. Aircraft flyby at constant heading, airspeed, and altitude at 6 miles from tracking station a. Stations record and report range, azimuth, elevation, and system time at acquisition, acquisition +40 seconds, midpoint of track, 40 seconds before fade point, and fade point b. Stations transmit tracking data to PAC for evaluation 2. Downrange telemetry ship departs for station a. Daily communication schedule for T/M ship and VCC from sailing time to T-24 hours. 1630 GMT – Equipment status report 2230 GMT – Position, weather, and equipment status report
X-4	1. Dress rehearsal (if deemed necessary by the STC) a. Launch simulation b. Orbit pass simulation
X-3	1. Correct difficulties experienced in earlier countdown operations

* *The STC may add to this countdown sequence as necessary, or may delete portions when system performance is being demonstrated by concurrent operations.*

Table 4-1 (continued)

DAY	OPERATIONS
X-2	1. PAC transmits actual command, acquisition message, and program a. All stations acknowledge receipt and run preplot 2. VCC submits weather forecast for VAFB and T/M ship at T-48 hours
X-1	1. VCC transmits weather forecasts for VAFB and T/M ship area at T-24, T-12, T-6, and T-2 hours to STC 2. HCC transmits weather forecasts fo[redacted]and recovery area at T-24, T-12, T-6, and T-2 hours to STC 3. Downrange T/M ship reports position, weather, and equipment status to VCC at T-24, T-20.5, T-15.5, T-12, and T-6 hours. 4. Re-entry T/M Ship reports position, weather, and equipment status at: a. T-20, T-14.5, T-11.5, and T-3.5 hours to VCC b. T-19.5, T-6, T-3, and T-0.5 hours to[redacted]r HCC (whichever is closer)
X	1. Boresight at [redacted] n [redacted] Transmit data to STC 2. PAC transmits acquisition program to each station a. Stations run preplot and transmit tracking data to PAC 3. All stations report readiness to STC by T-20 minutes 4. [redacted]monitors r-f output from launch pad from T-15 minutes until launch 5. 1000-cps lift-off tone transmitted to VCC, STC, and all stations a. Stations note system time of launch and obtain time verification from STC for use in timer adjustment calculations

Condition of Discoverer Vehicle	Critical Surface Wind (Including gusts)
Launcher erect Fueled or unfueled, vehicle clamped with three bolts in base of vehicle	75 knots
Launcher retracted Fueled, all bolts and clamps removed	45 knots

(2) Wind aloft will be determined from sounding data given to PAC and analyzed for maximum shear conditions. The allowable wind velocity gradient is a function of several factors and cannot be presented as a fixed quantity. Wind shear data will be evaluated in the computer area by the LMSD Structures Department and a statement of acceptability will be made to the STC.

b. Recovery Area

Element	Critical Condition
(1) Precipitation	Continuous
(2) Visibility	10 miles
(3) Cloud coverage	0 to 14,000 feet -- clear 14,000 to 30,000 feet -- 0.2 above 3000 feet --- no limit
(4) Sea state and surface wind	Surface force effectiveness diminished above sea state 4, and helicopters in wind in excess of 15 mph.

c. Other Facilities. Weather conditions must permit satisfactory operation of station equipment. Precipitation will not require postponement of launch since the intensity which could cause trouble is not likely to exist for extended periods. Considerations, such as those listed below, will be required for each facility:

(1) At [redacted] during launch, the surface wind limitation is 50 knots unless the tri-helix antenna is inoperative. If this antenna is inoperative, the wind limitation is reduced to 35 knots.

(2) Visibility required for boresight operations at ground stations is 300 feet.

(3) The maximum sea condition that would permit a specific T/M ship to complete its mission adequately is required.

4.3.4 Range and Support

Range and support considerations are given in Appendix A, Table A2-1, Nominal Flight Planning Data.

4.3.5 Instrumentation

Telemetered functions required to be operative at launch are listed in Appendix A, Table A4-1.

4.3.6 Systems Communications

4.3.6.1 Communications between the STC and remote stations must be maintained as follows:

a. Voice or 60-wpm teletype to VCC
b. Voice or 60-wpm teletype to [redacted]
c. Voice or 60-wpm teletype to [redacted]
d. 100-wpm teletype or 60-wpm teletype between [redacted] and PAC
e. Voice to [redacted]
f. Voice to [redacted]

4.3.6.2 Communications between [redacted] HCC, or VCC and the telemetry ship Pvt. Joe E. Mann must be verified during countdown.

4.3.6.3 Communications between the VCC and the downrange telemetry ship will be maintained during countdown. If loss of communications is experienced [redacted] will monitor the HF radio signal and relay pertinent information to the ship through PMR.

4.3.6.4 APL Communications. Loss of the direct communication link between DEA and Project Space Track will not be cause for abort of launch.

4.3.7 Tracking Station and Telemetry Ship Readiness

4.3.7.1 All Discoverer Tracking Station equipment must be in operable condition except as follows:

a. Plotboard operation is not required.

b. Slaving capability is not required.

c. Track[redacted]ta[redacted]smission failure is allowable at [redacted]nd eithe[redacted]or [redacted]

d. Optical tracking is not required at [redacted]

e. Failur[redacted]er tri-helix or TLM-18, but not both, is allowable at [redacted]

f. Failure of tri-helix and T/M data recording is allowable at [redacted]

g. Failure of tri-helix is allowable at [redacted]

h. Failure of acquisition programmer or orbital computer, but not both, is allowable at any station.

i. Doppler receiving, recording and data transmission equipment failure is allowable at any station.

4.3.7.2 The equipment on both the Pvt. Joe E. Mann and the King County must be operable to the extent that a combination of operable equipment is available on each ship to provide a telemetry receiving and recording capability.

4.3.8 Recovery Force Readiness

4.3.8.1 The following minimum force requirements with all search and recovery equipments operable must be met. These requirements may be increased for a flight and will be specified in the applicable Appendix A if an increase is necessary.

a. 3 RC-121 radar aircraft

b. 7 C-119J recovery aircraft

c. 2 surface ships.

4.3.8.2 Surface ships must be within four hours of assigned station location at T = 0.

4.3.9 Satellite Test Center Readiness

4.3.9.1 Communication equipment and at least one 1103A computer must be operable.

4.3.9.2 Failure of the TV cameras and/or failure of the tape recorder will not be cause for launch abort.

SECTION 5
LAUNCH OPERATIONS

5.1 GENERAL

5.1.1 The launch phase of operations, as defined for tracking and control operations, will begin at liftoff and will consist of all operations associated with the exit trajectory to the first northbound crossing of the equator. The launch phase nominal trajectory is presented in Figure A5-1. During the launch phase, the following operations will occur:

a. Liftoff 1000-cps tone and voice verification of liftoff by LMSD Launch Conductor
b. Tracking by [redacted] and [redacted] to extent of range
c. Determination of required second stage time-to-fire correction command and velocity-to-be-gained adjustment command by [redacted]
d. Issuance of time-to-fire correction command and velocity-to-be-gained adjustment command by [redacted]
e. Recording of T/M data by [redacted] and Downrange T/M Ship
f. Real-time readout of significant telemetered data by [redacted] and Downrange T/M Ship (see Table A8-1)
g. Reports by [redacted] and Downrange T/M Ship of the system time at which significant events occurred (see Table 5-1)
h. Transmission of launch trajectory data from [redacted] and [redacted] to the Palo Alto Computer (PAC)
i. Calculation of ephemeris and correction of nominal acquisition data by PAC.

5.1.2 In order to expedite the effective relay of real-time launch and exit data to the STC over the 100-wpm voice line, a lift-off commentary (Table 5-1) has been prepared to integrate the voice launch reports of [redacted] and [redacted] The times listed in the table are guides and shall remain flexible. The frequencies of the telemetry transmitter and the acquisition beacon transmitter

Table 5-1

LIFT-OFF COMMENTARY

TIME (SEC)	STATION	EVENT
T = 0	[redacted]	1. Report system time of liftoff 2. Relay any available visual data 3. Continue commentary of radar track on plotboard through active phase
T+50	[redacted]	Announce lock-on and quality of track
T+164	[redacted]	Announce passive track
T+175	[redacted]	1. Report system time of MECO 2. Assume radar track commentary and continue until fade
T+180	[redacted]	Announce separation, if available
T+190	[redacted]	Verify system times of MECO and VECO
T+223	[redacted]	Report Command 5 initiation
T+241±	[redacted]	Report Command 6 initiation
T+270±	[redacted]	Report system time of Discoverer Satellite ignition
T+290	[redacted]	Verify system time of Discoverer Satellite ignition
T+320	[redacted]	1. Announce mode of Commands 5 and 6 determination 2. Report system time of Commands 5 and 6 initiation 3. Report system time of Commands 5 and 6 termination 4. Report time duration for Commands 5 and 6
T+385±	[redacted]	Report system time of Discoverer Satellite burnout
T+395±	[redacted]	Verify system time of Discoverer Satellite burnout
FADE	[redacted]	Report system time of equipment fade
T+420	[redacted]	1. Report orbital programmer period and position of increase/decrease switch 2. Report position of payload function selector
T+440	[redacted]	Verify above data
T+800	VCC	1. Relay T/M ship real-time data as follows: a. System time of engine burnout b. Orbital programmer period c. Position of increase/decrease switch d. System time of acquisition e. System time of fade f. Comments 2. Transmit the T/M ship data over the 60-wpm TT

will be monitored at liftoff and deviations from nominal values will be reported to all stations via the STC. Any abnormalities noted during the launch phase must be reported immediately. In the event either [redacted] or [redacted] loses communications with the STC during the launch phase, the remaining station will report all listed items of information available.

5.1.3 Internal functions of the Discoverer Satellite during the launch phase will be controlled by the SS/D timer and the orbital programmer. Operations of the SS/D timer are tabulated in Table A5-1 of Appendix A. The SS/D timer will start at liftoff and continue through the injection and reorientation phase. The orbital programmer will be started by the SS/D timer at booster separation and will remain on for the duration of battery power. The orbital programmer will turn off the S-band beacon transponder and telemetry transmitter beyond the Downrange T/M Ship reception range, will cycle this equipment on and off for readout periods over tracking stations, and will turn the SS/D timer on halfway in the recovery pass to initiate the recovery sequence of satellite operations. Orbital period setting in the orbital programmer at liftoff is listed in Table A2-1 of Appendix A.

5.2 VANDENBERG CONTROL CENTER (VCC)

5.2.1 The VCC will conclude countdown operations by connecting the blockhouse communication circuit to the STC communications conference networks approximately 15 minutes before launch. In this manner the lift-off tone and verbal confirmation will be transmitted to the STC and all tracking stations communicating with the STC. Following liftoff, the VCC will disconnect the blockhouse circuit from the STC communications network.

5.2.2 The VCC will notify the Downrange T/M Ship immediately by SSB radio that liftoff has occurred and will give system time of liftoff. In the event of loss of communications with the ship, the VCC will request [redacted] to monitor the HF radio frequency and relay messages to the ship.

5.2.3 Both [redacted] and [redacted] Tracking Station radar tracking charts will be preplotted with elevation angles for the Downrange T/M Ship. These angles will be read periodically from the plotboard of the active tracking station as long as the exit trajectory is being plotted and will be relayed to the ship by the VCC to assist in acquisition and tracking.

5.2.4 Tracking and real-time telemetry data, as transmitted over the voice and 60-wpm teletype circuit to the STC from the [redacted] and the [redacted] will be monitored by the VCC. Real-time telemetry data transmitted to the VCC via SSB radio from the Downrange T/M Ship will be relayed by voice to the STC and by 60-wpm teletype to the PAC.

5.2.5 Following launch, the VCC will maintain communications with the Downrange T/M Ship and monitor the voice and 60-wpm teletype equipment until directed to secure by the STC.

5.3 [redacted] TRACKING STATION [redacted]

5.3.1 The lift-off tone will be recorded on the oscillograph/Datarite equipment in the telemetry building at [redacted] Utilizing the binary system time indication on the recording, time of liftoff (using the appropriate code word) to the nearest second will be transmitted to the STC and PAC over the 60-wpm teletype. The announcement of liftoff will also be made by voice to the STC, giving system time in digitized form from the system clock. Time-event reports will be made in accordance with the format in [redacted]

5.3.2 At liftoff, tracking will begin with the TLM-18 self-tracking antenna driving the slave tracking data bus. The VERLORT radar antenna will assume this function at T + 100 seconds when parallel errors are sufficiently reduced and multipath and signal reflection interferences have decreased to a negligible level. Initial radar positioning will be accomplished by the use of a Mark 51 gun director if radar difficulties are experienced and "lock-on" cannot be maintained.

The tri-helix will be positioned manually as a function of maximum signal strength until consistent tracking data are available from the slave tracking data bus, at which time it will be manually slaved to the slave tracking data bus.

5.3.3 Under normal circumstances [redacted] radar will track actively from earliest acquisition until the end of track. [redacted] ill go passive and the two [redacted] range safety MPS-19 radars (one active and one passive) will be shut down at T + 164 seconds. Fine PRF synchronization by [redacted] will be required only during the time [redacted] and range safety are actively tracking.

5.3.4 To preclude the possibility of tracking on a side lobe of the radar antenna, [redacted] will manually attenuate the received signal strength before launch to a value which will limit automatic tracking to the main lobe. The attenuation will be removed gradually as signal strength decreases after launch.

5.3.5 [redacted] will record radar, TLM-18, and Doppler tracking data on punched teletype tape as long as tracking is maintained and will transmit radar tracking data to the Palo Alto Computer via 100-wpm teletype immediately. TLM-18 and Doppler data will be transmitted when directed by the STC.

5.3.6 All telemetry data will be recorded on magnetic tape. Significant real-time data will be recorded on an oscillograph/Datarite, as described in Section 8.

5.3.7 Performance, command, and status summaries will be submitted via the 60-wpm teletype following launch. The performance summary will include fade time of the radar, tri-helix, and TLM-18 tracker. The report will also include fade time of telemetry and Doppler signals separately. The values of the payload binary readout, as read from the oscillograph/Datarite or other recorder, and the numerical equivalent from the conversion table, will be added at the end of the command summary for transmission over the 60-wpm teletype.

5.3.8 Emergency procedures and alternate modes of operation will be directed or authorized by the STC whenever time and circumstances permit. If time is critical or communications out, [redacted] will follow the general procedures outlined below for abnormal conditions.

5.3.8.1 Loss of Radar During Exit Trajectory. Upon loss of radar tracking during the exit trajectory, the TLM-18 will be used as the slaving master to drive the radar and tri-helix antennas. Radar data will be recorded without range. Slaving data will still be sent to [redacted] in the event [redacted] has not acquired. If the TLM-18 is not tracking but the vehicle is in sight, the Mark 51 optical tracker will provide the slaving data.

5.3.8.2 Loss of Slaving Capability. Upon loss of slaving functions, voice position data (azimuth and elevation) will be called out from the operating panel of the most accurate equipment successfully tracking and will be used to position manually any equipment not already tracking.

5.3.8.3 Loss of Data Recording. Malfunctioning of the radar digital-to-teletype data link will require alternate data transmittal procedures. For both the exit trajectory and orbit passes, six points from each of the XY and YZ plotted trajectories will be tabulated and transmitted via the 60-wpm teletype if so directed by the STC. Angular data alone will be of small value for the trajectory calculations; therefore, TLM-18 plotboard information will not be transmitted unless specifically requested. Loss of plotting capabilities will not affect operations significantly at the station during launch.

5.3.8.4 Loss of Communications. Loss of communications to the [redacted] before launch will be reported to the VCC and a launch hold will be called. In the event of loss of communications during the exit trajectory, [redacted] will maintain passive radar tracking status, recording telemetry and Doppler data as long as track can be maintained.

5.4 [redacted] TRACKING STATION [redacted]

5.4.1 At liftoff, either the radar will be slaved to [redacted] r directed at the launch pad with a one-degree elevation, depending on equipment status. The tri-helix antenna will be slaved manually to the [redacted] slave tracking data bus which will be driven by either th [redacted] or [redacted] radar. The range-phasing equipment will be used to synchronize the radar triggers of [redacted] and [redacted] Tracking on the main radar antenna lobe will be verified by signal strength level at acquisition. If side lobe tracking indications are noted, a manual excursion of ±10 degrees in azimuth and ±5 degrees in elevation will be made at the earliest possible time before T + 90 seconds to establish tracking on the main antenna lobe. Active tracking will be accomplished as soon as lock-on is established with data being punched on the data tape. Radar tracking data will be transmitted immediately to the PAC via 100-wpm teletype. Doppler tracking data will be transmitted when directed by the STC.

5.4.2 All telemetry data will be recorded on magnetic tape. Significant real-time data will be recorded on an oscillograph/Datarite, as described in Section 8.

5.4.3 [redacted] racking Station has the responsibility of determining and transmitting the required time-to-fire and velocity-to-be-gained correction commands to provide engine ignition and cutoff times necessary for achievement of the desired orbit. Computation and transmission of these correction commands will be accomplished automatically by the Reeves guidance computer system by sampling and evaluating launch tracking data at two predetermined points. The time-to-fire correction command will be transmitted automatically through the vehicle command panel and will be initiated on Command Channel 5 of the VERLORT S-band radar encoder. This command will delay the engine ignition time by an amount equal to the duration of command. The velocity-to-be-gained correction command will be automatically initiated on Command Channel 6 of the S-band radar encoder when Command 5 is terminated. Reduction in velocity-to-be-gained, as determined by the airborne guidance integrator, will be proportional to the duration of the command sent.

5.4.4 The time-to-fire correction received by the vehicle S-band radar decoder is relayed to the SS/D timer. The SS/D timer clutch is slipped by a time equal to the duration of the command sent, delaying the engine ignition sequence by a like amount. The sequence of event which follows correction command termination is initiated after a short time delay period. This time delay period, which is given in Table A5-1 of Appendix A, is programmed into the sequence of events to allow for any momentary dropout of command signal as it is being transmitted to the vehicle. Following termination of the time delay period, the ullage rockets will be fired, thus initiating engine ignition. Duration of engine firing, engine shutdown, and all of the above events are listed in Table A5-1 of Appendix A along with their respective times of occurrence.

5.4.5 Nominal, preset correction command durations are provided in the manual control console as a backup to the Reeves guidance computer. If selected by the operator, these commands will be transmitted to the vehicle instead of the computer commands.

5.4.6 Computer sampling times, the time to transmit the commands to the vehicle, and the nominal command durations will be provided to [redacted] separately as early as possible consistent with receipt of finalized weight data by the design group.

5.4.7 Emergency procedures and alternate modes of operation will be directed or authorized by the STC whenever time and circumstances permit. If time is critical or communications are out, [redacted] will follow the general procedures outlined below for abnormal conditions.

5.4.7.1 <u>Loss of Radar Tracking</u>. Radar tracking by [redacted] is considered a primary requisite for launch. Loss of this capability before launch will result in postponement of the flight until radar tracking has been restored.

5.4.7.2 <u>Loss of [redacted]-to-[redacted] Slaving Data Link</u>. An acquisition programmer preplot (or a manual plot, if necessary) will be provided on the plotboard for comparison with the actual tracking data during the launch phase. This plot will be used as a rough guide in positioning the radar in the event of failure to acquire immediately at liftoff, with no slaving capabilities available. A 10-degree spiral scan should be utilized during the search mode in this event.

5.4.7.3 <u>Loss of Radar Digital Recording</u>. Alternate procedures will not be required for this condition except that plotboard data, particularly the data following orbit injection, will be read and tabulated manually, then transmitted via the 60-wpm teletype if this is requested by the STC.

5.4.7.4 <u>Loss of Communications</u>. Loss of communications before launch will cause a hold until corrected. In the event the loss of communications follows launch, [redacted] will proceed according to the normal plan. In the event of loss of SSB communications between the Downrange T/M Ship and the VCC, [redacted] will be directed to relay communications through PMR to the ship.

5.5 DOWNRANGE TELEMETRY SHIP

5.5.1 At launch, the Downrange Telemetry Ship will be on station on the projected trajectory approximately 1150 nm downrange. Location on the projected trajectory will provide maximum signal strength and the maximum range of reception. It will also facilitate tracking since a minimum of azimuth change will be required. The 1150-nm downrange location will provide the maximum possible data on the reorientation phase, while assuring coverage of engine burnout and orbit injection.

5.5.2 The Downrange Telemetry Ship will proceed with the minimum speed necessary to maintain steerage. A heading (Table A2-1) which will align the ship on the projected vehicle trajectory will be used to provide a relative antenna azimuth of zero degree for nominal acquisition, unless the sea condition necessitates a different heading to minimize ship roll. In this event the antenna acquisition azimuth will be modified by the difference between the ship heading and the "on trajectory" course.

5.5.3 The VCC will notify the Downrange Telemetry Ship of liftoff via the SSB radio. The two antennas will be directed in azimuth toward the launch site before T + 200 seconds, with a 5-degree elevation. With this setting, any trajectory within maximum deviation limits will place the Discoverer within a tri-helix beamwidth from earliest possible acquisition until approximately T + 440 seconds. The time at which the Discoverer will cross the 5-degree elevation and other tracking information pertinent to tracking by the Downrange Telemetry Ship is shown in Figure A5-2 and explained in Appendix A.

5.5.4 As a further aid to the Downrange Telemetry Ship tracking facility, the [redacted] nd [redacted] dar tracking data plots will contain preplots of elevation angles for the ship. The tracking stations will report the approximate angles as the Discoverer Satellite approaches the ship, and this information will be relayed to the ship by the VCC. Figure A5-2 should be used in conjunction with this information for antenna positioning in the case of a nominal vehicle trajectory (±4-degree variations).

5.5.5 Doppler frequency data will be recorded by the Downrange Telemetry Ship and, if requested, will be transmitted to the VCC via the SSB radio. The VCC will relay this data for the PAC.

5.5.6 Two copies of the magnetic tape recordings of telemetry and Doppler data will be made for retention aboard ship and delivery upon reaching port. Aircraft pickup will be made of original tape recordings. Immediately after receiving the launch data, the Downrange Telemetry Ship will depart from the station and proceed to Port Hueneme. An evaluation report of the data received by the ship will be made to VCC to assist in the decision as to whether air pickup is required and, if so, how soon. If a decision is made to accomplish air pickup, the ship will comply with the procedures established for the air pick-up operation in Paragraph 5.6.

5.6 DOWNRANGE TELEMETRY SHIP DATA AIR PICK-UP OPERATION

5.6.1 A specially fitted Air Force pick-up aircraft will be stationed at Edwards AFB until dispatched by the 6594th Test Wing. Orders to depart on the pick-up mission will be given only by the Air Force Test Controller or his designated representative. The 6594th Test Wing will notify the 11th Naval District of the scheduled launch date, and obtain clearance for the data pick-up aircraft through W-291.

5.6.2 If the launch is early enough to allow a daylight pickup, the data pick-up mission will be flown the day of the launch. Otherwise, the pickup will be scheduled for the following morning with the aircraft departure timed to effect a rendezvous with the telemetry ship shortly after sunrise.

5.6.3 If possible, the data pick-up aircraft will return the telemetry tapes to Moffett Naval Air Station where they will be picked up by an authorized Lockheed representative. If, due to weather or fuel limitations, delivery to Moffett is impossible, the tapes will be delivered to Vandenberg Air Force Base where they will be picked up by the 6594th Test Wing aircraft and delivered to Moffett NAS.

5.6.4 Position reporting of the data pick-up aircraft will be accomplished by standard Air Force procedures through McClellan Overseas Airways, and relayed to the STC. The STC will notify the ship via the VCC of the pick-up aircraft departure. HF contact will be established between the ship and the aircraft using 11.214 mc or 6.741 mc. When in the immediate area of the ship, and for pick-up operations, the assigned UHF frequencies (301.8 mc primary and 338.0 mc secondary) will be utilized.

5.7 PALO ALTO COMPUTER (PAC)

5.7.1 The basic operation of the Palo Alto Computer (PAC) will be:

a. Receive time-event alphanumeric messages via 60-wpm teletype
b. Receive radar, TLM-18 tracker, and Doppler range-tracking data
c. Enter data into the 1103AF computer program and perform necessary calculations
d. Advise STC of abnormal operations
e. Prepare and transmit acquisition messages to stations in alpha-numeric form, including command instructions
f. Prepare and transmit acquisition programs providing predicted trajectory data
g. Provide STC with plot data and operational information.

5.7.2 The computer operators will keep the STC informed as to the status of data received, any problems or malfunctions which occur during flight operations, and the overall status of computer functions.

SECTION 6
ORBIT OPERATIONS

6.1 NOMINAL ORBIT SCHEDULE

6.1.1 A nominal orbit schedule is listed in Table A6-1 of Appendix A. This table provides a time-latitude relationship for events that take place during passes which intersect station reception ranges during the vehicle battery life. Acquisition and fade times aid in acquisition by the tracking stations and provide an approximate time span of tracking time. The times listed in this table are for a nominal orbit period, and are for reference only.

6.2 ACQUISITION PROCEDURES

6.2.1 Starting at the liftoff signal, [redacted] racking [redacted] an [redacted] Tracking Station [redacted] will conduct an equipment check to insure readiness prior to first pass operations. A verification will be made of operational capability of all equipment, the correct settings of all switches and control adjustments, and readiness of recording equipment. A final boresight check will be made on the radar and teletype tape headings perforated for the data transmission. The radar interrogation signal will be checked for proper positioning of the center pulse to eliminate the possibilities of spurious vehicle commands during tracking operations.

6.2.2 The PAC will evaluate exit trajectory data and transmit to [redacted] and [redacted] up-dated Reeves orbit computer parameters, plotboard check points, and ETA and ETT clock settings. These will be transmitted on the 60-wpm teletype together with an up-dated acquisition program in Cartesian coordinates (X, Y, Z) and time via 100-wpm teletype. Reception will be verified by each station to the STC. The acquisition program will be entered in the programmer and a preplot of the program will be made to verify that a reasonable program has been transmitted. The program tape will be rewound and readied to start ETA=0. Orbit computer parameters will be set at all stations, the check points plotted, and the ETA and ETT clocks set. At the given system time, the ETA clock will be started by the shift supervisor at each station.

6.2.3 Positioning procedures for initial acquisition by the [redacted] nd [redacted] antennas are given in Table 6-1. Active search will begin at ETA-5 minutes and continue until ETA+15 minutes. When ETA=0, the Reeves orbit computer will be started. The acquisition programmer will drive the slave data tracking bus circuit beginning at ETA=0. Procedure for initial active search utilizes a sector horizon scan with the VERLORT antenna prepositioned at three degrees elevation and the tri-helix antenna at five degrees. Upon acquisition by any antenna, the other antennas will be vectored in the same direction. Following acquisition by the radar, the tri-helix will be manually slaved to the radar via the slave tracking data bus.

6.2.4 If acquisition is not achieved by the above procedure, tracking stations will be directed to make two types of search:

a. If sufficient data are known to predict the orbital plane of the vehicle, an orbital plane search of 232.4 mc will be directed. The STC will provide the necessary search coordinates.
b. If insufficient data exist to define the orbital plane, all tracking stations will be directed by the STC to make a tri-helix search of 232.4 mc. This search will be conducted in the vertical plane of the station at right angles to the vehicle path from horizon-to-horizon at a rate of approximately 180 degrees of search in 15 seconds. The radar will be directed in horizon sector search using the best estimates of probable trajectories from launch tracking data, until further search in the above manner is not considered necessary by the STC.

6.2.5 Loss of S-band beacon transmission will not affect "lost bird" acquisition procedures, since the narrow beamwidth of this equipment plus the cyclic on-time make first acquisition by this means unlikely. Loss of either the telemetry or C-W beacon does not affect procedures since the tri-helix

[redacted]
Revised Page
20 May 1960

Table 6-1
ANTENNA POSITIONING PROCEDURE FOR INITIAL ACQUISITION

STATION	EQUIPMENT	PARAMETER	ETA −5	ETA +2	ETA +4	ETA +6
[redacted]	VERLORT	Elevation angle Azimuth angle Azimuth scan	3° Acq Pt ± 10°	Acq prog + 2 position Acq prog + 2 position ± 20°	Acq prog + 4 position Acq prog + 4 position ± 20°	20° Fade Pt ±30°
	Tri-helix	Elevation angle Azimuth angle Azimuth scan	5° Acq Pt ± 10°	Match radar position 0°	Match radar position 0°	Match radar position ±10°
[redacted] (if station does not acquire)	VERLORT	Elevation angle Azimuth angle Azimuth scan	3° Acq Pt ± 10°	No change	No change	No change
	TLM-18	Elevation angle Azimuth angle Azimuth scan	0° Acq Pt ± 10°	No change	No change	No change
	Tri-helix	Elevation angle Azimuth angle Azimuth scan	± 10° Acq Pt ± 10°	No change	No change	No change

NOTES:

Radars will use a sector scan over the azimuth angle indicated.

Approximate scan rates are: radar, 12 deg/sec; tri-helix, manual limitation; TLM-18 8 deg/sec

is used in search for either. However, loss of the C-W beacon will make acquisition in the "lost bird" situation more difficult because of the cyclic nature of the telemetry transmissions.

6.2.6 In the event of a "lost bird" situation, full equipment availability will be required for the first 27 hours after launch. The radar will be in a stand-by, warmed-up status if not actually searching. This will allow the equipment to be placed in operation immediately for command functions and data recording if acquisition is effected by the tri-helix search. Operations beyond 27 hours, if requested by the STC, will consist of a tri-helix or fixed-antenna search on a limited-station-manning basis only.

6.3 TRACKING PROCEDURES

6.3.1 Tracking will be maintained from acquisition to signal fade or actual turn-off of the vehicle S-band beacon transponder and telemetry with the radar normally driving the slave tracking data bus. The TLM-18, where available, can be used to drive the slave tracking data bus in the event radar lock-on cannot be maintained.

6.3.2 During tracking, the Reeves orbit computer will be updated continuously by appropriate adjustments in the Reeves computer operator panel to zero out the error signals. If radar acquisition is lost temporarily, the Reeves orbit computer will drive the radar until reacquisition. Updating of the Reeves computer will be stopped near the end of track at a time when errors are zero, so that the parameters of the circular orbit which best fit the actual trajectory at that time may be read from the dials.

6.3.3 Post-pass activities consist of returning equipment to stand-by status and making checks, where possible to determine any changes in operation since the pre-pass checks. A boresight check is conducted, Doppler reference frequency is checked, synchros are checked for orientation and accuracy, and receiver sensitivities are checked. Plotboard scales are checked, pens cleaned, and maps changed. If acquisition is expected on the next pass, these preparations will begin immediately in order to insure readiness. Where several orbits occur between station passes, the STC may request a closed-loop check with the computer; in this case, the acquisition data are used to slave the radar, and recorded data are returned to the computer for evaluation. Considerations of time available and past performance will be weighed by the STC in deciding the course of action to be followed.

6.4 COMMAND OPERATIONS

6.4.1 The six ground commands and the changes that result from transmission of the commands are explained in Section 2. The following paragraphs explain the conditions which will require transmission of the ground commands and specify the times at which the commands should be sent.

6.4.2 Variations in launch phase performance of both Discoverer Booster (Thor) and Discoverer Satellite (Agena) vehicles may cause the actual orbit period to deviate from the nominal. Since the orbital programmer period was set at launch to agree with the nominal or predicted orbit period, the programmer rate must be changed to agree with the actual orbit period. The required adjustment is determined as explained below:

a. The actual orbit period can be found with adequate accuracy by determination of the elapsed time from launch to crossing of a reference latitude on Pass 1. Table A6-2 provides a tabulated means for determining the actual orbit period on Pass 1, and the corresponding programmer adjustment required for orbit periods differing from the initial orbital programmer setting.

b. On Pass 2, the orbit period, in seconds, can be determined more accurately by the difference in time of crossing the same latitude on Passes 1 and 2. If necessary, crossing of different latitudes on subsequent passes may be utilized, using an average value of four degrees per minute for transition between the two latitudes. The orbital programmer period can be obtained from telemetry data as discussed in Paragraph 2.4.5. The adjustment to be made is the number of increments of 10-2/3 seconds required to match the programmer setting to the orbit period. The programmer period can be checked accurately by observing the elapsed time from reset command at 60° N latitude on Pass 1 to the reset monitor signal in the vicinity of 60° N latitude on Pass 2, and similarly on subsequent passes.

6.4.3 In order to step the orbital programmer in a desired direction, the increase/decrease switch setting must be in the proper position. A change in position, if required, can be accomplished by transmission of Command 1. Verification of the increase/decrease switch setting must be obtained before transmitting step commands. Except when transmitting increase steps, all stations shall maintain the increase/decrease switch in the decrease position for calibration purposes. Step command transmissions will be limited to the number of commands directed by an actual count of outgoing transmissions. The number of verifications received, the telemetered period, and the increase/decrease switch position data will be reported to the STC for evaluation and issuance of further commands, if warranted.

6.4.4 The reset monitor signal, as shown in Figure A2-7, will be programmed to occur at 60° N latitude when reset is planned for [redacted] at 20° N latitude for [redacted] at 30° N latitude for northbound passes over [redacted] and at 40° N latitude for southbound passes over [redacted] Turn-on and turn-off of the reset monitor signal will be reported to the STC to give programmer tape position information. If the reset monitor signal is on at acquisition and ahead of the reset latitude, and a programmer lapping operation is not in process, the reset command (Command 3) is to be sent immediately and reported to the STC. No other reset commands will be given unless directed by the STC or as explained in Paragraph 6.5.5, Emergency Procedures.

6.4.4.1 On the pass preceding the recovery pass, the reset command will provide a time adjustment on the capsule separation event which occurs midway on the recovery pass. The actual reset point on the pass preceding the recovery pass will be obtained from the PAC, either as a latitude or a time-of-command transmission to compensate, as necessary, for variations in orbit parameters at the point of recovery initiation.

6.4.5 In the event of loss of telemetry data, the STC will direct orbital programmer period changes and reset commands based on past history of commands, assuming that all commands are received. Turn-on and turn-off data from previous passes should be used as a guide to the fullest possible extent.

6.4.6 Adjustment of the payload function selectory by issuance of Command 4 when an AET payload is carried will be by STC direction only.

6.4.7 Transmission of Commands 5 and 6 will be by STC direction only. The STC may direct transmission of Command 6 on Passes 10, 15, and 16 to assure normal re-entry initiation; however, this is not absolutely necessary insofar as the normal re-entry sequence has been programmed since liftoff. The position of the re-entry selector is telemetered and will be read out as listed in Table A8-1. The area between 55° and 40° N latitude should be avoided when transmitting commands on Passes 15, 16 or 17, since relay chatter might result in an inadvertent re-entry initiation if commands were transmitted during the time a re-entry initiation was programmed.

The table below shows the program tape punch arrangement for the normal and alternate re-entry initiation circuits. Re-entry will be assured on Pass 18, if it has not occurred earlier, by punches in both channels on this pass.

Command	Re-entry Tape Channel	Pass 15	Pass 16	Pass 17	Pass 18
6	Normal			X	X
5	Alternate	X	X		X

6.4.8 Verifications of commands to the satellite are achieved by telemetry signals which are decommutated, recorded, and presented to the command control operator in the form of lights above each command button. A warning light is also provided to indicate a decommutator "out-of-sync" which would give an erroneous verification of commands. The six commands are possible by combinations of four beacon tones. Combinations of telemetry verifications of these four tones, in turn, verify the six possible commands.

Commands are verified by the following combinations:

	Command	Action	Tone Verifications
	1	Increase/Decrease (change direction)	A and B
	2	Step (adjust period)	B and C
	3	Reset (shift program tape)	A and D
	4	Payload Function	A and C
Exit	5	Time-to-Fire Correction	B and D
Exit	6	Velocity-to-be-Gained Correction	C and D
Orbit	5	Alternate Re-entry	B and D
Orbit	6	Normal Re-entry	C and D

6.4.9 The primary verification of Commands 1 through 4 will be provided by transmission of four frequencies on continuous Channel 11 as follows:

Command	Frequency (cps)
1 (tones A and B)	183
2 (tones B and C)	244
3 (tones A and D)	293
4 (tones A and C)	400

Command verification lights on the command console will be energized when the proper frequencies are received on Channel 11.

6.5 EMERGENCY PROCEDURES

6.5.1 It is important that whenever possible the STC shall direct the course of action followed in any emergency condition in order to maintain overall system coordination. In the event of complete loss of communications, however, certain emergency operations required to maintain scheduled operations may be directed and data may be obtained when communications again are established.

6.5.2 In the event of communications failure, the primary objectives of tracking stations are:

a. Acquisition of the vehicle during the pass
b. Issuance of commands to the vehicle, if necessary, to insure reception by the following stations or on the subsequent pass; and issuance of commands in accordance with instructions contained in this document
c. Storage of data for the earliest possible transmission.

6.5.3 The stations will be provided with tracking acquisition times and durations for a nominal trajectory. This information will provide a good chance of acquisition on Pass 1 even though a corrected prediction is not received. On subsequent passes, the tracking information received by the station on earlier passes will provide approximate values of orbit period, longitudinal regression per orbit pass, and inclination of the orbit plane. Lack of acquisition data from the PAC will make acquisition more difficult but not impossible or improbable.

6.5.4 If the station has received acquisition data but loses all communications with the STC before acquisition it will proceed in the normal manner and record all data possible, maintaining the data in readiness for transmission when communications are restored.

6.5.5 Vehicle commands ordinarily will be specified by the STC. However, in the event of loss of communication with the STC, programmer corrections may be made provided that sufficient information is available to show beyond doubt that the correction is required and correct, and provided that the orbit period is between 89.6 and 107.2 minutes. Sufficient information must include the following:

a. Position of the increase/decrease switch verified by T/M data

b. Existing timer period verified by T/M data

c. Required timer period based on calculations made from tracking data that are known to be valid.

6.5.6 Reset commands will also be transmitted under the conditions of Paragraph 6.5.5. The reset procedures to be followed provided a programmer lapping operation is not in process are:

a. If the reset monitor signal is observed at acquisition and ahead of the reset latitude, command reset immediately. Repeat the reset command at the specified latitude and make compensating programmer adjustments at this time.

b. If the reset monitor signal comes on after acquisition and before the reset latitude, transmit the reset command at the reset latitude. Compensating programmer adjustments may be made at this time.

c. If the reset monitor signal is not on at the time of crossing the reset latitude, transmit the reset command at the reset latitude. Compensating programmer adjustments may be made at this time.

6.5.7 If a prime tracking station indicates to the STC that tracking is erratic or has been lost completely, the STC may request a second station to assume the prime tracking role for command purposes.

6.5.8 Lack of acquisition programmers for any reason will result in use of the Reeves orbit computer as an acquisition programmer, using parameters furnished by the PAC.

6.6 STATION REPORTS

6.6.1 Tracking stations will report items of information to the STC in a manner predicated by the type and importance of the information. This information may be announced over the voice communication line or presented in the station post-pass reports via the 60-wpm teletype. Under normal circunstances, tracking station voice communications will be maintained throughout the active tracking period with switchover to data transmission immediately after tracking is completed. Communications will be directed and controlled by the STC.

6.6.2 Several items of information will be announced over the voice communications line immediately as they occur, e.g., a latitude crossing would be reported by simply announcing, "Crossing the 65° latitude now." The word or exclamation "now" will indicate the actual 65° latitude crossing as observed on the station radar plotting board. The system time of the reference latitude crossing will be given as soon as possible thereafter. Items of information to be reported in this manner are:

a. Acquisition
b. Reset monitor signal
c. The 65°, 25°, and the station latitude crossings on Pass 1S, and station latitude crossings on subsequent passes.

6.6.2.1 In the event that the plotboard should function erratically or fail to function, due to mechanical or signal reception difficulties, the station 90° or 270° azimuth line crossing will be reported in lieu of latitude crossing. The 90° or 270° azimuth line crossing time can be determined by observing the radar or tri-helix position indicators.

6.6.3 All items, as follows, will be reported by voice as soon as feasible and all times will be reported in system time:

a. Programmer period setting (in steps and seconds) from telemetry data
b. Reset monitor signal initiation and termination (system time)
c. Position of increase/decrease switch from telemetry data
d. Commands transmitted
e. Command verifications received
f. Change in programmer settings as a result of commands sent
g. Position of re-entry selector
h. Beacon and telemetry turn-on and turn-off.

The above items also will be included in reports following pass completion.

6.6.4 At the conclusion of the tracking operation, each station will transmit the following via the 60-wpm teletype: (1) a performance summary describing the quality of operation of various station equipments, and (2) a command summary giving commands transmitted, verifications received, time of crossing, Reeves orbital parameters, and a Doppler calibration report. Format and procedures for these reports are given in [redacted] Any of the above information may be transmitted via the 100-wpm teletype at the discretion of the STC.

6.7 RE-ENTRY TELEMETRY SHIP

6.7.1 The Re-entry Telemetry Ship, Pvt. Joe E. Mann, may be stationed directly under the Discoverer Satellite on nominal orbit Pass 17 to provide a continuous Agena vehicle and recovery capsule telemetry record during satellite reorientation, capsule separation, and the initial re-entry trajectory. On other flights, it may be used south of Hawaii to provide telemetry coverage in the event the re-entry is not nominal. The position of this ship will be specified in Appendix A.

6.7.2 The Pvt. Joe E. Mann will be on station at T + 3 hours and ready to relocate as orbit tracking information is obtained and converted into an ephemeris prediction for the recovery pass. Expected deviations in the longitude at which the satellite will cross the ship station latitude will be given to the HCC by the STC. The PMR representative in the HCC will then direct the ship to relocate as necessary to the closest point possible under the predicted satellite path. Finer revisions will be issued as orbit prediction accuracy increases.

6.7.3 During active passes, the Pvt. Joe E. Mann will receive acquisition messages, track the satellite to the maximum extent possible, and reduce orbital programmer data and other data that will be observed during the recovery pass. Data as described later will be reported to provide all available information on the re-entry operations.

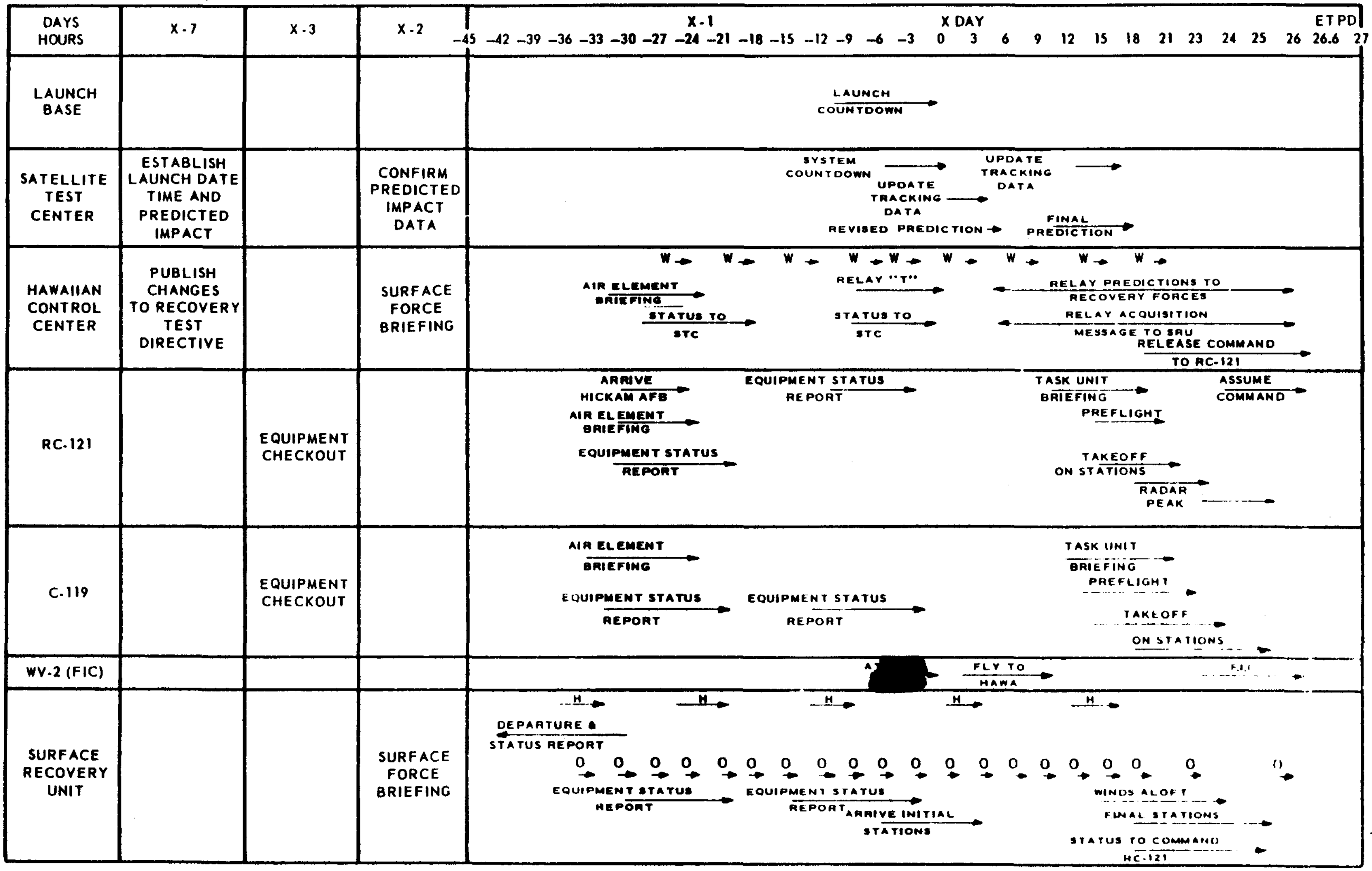
SECTION 7
RECOVERY OPERATIONS

7. 1 GENERAL

7. 1. 1 A primary objective of this program is the recovery of a re-entry capsule ejected from orbit on the scheduled recovery pass. The recovery capsule will be placed on a re-entry trajectory, shown in Figure A7-1 of Appendix A by a programmed retro rocket firing. Programmed parachute deployment will slow capsule descent rate. Activation of recovery aids will enable capsule detection for air recovery by specially equipped aircraft.

7. 1. 2 On the pass preceding the recovery pass, orbital programmer correction commands will be transmitted to the vehicle to refine the timing of the re-entry sequence to place the recovery capsule within a predetermined area in which the recovery force is operating. The correction commands will be based on data received from the vehicle on the second pass preceding the recovery pass. Acquisition aids contained within the capsule will aid both air and surface craft to acquire the capsule during re-entry. Coordinates of the center of the initial predicted impact area along with other pertinent recovery data are listed in Table A2-1 of Appendix A. The time sequence of recovery operations is shown in Figure 7-1. Figure A7-2, Surface Ship Deployment, of Appendix A presents a positioning plan for the surface ships taking part in the recovery operations. Additional figures needed to further describe the recovery effort on a particular flight will be included in Appendix A, the tab for that flight.

7. 1. 3 Detailed recovery operating procedures are contained in the [redacted] and the [redacted] Recovery capsule disposition instructions are provided by the current AFBMD Implementation Plan.



W - *HCC compiles and relays weather information to STC*
H - *Haiti submits Rawinsondes to Fleet Weather Central*
O - *Surface observations to Fleet Weather Central, Haiti, and Dalton*

Figure 7-1 Time Sequence of Recovery Operations

7.1.4 Deviations of detailed procedures from general procedures contained herein must have the approval of the STC.

7.2 ESTIMATED TIME OF PARACHUTE DEPLOYMENT (ETPD)

7.2.1 The estimated time of parachute deployment (ETPD) is nominally T + 26.6 hours.

7.3 PRERECOVERY OPERATIONS

7.3.1 Final confirmation of the flight date will be disseminated by the 6594th Test Wing (Satellite) (ARDC) on or before seven days prior to launch. The message will contain a prediction of the recovery area location. Recovery operations will begin by notification of all supporting forces by the 6594th Recovery Control Group and arrangement for the assignment of the elements in the Hawaiian area listed in Paragraph 3.6.2. Elements in the continental United States will be notified by the 6594th Test Wing in Sunnyvale.

7.3.2 Equipment preparation and checkout will be monitored, and satisfactory reports will be obtained for the following:

a. Aircraft
b. All radar (airborne and shipborne)
c. VHF/HF radios (airborne and shipborne)
d. Beacon receivers (airborne and shipborne)
e. Navigation equipment (airborne and shipborne)
f. HCC communication and other equipment
g. Recovery equipment

7.3.3 Weather forecasts for the Hawaiian area and the recovery area will be monitored starting at X-7 days. Forecasts will be transmitted to the STC at T-24 hours, and every six hours thereafter until recovery, except that the T=0 report will be given at T-2 hours to allow for prelaunch decision on weather. Aerial reconnaissance will provide weather information from the recovery area as described in the [redacted] dated 14 November 1958, and subsequent addenda. The recovery ships will report to Fleet Weather Central. The Haiti Victory submits Rawinsondes at 0000 and 1200 hours GMT daily. The Haiti Victory and the Dalton Victory submit surface observations every 3 hours commencing at 1200 GMT.

7.3.4 A Recovery Force briefing of all surface forces will be conducted on approximately X-2 day and a briefing of all aircraft forces on approximately X-1 day in order to provide:

a. Predicted impact area
b. Predicted time of parachute deployment
c. Force deployment schedules and positions
d. Communication procedures
e. Predicted weather conditions
f. Search plans and flight patterns
g. Emergency procedures.

7.3.5 Ships will depart with sufficient time to reach initial deployment positions by T+4 hours. Approximate locations of the ship deployment stations are listed in Table A2-1 of Appendix A for a nominal flight trajectory.

7.3.6 The PAC will evaluate the tracking data after launch and will provide a revised impact location as soon as possible. The HCC will command redeployment of ships concurrently. By T+17 hours, the computer will calculate a further revised impact location and revised deployment positions will be established by the HCC. The predicted impact area covers 60 nm crossrange by 200 nm downrange.

7.3.7 A preflight briefing of all aircraft crews will be conducted by the Recovery Test Controller and the Recovery Test Director approximately three hours before dispatching the aircraft providing the refined deployment area, predicted parachute deployment time, impact location, latest weather conditions, and a general review of operations detailing any revision of plans since the general briefing.

7.3.8 The RC-121 aircraft will depart for the recovery area so as to be on station approximately three hours before ETPD. An HCC representative, designated "On-the-Scene Test Controller," will be aboard the Command RC-121 and will conduct the recovery operation. The C-119J aircraft will depart at a time so they will be at their designated locations one hour before ETPD. Communication and time checks over established UHF frequencies will be conducted between the Command RC-121 and the surface ships as they rendezvous prior to assuming their assigned positions. Search flight patterns will be designated by the HCC and will provide a straight flight path for the RC-121 aircraft from ETPD -10 minutes to ETPD +20 minutes. Locations of aircraft in the recovery area will be specified by the HCC, depending upon the number of aircraft available.

7.3.9 Operating on an "as available" basis from PMR, two WV-2 aircraft will be used in the recovery operation and, if their assigned recovery locations permit, will complete a search for interference in the recovery area by ETPD-30 minutes. All frequency transmissions which might interfere with recovery operations will be position plotted and reported to the Command RC-121. At ETPD-15 minutes, the WV-2 aircraft will be positioned at their assigned locations to receive and record the capsule beacon and telemetry signals during the descent trajectory. Signal acquisitions, frequencies, and bearings will be reported immediately to the Command RC-121.

7.3.10 A later revision of the impact location will be given to the HCC by the STC following computer evaluation of the data from the second pass preceding the recovery pass. The final prediction will be made by the computer at the end of the pass preceding the recovery pass based on the final timer setting, and will be given to the HCC for final instructions to the recovery forces.

7.3.11 In the event of no acquisition on capsule re-entry, the computer will utilize tracking data from the recovery pass to establish the most probable impact area.

7.3.12 The HCC will be notified by the tracking stations of all data which would indicate successful or unsuccessful separation operations. Beacon and telemetry turn-off over [redacted] on the recovery pass will also be reported to indicate passage of the re-entry phase in the program tape.

7.3.13 The Re-entry Telemetry Ship, Pvt. Joe E. Mann, will put to sea with sufficient time to arrive on station not later than T+3 hours. Communications checks from sailing time to T-24 hours will be accomplished daily with the VCC at 1830 and 2300 hours GMT and with [redacted] or HCC (whichever is closer) at 1800 and 2330 hours GMT. The equipment status report will be given during the 1800 and 1830 GMT contacts, and the ship's position, weather, and equipment status reports will be given during the 2300 and 2330 GMT contacts. The [redacted] or HCC will include the ship's equipment status report, weather, and position with its own scheduled station status reports.

After T-24 hours, the ship will report the ships position, weather, and equipment status to the VCC at T-20, T-14.5, T-11.5, and T-3.5 hours, and to [redacted] or HCC at T-19.5, T-6, T-3, T-0.5, T+6, T+12, T+18, and T+24 hours.

Prior to launch, the ship and [redacted] or HCC will maintain radio silence from T-6 hours until T+30 minutes except for communication checks at T-6, T-3, and T-0.5 hours. Following launch, the [redacted] or HCC and the Pvt. Joe E. Mann will maintain radio silence during active satellite passes over the [redacted] Radio silence will also be maintained during active satellite passes over the ship. Following recovery, the communications will revert to the prelaunch daily schedule.

7.3.14 The following SSB frequencies will be used for ship-to-shore communications.

	[redacted]or HCC/ Pvt. Joe. E. Mann	VCC/ Pvt. Joe. E. Mann
In port and first day out	17622.5 kc	6741 kc
Second day out and beyond	11214.0 kc	11214 kc

7.3.15 Before crossing the 145° meridian, communication with the Captain of the Pvt. Joe E. Mann will be made through PMR Headquarters at Pt. Mugu; after the ship crosses the 145° meridian, communication will be through the PMR representative at the HCC. This communication channel will be used to request changes in the on-station location of the ship and movement of the ship for the data pickup.

7.4 RECOVERY OPERATIONS, POST RECOVERY OPERATIONS

7.4.1 Major changes to the recovery operations and the post recovery operations planned for Discoverer XII resulted from the decision to fly a diagnostic capsule and increase the detection capability of the Recovery Force. The Recovery Force configuration for subsequent flights may be revised again as significant new data are obtained. Therefore, the recovery operations and the post recovery operations sections have been removed from the basic text and will be included in Appendix A for each flight.

SECTION 8
REAL-TIME DATA REQUIREMENTS

8.1 GENERAL

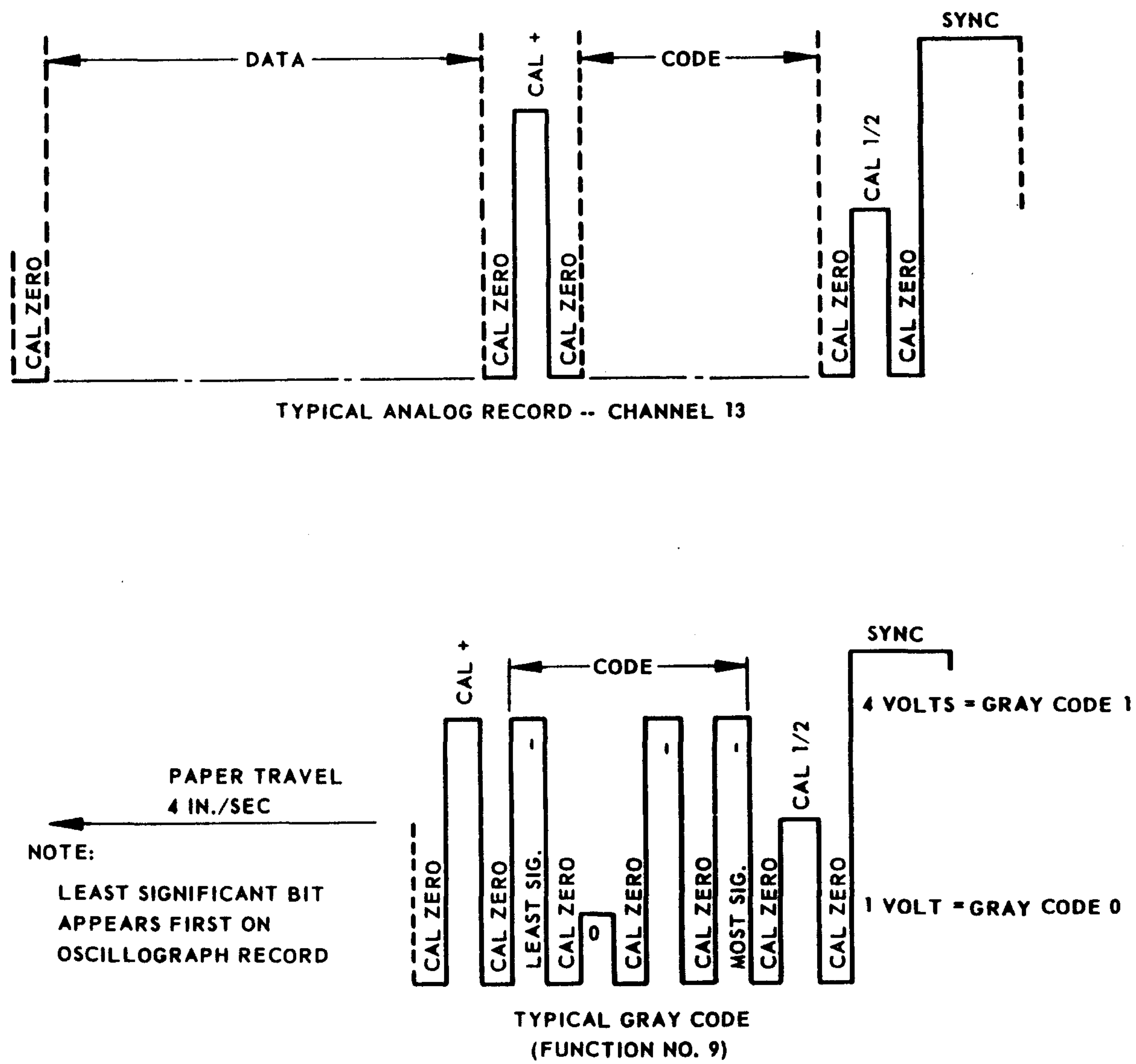
8.1.1 "Real time" is defined as "occurring during the active portion of a pass". A real-time record is a permanent record generated during the active portion of a pass and a real-time readout is information read during the active portion of a pass. A real-time record does not necessarily have to be read in real time.

8.1.2 Reporting of real-time readout information to the STC during a pass will generally be by voice while reporting of readout information to the STC after a pass will generally be by 60-wpm teletype. Commutated channel quantities reported by voice or 60-wpm teletype will be given in percent voltage with the zero calibrate signal defined as zero percent and the plus calibrate signal defined as 100 percent. Continuous channel quantities will be referenced to frequency bandwidth (±7-1/2 percent).

8.1.3 Efficient utilization of vehicle command capabilities requires the real-time readout of essential flight parameters on a first priority basis for evaluation by STC personnel. Other flight data are required in real time to determine events useful in the recovery effort and to monitor critical payload functions.

8.2 DETAILED REQUIREMENTS

8.2.1 Table A8-1 of Appendix A defines the real-time data readout and reporting requirements for ascent, orbit, and re-entry. Each measurement required is shown together with its channel number, priority, effective pass numbers, the tracking station or telemetry ship from which readout is



EQUIVALENCE

POSITION	GRAY CODE
1	0001
2	0011
3	0010
4	0110
5	0111
6	0101
7	0100
8	1100
9	1101
10	1111
11	1110

NOTE:

LEAST SIGNIFICANT BIT IS IN RIGHT HAND COLUMN

Figure 8-1 Determination of Payload Functions from Analog Record (AET Payload Only) expected, the time readout is required, and applicable notes. Telemetry magnetic tape recorder channel allocations are presented in Table 9-1. Changes to this table for each flight (required, for example, if two capsule telemetry transmitters are used) and the detailed requirements for recording and/or displaying real-time data on specific equipment at each station will be specified in an Interdepartmental Communication (IDC) or TWX to all stations by LMSD 61-44 (SV) not later than five days prior to flight.

8.2.2 Payload functions, listed in Table A8-1 of Appendix A and transmitted in the form of wave trains at predetermined intervals on continuous channels, will be monitored during flights on which an AET payload is carried. A qualitative comparison of these wave train forms shown in Figure A8-2 is required together with the system time of initiation and termination of the series of pulses.

8.2.3 The payload function selector setting at launch is listed in Table A2-1 for flights on which an AET payload is carried. In flight, the setting is transmitted from the vehicle in four-bit Gray code form on a commutated channel specified in Table A8-1. This channel will not be decommutated. The selector setting readout will be obtained by observation of the commutated wave train presentation on an oscillograph/Datarite record, a visicorder record, or an oscilloscope screen. Figure 8-1 illustrates how the commutated wave train is converted to the Gray code and then to the payload function selector setting. The four Gray code bits are located between the plus calibrate signal and the one-half calibrate signal and the bits are separated from each other by a zero calibrate signal. The one-half calibrate signal is followed by a zero calibrate signal and the sync pulse. A "O" Gray code bit is indicated by a 1-volt signal and a "1" Gray code bit is indicated by a 4-volt signal. The least significant bit occurs first on the oscillograph record following the calibrate pulse signal. The table in Figure 8-1 for converting the Gray code to the payload function selector setting should be used with caution since the least significant bit is the last digit in each Gray code number listed. The Gray code readout, with the most significant digit first and the corresponding payload function selector setting will be reported verbally to the STC during each pass. This will be transmitted to the STC over the 60-wpm teletype at the end of the command summary following each pass by all stations except [redacted]

SECTION 9
TEST DATA AND REPORTS

This section specifies details of the test data and reports required during the launch, orbit, and recovery phases of a flight to supplement the general information published in Section 7 of the [redacted] Similar details of the launch phase of a flight are also published in the FTD.

9.1 GENERAL

9.1.1 Recording of Test Data

Telemetry magnetic tape recorder channel allocations are presented in Tables 9-1 and 9-1A. Changes to these tables for each flight (required, for example, if two capsule telemetry transmitters are used) and the detailed requirements for recording and/or displaying real-time data on specific equipment at each station will be specified in an IDC or TWX to all stations by LMSD 61-44 (SV) not later than five days prior to flight.

9.1.2 Handling of Test Data

Every effort will be made to deliver the required test data within the time specified. Deviations due to conditions which occur during or after the conduct of the flight will be coordinated with LMSD 61-44 (SV). All test data will be correlated with LMSD system time, accompanied by appropriate calibrations, and annotated to facilitate identification and interpretation. The date, test number, source of data, and content must be included with each item.

Each data shipment will be accompanied by an inventory of all items included. A special heavy canvas mail bag and combination security lock provided by

Table 9-1
TELEMETRY MAGNETIC TAPE RECORDER CHANNEL ALLOCATIONS

TRACK	PASS	[redacted]	[redacted]	[redacted]	[redacted]
Track 1	launch	Vehicle* T/M (TLM-18)	Vehicle T/M (tri-helix)		
	orbit			Vehicle T/M (tri-helix)	Vehicle T/M (TLM-18)
	recovery				Capsule T/M (TLM-18)
Track 2	launch	Vehicle T/M (best of TLM-18 or tri-helix)	Vehicle T/M (tri-helix)		
	orbit	Vehicle T/M (TLM-18)		Vehicle T/M (tri-helix)	Vehicle T/M (TLM-18)
	recovery				Capsule GE beacon (TLM-18)
Track 3	launch	Vehicle T/M (tri-helix)	Vehicle T/M (tri-helix)		
	orbit			Vehicle T/M (tri-helix)	Vehicle T/M (tri-helix)
	recovery			Capsule GE beacon (tri-helix)	Vehicle T/M (tri-helix) Switch to capsule GE beacon if TLM-18 does not reacquire capsule after it passes through ionization layer
Track 4	launch	Thor ** T/M (best of TLM-18 or tri-helix)	Thor T/M (tri-helix)		
	orbit	Vehicle T/M (tri-helix)		Spare	Vehicle CWAT (tri-helix)
	recovery			Capsule T/M (tri-helix)	Capsule T/M (tri-helix)
Track 5	launch	Spare	Voice		
	orbit			Voice	Spare
	recovery				

* *Discoverer Satellite*
** *Discoverer Booster*

Table 9-1 (continued)

TRACK	PASS	[redacted]	[redacted]	[redacted]	[redacted]
Track 6	launch, orbit	Speedlok 10- and 50-kc reference signals Liftoff tone	Speedlok 10- and 50-kc reference signals Liftoff tone		
	orbit			Speedlok 10- and 50-kc reference signals	Speedlok 10- and 50-kc reference signals
	recovery				
Track 7†	launch	System time	System time		
	orbit	Voice Vehicle T/M signal strength Vehicle CWAT signal strength	Vehicle T/M signal strength Vehicle CWAT signal strength	System time Vehicle T/M signal strength Vehicle CWAT signal strength	System time Voice Vehicle T/M signalstrength Vehicle CWAT signal strength
	recovery			System time Signal strengths -- vehicle T/M, capsule T/M, capsule GE beacon	System time Voice Signal strengths -- vehicle T/M, capsule T/M, capsule GE beacon

† *If sufficient VCO's are not available, delete vehicle CWAT signal strength*

Table 9-1A
TELEMETRY MAGNETIC TAPE RECORDER CHANNEL ALLOCATIONS

TRACK	PASS	PVT. JOE E. MANN	KING COUNTY	WV-2 (if available)	HAITI	DALTON
Track 1	launch		Vehicle T/M (manual antenna)			
	orbit	Vehicle T/M (forward tri-helix)			Voice	Voice
	recovery	Capsule T/M (forward tri-helix)		Capsule T/M	Capsule T/M	Capsule T/M
Track 2	launch		Vehicle T/M (driven antenna)		Not installed	Not installed
	orbit	Vehicle T/M (aft tri-helix)				
	recovery			Capsule T/M		
Track 3	launch		Vehicle T/M (driven antenna)			
	orbit	Vehicle T/M (single helix)			Vehicle T/M	Vehicle T/M
	recovery			Voice; then switch to WWVH time		
Track 4	launch		Spare		Not installed	Not installed
	orbit	Vehicle CWAT (forward tri-helix)				
	recovery	Capsule GE beacon (forward tri-helix)		Capsule GE beacon signal strength ‡		

‡ *Record also on pen recorder*

Table 9-1A (continued)

TRACK	PASS	PVT. JOE E. MANN	KING COUNTY	WV-2 (If available)	HAITI	DALTON
Track 5	launch		Spare			
	orbit				Vehicle T/M signal strength ‡ Vehicle CWAT signal strength	Vehicle T/M signal strength ‡ Vehicle CWAT signal strength
	recovery	Capsule T/M (aft tri-helix)		Capsule T/M signal strength ‡	Capsule T/M signal strength ‡ Capsule GE beacon signal strength	Capsule T/M signal strength ‡ Capsule GE beacon signal strength
Track 6	launch		Speedlok 10- and 50-kc reference signals WWVH time		Not installed	Not installed
	orbit	Speedlok 10- and 50-kc reference signals				
	recovery					
Track 7†	launch		Vehicle T/M signal strength Vehicle CWAT signal strength			
	orbit	System time Voice Vehicle T/M signal strength Vehicle CWAT signal strength			Speedlok 10- and 50-kc reference signals WWVH time	Speedlok 10- and 50-kc reference signals WWVH time
	recovery	System time Voice Signal strengths – Vehicle T/M, Capsule T/M, Capsule GE beacon			Speedlok 10- and 50-kc reference signals Voice	Speedlok 10- and 50-kc reference signals Voice

† If sufficient VCO's are not available, delete vehicle CWAT signal strength
‡ Record also on pen recorder

LMSD 61-44 (SV) will be used to transport the required test data. All data sent to LMSD (SV) will be addressed to:

Lockheed Aircraft Corporation
Missiles and Space Division
Satellite Test Center, Building [redacted]
Attention: [redacted] 61-44
Post Office Box 504
Sunnyvale, California

9.1.3 <u>Communications</u>

A magnetic tape recording of all voice link communications will be made at the STC during the launch and orbital phases of a flight. System time will be recorded on the tape at intervals no longer than 30 minutes to permit correlation of information. One copy of these recordings will be available to LMSD 61-44 (SV) and the STWG (SV) at all times.

One copy of all 60-wpm teletype communications received at the STC during countdown, launch, active orbit, and recovery operations will be furnished to the 6594th Test Wing (Satellite) (ARDC) and LMSD 61-44 (SV) immediately following launch and each pass.

9.2 LAUNCH TEST DATA

9.2.1 Specific test data and reports required of the VCC, [redacted] and the Downrange Telemetry Ship are listed in Section 7 of the [redacted] and the FTD. These requirements will be coordinated with the various range agencies by the FTWG (VAFB).

9.3 ORBITAL TEST DATA

9.3.1 The following Discoverer Satellite orbital test data obtained during each period of contact will be transmitted to LMSD (SV) by the tracking stations, and where appropriate, by the Recovery Telemetry Ship in accordance with the schedule presented in Table 9-2:

Table 9-2

REQUIREMENTS FOR DELIVERY OF ORBITAL TEST DATA TO LMSD (SV)

ITEM NO.	TRACKING STATION	ORBITAL PASS	TIME REQUIRED	DELIVERY METHOD
PASSES PRIOR TO AND INCLUDING RECOVERY PASS				
9.1	[redacted]	Pass 1 southbound	T+9 1/2 hrs	Courier
		Active northbound	T+15 hrs	Courier or registered airmail
	[redacted]	Active southbound	T+30 hrs	
9.2	[redacted]	First active	T+20 hrs	Courier
		Other active	T+48 hrs	Courier or registered airmail
9.3	[redacted]	All active	T+48 hrs	Courier
9.4*	Re-entry T/M Ship	Recovery Pass	T+72 hrs (if located at 40°N latitude)	Air pickup and courier
PASSES AFTER RECOVERY PASS				
9.5	All	All active	As soon as possible	Registered airmail

*Air pickup of Item 9.4 will be made only if these data are required at T+72 hours.

a. Original magnetic tape records of telemetered data (a duplicate is made for retention by the station)
b. Real-time analog records of telemetered data
c. VERLORT radar tracking data; 6- and 100-channel, Brush recorder records
d. Radar, telemetry tracker, and Doppler punched paper tapes
e. Radar, telemetry, and Doppler signal strength records
f. Plotting board charts of radar and telemetry tracking data.

9.3.2 All ground stations and ships will send command summaries and performance summaries to the STC and PAC via 60-wpm teletype following each pass, as specified in [redacted].

Ground station and ship personnel will include the data tape log, real-time analog record setup sheets, and the pass summary log with data shipped to LMSD 61-44 (SV). A station operation log shall be included in the Tracking Station Operation Report TWX sent 24 hours after termination of operations. The pass summary log summarizes data obtained during each pass and the station operation log is a chronological summary of station events during a flight. Data tape log forms and pass summary log forms will be furnished by LMSD 61-44 (SV).

9.3.3 Selected magnetic tape records of telemetered data will be used by LMSD Data Services, 59-13 (SV), for preparation of Task Force kits (preliminary) and Quick-Look kits (final) of analog or digital data with calibrations. At least one pass per group of consecutive active passes will be reduced. Task Force data will be available for distribution within 24 hours after tape arrival and the Quick-Look data will be available within five days after tape arrival.

One copy of the Task Force data and seven copies of the Quick-Look data will be delivered to LMSD 61-44 (SV). The following distribution of the Quick-Look data will be made:

FTWG (VAFB)	1 copy
LMSD (SV)	2 copies
LMSD [redacted])	2 copies
LMSD [redacted]	1 copy
LMSD [redacted]	1 copy

9.3.4 Raw tracking data received by 100-wpm teletype at the PAC will be tabulated in polar coordinates, correlated with LMSD system time, and annotated with pass number, data source, and mode of tracking station operation.

A computed ephemeris will be compiled immediately after each pass and will be followed by smoothed and extrapolated data as soon as practicable. When the original punched paper tapes are received from the tracking stations, these data will be compared to the transmitted teletype data to determine information lost in the real-time transmission process. If necessary, the ephemeris data will be revised at this time.

Two copies of ephemeris data will be prepared for LMSD 61-44 (SV), and two copies of ephemeris data will be delivered to the 6594th Test Wing (Satellite) (ARDC).

9.4 RECOVERY TEST DATA

9.4.1 All telemetered and tracking data requirements listed in Paragraph 9.3, Orbital Test Data, are applicable for the recovery pass. In addition, recording of data telemetered from the capsule and tracking of the capsule after separation are required. The requirements for recording and handling the capsule data are the same as for Discoverer Satellite telemetered and tracking data.

Each of the Recovery Force surface ships and the WV-2 aircraft (if available) will record the capsule telemetered data and send the data tapes to LMSD 61-44 (SV) expeditiously.

9.4.2 The Recovery Force and HCC test data categories listed in Section 7 of the DTO are discussed below. These data will be transmitted to LMSD 61-44 (SV) within 48 hours after termination of recovery operations. Log sheets for recording the required recovery test data will be furnished by LMSD 61-44 (SV).

9.4.3 The following data will be recorded at the time of recovery initiation:

a. Surface and upper air weather conditions in the recovery area
b. Recovery Force deployment
c. Status of communications.

9.4.4 The following data pertaining to the performance of the acquisition aids will be recorded:

a. RC-121 aircraft and surface ship radar logs (chaff and silvered parachute acquisition and tracking data).
b. C-119 aircraft and surface ship D/F logs (beacon acquisition and homing data)
c. WV-2 aircraft (if available) information on capsule beacon pulse width, pulse repetition frequency, and frequency stability
d. Aircraft and surface ship visual logs (parachute, rescue light, and capsule acquisition data)
e. Rate of descent and impact location data.

9.4.5 The following data will be recorded for each unsuccessful capsule pickup attempt and for capsule recovery:

a. Identification of aircraft or surface vessel making capsule pickup effort
b. Time of day
c. Capsule altitude at visual sighting and on contact
d. Condition of parachute before pickup
e. Capsule and parachute motion before contact
f. Cable payout if recovered in the air

g. Contacts, if any, with air pick-up poles, pick-up cables, aircraft fuselage, surface ship's hull, grappling hooks, or sharks

h. Observed operational status of rescue light and beacon transmitter.

9.4.6 The following data will be recorded after capsule recovery on completion of a preliminary examination of the capsule:

a. Extent of capsule damage

b. Condition of parachute

c. Condition of water seals

9.4.7 The following recovery operational data are also required:

a. A detailed time correlated log of Recovery Force deployment maintained at the HCC from the time of recovery initiation to the termination of recovery operations. Pictorial coverage of the status boards will be included.

b. Tape recordings of radio communications made at the HCC, aboard the lead and one other RC-121 aircraft, abord the recovery surface ships, and aboard the WV-2 aircraft (if available)

c. Two copies of all photographic coverage. Still pictures of all significant items of equipment, including the capsule and parachute after their recovery and return to the HCC, will be made by Air Force photographers. Photographic coverage of the recovery sequence will be provided by Air Force photographers, using hand-held 16mm cameras at 32 frames per second or Fastair cameras providing 300-frames-per-second coverage in aircraft equipped with the necessary mounting fixtures. APS-20 radar scope pictures will be obtained on all RC-121 aircraft. Oscilloscope pictures of the capsule beacon signals will be obtained on the WV-2 aircraft (if available). All film must be properly identified by title board leader.

d. Routine logs maintained by the recovery aircraft, surface ships, and WV-2 aircraft (if available).

9.5 TEST REPORTS

Test reports required for official distribution are summarized in Table 9-3. Each of these reports is listed below with comments on the content if necessary.

Table 9.3

TEST REPORTS REQUIRED

ITEM NO.	REPORT	TYPE	RESPONSIBILITY	INPUTS REQUIRED BY	DISTRIBUTION	TIME REQUIRED
			LAUNCH PHASE REPORTS			
1.1	Commentary on Launch	Voice Link	Test Director (VAFB)	Launch Conductors LMSD, DAC	STC (SV)	T-0 to T + 12 min
1.2	Flash Launch Report	TWX	AFBMD (VAFB)	FTWG (VAFB) LMSD (VAFB) DAC (VAFB)	AFBMD/WDZT AFBMD/WDZY 6594th Test Wing (SV) LMSD 61-70 (VAFB) LMSD 61-30 (SV) LMSD 61-44 (SV) DAC (SM)	0-8 hrs
1.3	Follow-on Launch Report	TWX				24-48 hrs
1.4	Launch Pad Damage Report	Published	LMSD (VAFB)		AFBMD/WDAT AFBMD (VAFB) 6594th Test Wing (SV) LMSD 61-70 (VAFB) LMSD 61-44 (SV) LMSD (SV)	14 days
1.5	Final Launch Report	Published	AFBMD (VAFB)	FTWG (VAFB) LMSD (VAFB) DAC (VAFB)	AFBMD/WDAT AFBMD (VAFB) 6594th Test Wing (SV) LMSD 61-70 (VAFB) LMSD (SV) DAC (SM) DAC (VAFB)	7-14 days
			THOR PERFORMANCE REPORTS			
1.6	Douglas Quick-Look Report	TWX	DAC (SM)		AFBMD/WDZT AFBMD/WDZY 6594th Test Wing (SV) LMSD 61-70 (VAFB) LMSD 61-44 (SV) DAC (SM)	48 hrs
1.7	Final Douglas Flight Test Report	Published	DAC (SM)		AFBMD/WDZT/WDZN AFBMD/WDZY AFBMD/VAFB LMSD 61-44 (SV) LMSD 61-70 (VAFB) DAC (SM)	30 days

Table 9-3 (Continued)

ITEM NO.	REPORT	TYPE	RESPONSIBILITY	INPUTS REQUIRED BY	DISTRIBUTION	TIME REQUIRED
			RECOVERY PHASE REPORTS			
1.8	Commentary on Recovery Operations	Voice Link	HCC		STC (SV)	0 hrs after termination of recovery operations
1.9	Flash Recovery Report	TWX			AFBMD/WDZT AFBMD/WDZY AFBMD/WDZN LMSD 61-30 (SV) LMSD 61-44 (SV) Att[redacted]	0-8 hrs after termination of recovery operations
1.10	Recovery Force Operation Reports	Log Sheets and Verbal	Each major contingent of Recovery Force		HCC	As needed for Item 1.11
1.11	a) Preliminary Recovery Test Report b) Reports in Item 1.10	Published	HCC	Each major contingent of Recovery Force	LMSD 61-30 (SV) LMSD 61-44 (SV)	48 hrs after termination of recovery operations
			DISCOVERER FLIGHT REPORT			
1.12	1 Hour Report	Letter	LMSD 61-44 (SV)	STC (SV) LMSD (VAFB) Tracking Stations	6594th Test Wing (SV) LMSD Satellite Systems Operations Manager	1 hr
1.13	3 Hour Report	Letter				3 hrs
1.14	Preliminary Flight Information Report	Letter	LMSD 61-44 (SV)	STC (SV) LMSD (VAFB) DAC (SM) Tracking Stations	AFBMD/WDAT (1.15, 1.16 only) AFBMD/WDZT (1.14 only) AFBMD/WDZY (1.14 only) AFBMD (VAFB) AFPR (SV) 6594th Test Wing (SV) LMSD (SV and Remote) LMSD (VAFB) DAC (SM)	8 hrs
1.15	Preliminary System Test Report	Published				7-10 days
1.16	System Test Evaluation & Performance Analysis Report	Published				35 days
1.17	Tracking Station Operation Reports	TWX	Tracking Stations and ships		LMSD Satellite Systems Operations Manager 6594th Test Wing (SV) LMSD 61-44 (SV)	24 hrs after termination of operations
1.18	STC Operation Report	Letter	LMSD 61-46 (SV)	Tracking Stations		

9.5.1 Launch Phase Reports

a. Commentary on Launch

b. Flash Launch Report. This TWX will briefly describe the launch operations and results.

c. Follow-On Launch Report. This TWX will contain a more complete description of launch operations and results after a review of preliminary launch data.

d. Launch Pad Damage Report. This published report will document the damage which occurred at the launch pad.

e. Final Launch Report. This published report will contain the FTWG evaluation of the launch operations and results and pertinent launch data.

9.5.2 Discoverer Booster (Thor) Performance Reports

a. Douglas Quick-Look Report. This TWX will contain the results of a preliminary review of Discoverer Booster launch data of Santa Monica with particular emphasis upon indicated problem areas.

b. Final Douglas Flight Test Report. This published report will contain an analysis of booster equipment operation and performance during countdown, launch, and flight. Possible modification of equipment, plans, or procedures on future tests will be discussed.

9.5.3 Recovery Phase Reports

a. Commentary on Recovery Operations

b. Flash Recovery Report. This TWX will briefly describe the recovery operations and results.

c. Recovery Force Operation Reports. Each major contingent of the Recovery Force will prepare a written report describing the operation of equipment, procedures used, and pertinent observations. These reports will be used by the HCC in preparing the Preliminary Recovery Test Report.

d. Preliminary Recovery Test Report. This published report contains a preliminary summary of recovery operations and results, and includes the operation reports received from each major contingent of the Recovery Force.

9.5.4 Discoverer System Flight Reports

a. One-Hour Report. This letter will contain a brief description of launch and orbit injection, and the major events and orbital status.

b. Three-Hour Report. This letter will contain a brief description of the flight after Pass 1 tracking data is available.

c. Preliminary Flight Information Report. This letter will contain information on flight operations and results based on the Flash Launch Report and the latest reports from the tracking stations.

d. Preliminary System Test Report. This published report will contain a preliminary summary of test results and will include discussions of overall system performance, vehicle performance, problems encountered, test conduct, and whether objectives were or were not achieved. It will be based on the system quick-look evaluation at Sunnyvale, the Follow-On Launch Report, the Douglas Quick-Look Report, and internal LMSD reports from the STC, the Development Division, and the tracking stations.

e. System Test Evaluation and Performance Analysis Report. This published report will contain a complete documentation of the flight, test data, and a final operational evaluation of overall system performance. An analysis of all factors pertaining to possible refinement of hardware or test procedures and specific recommendations regarding possible program redirection will be included.

f. Tracking Station Operation Reports. Each tracking station will prepare a TWX reporting on the operation of station equipment. It will include a summary of station performance during launch and all active passes, and a discussion of any problem areas encountered. These reports will be used by the STC in preparing the STC Operation Report.

g. STC Operation Report. This letter contains a summary of STC operations and includes the equipment malfunction reports, pass summary reports, and post test reports received from the tracking stations.

9.6 SIXTY-WPM TELETYPE REPORTS REQUIRED BY THE STC

9.6.1 The STC requires that area weather forecast reports, winds aloft reports, Recovery Force status reports, discrepancy summary reports, and telemetry ship position, weather, and status reports be sent at specific times via 60-wpm teletype. Ths station or ship from which each of these reports is required and the time at which the report is to be sent are summarized in Table 9-4 for the period from T-48 to T+24 hours.

9.6.2 Additional 60-wpm teletype reports required and comments on the requirements of Table 9-4 are listed below:

a. Weather Reports
   (1) All VCC weather forecasts are to cover the launch and King County areas and are to be valid for T-1 to T+6 hours.
   (2) All HCC weather forecasts are to cover the [redacted] area, valid for T-0 to T+27 hours, and the predicted im[redacted], Pvt. Joe E. Mann, Johnston Island, Hickam AFB, and Hilo areas, valid for T+24 to T+40 hours.
   (3) VCC winds aloft reports are to be based on soundings at T-12 and T-6 hours

b. Telemetry Ship Reports
   (1) Requirements for the period from T-24 to T+24 hours are summarized in Table 9-4.
   (2) Requirements from sailing time to T-24 hours, and from data pickup or recovery operations until the ship returns to port are presented below. These reports are required from the telemetry ships every w[redacted] day. The Pvt. Joe E. Mann will report, as indicated, to [redacted]r HCC (whichever is closer).

Time (GMT)	Ship	Report	To
1630	KC	Status	VCC
1800	JM	Status	[redacted]or HCC
1830	JM	Status	VCC
2230	KC	Position, Weather, Status	VCC
2300	JM	Position, Weather, Status	VCC
2330	JM	Position, Weather, Status	[redacted]or HCC

   (3) The King County is to send ship position, weather, and status reports at T+1, T+4, and every four hours thereafter until notified that the data pick-up aircraft has been dispatched. Subsequent to aircraft launching, the King County will maintain hourly contact on the hour with the VCC to report aircraft progress (if known), ship position, weather, and status.

c. Station Status Reports. Equipment status reports are required from the [redacted] and the VCC between 2000 and 2100 hours GMT for each working day between operations. Discrepancy summaries are required immediately following a change in station status.

Table 9-4

60-WPM TELETYPE REPORTS REQUIRED BY THE STC
T-48 TO T+24 HOURS

TIME (HOURS)	AREA WEATHER FORECAST	RECOVERY FORCE STATUS	DISCREPANCY SUMMARY	WINDS ALOFT	RELAY T/M SHIP POSITION, WEATHER, AND STATUS	
					FROM	VIA
T-48:00	VCC					
T-24:00	VCC HCC	HCC	VCC [redacted]		KC	VCC
T-20:30					KC	VCC
T-20:00					JM	VCC
T-19:30					JM	[redacted]or HCC*
T-15:30					KC	VCC
T-14:30					JM	VCC
T-12:00	VCC HCC	HCC			KC	VCC
T-11:30					JM	VCC
T-09:00				VCC		
T-06:00	VCC HCC	HCC	VCC [redacted]		KC JM	VCC [redacted]or HCC*
T-04:00			VCC [redacted]			
T-03:30					JM	VCC
T-03:00	VCC			VCC	JM	[redacted]or HCC*
T-02:00	HCC	HCC			KC	VCC
T-01:00	VCC					
T-00:30					JM KC	[redacted]or HCC* VCC
T+06:00	HCC	HCC			JM	[redacted]or HCC*
T+12:00	HCC	HCC			JM	[redacted]or HCC*
T+18:00	HCC	HCC			JM	[redacted]or HCC*
T+24:00	HCC	HCC			JM	[redacted]or HCC*

**The <u>Pvt. Joe E. Mann</u> will report to [redacted] or HCC (whichever is closer)*

Notice of Page Substitution

Tab 1 - Appendix A
Vehicle 1052/Booster 218

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

DISCOVERER

SYSTEM TEST DIRECTIVE

TAB 1 APPENDIX A

FOR

AGENA VEHICLE 1052/
THOR BOOSTER 218

Approved

[redacted] Manager
Systems Operation
Satellite Systems

Approved

[redacted]

FOR [redacted]
Lt. Col. USAF
6594th Test Wing (ARDC)
Chairman, STWG

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Division

Sunnyvale, California

[redacted]

CONTENTS

[redacted]

LIST OF TABLES

LIST OF ILLUSTRATIONS

FOREWORD

The basic System Test Directive [redacted] purposely omitted detailed variable flight to flight data but contains information of a permanent nature applicable to all flights of the initial Discoverer series. Detailed data and directives are presented in this Appendix for the Agena 1052/Thor 218 combination and are applicable to this configuration only.

Engineering and procedural changes pertinent to the Agena 1052/Thor 218 combination are summarized as follows:

a. Annette Tracking Station operations have been discontinued

b. The Discoverer Control Center (DCC) has been redesignated the Satellite Test Center (STC)

c. Changed recovery capsule acquisition transmitter frequency from 232.4 ± 10 mc to 235.0 ± 12 mc

d. Revised downrange telemetry ship data air pickup operation

e. Added alternate re-entry initiation circuitry in the Agena vehicle which will provide ground capability of selective capsule re-entry on either Pass 15, 16, 17, or 18

f. Changed the adjustment range of the orbital programmer from 84.0 - 100.5 minutes to 89.6 - 107.2 minutes.

g. Added APL Doppler acquisition transmitter and tracking lights.

h. The [redacted] tracking station at South Point, Hawaii, will be employed during the recovery operation.

APPENDIX A
SUPPLEMENTAL TEST INFORMATION

A1 GENERAL

A1.1 This section contains descriptive material which supplements the text of the general STD for this flight only. Material presented herein may also correct or supersede material in the general STD for this flight only if necessary. General STD changes of a permanent nature will be affected by replacement pages in the main text at the earliest possible date. Reference will not be made to this Appendix for subsequent flight operations. The following material is divided into general sections, with parenthetical references to relative paragraphs in the main text provided where beneficial.

A2 CONFIGURATION

A2.1 Annette Tracking Station

A2 1.1 Annette Tracking Station operations have been discontinued. All references to ATS in the general STD text will be disregarded.

A2.1 2 [redacted] Tracking Station will be prime station on all passes within range which would have been prime passes for ATS.

A2.2 Re-entry T/M Ship

A2 2.1 The Re-entry Telemetry Ship, Pvt. Joe E. Mann, will nominally be stationed at 39° 35' N latitude and 161° 45' W longitude, directly under the satellite on nominal orbit Pass 17, to provide a continuous Discoverer

[redacted]

vehicle and recovery capsule telemetry record during vehicle reorientation, capsule separation, and the initial re-entry trajectory. The Pvt. Joe E. Mann will have the equipment listed in Paragraph 3. 5. 1.

A2. 2. 2 A Discoverer transmission frequency, 228. 2 mc, has been added for telemetering of re-entry capsule function tell-tales and capsule environment data. The recovery capsule acquisition transmitter frequency has been changed from 232. 4 ± 10 mc to 235. 0 ± 12 mc. (See Paragraph 3. 8. 1)

A2. 3 Communications

A2. 3. 1 A SSB radio and complementary teletype equipment has been provided at [redacted] to provide a positive Discoverer communication link to the Pvt. Joe E. Mann on station.

A2. 4 The King County will replace the Pvt. Joe E. Mann as the launch downrange T/M Ship for this operation. The King County will have the following equipment aboard:

- a. Two tape recorders for T/M data
- b. Doppler data receiving and recording equipment similar to that used by other tracking stations
- c. SSB radio for ship to VCC communication
- d. Air pickup equipment for air snatch of magnetic tape data
- e. Two 6-pen recorders
- f. Teletype equipment
- g. Two single helix antennas
- h. T/M receiving equipment
- i. UHF radio for ship-to-aircraft communication.

A3 PRE-LAUNCH OPERATIONS

A3.1 Re-entry T/M Ship

A3.1.1 The re-entry T/M ship, Pvt. Joe E. Mann, will put to sea with sufficient time to arrive on station not later than T + 3 hours. Communications checks will be accomplished with the VCC daily at 1600 and 2130 GMT (0800 and 1330 PST). Communications checks with [redacted] will be scheduled daily at 1800 and 2330 GMT (0800 and 1330 AST) with the equipment status report given during the 1800 GMT contact and with the ship's position, weather, and equipment status reports given during the 2330 GMT contact. The [redacted] will include the ship's equipment status report, weather, and position with its own scheduled station status reports. Beginning at T - 24 hours, the ship's SSB radio will be manned continuously and accomplish communication checks with the VCC at T-23.5, 18.5, 14.5, and 10.5 hours, and with [redacted] at T - 25, 18, 14, and 10 hours. From T - 6 hours until T + 30 minutes, [redacted] and Pvt. Joe E. Mann will remain silent except for a communication check between the Pvt. Joe E. Mann and [redacted] at T - 30 minutes. Complete radio transmitter silence will be maintained on all ship equipment by the Pvt. Joe E. Mann for the duration of the active track on those passes during which the Pvt. Joe E. Mann is participating in active orbit operations.

A3.1.2 The following SSB radio frequencies will be used for ship-to-shore communications:

VCC/Pvt. Joe E. Mann		[redacted] Pvt. Joe E. Mann
6741 KC	In port and first day out	17622.5 KC
11214 KC	Second day out and beyond	11214.0 KC

A3.1.3 Before crossing the 145° meridian communications with the Captain of the Pvt. Joe E. Mann will be made through PMR Headquarters a[redacted] and after the ship crosses the 145° meridian, through the PMR representative at the HCC. This communications channel will be used to request changes in the on-station location of the ship and movement of the ship for the data pickup if made by aircraft from Hawaii.

A4 LAUNCH OPERATIONS

A4.1 Downrange Telemetry Ship Data Air Pickup Operation (Replaces Paragraphs 5.6.1 through 5.6.3 of General STD)

A4.1.1 A specially fitted Air Force pick-up aircraft will be stationed at Edwards AFB until dispatched by the 6594th Test Wing. Orders to depart on the pick-up mission will be given only by the Air Force Test Controller or his designated representative. The 6594th Test Wing will notify the 11th Naval District of the scheduled launch date, and obtain clearance for the data pick-up aircraft through W-291.

A4 1.2 If the launch is early enough to allow a daylight pick-up, the data pick-up mission will be flown the day of the launch. Otherwise, the pick-up will be scheduled for the following morning with the aircraft departure timed to effect a rendezvous with the telemetry ship shortly after sunrise.

A4.1.3 If possible, the data pick-up aircraft will return the telemetry tapes to Moffett Naval Air Station where they will be picked up by an authorized Lockheed representative. If, due to weather or fuel limitations, delivery to Moffett is impossible, the tapes will be delivered to Vandenberg Air Force Base where they will be picked up by a 6594th Test Wing aircraft and delivered to Moffett.

A4 1.4 Position reporting of the data pick-up aircraft will be accomplished by standard Air Force procedures through McClellan Overseas Airways, and relayed to the STC. When in the immediate area of the ship, and for pick-up operations, the assigned UHF frequencies will be utilized.

KING COUNTY	JOE E. MANN
301.8 Primary	351.3 Primary
338.0 Secondary	347.1 Secondary
	383.6 Tertiary

A5 ORBIT OPERATIONS

A5.1 Alternate Recovery Selector

A5.1.1 The Agena vehicle will be equipped with an alternate re-entry initiation circuit which will provide re-entry on Passes 15, 16 or 18 depending upon the time of transmission of the alternate ground command. Commands 5 and 6, which are used for making engine firing corrections during the ascent phase, will provide control of the re-entry selection during the re-entry phase. Separation will be programmed at the same latitude as is provided by the normal re-entry on Pass 17.

A5.1.2 If neither Command 5 or 6 is sent, normal re-entry will occur on Pass 17.

A5.1.3 Transmission of Command 5 will select the alternate recovery sequence at any time following the launch injection phase. Re-entry will occur on Pass 15 if Command 5 is transmitted before the separation initiation point on that pass, on Pass 16 if the command is sent between the separation point on Passes 15 and 16, and on Pass 18 if Command 5 is transmitted between Passes 16 and 17.

A5.1.4 Issuance of Command 6 will select the normal re-entry circuit providing re-entry on Pass 17 and will negate Command 5 at any time unless the re-entry sequence has already been initiated.

A5. 1. 5 Transmission of Commands 5 and 6 will be by Satellite Test Center (STC) direction only. The STC may direct transmission of Command 6 on Passes 10, 15, and 16 if desired to assure normal re-entry initiation, however, this is not necessary since the normal re-entry sequence has been programmed since lift-off. The area between 55° and 30° N latitude should be avoided when transmitting Commands 5 and 6 on Passes 15, 16 or 17 since relay chatter might result in an inadvertent re-entry initiation if command transmission occurred coincident with a programmed re-entry initiation on the punched tape.

A5. 1. 6 The table below shows the program tape punch arrangement for the normal and alternate re-entry initiation circuits. Re-entry is assured on Pass 18, if it has not occurred earlier, by punches in both channels on this pass.

Command No.	Re-entry Tape Channel	Pass No.			
		15	16	17	18
6	Normal			X	X
5	Alternate	X	X		X

A5. 1. 7 The recovery sequencing position is telemetered on Channel 16-25. A one volt level signal (20% bandwidth) will indicate nominal re-entry initiation (Pass 17) while a 4 volt level signal (80% bandwidth) will indicate alternate re-entry initiation on either Pass 15, 16 or 18, whichever is the next to occur following the readout. These data will be read out and reported by [redacted] on Passes 8 and 15, [redacted] Passes 2 and 9, and [redacted] on Passes 10, 15, 16, and 17.

A5. 2 Orbital Programmer

A5. 2. 1 The adjustment range of the orbital programmer has been changed from 84. 0-100. 5 minutes to 89. 6-107. 2. This new range has been adapted in view of past flight history and will accommodate any orbit period up to 107. 2 minutes without recourse to a lapping technique. This range can be further extended approximately 1-1/2 minutes in either direction by arbitrarily shifting the reset point during flight operations.

A5. 2. 2 Since the orbital programmer was designed to operate within a range of 84. 0-100. 5 minutes, it was necessary to expand the punching of the program on the programmer tape to achieve a 89. 6-107. 2 adjustment range. As a result of this "tape stretching", each ground command No. 2 (Step) will now change the orbital programmer period by a 10. 67 second increment rather than the previous 10 second time increment.

A5. 2. 3 As a consequence of changing the programmer adjustment range, the orbital period displayed by the console equipment as a function of 10 second and 100 second decade switch positions will read low, and must be increased by a factor of 6. 67%. (Conversely, the actual period must be multiplied by a factor of 0. 9375 to obtain the period indicated in the control console.) However, the true programmer period will be provided by the motor input frequency, telemetered on Channel 1, divided into 2, 304, 000, which can be accomplished automatically by means of a Berkeley Counter.

A5. 2. 4 Conversion tables for converting stepping switch positions and motor input frequencies to orbital programmer period, Tables 2-1 and 2-2 and the first pass timer correction chart, Table A6-2, have been revised to the new adjustment range. Console readout of programmer period in seconds will be artifically low as a result of "tape stretching".

Therefore, the low, incorrect period, as presented on the console, will be the numbers in parentheses under the true, correct period numbers in Table A2-3. The ratio of the correct period to the low, incorrect period will be 16/15.

A5.3 APL Doppler Evaluation

A5.3.1 An additional acquisition transmitter will be employed on Agena Vehicle 1052 for evaluation purposes. The transmitter will operate continuously on 162 mc and 216 mc and may be used as an acquisition aid in the event the CWAT becomes inoperative. LMSD tracking stations will receive the signals on 162 mc and 216 mc on all passes except the recovery pass to verify that the transmitter is operative with no attempt to record any intelligible data. APL Doppler tracking stations will receive the beacon signals and record Doppler data on teletype tape for post flight evaluation.

A5.3.2 A pair of lights will also be installed on Agena Vehicle 1052 and turned on by the orbital programmer while the satellite is within reception range of Project Space Track and Smithsonian stations equipped with Baker-Nunn cameras.

A5.4 Re-entry T/M Ship

A5.4.1 The Pvt. Joe E. Mann will be on station at T + 3 hours and ready to relocate as orbit tracking information is obtained and converted into an ephemeris prediction for the 17th pass. Expected deviations in the longitude at which the satellite will cross the ships station latitude will be given to the HCC by the STC. The PMR representative in the HCC will then direct the ship to relocate as necessary to the closest point possible under the predicted satellite path. Finer revisions will be issued as orbit prediction accuracy increases.

A5. 4. 2 During Passes 1, 2, 10, and the recovery pass, the Pvt. Joe E. Mann will receive acquisition messages, track the satellite to the maximum extent possible and reduce orbital programmer data and all other available data of that which they will be observing during the recovery pass. Data as described later will be reported to provide all available information on the re-entry operations.

A6 RECOVERY PHASE OPERATIONS

A6. 1 Weather

Weather forecasts and reports for the re-entry T/M ship area will be included with the forecasts for the recovery area. (See Paragraph 7. 3. 3)

A6. 2 Capsule Re-entry and Recovery Events

The recovery phase will be initiated when the orbital programmer turns on the SS/D timer south of Alaska during the selected recovery pass. Significant events which will occur during the capsule re-entry sequence and the capsule recovery sequence are listed in the following paragraphs.

A6. 2. 1 Capsule Re-entry Sequence

T-93. 5 sec	SS/D timer started Capsule telemetry oscillator inputs are in re-entry event position; capsule beacon and telemetry filaments and oscillators on
T-75. 5 sec	Vehicle reorientation started Capsule beacon and telemetry plates energized; transmission will start as soon as the necessary filament temperatures are reached

T-1.5 sec	Vehicle reorientation completed
	Thrust cone thermal battery and thermal battery 2A8 activated
T-0 sec	Capsule separated from vehicle
T+1.0 sec	Spin rockets fired providing a nominal 60 rpm spin rate
T+2.25 sec	Retro-rocket fired
T+13.0 sec	Despin rockets fired to reduce spin rate to 5-15 rpm
T+15.25 sec	Thrust cone separation
	Capsule telemetry oscillator inputs switched to recovery events; subcarrier oscillator for capsule Channel 7 turned off

A6.2.2 Capsule Recovery Sequence

T+219 sec	Ionization layer entered at approximately 350,000 feet and prevents ground reception of capsule beacon and telemeter signals
T+328 sec	5G switch closes at approximately 186,000 feet
	Timer started
	Subcarrier for capsule Channel 7 turned on to transmit recovery event data
T+378 sec	Capsule leaves ionization layer at approximately 120,000 feet permitting ground reception of capsule beacon and telemeter signals through uncharred Duriod windows added in the ablative shell for this purpose
T+451 sec	Timer switch closes at approximately 58,000 feet
	Explosive bolts fired

Parachute cover comes off
Cutters sever cable
Parachute deploys
Ablative shell comes off
Radar chaff dispensed, visual aids on.

A6.2.3 Capsule Telemetry

Capsule telemeter Channels 7 and 8 will measure one set of events during the re-entry sequence and another set of events during the recovery sequence. The oscillator inputs will be switched when the thrust cone is separated. Channel 9 will measure axial acceleration during both the re-entry sequence and the recovery sequence. The subcarrier for Channel 7 will be turned off after thrust cone separation and will be turned on again at 5G switch closure. Channels 8 and 9 will transmit data continuously throughout the descent trajectory. Figure A8-1 shows the voltage levels which indicate that normal re-entry and recovery sequences have occurred.

A6.3 Tracking Station Operations

A6.3.1 On the selected recovery pass, the tracking stations will receive the acquisition transmitter signal on 232.4 mc and the T/M on 237.8 mc, as usual. In addition, one receiver will be tuned to 228.2 mc to receive re-entry capsule T/M data, and another to 235.0 mc (with a ±12 mc search scan) for the capsule acquisition transmitter. The capsule acquisition transmitter can be identified by its 1000 cps pulsation. The transmitter will be on for 34 micro-seconds and off for 965 micro-seconds. A tabulation of receiving equipment assignments and settings for the recovery phase of operations is included in Table A7-1.

A6.3.2 Data to be reported by the stations during the selected recovery is shown in Table A8-1. Data assigned number one priority should be reported by voice at the earliest possible time. In addition, this data and the lower priority data will be transmitted by 60-wpm teletype following the pass. Additional details of reporting requirements are discussed in individual station instructions in the following paragraphs.

A6.3.3 [redacted] will immediately report the following information to the Pvt. Joe E. Mann via Discoverer SSB, and to the STC via the voice net if it is available.

a. System time of initiation of pitchover
b. Capsule transmitting equipment turn-on (System time not required)
c. Deviations from nominal frequencies of capsule T/M and acquisition transmitters
d. Signal strength of capsule transmission reception.

A6.3.4 The Pvt. Joe E. Mann will receive acquisition messages from the Palo Alto Computer via [redacted] and will record Doppler and T/M data in a normal manner on all active passes within reception range through Pass 16. Minimum speed for steerage will be maintained, and a true North bearing held, if possible, to facilitate azimuth readouts. The Pvt. Joe E. Mann will not transmit information while tracking is in progress since antenna proximities result in blocking out tracking data when any shipborne radio transmitter is used.

A6.3.4.1 On the selected recovery pass, the re-entry telemetry ship will track and receive the capsule T/M (228.2 mc) and beacon (235.0 ±12 mc) on the forward tri-helix antenna. At the same time the aft tri-helix antenna will be tracking and receiving Agena vehicle T/M (237.8 mc) and beacon (232.4 mc) signals. When capsule T/M tracking has been established as reliable by the forward antenna, the aft antenna will switch to tracking the capsule T/M signal and record both vehicle and capsule T/M data. Should one of the tri-helix antennas become inoperable, the remaining tri-helix antenna will search for and acquire the Agena vehicle

T/M signal and thereafter track on the capsule T/M signal when it is acquired. If operable, the single helix antenna will manually track and receive the vehicle T/M. Receiver-antenna assignments for the re-entry T/M ship, Pvt. Joe. E. Mann are as follows:

Receiver	Signal Source	Antenna
1302 Nems Clark*	Capsule T/M	Single Helix
1401 Nems Clark	Capsule T/M	Forward Tri-Helix
1302 Nems Clark	Capsule Beacon	Forward Tri-Helix
1302 Nems Clark	Vehicle T/M	Aft Tri-Helix
1302 Nems Clark	Capsule T/M	Aft Tri-Helix
Doppler Receiver	Vehicle Doppler	Aft Tri-Helix
1302A Receiver (with scope)	Capsule Beacon	Aft Tri-Helix

A6. 3. 4. 2 The Pvt. Joe E. Mann standard antenna positioning for acquisition on all active passes is outlined below:

> ETA - 5 minutes - Start search with all antennas pointed in the direction specified in the acquisition message. The aft tri-helix antenna will be at ±15° elevation, the forward tri-helix will be at +5° elevation, and the single helix will be manually positioned at +45° elevation.
>
> Acquisition - All antennas will be vectored to the azimuth and elevation of the acquiring antenna.

The above antenna positioning procedure will provide a search coverage of 20° in azimuth and 65° in elevation and thereby preclude the possibility of acquisition failure due to atmospheric phenomena interference. During the re-entry tracking the capsule will remain sufficiently close to the line of sight between the ship and the main vehicle so that the capsule can be acquired at any point by directing antennas at the main vehicle.

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*If single helix is not operable, this receiver will be used with the forward tri-helix antenna to receive vehicle T/M data.

[redacted]
Revised Page
20 January 1960

A6. 3. 4. 3 Preliminary real time data will be reported orally by the Pvt. Joe E. Mann to the STC via Discoverer SSB at [redacted] immediately following telemetry fade on the recovery pass. Data is to be reported orally and in order of priority as listed in the recovery section of Table A8-1. Clear text reference will not be made to any specific event or channel nome. Individual items of the separation or recovery programmed sequence will be identified as follows for separate comments if necessary.

Separation (by code word) followed by appropriate event number

Event 1	Spin I
Event 2	Spin II
Event 3	Retro rocket
Event 4	Despin I
Event 5	Despin II
Event 6	Thrust cone separation

Recovery (by code word) followed by appropriate event number

Event 1	G switch closure
Event 2	Timer switch closure
Event 3	Parachute cover off
Event 4	Cutters
Event 5	Parachute deployed
Event 6	Ablative shell off

All telemetry real time data with system times will be included in the pass performance summary which will be transmitted to the STC via Discoverer SSB at [redacted] as soon as practicable.

A6. 3. 4. 4 In the event of communications failure between the T/M ship and the [redacted] the T/M ship will attempt to establish communications with the VCC on SSB and perform functions as outlined herein.

A6.3.5 Following the pass prior to the recovery pass, the [redacted] will receive from the Palo Alto Computer a capsule acquisition program which will be entered in the acquisition programmer and used to drive the TLM-18 antenna until capsule acquisition. [redacted] will also use the acquisition program to preplot the capsule trajectory manually if desired to assist in reacquisition following those periods of the recovery phase when no tracking is possible. The programmer will be started at the predicted system time of separation. [redacted] nominally will acquire with the TLM-18 after thrust cone separation and will receive the recovery capsule modulated telemetry signal and pulsed beacon until the re-entry capsule enters the ionization layer. [redacted] should reacquire the capsule after it leaves the ionization layer at approximately 120,000 feet altitude which is within line of sight range for [redacted] for a nominal re-entry trajectory. If the TLM-18 tracker has not reacquired the capsule by the time the Agena vehicle passes the station, the tri-helix antenna will be repositioned toward the expected blossom point and the receivers tuned to the capsule frequencies to utilize the wide beam of this antenna in the search.

A6.3.5.1 Upon acquisition of capsule transmissions, [redacted] will report the following as soon as possible.

a. Deviation from nominal frequencies
b. Azimuth and elevation
c. System time of acquisition

d. Signal strength characteristics

e. Modulation characteristics.

A6. 3. 5. 2 To reduce possibility of confusion from local interference signals, [redacted] will search the frequency range from 223 to 247 mc for approximately 15 minutes before the recovery pass, and log the frequency and type of modulation of any signals received.

A6. 3. 6 The TLM-18 type antenna at the [redacted] tracking station on South Point, Hawaii, will be employed in this operation to provide a triangulation with [redacted] on the recovery pass for determining the capsule location at parachute deployment. The antenna will be positioned as a function of maximum signal strength, and the azimuth, elevation, and system time will be recorded each time the positioning errors are minimum. At these times, the azimuth and elevation will be reported over the telephone line to [redacted] so that the data can be manually plotted and triangulation effected. When the capsule enters the ionization layer and the telemetry signal disappears, South Point will reposition the antenna to the parachute deployment azimuth and elevation as directed by the [redacted] based on the [redacted] tracking data extrapolated to the blossom point and converted to South Point coordinates.

When the South Point Station acquires after parachute deployment the antenna movement will slight so that an accurate azimuth can be determined and will be reported to the [redacted] The South Point Station will record the T/M signal received for later evaluation.

A6. 4 Recovery Force Procedures

A6. 4. 1 During the FLR-2 search operation, C-119J aircraft in positions 2 and 6 will search for the capsule FM telemetry signal, 228. 2 mc, while the other C-119J aircraft search for the capsule beacon signal. This search mode will be continued until (1) two or more C-119J's acquire an adequate homing signal to permit a triangulation; (2) ETPD + 10 minutes when all aircraft will search for the capsule beacon signal; or (3) directed otherwise by the HCC.

A6. 4. 2 Should the re-entry capsule not be sighted before ETPD + 15 minutes, the Command RC-121 will report all received signal data to the HCC for relay to the STC. The data to be reported are aircraft position at time of signal acquisition, signal bearing, and local time for each acquiring C-119J aircraft and ship. In addition, range and azimuth with local time and aircraft position will be reported for each valid radar return. The report shall also contain the controller's conclusions regarding quality of reported signals and bearings, results of triangulation attempts and most probable impact location. These data will be relayed to the STC immediately upon receipt by the HCC to enable the PAC to determine the most productive search areas.

A7 POST-RECOVERY OPERATIONS

A7. 1 Re-entry Ship Data Air-pickup

A7. 1. 1 Subsequent to fade on the selected recovery pass, the Pvt. Joe E. Mann will proceed at the best speed of advance toward either Pearl Harbor or Port Hueneme, as directed by the STC. While enroute the ship will make copies of tape recorded data, and decommutate and record on the oscillograph/Datarite the data requested in the following section. If so directed by the STC, this data will be retrieved by a C-119J aircraft pickup operation at the earliest time consistent with flight safety after the ship enters an 800 nautical mile range from the pickup aircraft departure point.

A7. 1. 2 The C-119J data pickup aircraft will communicate with the Captain of the Pvt. Joe E. Mann on 3. 067 megacycles primary and 9. 018 megacycles secondary. The aircraft will communicate with LMSD personnel on board the Pvt. Joe E. Mann on 6.241 megacycles, 11.214 megacycles, or 17.6225 megacycles. The aircraft and ship will use 351.3 megacycles for UHF short range communications and the DF operation.

A7.1.3 A beacon will be installed on the C-119J data pickup aircraft, using either the continuous wave acquisition transmitter or telemetry frequency. The beacon will be turned on at the direction of the shipborne LMSD personnel who will lock on the signal and use the tri-helix antennas to provide the aircraft with backup vectoring data.

A7.1.4 The re-entry T/M ship data will be hand carried to Palo Alto on the first available commercial air flight if data pickup is made at Hawaii. This data will be vitally important in the event the recovery capsule is not located by any tracking source at the blossom point. However, if the capsule is successfully located and recovered, rapid transmission of the data is not essential and C-119J air pickup may be waived.

A7.1.5 The tracking stations will continue observations of the Discoverer vehicle for S-band beacon and telemetry transmission until the battery power is exhausted. The orbital programmer is programmed to maintain the beacon and telemetry on continuously from nominal acquisition on Pass 24 through Pass 25. The beacon and telemetry will be turned off after [redacted] ade on Pass 25 and cycled thereafter through Pass 40 as shown in Figure A2-4. Command transmission and tracking on Passes 24 through 40, or battery power exhaustion, will be at the direction of the STC.

A7.1.6 The Discoverer SSB radio onboard the Pvt. Joe E. Mann will be maintained in an operational status for six hours after recovery, or until directed to secure by the DCC. During this interval required data may be requested to absolve any recovery anomalies.

[redacted]

A8 TABLES AND ILLUSTRATIONS

The following tables and illustrations are applicable to Flight 1052/218 only. Each table or figure is given the basic number of the section of the general STD to which it applies, the letter A to indicate appendixed material, and a numerical number to sequence items in the same category.

Items	Data
DISCOVERER	
S/N	1052
Payload	GFE
Fuel	UDMH
Oxidizer	IRFNA
Launch weight	8685 lb.
THOR	
S/N	218
Launch weight	117,352 lb (includes payload)
Fuel	RJ-1
Oxidizer	Liquid oxygen
LAUNCH	
Site	VAFB, SM-75-3, Pad No. 4
Date	January 1960
Pad azimuth	181° 28' 53.86
Launch azimuth	172°
Nominal airborne command	20 sec
Orbital boost time	115.4 sec
Downrange T/M ship location (King County)	16°00'N 117° 43'W
Downrange T/M ship heading	353°T
Programmer setting	5610 seconds (5260 on unmodified console presentation)
INJECTION	
Time	T + 387.5 sec
Location	24.1° N 118.84°W
Altitude	120 sm
Azimuth	171.6°
Nominal velocity	26,037 ft/sec
ORBIT	
Period	93.48 min 5609 sec
Apogee	438 mi
Perigee	120 sm
Eccentricity	.036
Average regression rate (17 passes)	23.52°
Reset latitudes	25°N (for northbound passes over [redacted] 30°N (for northbound passes over [redacted] 60°N (for southbound passes)
Inclination angle	79.89°
Re-entry T/M ship location (Pvt. Joe E. Mann)	39°35'N 161°45'W
RECOVERY	
Aircraft (type and quantity)	C-119's (9) and RC-121's (4)
Surface ships (recovery)	Dalton Victory and Haiti Victory
Surface ship initial locations	17°N, 153°45'W and 17°N, 162°15'W
Surface ship helicopters	HRS-3 (2 on each ship)
Recovery pass	17
Predicted impact area center	17°N, 158°W
ETPD	T + 27 hr

Table A. 2-1 NOMINAL FLIGHT PLANNING DATA

[redacted]

Table A2-2

NOMINAL ACQUISITION TIMES

Pass	Station	Acquisition Time (minutes)	Fadeout Time (minutes)	Duration Time (minutes)
Launch	[redacted]	0.5	8.1	7.6
		0.0	7.9	7.9
	T/M Ship	4.6	13.0	8.4
1	[redacted]	87.3	95.1	7.8
2		182.8	187.5	4.7
		191.2	197.2	6.0
8		717.7	728.9	11.2
9		811.1	815.3	4.2
		811.7	823.4	11.7
		818.9	826.9	8.0
10		900.4	913.5	13.1
		910.9	922.1	11.2
*11		993.1	1005.2	7.1
		1006.3	1019.1	12.8
*12		1104.9	1108.8	3.9
15		1395.7	1399.8	4.1
		1402.4	1408.8	6.4
16		1489.3	1496.9	7.6
		1498.9	1500.5	1.6
17		1584.2	1590.4	6.2
		1592.8	1599.6	6.8
*23		2120.9	2129.7	8.8
24		2222.7	2227.6	4.9

*Acquisition only - no T/M readout

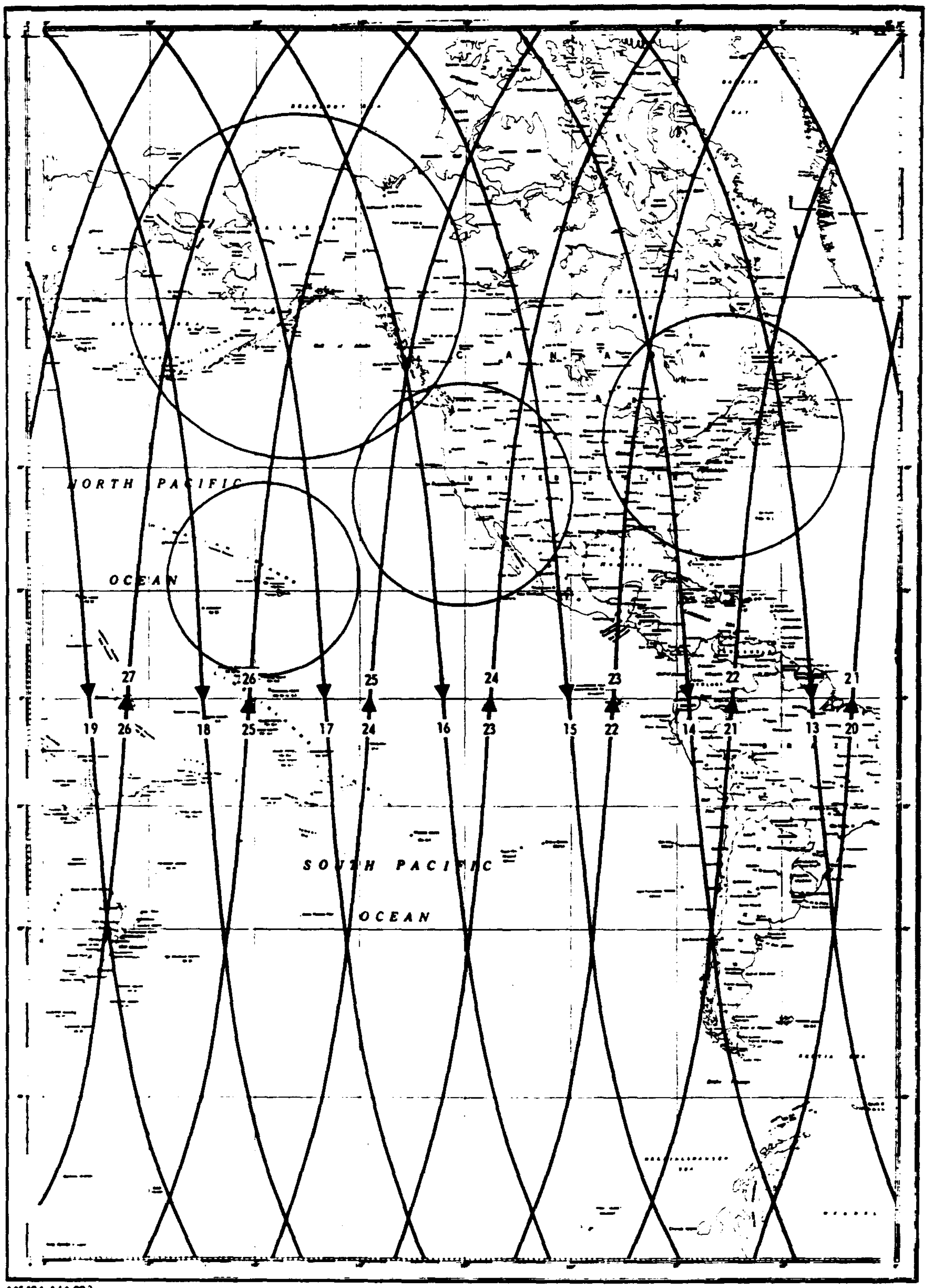


Figure A2-1(b) Nominal Orbit Traces – Passes 13 Through 27

[redacted]

1114/324

Table A2-3

PROGRAMMER SETTING CONVERSION CHART*

			10-Second Increment									
			Switch Position									
			1	2	3	4	5	6	7	8	9	10
			Voltage									
100-Second Increment	Switch Position	Voltage	0.50	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
	1	0.5	5376 89m36s (5040)	5387 89m47s (5050)	5398 89m58s (5060)	5408 90m8s (5070)	5419 90m19s (5080)	5430 90m30s (5090)	5440 90m40s (5100)	5451 90m51s (5110)	5462 91m2s (5120)	5472 91m12s (5130)
	2	1.0	5483 91m23s (5140)	5494 91m34s (5150)	5504 91m44s (5160)	5515 91m55s (5170)	5526 92m6s (5180)	5536 92m16s (5190)	5547 92m27s (5200)	5558 92m38s (5210)	5568 92m48s (5220)	5579 92m59s (5230)
	3	1.5	5590 93m10s (5240)	5600 93m20s (5250)	5611 93m31s (5260)	5622 93m42s (5270)	5632 93m52s (5280)	5643 94m3s (5290)	5654 94m14s (5300)	5664 94m24s (5310)	5675 94m35s (5320)	5686 94m46s (5330)
	4	2.0	5696 94m56s (5340)	5707 95m7s (5350)	5718 95m18s (5360)	5728 95m28s (5370)	5739 95m39s (5380)	5750 95m50s (5390)	5760 96m0s (5400)	5771 96m11s (5410)	5782 96m22s (5420)	5792 96m32s (5430)
	5	2.5	5803 96m43s (5440)	5814 96m54s (5450)	5824 97m4s (5460)	5835 97m15s (5470)	5846 97m26s (5480)	5856 97m36s (5490)	5867 97m47s (5500)	5878 97m58s (5510)	5888 98m8s (5520)	5899 98m19s (5530)
	6	3.0	5910 98m30s (5540)	5920 98m40s (5550)	5931 98m51s (5560)	5942 99m2s (5570)	5952 99m12s (5580)	5963 99m23s (5590)	5974 99m34s (5600)	5984 99m44s (5610)	5995 99m55s (5620)	6006 100m6s (5630)
	7	3.5	6016 100m16s (5640)	6027 100m27s (5650)	6038 100m38s (5660)	6048 100m48s (5670)	6059 100m59s (5680)	6070 101m10s (5690)	6080 101m20s (5700)	6091 101m31s (5710)	6102 101m42s (5720)	6112 101m52s (5730)
	8	4.0	6123 102m3s (5740)	6134 102m14s (5750)	6144 102m24s (5760)	6155 102m35s (5770)	6166 102m46s (5780)	6176 102m56s (5790)	6187 103m7s (5800)	6198 103m18s (5810)	6208 103m28s (5820)	6219 103m39s (5830)
	9	4.5	6230 103m50s (5840)	6240 104m0s (5850)	6251 104m11s (5860)	6262 104m22s (5870)	6272 104m32s (5880)	6283 104m43s (5890)	6294 104m54s (5900)	6304 105m4s (5910)	6315 105m15s (5920)	6326 105m26s (5930)
	10	5.0	6336 105m36s (5940)	6347 105m47s (5950)	6358 105m58s (5960)	6368 106m8s (5970)	6379 106m19s (5980)	6390 106m30s (5990)	6400 106m40s (6000)	6411 106m51s (6010)	6422 107m2s (6020)	6432 107m12s (6030)

Key: m - minutes; s - seconds

NOTE: Numbers in parentheses are the artificially low, incorrect periods which will be read out on the command consoles.

Table A5-1

SS/D SEQUENCE FOR DISCOVERER VEHICLE SERIAL 2205-1052

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
	-0.1	Timer reset
0	0	Start SS/D timer
0.1	0.1	Timer reset
0.1	0.1	Timer safety circuit
167	167	De-energize K30, 31, 32 (uncage gyros)
167	167	Programmed destruct lockout
178.5	178.5	Isolate K24 from beacon #5
178	178	Vehicle pneumatic control
178	178	Open pneumatics valve & spare
178	178	Fire explosive bolts
178	178	Fire explosive bolts
179	179	Start orbital programmer (paralleled)
179	179	Fire retro rockets (paralleled)
179	179	Arm pitch & yaw control
179	179	Arm integrator correction
192	192	Command -45°/min pitch rate (pitchover 21.75)
192	192	Arm roll H/S command
192	192	Fire H/S cover squib
192	192	Break 28V to N_2 valve, shut down separation monitor
192	192	Fire H/S cover squib
204	204	+28V to SS/D for brake control (not effective until 221 sec. S5D - N.O.)
221	221	Command -2°/min pitch rate from integ. pot.

[redacted]

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
221	221	Connect pitch H/S command
221	221	Arm beacon #5 timer brake control
221	221	Arm integ. uncaging circuit
221	221	Arm K21 hold-in circuit, latch up K1 to start delay via orbital programmer
221	221	Roll H/S signal shunt
*221	221	Timer brake hold-in control or integ. corr. respectively (isolated by S5C-NO)
242	222	Stop SS/D timer delay (nominally 20 sec.)
255	234	Fire ullage rockets
255	234	Fire ullage rockets
255	234	Preactivate hydraulics
255	234	Deactivate beacon #5 timer brake control
255	234	K21 hold-in
270	249	Arm gas generator squib. Energize K28 (Pitch and Yaw Pneu. Off)
270	249	Fire helium valve and gas gen. squib (par.)
270	249	Connect accelerometer to integrator
271	250	Pneumatic off backup (pitch & yaw)
271	250	Open gas gen. fire & He squib circuits
271	250	Start P.G. offset corr. (Disconnected)
271	250	Open gas generator squib arm circuit
271	250	Close circuit to T/M off switch
271	250	Start thrust M/A Corr. (disconnected)

*This sequence is based upon a nominal trajectory: Orbital programmer set for 21 sec. timer brake delay and no timer brake modification from beacon channel #5 or #6.

[redacted]

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time Launch	Computer Running Time	
271.5	250.5	Steady state thrust
371	350	Stop Thrust M/A Corr. (disconnected)
371	350	Stop P.G. Offset Corr. (disconnected)
382	361	Arm Pneumatic (Pitch and Yaw)
382	361	Engine Cut off Safety Switch
385.9	(364.9)	Test Isolation (No flight function)
**385.9	(364.9)	Disconnect accel. from integrator
385.9	(364.9)	Engine shut down by Integ.
385.9	(364.9)	Activate pneumatic controls (de-energize K-28)
395	374	SS/L +28VDC unreg.
395	374	Hydraulic controls shut down, shut off Ullage rockets & de-energize K34 (Par.)
395	374	Command +40/min yaw rate
395	374	Command 0°/min pitch rate
395	374	Fire oxidizer, helium, fuel vent valves (Paralleled)
395	374	De-Energize K21
493	472	Calibrate T/M
493	472	Connect K24 to Beacon #5 (Inoperative)
493	472	Heater Ampl. Excitation
503	482	Stop. calibrate
503	482	Open engine shut down circuit & Switch Ant.
665	644	Command +3.85°/min pitch rate

** The Dial Reading of the Integrator when caged is <u>1725</u> representing a Velocity to be gained of 13.800 ft/sec.

[redacted]

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
665	644	Connect roll H/S to Yaw Gyro
665	644	Roll Accel. Output Grounded
665	644	Shut down +28V reg. ascent only power (Paralleled)
665	644	Aux. Heater on
665	644	De-energize K33, Switch out 0.1% reg.
665	644	Integ. Pot. Ground to Pitch Corr. Mode (Inoperative)
665	644	F/C Gain change (Spare)
665	644	Integ. Shut down (Latch down K4, K5, K6)
891	870	Phase Balance Ø A
891	870	Arm Tape Recorder
891	870	Phase Balance Ø B
891	870	Recage Integrator (Inoperative)
891	870	Set K21 for Pitch rate correction (Inoperative)
891	870	Accelerometer Power Amp return
891	870	Telemetry Off
891	870	Pulse latch K7 (SS/D timer off) H/S to Low Gain
891	870	Open Integ. Recage (Inoperative)
891	870	Arm SS/D Timer for Recovery Phase
891	870	Stop Integrator Caging (Inoperative)
891	870	Spare
*X	870	Pulse latch K7, K14, K17, K18 (SS/D Timer on H/S off)
X + 18	888	Command -45°/min pitch rate

* Time of initiation of recovery phase.

[redacted]

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
X + 18	888	Arm Capsule ejection (squib)
X + 92	962	Command $+4^{\circ}$/min pitch rate
X + 92	962	SS/L Transfer Circuit #1
X + 92	962	SS/L Transfer Circuit #2
X + 92	962	Disconnect capsule from Electrical P.S.
X + 93.5	963.5	Shut down SS/D Timer
X + 93.5	963.5	Command Eject (Paralleled)

[redacted]

Table A6-1

NOMINAL ORBIT SCHEDULE: DISCOVERER SERIAL NO. 2205-1[illegible]

(Based on a 93.5 Minute Period)

Phase	Event	Time T (min)	Location N Latitude (deg)
Launch	Launch	0	34.8
	Separation	2.98 (179 sec)	----
	Start orbital timer	2.98 (179 sec)	----
	Nominal fire time	4.5 (270 sec)	----
	Nominal burnout and orbit injection	6.43 (385.9 sec)	---
	First crossing of equator	12.3 (736 sec)	---
	Beacon and T/M off	15.2 (913 sec)	12 (S)
Pass 1 (N-S)	Beacon and T/M on	83.3	79
	Reset enable	87.0	74
	Acquire [redacted]	87.3	72.7
	65°N latitude (ref.)	89.3	65
	Reset signal/command	90.9	60
	57.6°N latitude (ref.) [redacted]	91.5	57.6
	Reset disable	102.8	12
	Beacon and T/M off	103.3	10
	End of orbit 1	152.2	0 (S)
Pass 2 (N-S)	Beacon and T/M on	178.3	79
	Reset enable	180.4	74
	Acquire [redacted]	182.8	65.7
	Reset signal/command	184.4	60
	57.6°N latitude (ref) [redacted]	184.9	57.6
	Acquire [redacted]	191.2	32.3
	21.6°N latitude (ref.) [redacted]	193.9	21.6
	Beacon and T/M off	195.4	16
	Beacon and T/M on	195.9	14
	Reset disable	196.3	12
	Beacon and T/M off	197.3	8
	End of orbit 2	245.6	0 (S)
Passes 3 thru 7	End of orbit 3	339.1	0 (S)
	End of orbit 4	432.6	0 (S)
	End of orbit 5	526.1	0 (S)
	End of orbit 6	619.6	0 (S)
	End of orbit 7	713.	0 (S)

[redacted]

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 8 (S-N)	Beacon and T/M on	718.3	14
	Reset enable	718.9	16
	Acquire [redacted]	717.7	12.7
	Reset signal/command	722.8	30
	34.8°N latitude (ref.) [redacted]	723.8	34.8
	Beacon and T/M off	726.6	44
	Beacon and T/M on	727.1	46
	Reset disable	728.2	50
	Beacon and T/M off	728.8	52
	End of Orbit 8	806.5	0 (S)
Pass 9 (S-N)	Beacon and T/M on	810.1	8
	Reset enable	812.1	16
	Acquire [redacted]	811.1	12.3
	Acquire [redacted]	811.7	14.7
	21.6°N latitude (ref.) [redacted]	813.8	21.6
	Reset signal/command	816.1	30
	Acquire [redacted]	818.9	40.2
	57.6°N latitude (ref.) [redacted]	823.6	57.6
	Beacon and T/M off	824.5	60
	Beacon and T/M on	825	62
	Reset disable	827.3	70
	Beacon and T/M off	829.3	76
	End of orbit 9	900.0	0 (S)
Pass 10 (S-N)	Acquire [redacted]	900.4	2.7
	Beacon and T/M on	903.6	8
	Reset enable	904.4	11
	21.6°N latitude (ref.) [redacted]	907.3	21.6
	Reset signal/command	908.3	25
	Acquire [redacted]	910.9	35
	57.6°N latitude (ref.) [redacted]	916.8	57.6
	Beacon and T/M off	918	60
	Beacon and T/M on	918.5	62
	Reset disable	920.8	70
	Beacon and T/M off	922.8	76
	End of orbit 10	993.5	0 (S)

[redacted]

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 11 thru 13	End of orbit 11 End of orbit 12 End of orbit 13	1087.0 1180.4 1273.9	0 (S) 0 (S) 0 (S)
Pass 15 (N-S)	Beacon and T/M on Reset enable Reset signal/command [redacted] 57.6°N latitude (ref.) Reset disable Reset enable [redacted] 34.8°N latitude (ref.) Reset signal/command Reset disable Beacon and T/M off End of orbit 14	1301.6 1302.3 1306.2 1306.8 1307.7 1309.7 1312.3 1313.7 1316.2 1316.7 1367.4	76 74 60 57.6 54.0 46.0 34.8 30 20 18 0 (S)
Pass 16 (N-S)	Beacon and T/M on Reset enable Acquire [redacted] Reset si[redacted]l/command [redacted] 57.6°N latitude (ref. Reset disable Acquire [redacted] Reset enable [redacted] 34.8°N latitude (ref.) Reset signal/command Beacon and T/M off Beacon and T/M on Reset disable Beacon and T/M off End of orbit 15	1395 1395.9 1395.7 1399.7 1400.3 1401.2 1402.4 1403.2 1405.8 1407.2 1408.1 1408.6 1409.6 1412.6 1460.9	76 74 73.5 60 57.6 54 48.5 46 34.8 30 26 24 20 8 0 (S)

[redacted]

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 17 (N-S)	Beacon and T/M on	1582	76
	Reset enable	1582.7	74
	Acquire [redacted]	1584.2	67.6
	Reset signal/command	1586.6	60
	57.6°N latitude (ref.) [redacted]	1586.8	57.6
	Acquire [redacted]	1592.8	34.2
	21.6°N [redacted] (ref.) [redacted]	1595.7	21.6
	Beacon and T/M off	1597.5	16
	Beacon and T/M on	1598.0	14
	Reset disable	1598.5	12
	Beacon and T/M off	1599.5	8
	End of orbit 17	1647.8	0 (S)
Pass 18 (N-S)	Beacon and T/M on	1675.4	76
	Reset enable	1676.2	74
	Reset Signal/command	1680.1	60
	57.6°N. latitude (ref.) [redacted]	1680.3	57.6
	21.6°N. latitude (ref.) [redacted]	1689.2	21.6
	Beacon and T/M off	1691.0	16
	Beacon and T/M on	1691.5	14
	Reset disable	1692.0	12
	Beacon and T/M off	1692.9	8
	End of Orbit 18	1741.3	0 (S)

Table A6-2

FIRST-PASS PROGRAMMER CORRECTION BASED ON TIME OF CROSSING

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	55°N T (sec)	55°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
5280	Decrease 31 steps	5069		5178		5215		5654		5698	
5340	Decrease 25 steps	5122		5230		5270		5714		5759	
5400	Decrease 20 steps	5175		5285		5325		5774		5819	
5460	Decrease 14 steps	5228		5340		5380		5834		5880	
5520	Decrease 8 steps	5281		5394		5434		5894		5940	
5580	No change	5334		5449		5489		5954		6001	
5640	No change	5388		5503		5544		6014		6061	
5700	Increase 8 steps	5441		5558		5599		6074		6121	
5760	Increase 14 steps	5494		5612		5654		6134		6182	
5820	Increase 20 steps	5547		5667		5709		6194		6242	
5880	Increase 25 steps	5600		5722		5764		6254		6302	

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	55°N T (sec)	55°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
5940	Increase 31 steps	5654		5776		5818		6313		6363	
6000	Increase 37 steps	5707		5830		5873		6373		6423	
6060	As directed	5760		5885		5928		6433		6483	
6120	As directed	5813		5939		5983		6493		6544	
6180	As directed	5866		5994		6038		6553		6605	
6240	As directed	5919		6048		6093		6613		6665	
6300	As directed	5973		6103		6148		6673		6725	
6360	As directed	6026		6157		6203		6733		6786	
6420	As directed	6079		6211		6258		6792		6846	
6480	As directed	6133		6266		6313		6852		6906	
6540	As directed	6186		6321		6368		6912		6967	

[redacted]

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	55°N T (sec)	55°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
6600	As directed	6239		6375		6422		6972		7027	
6660	As directed	6292		6429		6477		7032		7088	
6720	As directed	6346		6484		6532		7092		7148	
6780	As directed	6399		6539		6587		7152		7208	
6840	As directed	6452		6593		6642		7212		7269	
6900	As directed	6505		6647		6696		7272		7329	
6960	As directed	6558		6701		6751		7332		7390	
7020	As directed	6612		6756		6806		7392		7450	
7080	As directed	6665		6810		6861		7452		7511	
7140	As directed	6718		6865		6916		7512		7571	
7200	As directed	6772		6920		6971		7572		7632	

Table A. 7-1. RECEIVING EQUIPMENT ASSIGNMENTS AND SETTINGS DURING RE-ENTRY AND RECOVERY PASS

LOCATION	SIGNAL	ANTENNA (GAIN)	MULTI-COUPLER	RECEIVER	BANDWIDTH (AM/FM)	MONITOR
[redacted]	VEH beacon VEH T/M	Tri-Helix (15)	Nems Clark	Motorola NC 1302 (2)	100 cps CW 300 CK (FM)	Pan adapter
	Cap beacon Cap T/M Cap T/M or beac	TLM-18 (28)	Nems Clark	NC 1302 NC 1302 NC 1401	300 KC (AM) 300 KC (FM) 100 KC (FM)	Pan adapter
Pvt. Joe E. Mann	VEH beacon VEH T/M	AFT-Tri-Helix (15)	Nems Clark	NC 1302	300 KC (AM) 300 KC (FM)	Pan adapter Audio or SS meter
	Cap beacon Cap T/M	FWD-Tri-Helix (15)	Nems Clark	NC 1302 NC 1403	300 KC (AM) 100 KC (FM)	Pan adapter SS meter or audio
Dalton Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 Pan adapter
Haiti Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 SS meter or audio
C 119	Cap beacon Cap T/M	YAGI (7)	None	NC 1302A	300 KC (AM)	FLR-2

Table A. 8-1 (Continued)

	Measurement	Channel	Priority	Pass	Tracking Station				T/M Ship*		Note
					[redacted]				King County	J.E. Mann	
Launch	Lift-off signal	----	1	Ascent	x	x					
	Thor main engine cutoff	Thor 12	1	Ascent	x	x					
	Agena engine ignition	14	1	Ascent	x	x			x		
	Agena engine cutoff	14	1	Ascent	x	x			x		
	Tone verifications A,B,C,D	16-2,16-4,16-6,16-8	1	Ascent	x	x					
	Command verifications 1,2,3,4	11	1	Ascent	x	x					
	10 second step switch position	16-24	1	Ascent	x	x			x		
	100 second step switch position	16-26	1	Ascent	x	x			x		
	Increase/decrease switch position	16-22	1	Ascent	x	x			x		
Orbit	AET 50, wave train	8	2	1 thru 16	x		x	x			12
	Tone verifications A,B,C,D	16-2,16-4,16-6,16-8	1	1 thru 16	x	x	x	x			
	Command verifications 1,2,3,4	11	1	1 thru 16	x	x	x	x			
	10 second step switch position	16-24	1	1 thru 16	x	x	x	x			
	100 second step switch position	16-26	1	1 thru 16	x	x	x	x			
	Increase/decrease switch position	16-22	1	1 thru 16	x	x	x	x			
	Reset monitor signal	16-10	1	1 thru 16	x	x	x	x			
	Re-entry selector switch position	16-25	1	1 thru 16	x	x	x	x			1
	Control gas supply pressure	12-38	2	2,10,16			x	x			
	Battery bus voltage	16-15	3	2,10,16			x	x			
	Horizon scanner - pitch No. 1	17-22	3	2,10,16			x	x			2
	Horizon scanner - roll No. 1	17-26	3	2,10,16			x	x			2
	SPI temperature	15-9	3	2,16				x		x	3
	SPI pitch angle	15-15	3	2,16				x		x	3
	SPI yaw angle	15-17	3	2,16				x		x	3
	AET 49, wave train	18	2	1 thru 16	x		x	x			12
	Programmer period readout	1,2	1	1 thru 16	x	x	x	x			
Recovery	10 second step switch position	16-24	3	Recovery Pass			x	x			
	100 second step switch position	16-26	3	↓			x	x			
	Reset monitor signal	16-10	1	↓			x	x			
	Re-entry selector switch position	16-25	1	↓			x	x			1
	Battery bus voltage	16-15	3	↓			x	x			
	Horizon scanner - pitch No. 1	17-22	3	↓				x			2
	Horizon scanner - roll No. 1	17-26	3	↓				x			2
	SPI temperature	15-9	3	↓				x			4
	Programmer period readout	1,2	1	↓			x	x			

Table A. 8-1 (Continued)

	Measurement	Channel	Priority	Pass	[redacted]		T/M Ship* King County	T/M Ship* J.E. Mann	Note
Recovery (Cont'd)	SPI pitch angle	15-15	3	Recovery Pass		x		x	4
	SPI yaw angle	15-17	3	↓		x		x	4
	Pitch programmer	17-20	1	↓	x	x		x	5
	AET 51, capsule separation event	16-21	1	↓	x	x		x	6
	AET 26, payload connector disconnect	12-2	2	↓	x	x		x	7
	AET 28, payload connector disconnect	12-3	2	↓	x	x		x	7
	AET 30, payload connector disconnect	12-4	2	↓	x	x		x	7
	AET 33, resistance thermometer (Deleted)	12-18	2	↓	x	x		x	8
	Spin rocket 1 ign, spin rocket 2 ign, retro-rocket ign, despin rocket 2 ign, thrust cone separation	Capsule 7	1	↓	x	x		x	9
	Thrust cone thermal battery voltage, despin rocket 1 ign, thrust cone separation	Capsule 8	1	↓	x	x		x	9
	Longitudinal acceleration, thrust cone separation, 5G switch closure	Capsule 9	1	↓	x	x		x	10
	5G switch closure, parachute cover off, cutters, parachute deployed, ablative shell off	Capsule 7	1	↓	x	x		x	9
	Thermal battery 2A8 voltage, timer switch closure	Capsule 8	1	↓	x	x		x	9
	Capsule T/M signal strength	Capsule 7,8,9	2	↓	x	x		x	11

[redacted] [redacted]

Table A. 8-1 (Continued)

NOTES:

1. Reads 1 volt for normal recovery pass re-entry, 4 volts for alternate re-entry.
2. Record at least 2 points at approximately 5 second intervals to determine the degree of attitude stabilization. Record system time at turnoff on the recovery pass.
3. Record 3 times at approximately 2 minute intervals. Correlate with system time.
4. Record at 1 minute intervals before reorientation, 20 second intervals during reorientation, and immediately after separation.
5. Record at start and finish of reorientation. Correlate with system time. [redacted] records at acquisition to determine vehicle attitude at separation. Include accuracy of pitch programmer readout.
6. Reads 4 volts prior to separation, 1 volt after separation. Correlation within two seconds of exact system time is satisfactory for initial report.
7. Reads 1 volt prior to separation, out of band after separation.
8. Relatively constant prior to separation, increases rapidly at retro-rocket ignition, and gradually decreases after separation. Record voltage at acquisition, maximum value, and just prior to signal fade.
9. Figure A8-1 presents nominal voltage levels. The initial report will contain general comments on the sequence. The performance summary will report sequence of events to the nearest second.
10. Verbal report will contain system time of initiation, average value, and duration. The tabulated performance summary will report the readings made each one-half second during the retro-rocket burning period.
11. Provide a qualitative evaluation of signal reception.
12. A qualitative comparison with the wave train form in Figure A8-2 with the system times of initiation and termination of the series of pulses is required.

*T/M Ships will transmit real time data immediately after signal fade so no interference with the vehicle telemetry signal will be generated.

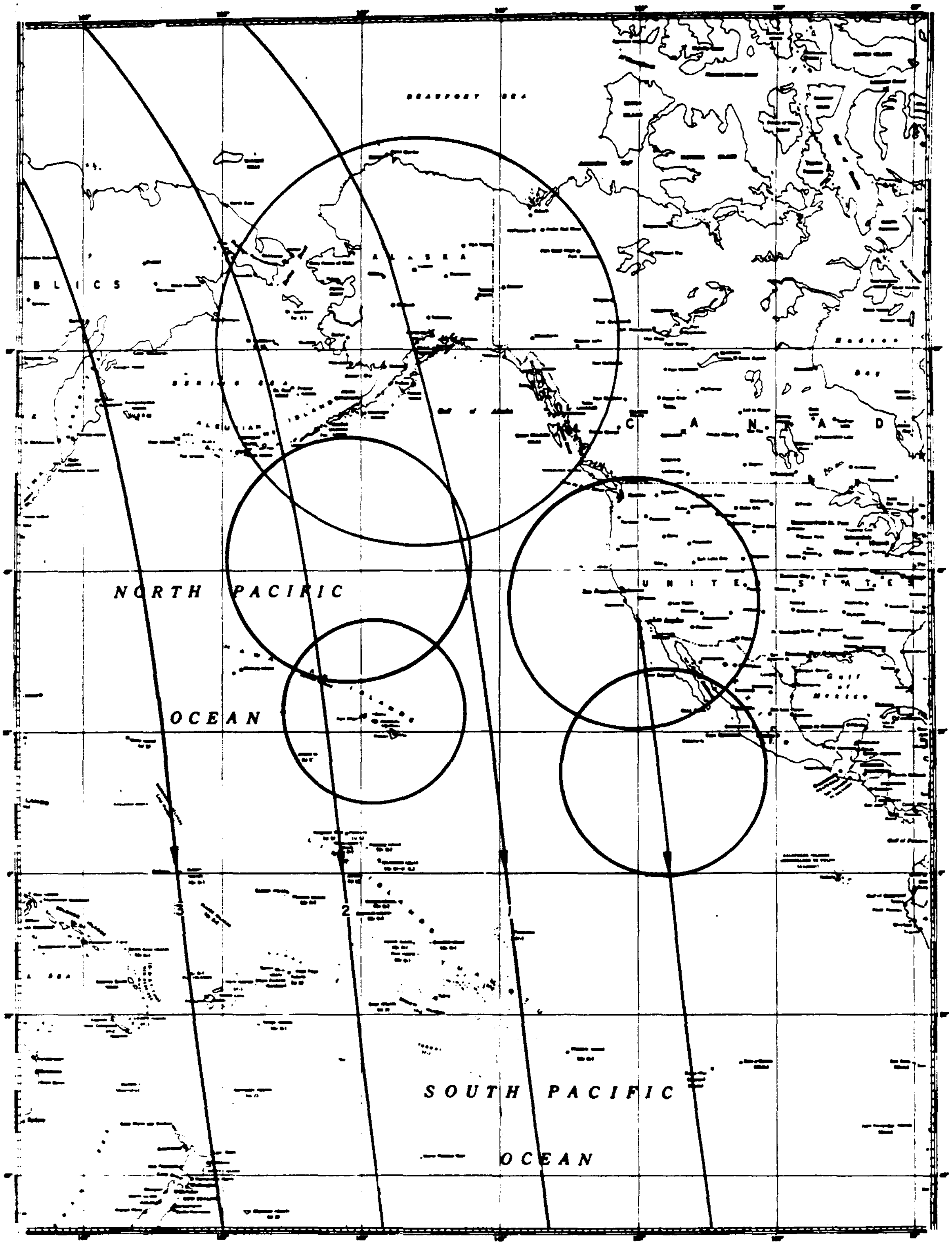


Figure A2-1 Nominal Orbit Traces Passes 1 thru 3

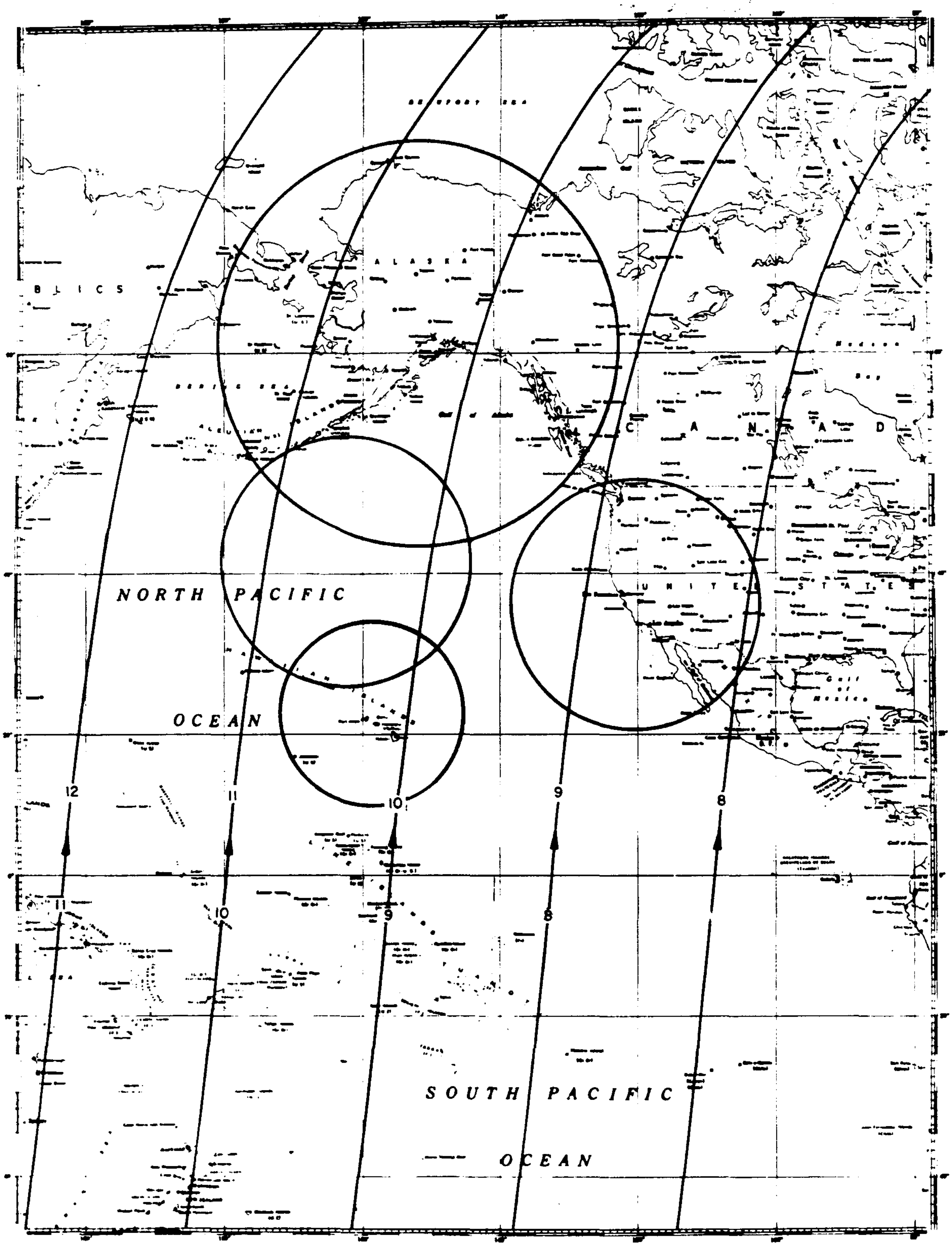


Figure A2-2 Nominal Orbit Traces Passes 8 thru 12

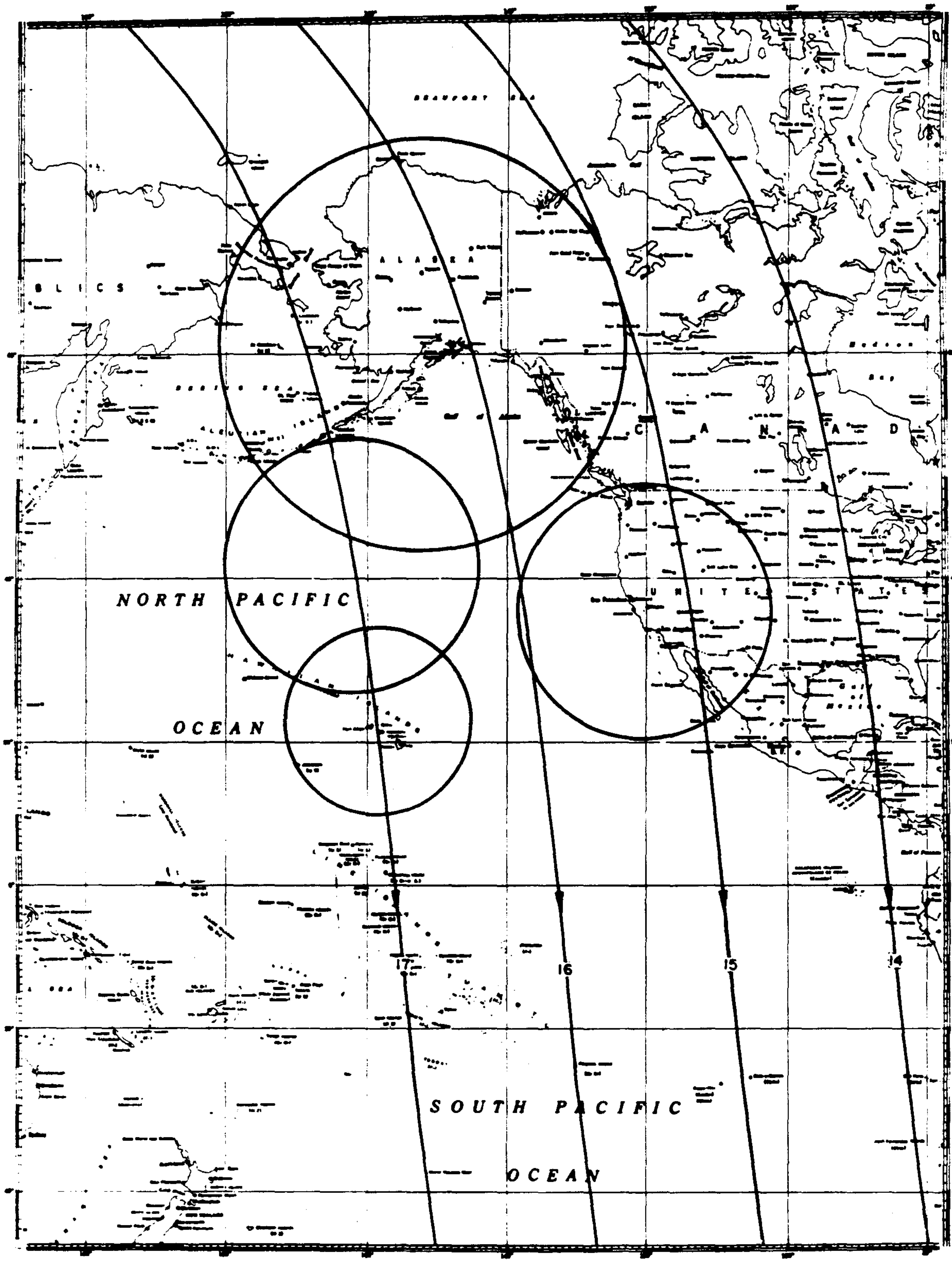
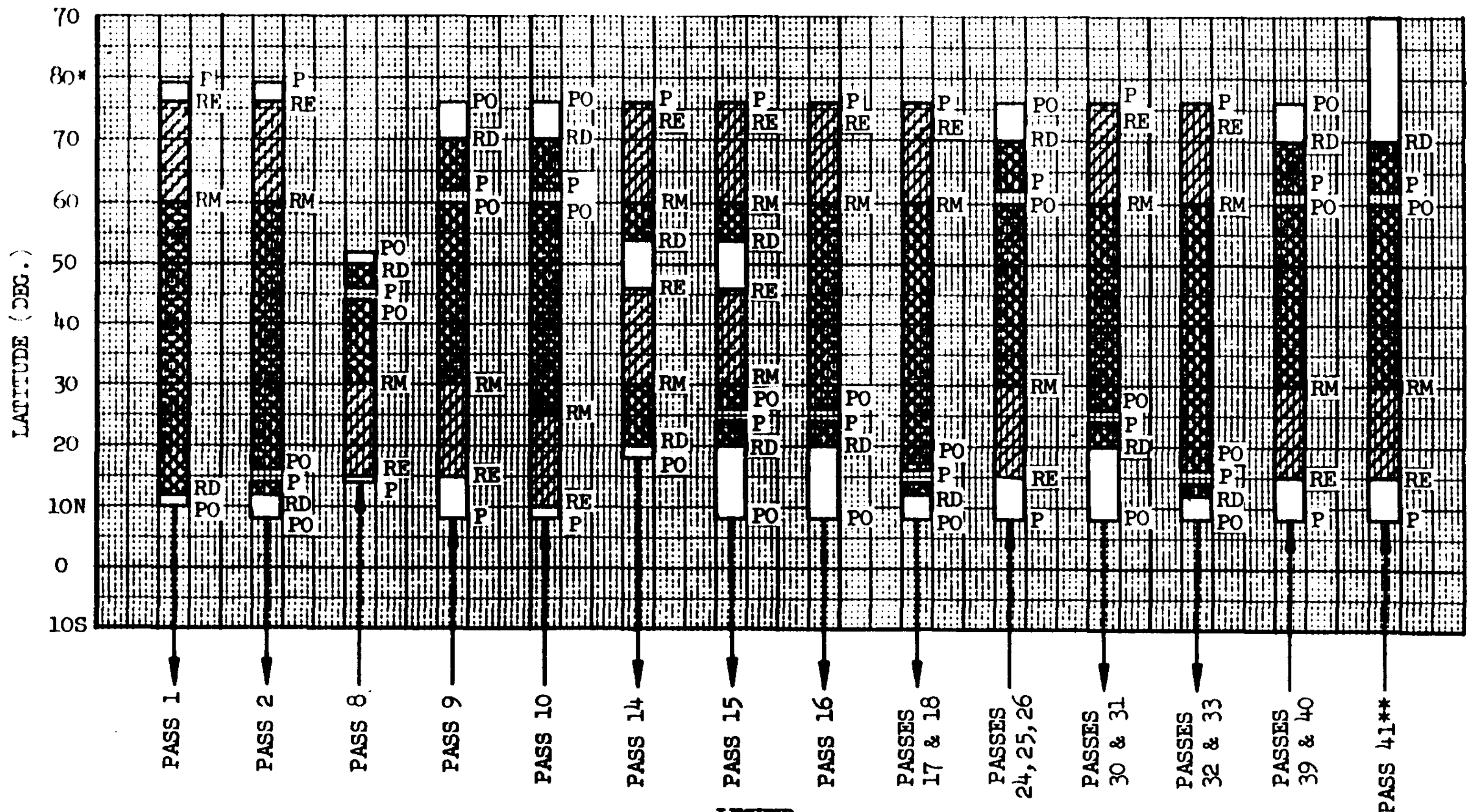


Figure A2-3 Nominal Orbit Traces Passes 14 thru 17

[redacted]



LEGEND

P PLATES ON
RE RESET ENABLE
RM RESET MONITOR SIGNAL
RD RESET DISABLE
PO PLATES OFF
* REPRESENTS EAST LONGITUDE LOCATION (MAXIMUM LATITUDE REACHED WITH THIS ORBIT-PLANE INCLINATION IS APPROXIMATELY 79.9° N. Latitude)

** BEACON AND TELEMETRY REMAIN ON FROM PASS 40 ON

NO RESET CAPABILITY

RESET COMMAND CAPABILITY

RESET MONITOR SIGNAL ON

Figure A2-4 Readout and Reset Programming

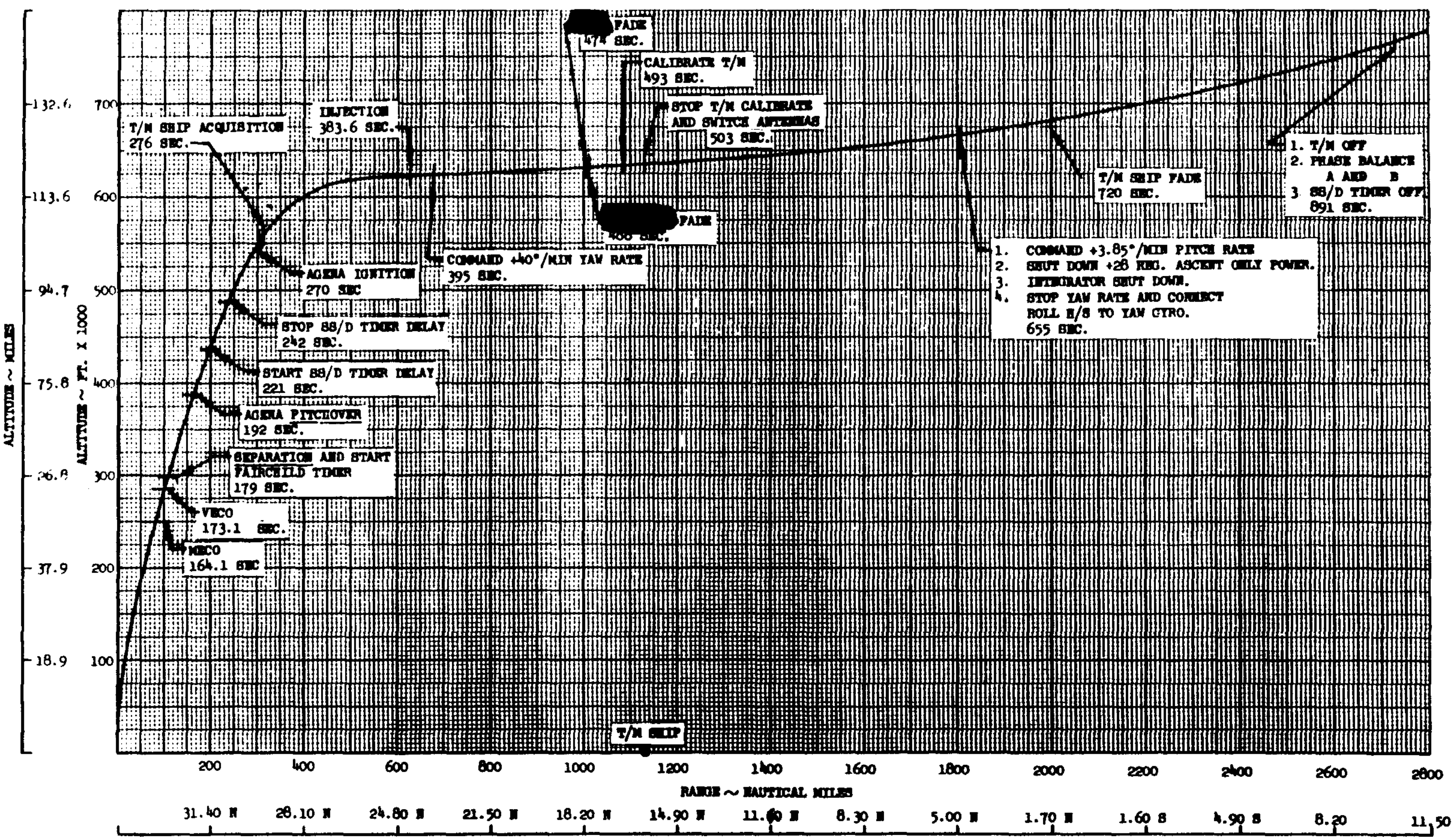


Figure A2-5 Launch Phase Nominal Time-Events Versus Location

[redacted]

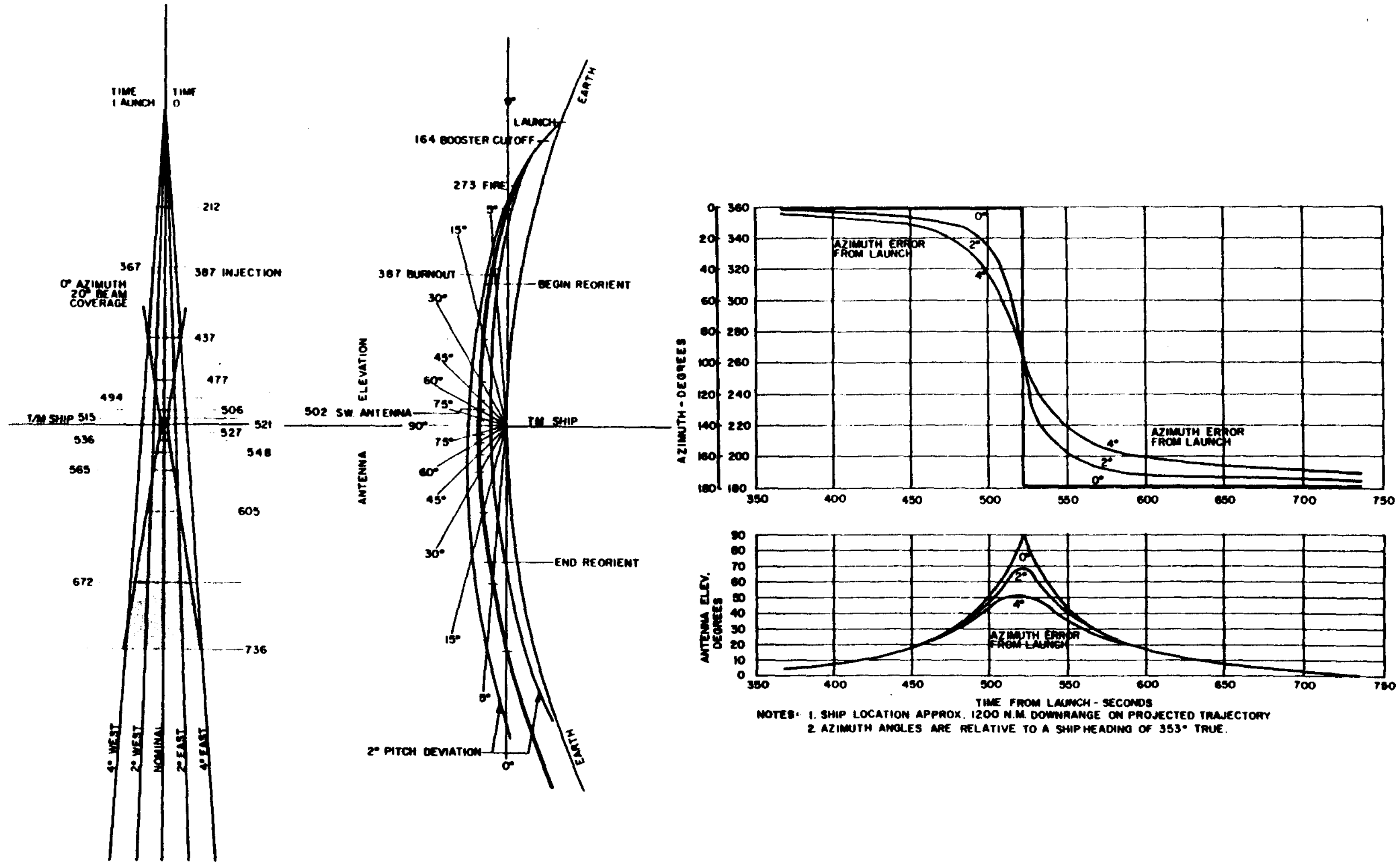


Figure A5-1 T/M Ship Antenna Positioning

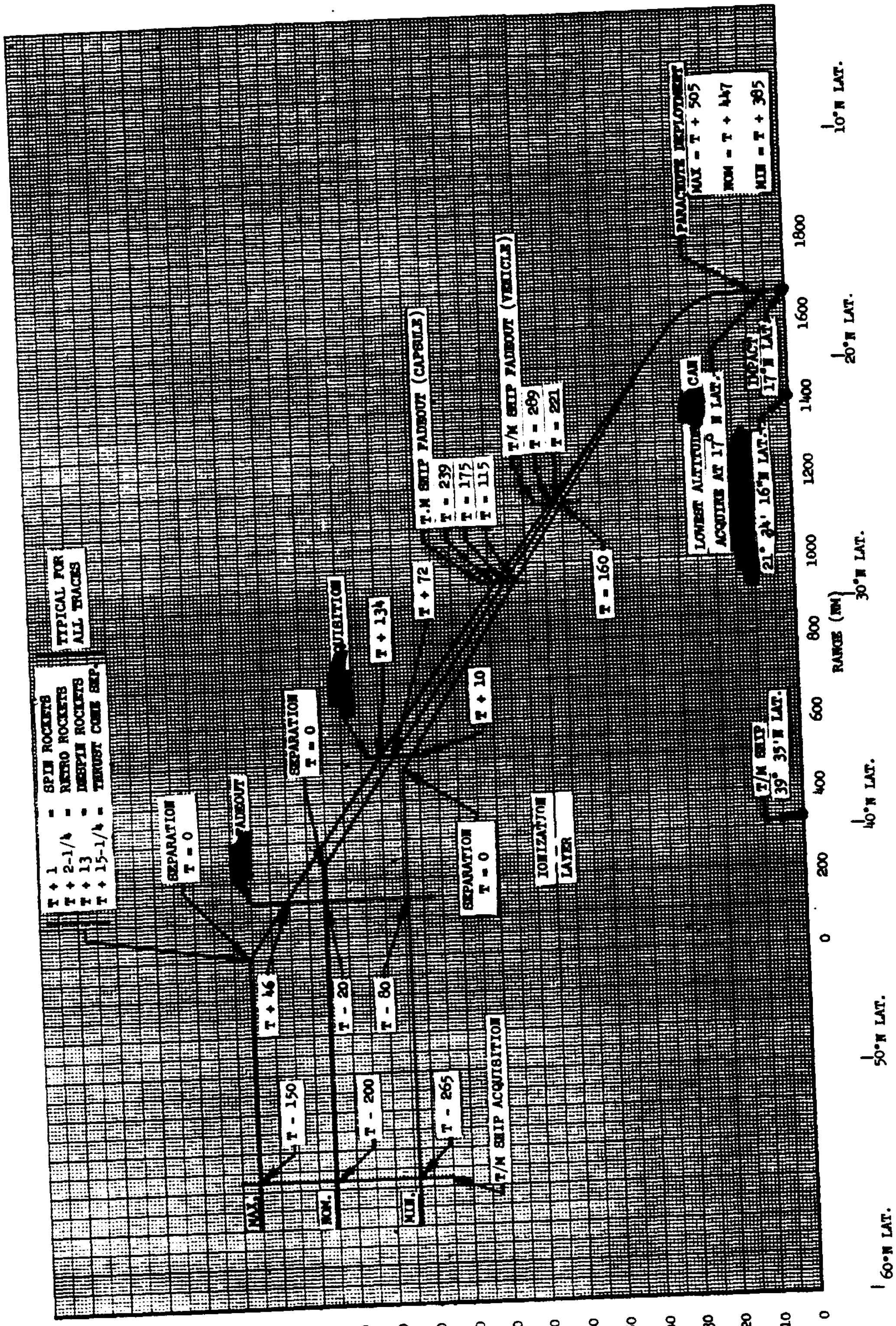


Figure A7-1 Re-Entry Trajectory

 [redacted]

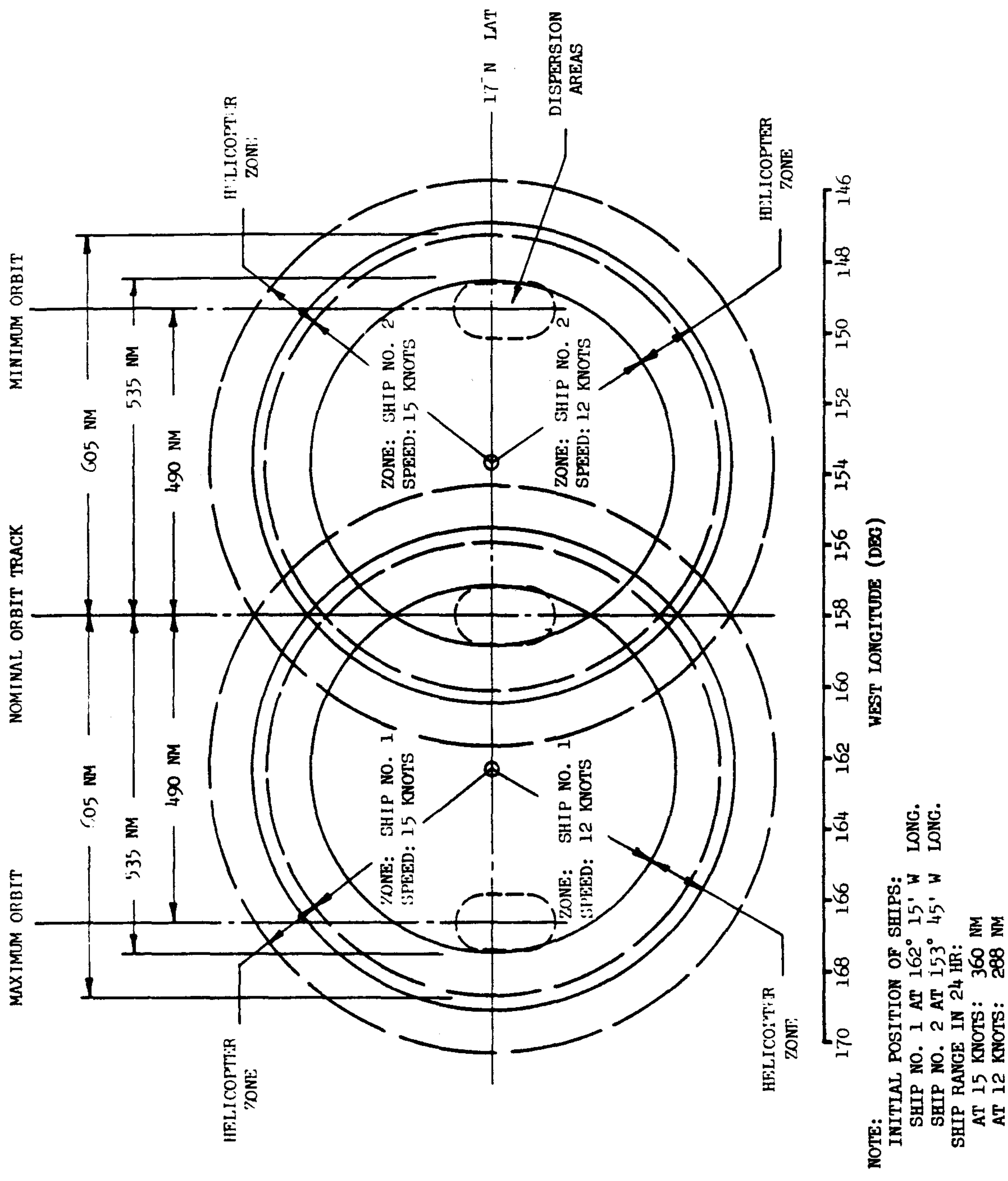


Figure A7-2 Surface Ship Deployment

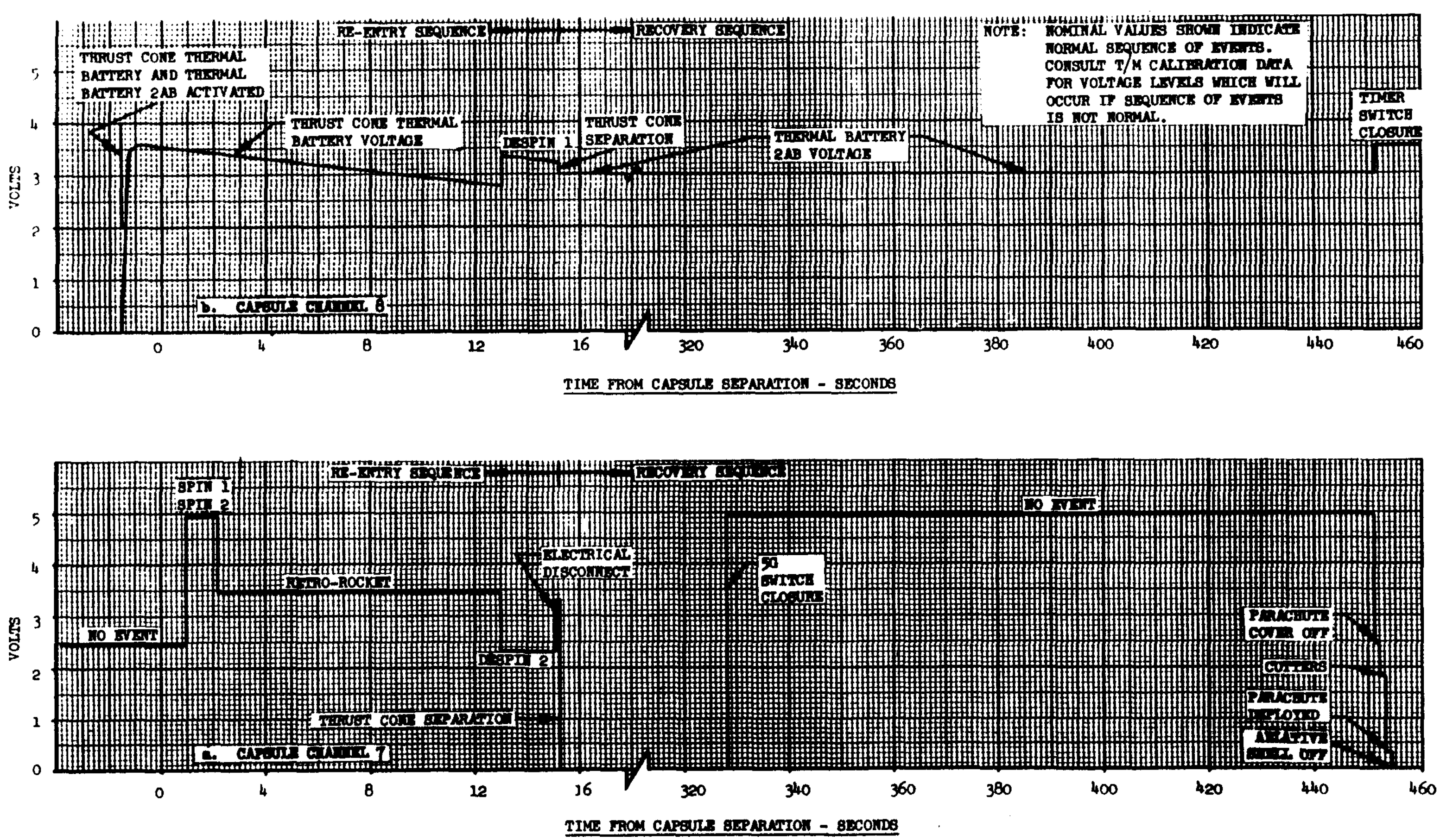


Figure A8-1 Nominal Capsule Telemetry Voltage Levels

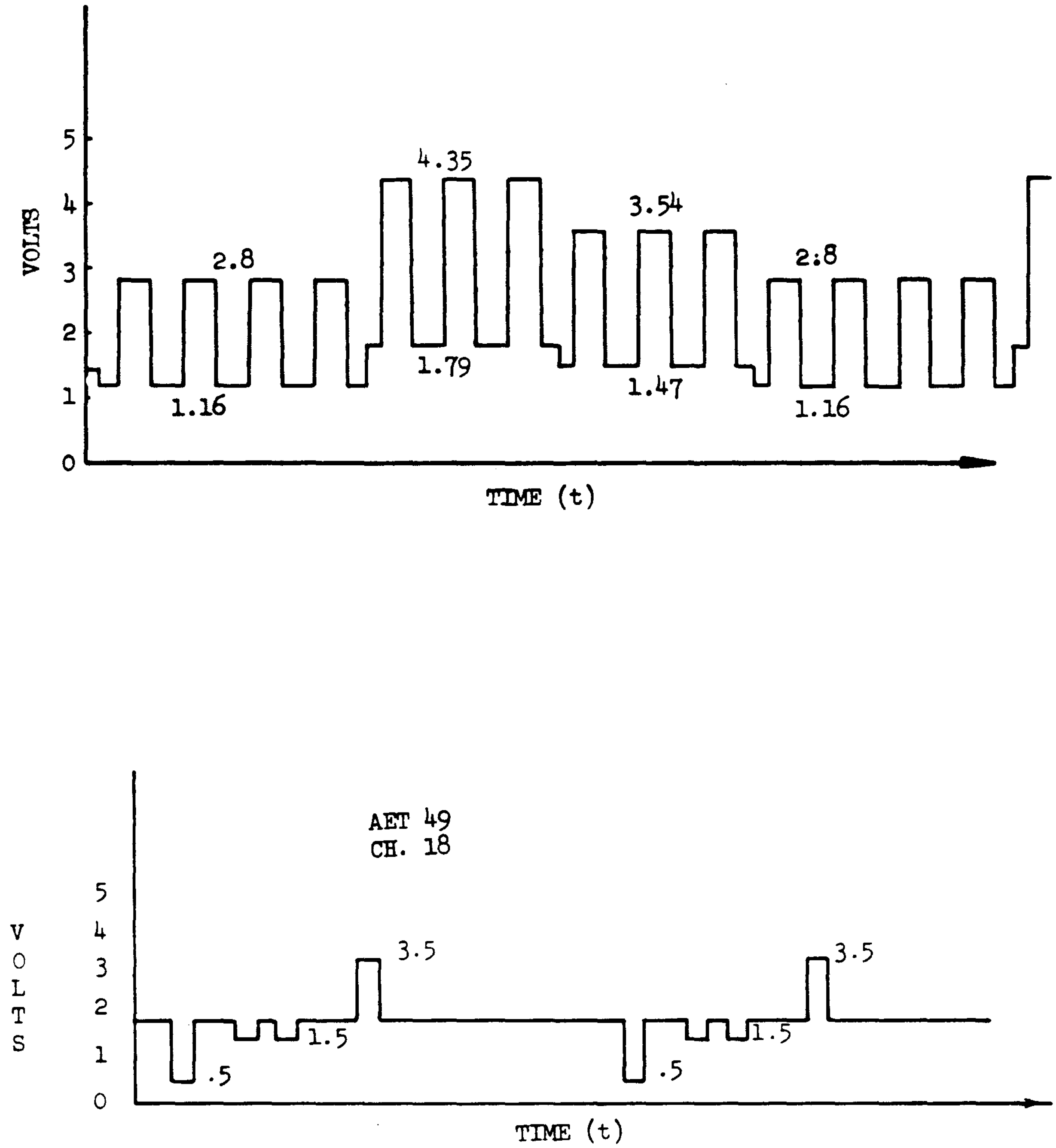


FIGURE A8-2 WAVE TRAIN FORM

Figure A8-2 Nominal Payload Function Wave Train

Notice of Page Substitution

Tab 2 - Appendix A
Vehicle 1054/Booster 223

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

[redacted]
1054/223
12 February 1960

DISCOVERER
SYSTEM TEST DIRECTIVE
TAB 2 APPENDIX A
FOR
AGENA VEHICLE 1054/
THOR BOOSTER 223

This document has been prepared by Systems Operations Planning, 61-41

Approved [redacted] Manager
Systems Operations
Satellite Systems

Approved
[redacted]
for
Lt. Col. USAF
6594th Test Wing (ARDC)
Chairman, STWG

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Division
Sunnyvale, California

APPENDIX A, TAB 2
SUPPLEMENTAL TEST INFORMATION

CONTENTS

TABLES

ILLUSTRATIONS

FOREWORD

The basic System Test Directive, [redacted] purposely omits detailed variable flight to flight data but contains information of a permanent nature applicable to all flights of the initial Discoverer series. Detailed data and directives are presented in this Appendix for the Agena 1054/ Thor 223 combination and are applicable to this configuration only.

Engineering and procedural changes pertinent to the Agena 1054/Thor 223 combination are summarized as follows:

a. **The orbital programmer period setting will be displayed on the equipment console in minutes and seconds and also as a function of the number of step adjustments made to the programmer, ranging in values from 0 to 99.**

b. **The APL Doppler acquisition transmitter and tracking lights will be incorporated for this flight.**

c. **The [redacted] tracking station at South Point, Hawaii, will be employed during the recovery operation.**

d. **C-119J aircraft assignments concerning the monitoring of capsule beacon and T/M frequencies have been modified.**

APPENDIX A
SUPPLEMENTAL TEST INFORMATION

A1 GENERAL

A1. 1 This section contains descriptive material which supplements the text of the general STD for this flight only. Material presented herein may also correct or supersede material in the general STD for this flight only if necessary. General STD changes of a permanent nature will be effected by replacement pages in the main text at the earliest possible date. Reference will not be made to this Appendix for subsequent flight operations. The following material is divided into general sections, with parenthetical references to relative paragraphs in the main text provided where beneficial.

A2 ORBIT OPERATIONS

A2. 1 Orbital Programmer Readout

A2. 1. 1 The orbital programmer period setting has been displayed in the past by the console equipment as a function of 10-second and 100-second decode switch positions. The console will now display a number from 0 to 99 indicating the number of steps the programmer is set above the minimum period. This step number, representing the orbital period, can be converted directly to seconds, or minutes and seconds by means of conversion Table A2-3. Table A2-3 will also provide the orbital programmer oscillator frequency corresponding to an orbit period setting as a backup measure.

A2. 1. 2 The orbital programmer period will also be read out and displayed as a function of the programmer oscillator frequency. This frequency will be telemetered on Channels 1 and 2 and automatically converted to programmer period in minutes and seconds for display on the acquisition and tracking console by means of a Berkeley Counter and a remote repeater.

A2. 1. 3 The number of programmer adjustment steps read from the command console display will be the prime method of reporting programmer period to the STC over the voice line. The backup for the report will be the 10- and 100-second stepping switch positions read in real time. The period readout as a function of oscillator frequency will be reported in the performance summary via the 60-wpm teletype. A verbal report of this item will be given as a backup only if requested.

A2. 2 APL Doppler Evaluation

A2. 2. 1 An additional acquisition transmitter will be employed on Agena Vehicle 1054 for evaluation purposes. The transmitter will operate continuously on 162 mc and 216 mc and may be used as an acquisition aid in the event the CWAT becomes inoperative. LMSD tracking stations will receive the signals on 162 mc and 216 mc on all passes except the recovery pass to verify that the transmitter is operative with no attempt to record any intelligible data. APL Doppler tracking stations will receive the beacon signals and record Doppler data on teletype tape for post flight evaluation.

A2. 2. 2 An optical beacon will also be installed on Agena Vehicle 1054 and turned on by the orbital programmer while the satellite is within reception range of Project Space Track and Smithsonian stations equipped with Baker-Nunn cameras.

A3 RECOVERY PHASE OPERATIONS

A3.1 Capsule Telemetry

Capsule telemetry Channels 7 and 8 will measure one set of events during the re-entry sequence and another set of events during the recovery sequence. The oscillator inputs will be switched when the thrust cone is separated. Channel 9 will measure axial acceleration during both the re-entry sequence and the recovery sequence. The subcarrier for Channel 7 will be turned off after thrust cone separation and will be turned on again at 5G switch closure. Channels 8 and 9 will transmit data continuously throughout the descent trajectory. Figure A8-1 shows the voltage levels which indicate that normal re-entry and recovery sequences have occurred.

A3.2 Tracking Station Operations

A3.2.1 The TLM-18 type antenna at the [redacted] tracking station on South Point, Hawaii, will be employed in this operation to provide a triangulation with [redacted] on the recovery pass for determining the capsule location at parachute deployment. The antenna will be positioned as a function of maximum signal strength, and the azimuth, elevation, and system time will be recorded each time the positioning errors are minimum. At these times, the azimuth and elevation will be reported over the telephone line to [redacted] so that the data can be manually plotted and triangulation effected. When the capsule enters the ionization layer and the telemetry signal disappears, South Point will reposition the antenna to the parachute deployment azimuth and elevation, as directed by the [redacted] based on the [redacted] tracking data extrapolated to the blossom point and converted to South Point coordinates.

When the South Point Station acquires, after parachute deployment, the antenna movement will be slight so that an accurate azimuth can be determined and will be reported to the [redacted] The South Point Station will record the T/M signal received for later evaluation.

A3.3 Recovery Force Procedures

A3.3.1 Assignments of C-119J aircraft to monitor the capsule telemetry frequency during the recovery operation are modified, as shown below, to gain full advantage of earlier tracking observations and the frequency stability offered by the telemetry crystal-controlled transmitter.

Mode	Tracking Reported by [redacted] [redacted] or T/M Ship	Aircraft Assigned to Telemetry Frequency Search	Aircraft Assigned to Beacon Frequency Search
1	No Signals Reported	2,4,6,8	1,3,5,7
2	Capsule T/M Signal Only	1,2,4,5,6,8	3,7
3	Beacon Signal Only	2,6	1,3,4,5,7,8
4	Both Signals Reported	2,4,6,8	1,3,5,7

If two or more aircraft report solid acquisition of either frequency and the other frequency is not received, two aircraft alone will search for the unreported frequency as in modes one or four above.

Fifteen minutes after time of capsule separation, any aircraft searching for the capsule telemetry will join in the search for the capsule beacon. The receiver setting for telemetry signal search will be the 100-kc fm mode.

A3.3.2 Should the re-entry capsule not be sighted before ETPD + 15 minutes, the Command RC-121 will report all signal data received to the HCC for relay to the STC. The data to be reported are aircraft position at time of signal acquisition, signal bearing, and local time for each acquiring C-119J aircraft and ship. In addition, range and azimuth with local time and aircraft position will be reported for each valid radar return. The report shall also contain the controller's conclusions regarding quality of reported signals and bearings, results of triangulation attempts, and most probable impact location. These data will be relayed to the STC immediately upon receipt by the HCC to enable the PAC to determine the most productive search areas.

A4 TABLES AND ILLUSTRATIONS

The following tables and illustrations are applicable to Flight 1054/223 only. Each table or figure is given the basic number of the section of the general STD to which it applies, the letter A to indicate appendix material, and a number to sequence items in the same category.

Table A2-1

NOMINAL FLIGHT PLANNING DATA

Items	Data
DISCOVERER	
S/N	1054
Payload	GFE
Fuel	UDMH
Oxidizer	IRFNA
Launch weight	8576
THOR	
S/N	223
Launch weight	108407
Fuel	RJ-1
Oxidizer	Liquid oxygen
LAUNCH	
Site	VAFB, SM-75-3, Pad No. 5
Date	February 1960
Pad azimuth	218° 24' 17.24"
Launch azimuth	172°
Nominal airborne Command #5 backup	20 sec
Orbital boost time	117.5 sec
Downrange T/M ship location (King County)	16° 00'N 117° 43'W
Downrange T/M ship heading	353°T
Programmer setting	5610 seconds (Step 22)
INJECTION	
Time	T + 387.5 sec
Location	24.1°N 118.84°W
Altitude	120 sm
Azimuth	171.6°
Nominal velocity	26,037 ft/sec
ORBIT	
Period	93.48 min (5609 sec)
Apogee	438 sm
Perigee	120 sm
Eccentricity	0.036
Average regression rate (17 passes)	23.52°
Reset latitudes	25°N (Resets over [redacted] 30°N (Resets over 60°N (Resets over
Inclination angle	79.89°
Re-entry T/M ship location (Pvt. Joe E. Mann)	39° 35'N 161° 45'W
RECOVERY	
Aircraft (type and quantity)	C-119's (9) and RC-121's (4)
Surface ships (recovery)	Dalton Victory and Haiti Victory
Surface ship initial locations	17°N, 153° 45'W and 17°N, 162° 15'W
Surface ship helicopters	HRS-3 (2 on each ship)
Recovery pass	17
Predicted impact area center	17°N, 158°W
ETPD	T + 27 hr

Table A2-2

NOMINAL ACQUISITION TIMES

Pass	Station	Acquisition Time (minutes)	Fadeout Time (minutes)	Duration Time (minutes)
Launch	[redacted]	0.5	8.1	7.6
	[redacted]	0.0	7.9	7.9
	T/M Ship	4.6	13.0	8.4
1	[redacted]	87.3	95.1	7.8
2	[redacted]	182.8	187.5	4.7
	[redacted]	191.2	197.2	6.0
8	[redacted]	717.7	728.9	11.2
9	[redacted]	811.1	815.3	4.2
	[redacted]	811.7	823.4	11.7
	[redacted]	818.9	826.9	8.0
10	[redacted]	900.4	913.5	13.1
	[redacted]	910.9	922.1	11.2
*11	[redacted]	998.1	1005.2	7.1
	[redacted]	1006.3	1019.1	12.8
*12	[redacted]	1104.9	1108.8	3.9
15	[redacted]	1395.7	1399.8	4.1
	[redacted]	1402.4	1408.8	6.4
16	[redacted]	1489.3	1496.9	7.6
	[redacted]	1498.9	1500.5	1.6
17	[redacted]	1584.2	1590.4	6.2
	[redacted]	1592.8	1599.6	6.8
*23	[redacted]	2120.9	2129.7	8.8
24	[redacted]	2222.7	2227.6	4.9

*Acquisition only - no T/M readout

Table A5-1

SS/D SEQUENCE FOR DISCOVERER VEHICLE SERIAL 2205-1054

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
	-0.1	Timer reset
0	0	Start SS/D timer
0.1	0.1	Timer reset
0.1	0.1	Timer safety circuit
167	167	De-energize K30, 31, 32 (uncage gyros)
167	167	Programmed destruct lockout
178.5	178.5	Isolate K24 from Beacon #5
178	178	Vehicle pneumatic control
178	178	Open pneumatics valve and spare
178	178	Fire explosive bolts
178	178	Fire explosive bolts
179	179	Start orbital programmer (paralleled)
179	179	Fire retro-rockets (paralleled)
179	179	Arm pitch and yaw control
179	179	Arm integrator correction
192	192	Command -45^{o}/min pitch rate (pitchover 21.75)
192	192	Arm roll H/S command
192	192	Fire H/S cover squib
192	192	Break 28V to N_2 valve, shut down separation monitor
192	192	Fire H/S cover squib
204	204	+28V to SS/D for brake control (not effective until 221 sec. S5D-NO)
221	221	Command -2^{o}/min pitch rate from integ. pot.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
221	221	Connect pitch H/S command
221	221	Arm Beacon #5 timer brake control
221	221	Arm integ. uncaging circuit
221	221	Arm K21 hold-in circuit, latch up K1 to start delay via orbital programmer
221	221	Roll H/S signal shunt
*221	221	Timer brake hold-in control or integ. corr. respectively (isolated by S5C-NO)
241	221	Stop SS/D timer delay (nominally 20 sec)
254	234	Fire ullage rockets
254	234	Fire ullage rockets
254	234	Preactivate hydraulics
254	234	Deactivate Beacon #5 timer brake control
254	234	K21 hold-in
269	249	Arm gas generator squib. Energize K28 (Pitch and Yaw Pneu. Off)
269	249	Fire helium valve and gas gen. squib (par.)
269	249	Engine ignition
269	249	Connect accelerometer to integrator
270	250	Pneumatic off backup (pitch and yaw)
270	250	Open gas gen. fire and He squib circuits
270	250	Start P.G. offset corr. (disconnected)
270	250	Open gas generator squib arm circuit
270	250	Close circuit to T/M off switch
270	250	Start thrust M/A Corr. (disconnected)

* This sequence is based upon a nominal trajectory: Orbital programmer set for 21-sec timer brake delay and no timer brake modification from beacon channel #5 or #6.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
270.5	250.5	Steady state thrust
370	350	Stop Thrust M/A corr. (disconnected)
370	350	Stop P.G. offset corr. (disconnected)
385	365	Arm pneumatic (pitch and yaw)
385	365	Engine cut-off safety switch
388	(368)	Test isolation (no flight function)
**388	(368)	Disconnect accel. from integrator
388	(368)	Engine shut down by integ.
388	(368)	Activate pneumatic controls (de-energize K-28)
394	374	SS/L +28VDC unreg.
394	374	Hydraulic controls shut down; shut off ullage rockets and de-energize K34 (Par.)
394	374	Command +40/min yaw rate
394	374	Command 0^{o}/min pitch rate
394	374	Fire oxidizer, helium, fuel vent valves (paralleled)
394	374	De-energize K21
492	472	Calibrate T/M
492	472	Connect K24 to Beacon #5 (inoperative)
492	472	Heater ampl. excitation
502	482	Stop calibrate
502	482	Open engine shut down circuit and switch ant.
502	482	Enable Command #5 and #6. Alternate recovery pass capability
664	644	Command $+3.55^{o}$/min pitch rate

** The dial reading of the integrator when caged is 1725 representing a velocity-to-be-gained of 13,800 ft/sec.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
664	644	Connect roll H/S to yaw gyro
664	644	Roll accel. output grounded
664	644	Shut down +28V reg. ascent only power (paralleled)
664	644	Aux. heater on
664	644	De-energize K33, switch out 0.1% reg.
664	644	Integ. pot. ground to pitch corr. Mode (inoperative)
664	644	Flight control gain change
664	644	Integ. shut down (latch down K4, K5, K6)
890	870	Phase balance Ø A
890	870	Arm tape recorder
890	870	Phase balance Ø B
890	870	Recage integrator (inoperative)
890	870	Set K21 for pitch rate correction (inoperative)
890	870	Accelerometer power amp return
890	870	Telemetry Off
890	870	Pulse latch K7 (SS/D timer off) H/S to tow gain
890	870	Open integ. recage (inoperative)
890	870	Arm SS/D timer for recovery phase
890	870	Stop integrator caging (inoperative)
890	870	Spare
*X	870	Pulse latch K7, K14, K17, K18 (SS/D timer on H/S off)
X + 15	885	Command -45°/min pitch rate
X + 15	885	Fire payload battery heater squibs

* Time of initiation of recovery phase

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
X + 18	888	Arm Capsule ejection (squib)
X + 92	962	Command 3.55°/min pitch rate
X + 92	962	SS/L Transfer Circuit #1
X + 92	962	SS/L Transfer Circuit #2
X + 92	962	Disconnect capsule from electrical P.S.
X + 93.5	963.5	Shut down SS/D timer
X + 93.5	963.5	Command eject (paralleled)

Table A6-1

NOMINAL ORBIT SCHEDULE: DISCOVERER SERIAL NO. 2245-1054

(Based on a 93.5-Minute Period)

Phase	Event	Time T (min)	Location N Latitude (deg)
Launch	Launch	0	34.8
	Separation	2.98 (179 sec)	----
	Start orbital timer	2.98 (179 sec)	----
	Nominal fire time	4.5 (270 sec)	----
	Nominal burnout and orbit injection	6.43 (385.9 sec)	---
	First crossing of equator	12.3 (736 sec)	---
	Beacon and T/M off	15.2 (913 sec)	12 (S)
Pass 1 (N-S)	Beacon and T/M on	83.3	79
	Reset enable	87.0	74
	Acquire [redacted]	87.3	72.7
	65°N latitude (ref.)	89.3	65
	Reset signal/command	90.9	60
	57.6°N latitude (ref.) [redacted]	91.5	57.6
	Reset disable	102.8	12
	Beacon and T/M off	103.3	10
	End of orbit 1	152.2	0 (S)
Pass 2 (N-S)	Beacon and T/M on	178.3	79
	Reset enable	180.4	74
	Acquire [redacted]	182.8	65.7
	Reset signal/command	184.4	60
	57.6°N latitude (ref) [redacted]	184.9	57.6
	Acquire [redacted]	191.2	32.3
	21.6°N latitude (ref.) [redacted]	193.9	21.6
	Beacon and T/M off	195.4	16
	Beacon and T/M on	195.9	14
	Reset disable	196.3	12
	Beacon and T/M off	197.3	8
	End of orbit 2	245.6	0 (S)
Passes 3 thru 7	End of orbit 3	339.1	0 (S)
	End of orbit 4	432.6	0 (S)
	End of orbit 5	526.1	0 (S)
	End of orbit 6	619.6	0 (S)
	End of orbit 7	713.	0 (S)

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 8 (S-N)	Beacon and T/M on	718.3	14
	Reset enable	718.9	16
	Acquire [redacted]	717.7	12.7
	Reset signal/command	722.8	30
	34.8°N latitude (ref.) [redacted]	723.8	34.8
	Beacon and T/M off	726.6	44
	Beacon and T/M on	727.1	46
	Reset disable	728.2	50
	Beacon and T/M off	728.8	52
	End of Orbit 8	806.5	0 (S)
Pass 9 (S-N)	Beacon and T/M on	810.1	8
	Reset enable	812.1	16
	Acquire [redacted]	811.1	12.3
	Acquire [redacted]	811.7	14.7
	21.6°N latitude (ref.) [redacted]	813.8	21.6
	Reset signal/command	816.1	30
	Acquire [redacted]	818.9	40.2
	57.6°N latitude (ref.) [redacted]	823.6	57.6
	Beacon and T/M off	824.5	60
	Beacon and T/M on	825	62
	Reset disable	827.3	70
	Beacon and T/M off	829.3	76
	End of orbit 9	900.0	0 (S)
Pass 10 (S-N)	Acquire [redacted]	900.4	2.7
	Beacon and T/M on	903.6	8
	Reset enable	904.4	11
	21.6°N latitude (ref.) [redacted]	907.3	21.6
	Reset signal/command	908.3	25
	Acquire [redacted]	910.9	35
	57.6°N latitude (ref.) [redacted]	916.8	57.6
	Beacon and T/M off	918	60
	Beacon and T/M on	918.5	62
	Reset disable	920.8	70
	Beacon and T/M off	922.8	76
	End of orbit 10	993.5	0 (S)

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location. N Latitude (deg)
Passes 11 thru 13	End of orbit 11	1087.0	0 (S)
	End of orbit 12	1180.4	0 (S)
	End of orbit 13	1273.9	0 (S)
Pass 14 (N-S)	Beacon and T/M on	1301.6	76
	Reset enable	1302.3	74
	Reset signal/command	1306.2	60
	57.6°N latitude (ref. [redacted]	1306.8	57.6
	Reset disable	1307.7	54.0
	Reset enable	1309.7	46.0
	34.8°N latitude (ref. [redacted]	1312.3	34.8
	Reset signal/command	1313.7	30
	Reset disable	1316.2	20
	Beacon and T/M off	1316.7	18
	End of orbit 14	1367.4	0 (S)
Pass 15 (N-S)	Beacon and T/M on	1301.6	76
	Reset enable	1302.3	74
	Reset signal/command	1306.2	60
	57.6°N latitude (ref.) [redacted]	1306.8	57.6
	Reset disable	1307.7	54.0
	Reset enable	1309.7	46.0
	34.8°N latitude (ref.) [redacted]	1312.3	34.8
	Reset signal/command	1313.7	30
	Reset disable	1316.2	20
	Beacon and T/M off	1316.7	18
	End of orbit 14	1367.4	0 (S)
Pass 16 (N-S)	Beacon and T/M on	1395	76
	Reset enable	1395.9	74
	Acquire [redacted]	1395.7	73.5
	Reset signal/command	1399.7	60
	57.6°N latitude (ref. [redacted]	1400.3	57.6
	Reset disable	1401.2	54
	Acquire [redacted]	1402.4	48.5
	Reset enable	1403.2	46
	34.8°N latitude (ref. [redacted]	1405.8	34.8
	Reset signal/command	1407.2	30
	Beacon and T/M off	1408.1	26
	Beacon and T/M on	1408.6	24
	Reset disable	1409.6	20
	Beacon and T/M off	1412.6	8
	End of orbit 15	1460.9	0 (S)

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 17 (N-S)	Beacon and T/M on	1582	76
	Reset enable	1582.7	74
	Acquire [redacted]	1584.2	67.6
	Reset signal/command	1586.6	60
	57.6°N latitude (ref.) [redacted]	1586.8	57.6
	Acquire [redacted]	1592.8	34.2
	21.6°N latitude (ref.) [redacted]	1595.7	21.6
	Beacon and T/M off	1597.5	16
	Beacon and T/M on	1598.0	14
	Reset disable	1598.5	12
	Beacon and T/M off	1599.5	8
	End of orbit 17	1647.8	0 (S)
Pass 18 (N-S)	Beacon and T/M on	1675.4	76
	Reset enable	1676.2	74
	Reset Signal/command	1680.1	60
	57.6°N. latitude (ref.) [redacted]	1680.3	57.6
	21.6°N. latitude (ref.) [redacted]	1689.2	21.6
	Beacon and T/M off	1691.0	16
	Beacon and T/M on	1691.5	14
	Reset disable	1692.0	12
	Beacon and T/M off	1692.9	8
	End of Orbit 18	1741.3	0 (S)

Table A6-2

FIRST-PASS PROGRAMMER CORRECTION BASED ON TIME OF CROSSING

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude)							
		65°N		57.6°N		25°N		22°N	
		T From Launch Time (sec)	T + Launch System Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)
5340	Decrease 21 steps	5122		5230		5714		5759	
5400	Decrease 20 steps	5175		5285		5774		5819	
5460	Decrease 14 steps	5228		5340		5834		5880	
5520	Decrease 8 steps	5281		5394		5894		5940	
5580	No change	5334		5449		5954		6001	
5640	No change	5388		5503		6014		6061	
5700	Increase 8 steps	5441		5558		6074		6121	
5760	Increase 14 steps	5494		5612		6134		6182	
5820	Increase 20 steps	5547		5667		6194		6242	
5880	Increase 25 steps	5600		5722		6254		6302	
5940	Increase 31 steps	5654		5776		6313		6363	
6000	Increase 37 steps	5707		5830		6373		6423	
6060	42	5760		5885		6343		6483	
6120	48	5813		5939		6493		6544	
6180	53	5866		5994		6553		6605	

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
6240	59	5919		6048		6613		6665	
6300	65	5973		6103		6673		6725	
6360	70	6026		6157		6733		6786	
6420	76	6079		6211		6792		6846	
6480	As directed	6133		6266		6852		6906	
6540	As directed	6186		6321		6912		6967	
6600	As directed	6239		6375		6972		7027	
6660	As directed	6292		6429		7032		7088	
6720	As directed	6346		6484		7092		7148	
6780	As directed	6399		6539		7152		7208	
6840	As directed	6452		6593		7212		7269	
6900	As directed	6505		6647		7272		7329	
6960	As directed	6558		6701		7332		7390	
7020	As directed	6612		6756		7392		7450	
7080	As directed	6665		6810		7452		7511	
7140	As directed	6718		6865		7512		7571	
7200	As directed	6772		6920		7572		7632	

Table A7-1

RECEIVING EQUIPMENT ASSIGNMENTS AND SETTINGS DURING RE-ENTRY AND RECOVERY PASS

LOCATION	SIGNAL	ANTENNA (GAIN)	MULTI-COUPLER	RECEIVER	BANDWIDTH (AM/FM)	MONITOR
[redacted]	VEH beacon VEH T/M	Tri-Helix (15)	Nems Clark	Motorola NC 1302 (2)	100 cps CW 300 CK (FM)	Pan adapter
	Cap beacon Cap T/M Cap T/M or beac	TLM-18 (28)	Nems Clark	NC 1302 NC 1302 NC 1401	300 KC (AM) 300 KC (FM) 100 KC (FM)	Pan adapter
Pvt. Joe E. Mann	VEH beacon VEH T/M	AFT-Tri-Helix (15)	Nems Clark	NC 1302	300 KC (AM) 300 KC (FM)	Pan adapter Audio or SS meter
	Cap beacon Cap T/M	FWD-Tri-Helix (15)	Nems Clark	NC 1302 NC 1403	300 KC (AM) 100 KC (FM)	Pan adapter SS meter or audio
Dalton Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 Pan adapter
Haiti Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 SS meter or audio
C 119	Cap beacon Cap T/M	YAGI (7)	None	NC 1302A	300 KC (AM)	FLR-2

Table A8-1

REAL-TIME READOUT AND REPORTING REQUIREMENTS

	Measurement						Tracking Station				T/M Ship**		
	Name	Number	Channel	Priority	Real Time* Readout Required	Pass	[redacted]				King County	J.E. Mann	Note
Launch	Liftoff signal	---	---	1	X	Ascent	[redacted]						
	Thor main engine cutoff	---	Thor 12	1	X	Ascent	X	X					
	Agena engine ignition and cutoff	B6	14	1	X	Ascent	X	X			X		
	Tone verifications A,B,C,D	H64,65,66,67	16-2,-4,-6,-8	1	X	Ascent	X	X					
	Command verifications 1,2,3,4	H112	11	1	X	Ascent	X	X					
	Programmer period readout (console)	H110	1,2	2	X	Ascent	X	X					
	Programmer step readout (console)	H108,109	16-24,-26	1	X	Ascent	X	X					
	10-second-step switch position	H108	16-24	1	X	Ascent	X	X			X		
	100-second-step switch position	H109	16-26	1	X	Ascent	X	X			X		
	Increase/decrease switch position	H107	16-22	1	X	Ascent	X	X			X		
Orbit	Tone verifications A,B,C,D	H64,65,66,67	16-2,-4,-6,-8	1	X	1 thru 16	X	X	X	X			
	Command verifications 1,2,3,4	H112	11	1	X	1 thru 16	X	X	X	X			
	Programmer period readout (console)	H110	1,2	2	X	1 thru 16	X	X	X	X			
	Programmer step readout (console)	H108,109	16-24,16-26	1	X	1 thru 16	X	X	X	X			
	10-second-step switch position	H108	16-24	1	X	1 thru 16	X	X	X	X			
	100-second-step switch position	H109	16-26	1	X	1 thru 16	X	X	X	X			
	Increase/decrease switch position	H107	16-22	1	X	1 thru 16	X	X	X	X			
	Reset monitor signal	H70	16-10	1	X	1 thru 16	X	X	X	X			
	Re-entry selector switch position	C22	16-25	1	X	1 thru 16	X	X	X	X			1
	Control gas supply pressure	D95	12-38	2		2,10,16			X	X			
	Battery bus voltage	C1	16-15	3		2,10,16			X	X			
	Horizon scanner - Pitch No. 1	D37	17-22	3		2,10,16			X	X			2
	Horizon scanner - Roll No. 1	D39	17-26	3		2,10,16			X	X			2
	SPI temperature	D130	15-9	3		2				X		X	3
	SPI pitch angle	D128	15-15	3		2				X		X	3
	SPI yaw angle	D127	15-17	3		2				X		X	3
	Wave train	AET 49	18	2		1 thru 16	X		X	X			12

Table A8-1 (Continued)

	Measurement		Channel	Priority	Real Time* Readout Required	Pass	Tracking Station [redacted]			T/M Ship**		Note
	Name	Number								King County	J.E. Mann	
Orbit (Continued)	Wave train	AET 50	8	2		1 thru 16	X	X	X			12
	No name assigned	AET 26	12-2	2		9	X					13
	No name assigned	AET 28	12-3	2		9	X					13
	No name assigned	AET 30	12-4	2		9	X					13
	No name assigned	AET 32	12-5	2		9	X					13
	No name assigned	AET 48	12-13	2		9	X					13
Re-Entry	Programmer period readout (console)	H110	1-2	3	X	Recovery Pass		X	X			
	Programmer step readout (console)	H108,109	16-24-26	2	X			X	X			
	10-second-step switch position	H108	16-24	2				X	X			
	100-second-step switch position	H109	16-26	2				X	X			
	Reset monitor signal	H70	16-10	1	X			X	X			
	Re-entry selector switch position	C22	16-25	1	X			X	X			1
	Battery bus voltage	C1	16-15	3				X	X			
	Horizon scanner - Pitch No. 1	D37	17-22	3					X			2
	Horizon scanner - Roll No. 1	D39	17-26	3					X			2
	SPI temperature	D130	15-9	3					X		X	4
	SPI pitch angle	D128	15-15	3					X		X	4
	SPI yaw angle	D127	15-17	3					X		X	4
	Pitch programmer	D41	17-20	1	X			X	X		X	5
	Capsule separation event	AET 51	16-21	1	X			X	X		X	6
	Payload connector disconnect	AET 26	12-2	2	X			X	X		X	7
	Payload connector disconnect	AET 28	12-3	2	X			X	X		X	7
	Payload connector disconnect	AET 30	12-4	2	X			X	X		X	7
	Resistance thermometer	AET 33	12-18	2		Recovery Pass		X	X		X	8

Table A8-1 (Continued)

	Measurement						Tracking Station		T/M Ship**		
	Name	Number	Channel	Priority	Real Time* Readout Required	Pass	[redacted]	[redacted]	King County	J.E. Mann	Note
Re-Entry (Continued)	Spin rocket 1 ign., spin rocket 2 ign., retro-rocket ign., despin rocket 2 ign., electrical disconnect/thrust cone separation	--	Capsule 7	1	X	Recovery Pass ↕	X	X		X	9
	Thrust cone thermal battery voltage, despin rocket 1 ign., electrical disconnect/thrust cone separation	--	Capsule 8	1	X	↕	X	X		X	9
	Longitudinal acceleration	--	Capsule 9	1	X	↕	X	X		X	10
	5G switch closure, parachute cover off, cutters, parachute deployed, ablative shell off	--	Capsule 7	1	X	↕	X	X		X	9
	Thermal battery 2A8 voltage, timer switch closure	--	Capsule 8	1	X	↕	X	X		X	9
	Capsule T/M signal strength	--	Capsule 7,8,9	2		Recovery Pass	X	X		X	11

Table A8-1 (Continued)

NOTES:

1. Reads 1 volt for normal Pass 17 re-entry, 4 volts for alternate re-entry.
2. Record at least 2 points at approximately 5-second intervals to determine the degree of attitude stabilization Record system time at turnoff on Pass 17
3. Record 3 times at approximately 2-minute intervals. Correlate with system time.
4. Record at 1-minute intervals before reorientation, 20-second intervals during reorientation, and immediately after separation.
5. Record at start and finish of reorientation. [redacted] records at acquisition to determine vehicle attitude at separation Correlate with system time and estimate accuracy of pitch programmer readout.
6. Reads 4 volts prior to separation, 1 volt after separation. Correlation within 2 seconds of exact system time is satisfactory for initial report.
7. Reads 1 volt prior to separation; out of band after separation.
8. Relatively constant prior to separation, increases rapidly at retro-rocket ignition, and gradually decreases after separation. Record voltage at acquisition, at maximum value, and just prior to signal fade
9. Figure A8-1 presents nominal voltage levels. The verbal report will contain general comments on the sequence. The performance summary will contain the sequence of events to the nearest second of system time
10. The verbal report will contain the system time of initiation, average value, and duration. The performance summary will contain readings every half second during the retro-burning period.
11. Provide a qualitative evaluation of signal reception.
12. A qualitative comparison with the wave train forms in Figure A8-2 with the system times of initiation and termination of the series of pulses is required.
13. Record voltage level at beginning and end of pass.

*Measurements to be read in real time and reported to the STC by voice are checked. Other measurements may be read after the pass. All data listed are to be reported to the STC by 60-wpm teletype as soon as possible.

**T/M ships will transmit real time data immediately after signal fade so no interference with the vehicle telemetry signal will be generated.

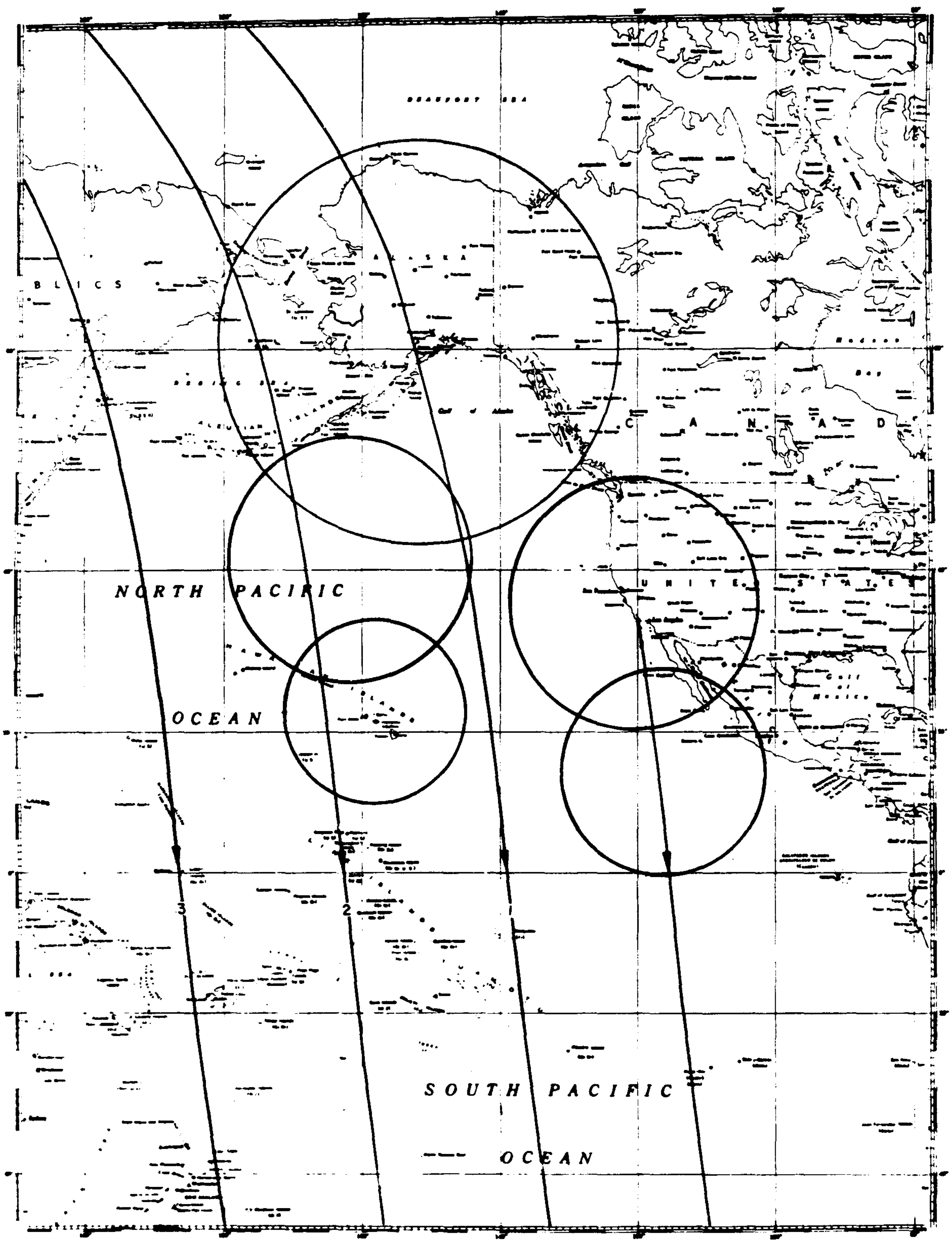


Figure A2-1 Nominal Orbit Traces - Passes 1 Through 3

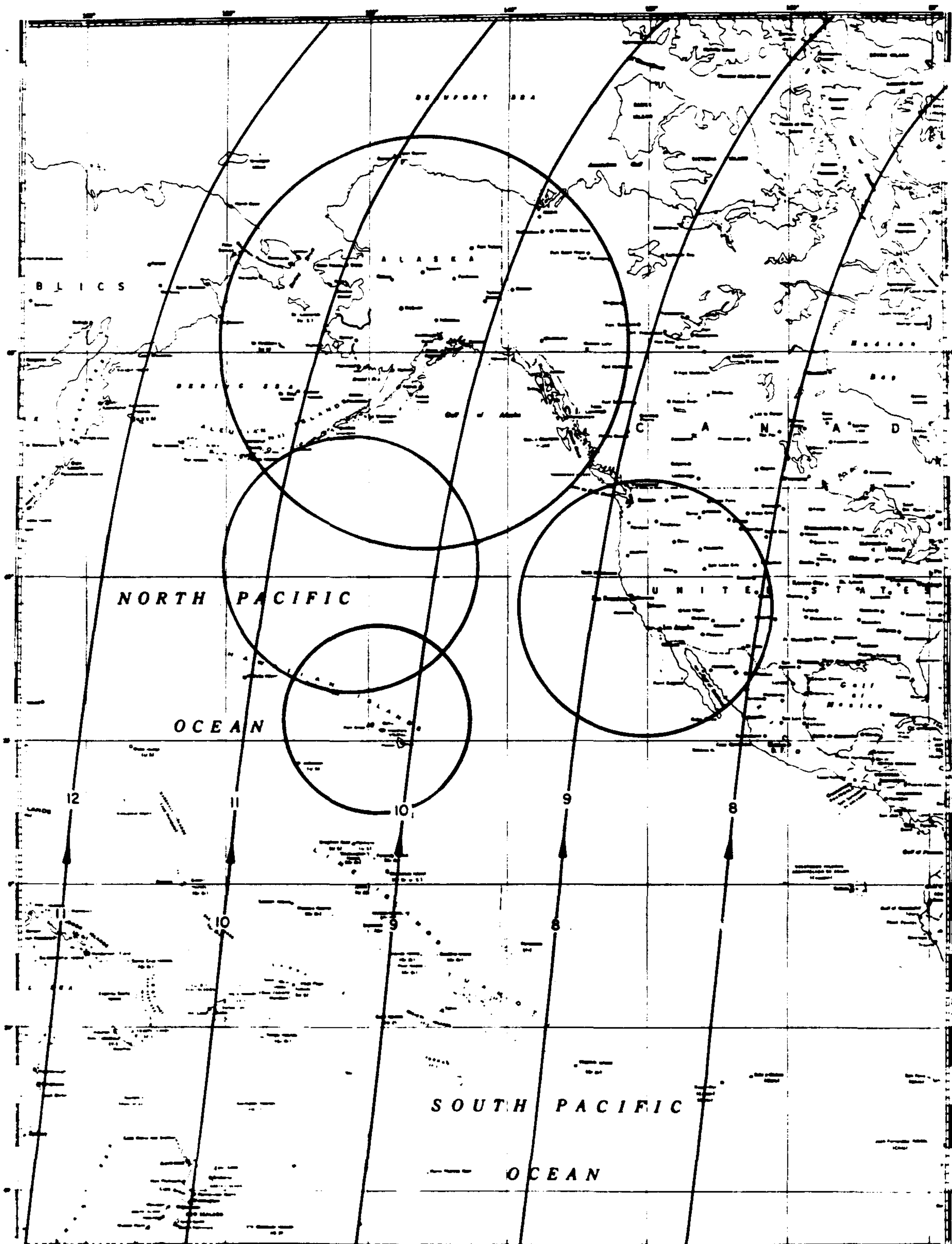


Figure A2-2 Nominal Orbit Traces - Passes 8 Through 12

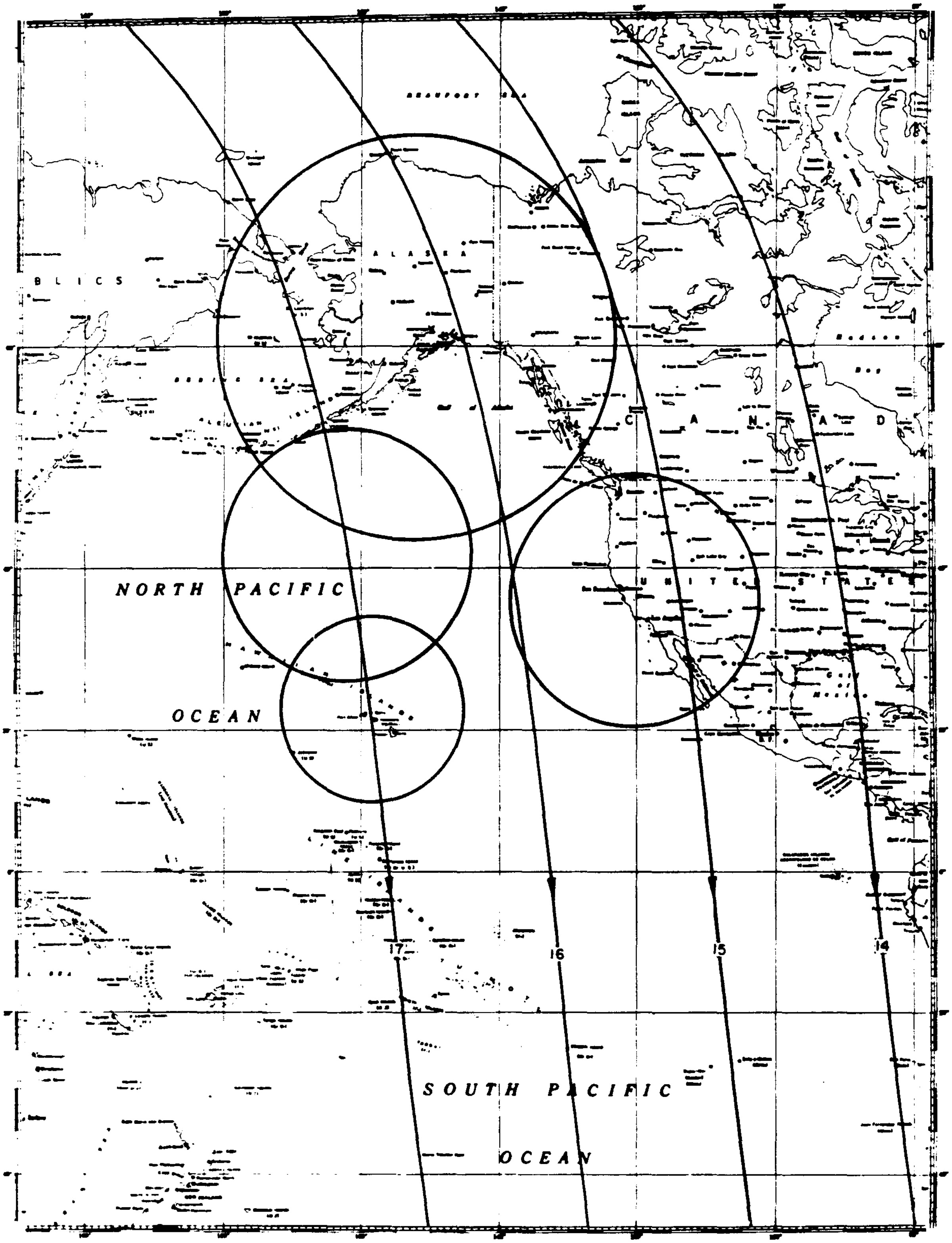
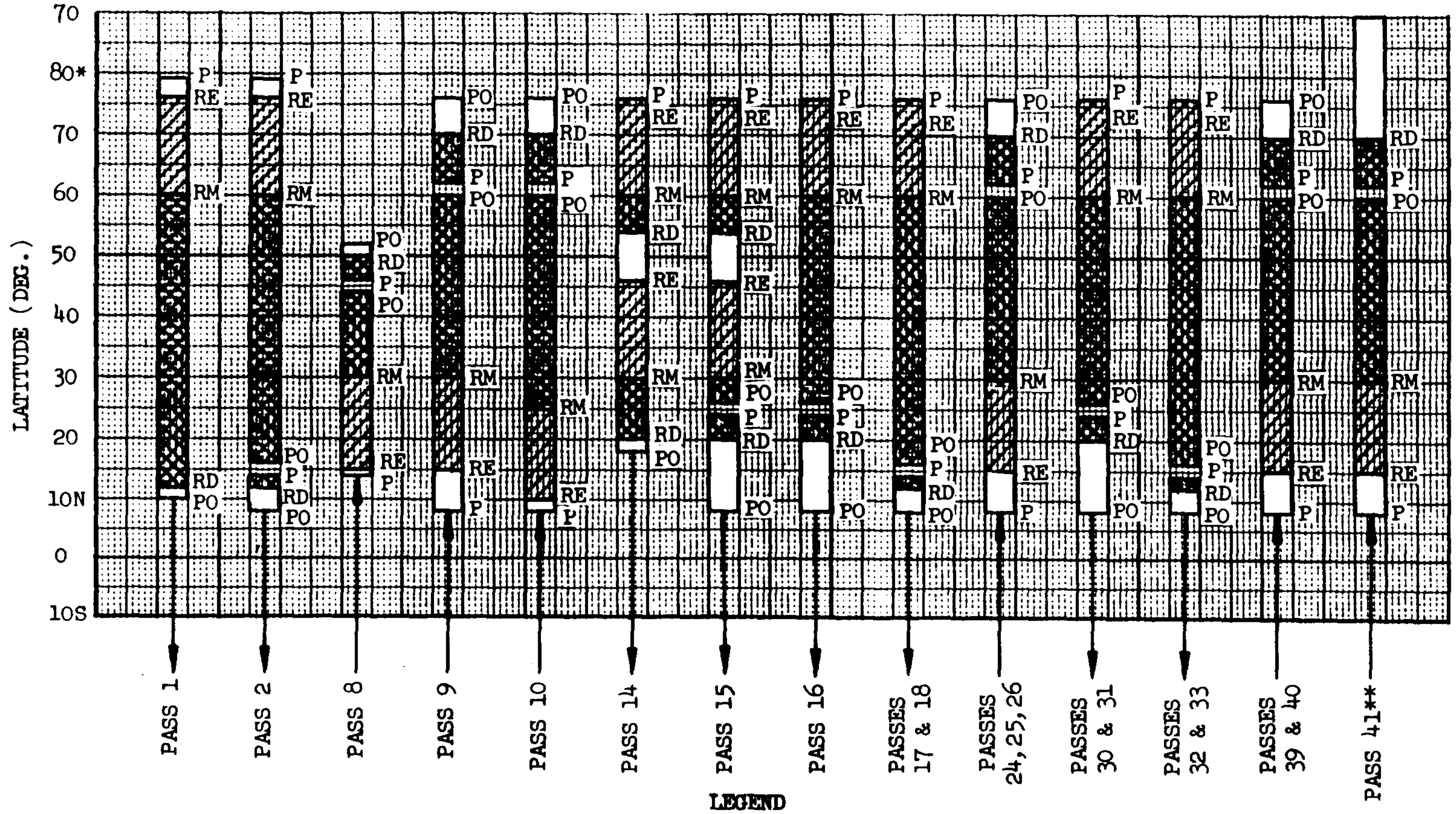


Figure A2-3 Nominal Orbit Traces - Passes 14 Through 17



LEGEND

P PLATES ON
RE RESET ENABLE
RM RESET MONITOR SIGNAL
RD RESET DISABLE
PO PLATES OFF
* REPRESENTS EAST LONGITUDE LOCATION (MAXIMUM LATITUDE REACHED WITH THIS ORBIT-PLANE INCLINATION IS APPROXIMATELY 79.9° N. Latitude)

** BEACON AND TELEMETRY REMAIN ON FROM PASS 40 ON

NO RESET CAPABILITY

RESET COMMAND CAPABILITY

RESET MONITOR SIGNAL ON

Figure A2-4 Readout and Reset Programming

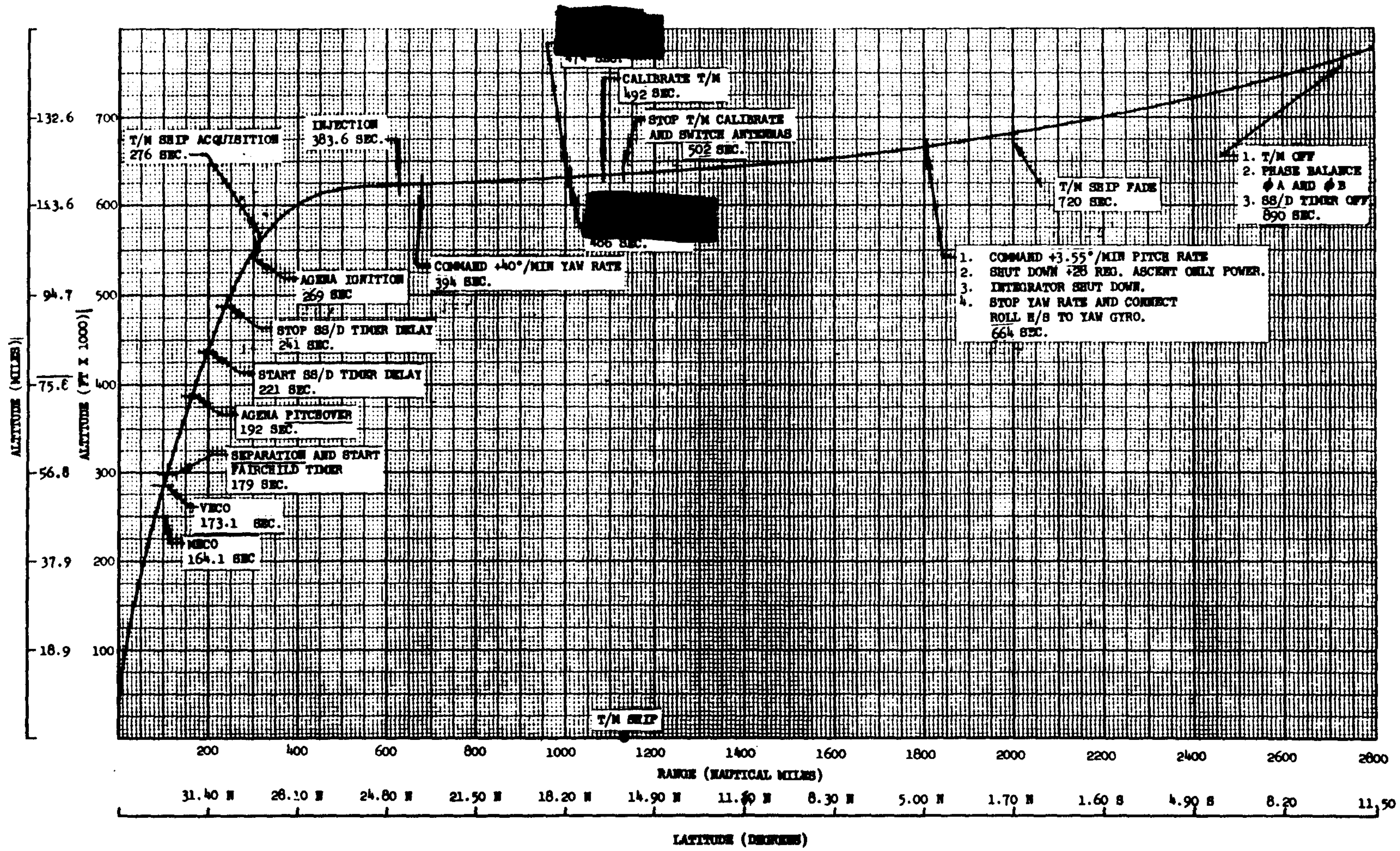


Figure A2-5 Launch Phase Nominal Time-Events Versus Location

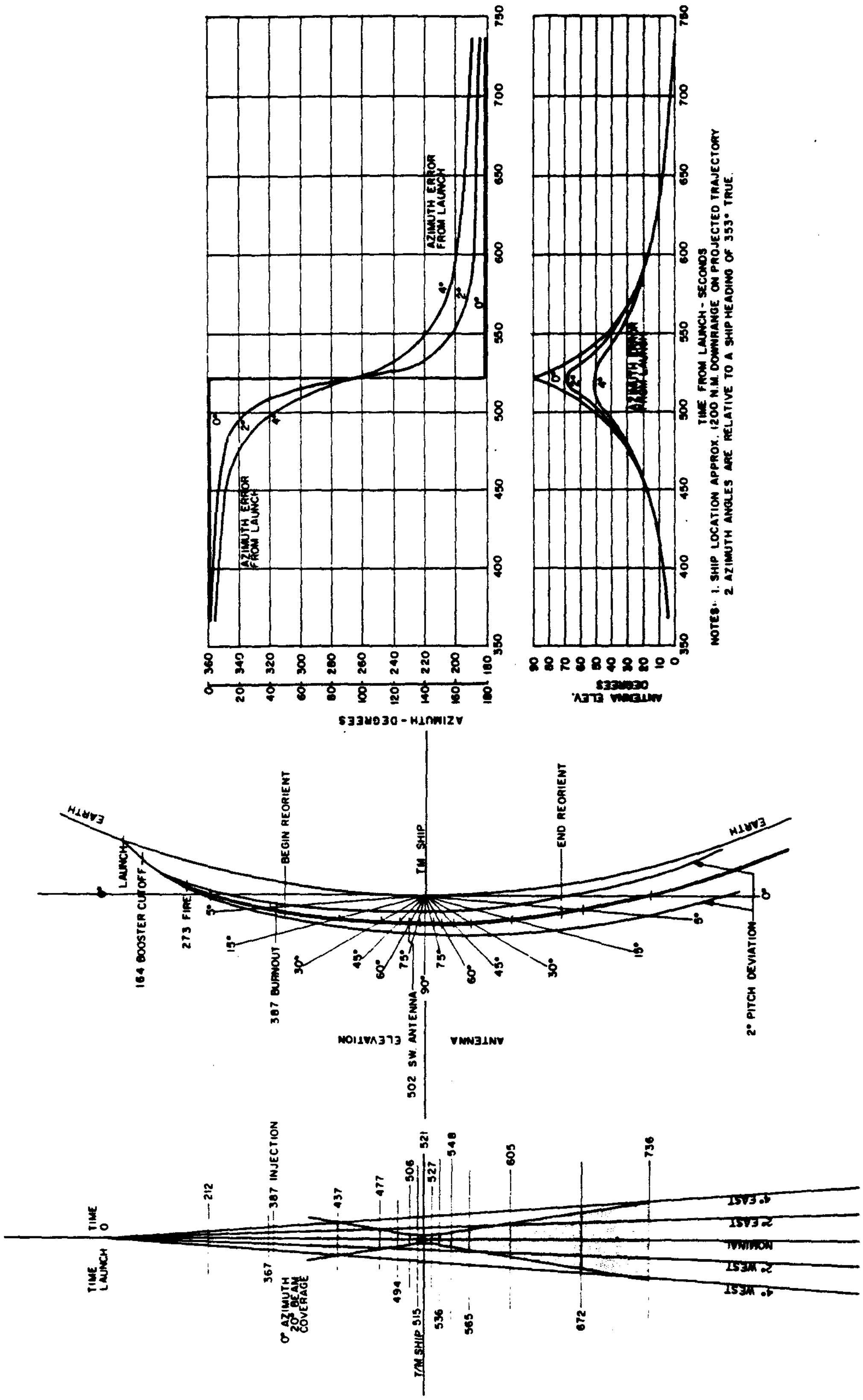


Figure A5-1 T/M Ship Antenna Positioning

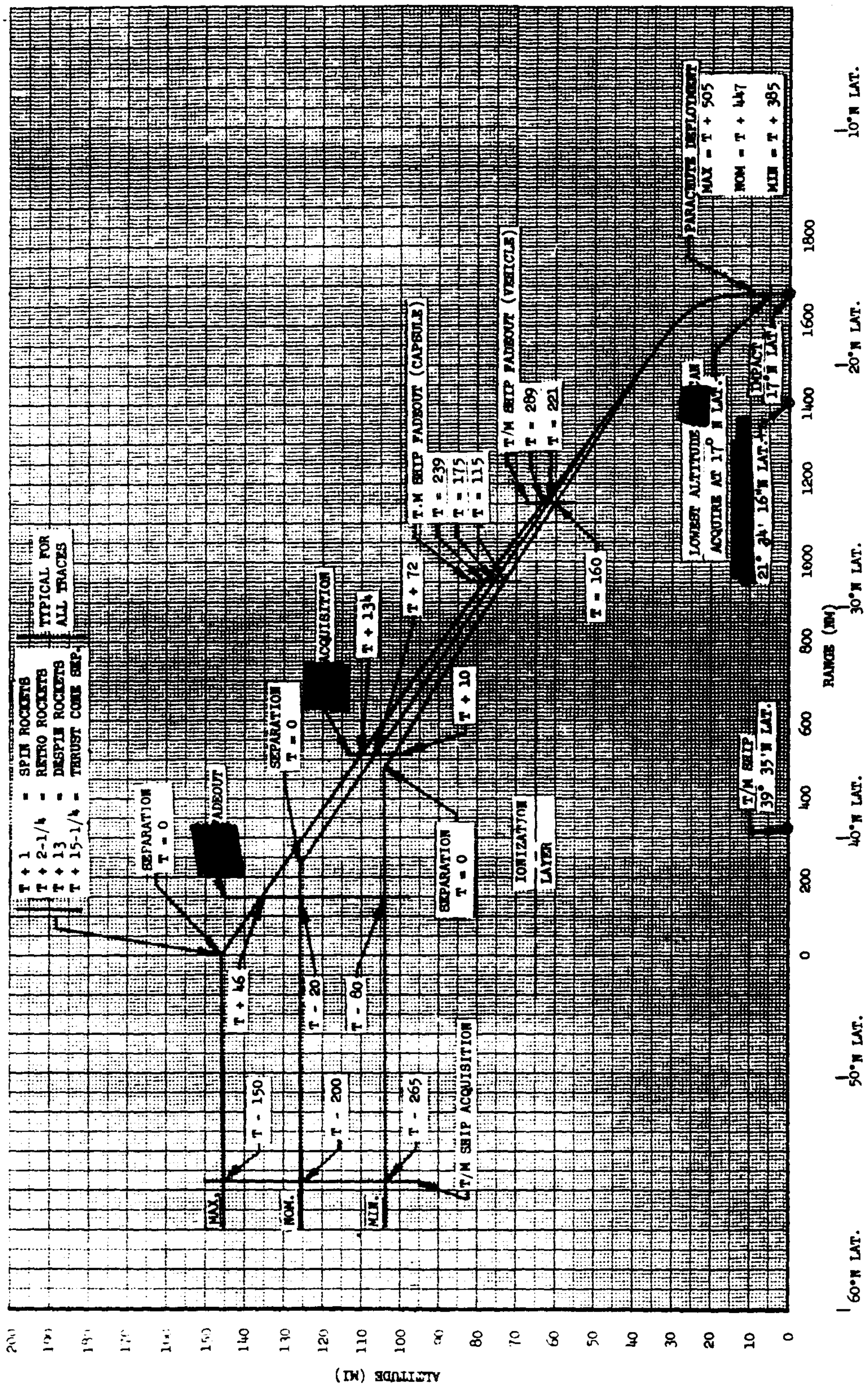
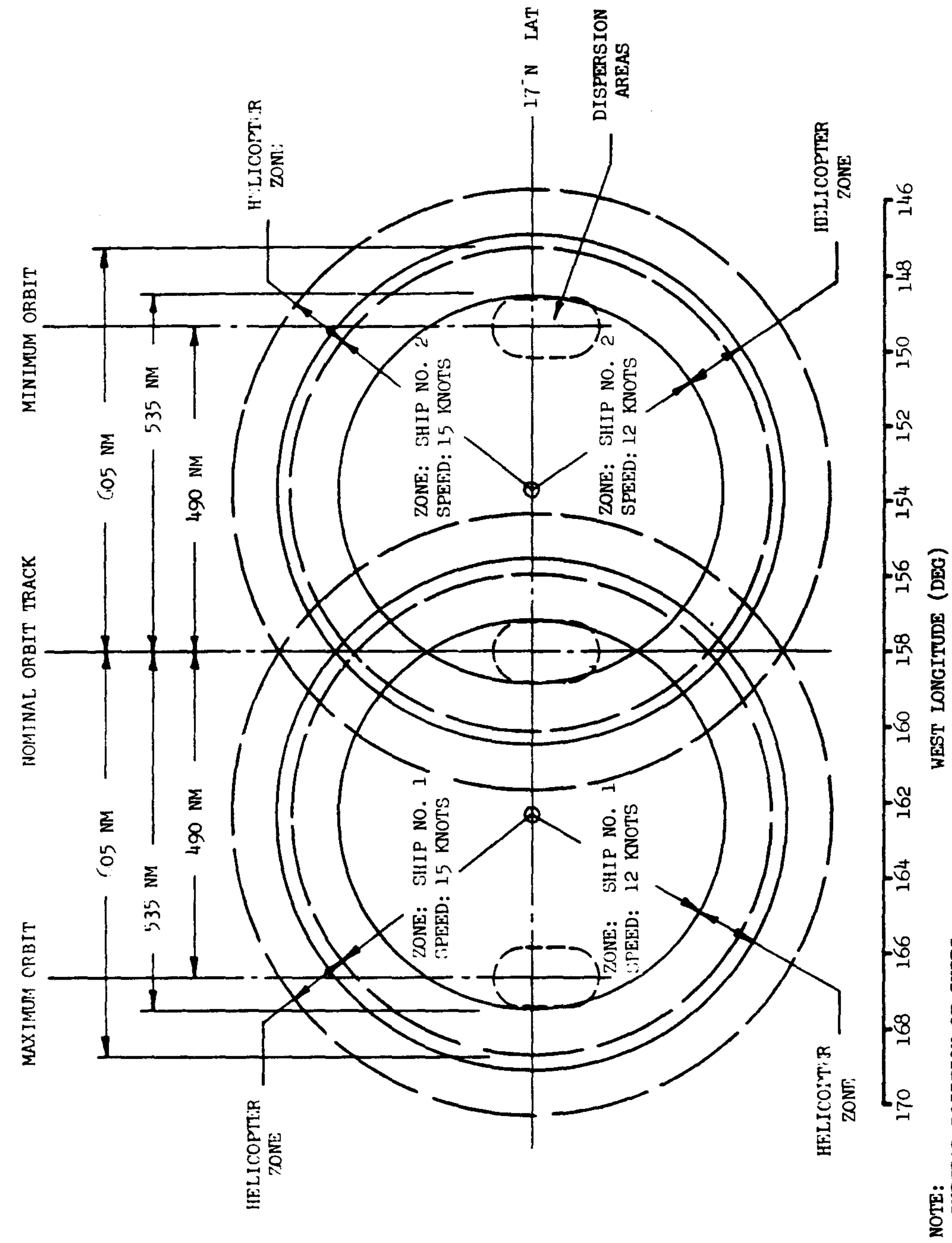


Figure A7-1 Re-Entry Trajectory



NOTE:
INITIAL POSITION OF SHIPS:
SHIP NO. 1 AT 162° 15' W LONG.
SHIP NO. 2 AT 153° 45' W LONG.
SHIP RANGE IN 24 HR:
AT 15 KNOTS: 360 NM
AT 12 KNOTS: 288 NM

Figure A7-2 Surface Ship Deployment

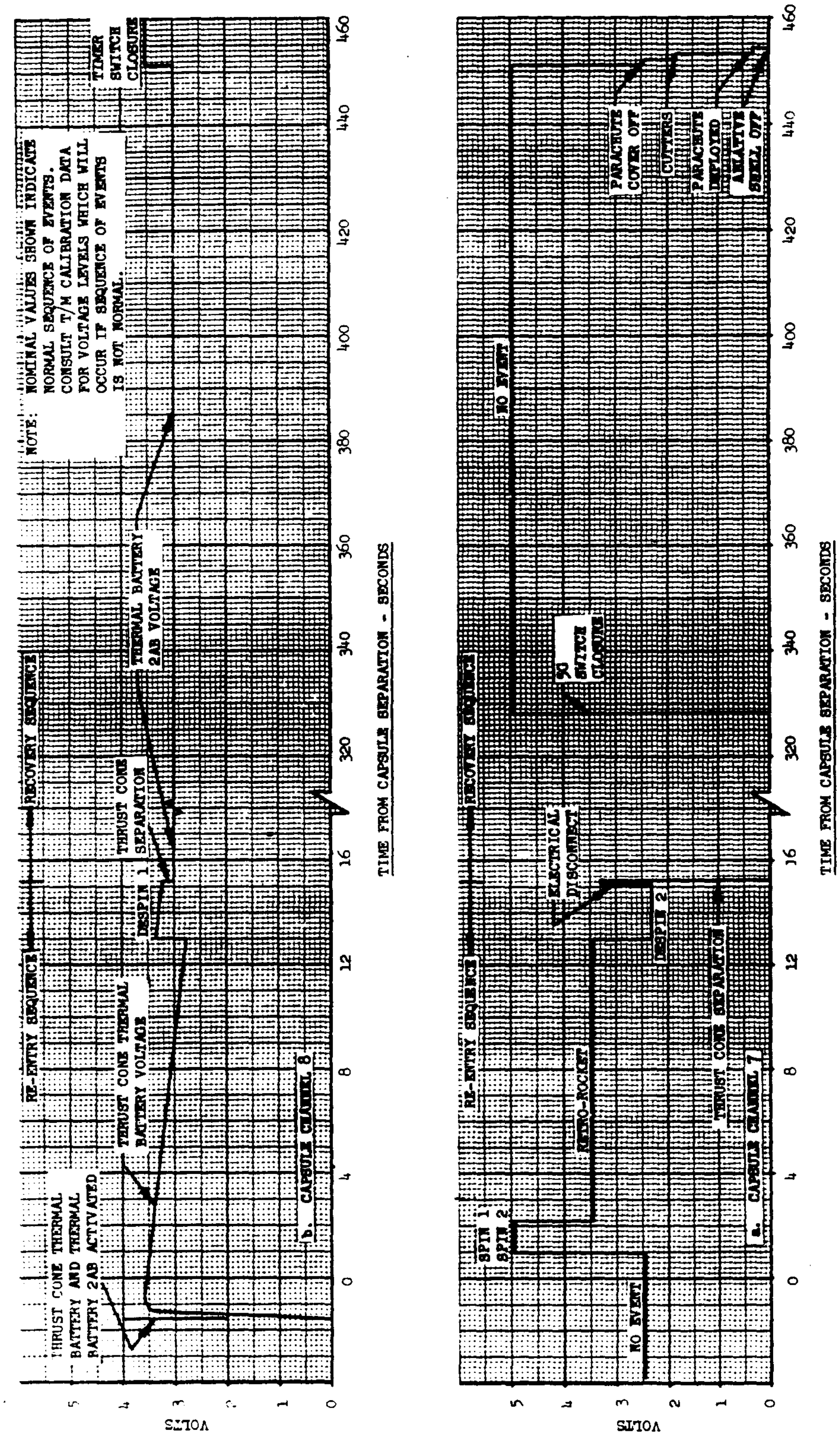


Figure A8-1 Nominal Capsule Telemetry Voltage Levels

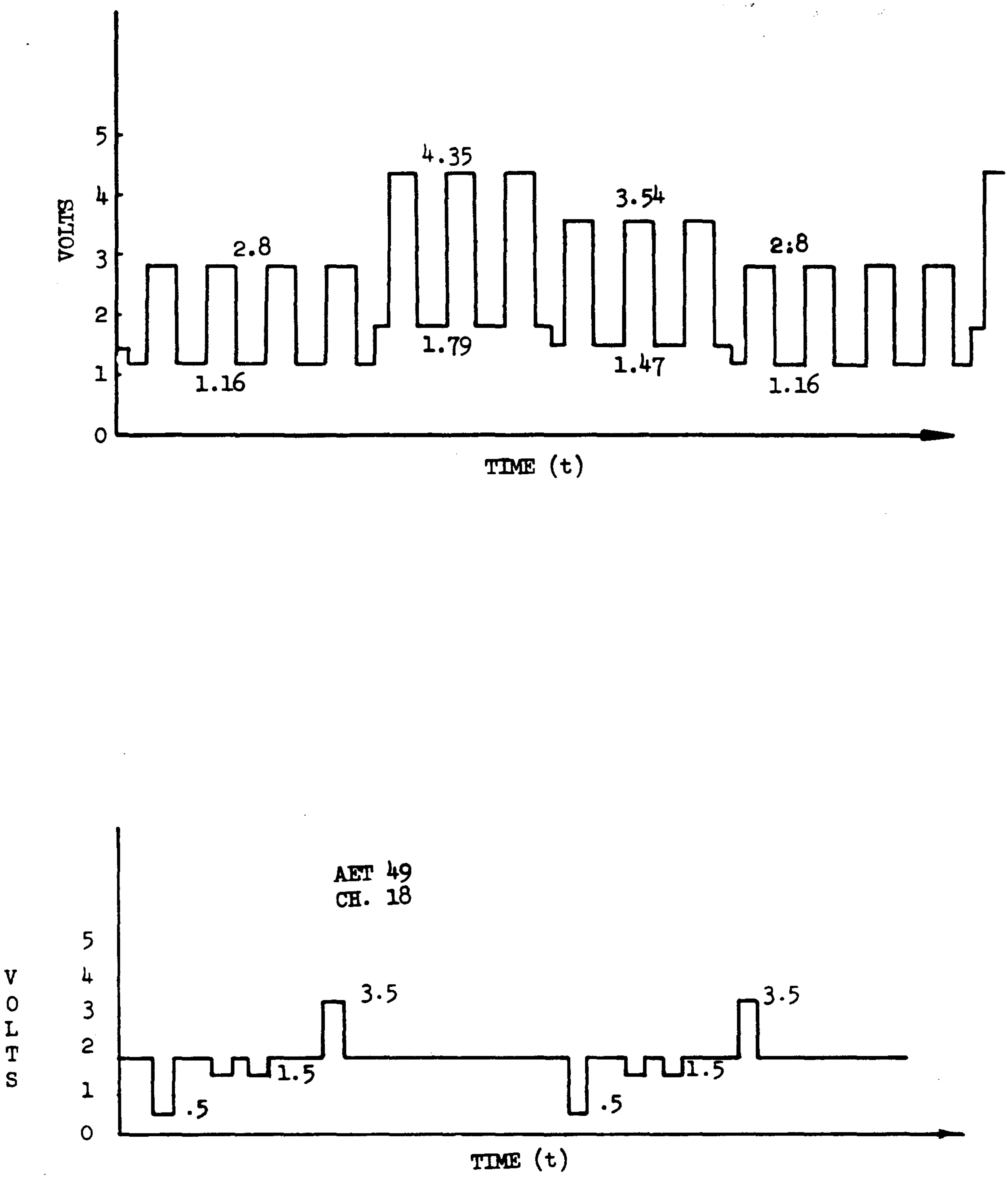


Figure A8-2 Nominal Payload Function Wave Trains

[redacted]

DISTRIBUTION LIST

No.	Addressee
[redacted]	

DISTRIBUTION LIST (Continued)

No.	Addressee
[redacted]	

Notice of Page Substitution

Tab 3 - Appendix A
Vehicle 1053/Booster 160

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

[redacted]
Revised Tab 3, Appendix A
31 May 1960

APPENDIX A - TAB 3
OF
DISCOVERER
SYSTEM TEST DIRECTIVE
FOR
DISCOVERER SATELLITE 1053/
DISCOVERER BOOSTER 160

Approved

[redacted] Manager
Systems/Operations
Satellite Systems

Approved

[redacted]
Colonel, USAF
Chairman,
System Test Working Group

APPENDIX A, TAB 3
SUPPLEMENTAL TEST INFORMATION

CONTENTS

TABLES

ILLUSTRATIONS

FOREWORD

Due to major operational changes, this Tab 3 of Appendix A supersedes the Tab 3 of Appendix A, previously published and dated 22 February 1960. This Tab contains detailed data and directives applicable to the flight testing of Agena Vehicle 1053 with Discoverer Booster 160. The data and directives in this Tab are applicable for this Discoverer Vehicle configuration only.

Engineering and procedural changes pertinent to this flight are as follows:

a. The geophysical equipment has been removed from the vehicle and the primary objectives have been modified to emphasize capsule detection and recovery. Primary emphasis on air retrieval has been retained only in the 60 x 200 nm nominal impact area.

b. A diagnostic payload will be installed containing equipment to facilitate tracking and improve telemetry data transmission during the separation and recovery phases.

c. Additional telemetry receiving facilities will be provided at Christmas Island, South Point, Hawaii, and Barking Sands, Kauai, to aid in the recovery operation.

d. JC-54, or other suitable telemetry receiving aircraft will be stationed south of the primary recovery area to aid in the recovery operation.

e. The capsule nominal impact latitude will be moved to 24° N latitude..

f. The entire recovery force deployment will be revised.

g. The Pvt. Joe E. Mann telemetry ship will be stationed south of Hawaii.

h. The RC-121 aircraft and the Hawaii Control Center will be equipped with single sideband radio.

i. HCC - STC communications during the recovery operations will be augmented by the addition of two voice lines (toll telephone).

The recovery operations contained herein are based on the [redacted] as approved by AFBMD. The Recovery Plan will not be revised to reflect changes stipulated in the AFBMD approval and should be used for background information only. This STD and the DTO will have precedence over the Recovery Plan for Discoverer XII.

APPENDIX A
SUPPLEMENTAL TEST INFORMATION

A1 INTRODUCTION

This section contains descriptive material which supplements the general text of the STD for this flight operation only. Material presented herein, which may conflict with information and/or procedures in the general text, has precedence, due to operations peculiar to the diagnostic mission of this Discoverer Satellite (Agena Vehicle 1053). This Tab will not be referenced for subsequent flight operations.

A2 CONFIGURATION

A2.1 Agena Vehicle Modifications

A2.1.1 Agena Vehicle 1053 will carry an instrumented payload in the capsule which will be operative only during the capsule separation and recovery phases of the flight operation. A complete capsule instrumentation list is included in the DTO, Appendix F, Tab 4, [redacted] The primary objective of the capsule instrumentation is to telemeter separation, re-entry, and recovery equipment operations to ground stations to enable a more complete post-flight quantitative analysis of the recovery operations than has been possible on previous flights.

A2.1.2 In order to accommodate the required capsule instrumentation and to achieve the required perigee altitude, it has been necessary to remove all geophysical research instrumentation and the JHU/APL Doppler beacon. The removal of this equipment releases a number of vehicle continuous telemetry channels that will be reassigned (vehicle 1053 only) to telemeter reset monitor, increase/decrease switch position, and alternate re-entry selector.

A2.1.3 A transistorized S-band transponder, which is a preproduction article of the type to be used on the Agena B series of vehicles, will be installed on the capsule and, thus, enhance the recovery probabilities by permitting computer determination of the re-entry trajectory and impact location. The capsule transponder will use pulse spacing No. 5 to allow selective tracking on either the vehicle or capsule transponder since both transponders will operate on the same frequencies. The capsule transponder will be programmed on by the orbital programmer on Pass 2 over [redacted] and [redacted] to facilitate airborne checkout and ground equipment compatibility adjustments prior to the recovery pass. The orbital programmer will enable and disable the capsule transponder Command 4 activation circuit at telemetry and beacon ON and OFF respectively. The transponder can be turned on by issuance of Command 4 at any time during the active portion of a pass. The orbital programmer will disconnect the capsule transponder after telemetry and beacon OFF.

A2.1.3.1 Before separation, the capsule transponder will operate from the vehicle electrical power supply through the vehicle transponder relay. Vehicle receipt of Command 4 at any time during the active portion of a pass will turn on the capsule transponder. The orbital programmer will turn on and turn off the capsule transponder on each active pass after vehicle beacon and telemetry turn-off; however, the beacon will not come on at these times since the vehicle transponder has already been turned off. The capsule transponder can be turned on via Command Channel 4, but it can only be turned off by the orbital programmer.

A2.1.3.2 Activation of the capsule transponder via Command Channel 4 will be by STC direction only. When the capsule transponder is commanded on, both the plate and filament voltages are applied simultaneously, the capsule gyros will be spun up, and the capsule telemetry transmitter filaments will be turned on. The equipment will be turned off by the orbital programmer. Repeated command turn-ons will materially reduce the life and reliability of the transponder and gyros; hence,the transponder will be commanded on only when absolutely necessary. Due to the programmed turn-on of the transponder during Passes 2 and 17, it should not be necessary to command transponder turn-on unless difficulties are experienced during the programmed Pass 2 turn-on.

A2.2 Capsule Instrumentation

The diagnostic capsule payload for this flight operation will contain a tape recorder, two commutators and two telemetry transmitters to: (1) telemetry equipment operations and capsule dynamics during the separation phase; (2) record on tape the capsule dynamics, ablative shell char, 5-G switch closure, and capsule external and internal temperatures during re-entry; and (3) telemeter the tape recorded data, capsule dynamics, and recovery equipment operations during the parachute deployment phase. The 1.2 watt telemetry transmitter, which has been used in previous re-entry capsules, will transmit all telemetry on 241.5 mc and will be paralleled with an 8-watt transmitter which will operate on 228.2 mc. Both transmitters will transmit the four commutated and one continuous telemetry channels.

A2.2.1 The capsule instrumentation schedule is contained in the DTO. The two telemetry transmitters will have parallel inputs in order to achieve transmitting redundancy. The 1.2-watt transmitter, 241.5 mc, will be diplexed with the capsule beacon on one of the capsule antennas, and the 8-watt transmitter, 228.2 mc, will radiate through the other capsule antenna. By receiving and recording both telemetry signals at a ground station, a complete telemetry record will be acquired during the capsule spin operation. The input to both transmitters will be one continuous channel, Channel 11, and four commutated channels, Channels 14, 15, 16, and 18. One 60-point, 5-rps high level commutator will drive the VCO's for Channels 14 and 15 and one 60-point, 5-rps high level commutator will drive the VCO's for Channels 16 and 18. The VCO for continuous Channel 11 will be driven by a -20-g to +8-g longitudinal accelerometer.

A2.2.2 In order to obtain telemetry data for events that will occur during radio blackout, the capsule will contain a recorder with an endless tape. The tape recorder will continuously read in the outputs of the VCO's for Channels 14 and 16 along with a 50-kc oscillator output and will continuously read out the data for transmission over both transmitters two minutes after read-in. The magnetic tape length will be sufficient to store two minutes of data with the read-out head just in front of the read-in head relative to the tape travel and the eraser between the two heads. The tape recorder will be activated by the SS/D timer 78 seconds before separation and will run continuously for the duration of telemetry transmission. The 50-kc reference oscillator output will be recorded on the two-track tape recorder to facilitate corrections to the data for the recorder wow and flutter. Because of the recorder wow and flutter characteristics and the two-minute time delay, all real-time data presentations will be derived from Channels 11, 15, and 18 with Channels 14 and 16 recorded on magnetic tape for post-flight analyses.

A2.3 Pvt. Joe E. Mann

A2.3.1 The Pvt. Joe E. Mann will put to sea with sufficient time to arrive at the initial station, 9° N latitude, $157^{\circ}24'$ W longitude, not later than T + 3 hours. LMSD personnel will accomplish communication checks with the VCC daily at 1830 and 2300 hours GMT (1130 and 1600 hours PDT). Communications checks with HCC will be scheduled daily at 1800 and 2330 GMT (0800 and 1330 HST) with the equipment status report given during the 1800 (HCC) and 1830 (VCC) GMT contacts and with the ship's position, weather, and equipment status reports given during the 2300 (VCC) and 2330 (HCC) GMT contacts. The HCC will relay the ship's equipment status report, weather, and position to the STC. On the day before the launch, communications checks will be accomplished in accordance with the daily schedule. Following the last regular communication check with HCC at 2330 GMT, the ship will transmit position, weather, and equipment status reports to the VCC at 0430 and 0730 GMT. Beginning at T-6 hours the

Pvt. Joe E. Mann will assume primary communications with the HCC except for one communication check with the VCC at T-3.5 hours. The ship and the HCC will maintain SSB radio silence from T-6 hours until T + 30 minutes except for communication checks at T-6, T-3, and T-0.5 hours. Following launch, the HCC and the Pvt. Joe E. Mann will maintain radio silence during active passes over the [redacted] and continuous contact during active passes within reception range of the ship. Following recovery, the communications will revert to the prelaunch daily schedule.

A2.3.2 The following SSB frequencies will be used for ship-to-shore communications:

	VCC/ Pvt. Joe E. Mann	HCC/ Pvt. Joe E. Mann
In port and first day out	6741 kc	17622.5 kc
Second day out and beyond	11214.0 kc	11214.0 kc

A2.3.3 Before crossing the 145° meridian, communication with the Captain of the Pvt. Joe E. Mann will be made through PMR Headquarters at [redacted] after the ship crosses the 145° meridian, communication will be through the PMR representative at the HCC. This communications channel will be used to request changes in the on-station location of the ship and movement of the ship for the data pickup, if required.

A2.4 Ground Station Modifications

A2.4.1 The [redacted] will be provided with a panadapter to facilitate acquisition of the AM capsule beacon and subsequent determination of the frequency deviation from nominal.

A2.4.2 Additional telemetry receiving equipment will be installed at the PMR facility at South Point to augment that station's telemetry acquisition and tracking capability. The PMR 60-ft antenna at South Point will be used for triangulation on the descending capsule; but, because it does not have automatic tracking and has a narrow beam width, a quad-helix antenna will be installed for this operation along with additional telemetry receivers.

A2.4.3 A telemetry receiving station will be installed on Christmas Island to extend the capsule detection and telemetry reception range below the equator. The Christmas Island facility will have a quad-helix antenna, three 1302-A telemetry receivers, a timing system, recorders, and UHF and SSB communication equipment.

A3 LAUNCH OPERATIONS

A3.1 Launch Criteria

The launch criteria listed in Paragraph 4.3 of the basic STD are applicable to this flight operation except as cited in Table A4-1.

A3.1.1 Paragraph 4.3.8 is revised for this operation. The following minimum Recovery Force with all search and recovery equipment operable must be met:

a. Four RC-121 radar aircraft
b. Eight C-119J recovery aircraft
c. Two surface ships.

A3.2 Launch Trajectory

The -5° yaw maneuver immediately following separation will not be made on this flight. This has been done previously to align the Discoverer Satellite with the Discoverer Vehicle coast velocity vector to increase the resultant velocity at Discoverer Satellite burnout.

A4 ORBIT OPERATIONS

A4.1 Vehicle Instrumentation

A4.1.1 Due to the absence of an orbital payload, additional continuous telemetry channels are available for telemetering of operational quantities. The reset monitor, position of increase/decrease switch, and alternate re-entry selector will all be telemetered on commutated Channel 16 as well as on separate continuous channels. The Vehicle Command Console will continue to display functions from commutated channels, but the real-time readouts on the oscillograph/Datarite will be derived from the continuous channels.

A4.1.2 No payload real-time readouts will be required for this flight operation. Only the normal operational quantities (reset monitor, programmer period, command verifications, etc.) will be read out and reported to the STC in realtime on all passes until the recovery pass, nominally Pass 17. The telemetered quantities to be read out in realtime during the recovery pass are listed in Paragraph A5 and Table A8-1 of this Tab.

A4.1.3 In order to determine capsule separation characteristics, a linear travel potentiometer has been installed adjacent to each of the four springs that force the capsule from the vehicle. At 75 seconds before separation, vehicle telemetry continuous Channels 7, 13, 14, and 18 will be switched from the orbit functions to the separation monitors by the SS/D timer and will telemeter the separation event. Channel 7 will be monitored at [redacted] for determination of the system time of separation and reported in realtime.

A4.2 Capsule S-Band Transponder

A4.2.1 A transistorized version of the S-band transponder will be installed on the capsule thrust cone to augment [redacted] radar tracking of the de-orbiting capsule subsequent to retro-rocket burnout. These tracking data will be entered into the Computer at Palo Alto to determine the most probable location of capsule impact and will facilitate redeployment of the search forces if the capsule is not acquired by the Recovery Force.

A4.2.2 The orbital programmer will control the capsule transponder. On Pass 2, the orbital programmer will turn on the capsule transponder at mid-track over [redacted] and will turn off the capsule transponder at mid-track over [redacted] On this pass, [redacted] and [redacted] will, after completing command operations required by the STC, switch the VERLORT pulse spacing to No. 5, lock on the capsule transponder, determine necessary VERLORT adjustments, and track in this mode until fade. The orbital programmer will also be programmed to turn on the capsule transponder before acquisition at [redacted] on Passes 17 and 18. If it is necessary to recover earlier than on Pass 17, the capsule transponder will be turned on via VERLORT Command Channel 4 after acquisition at [redacted] If it is impossible to complete the ground radar checks during Pass 2, the capsule transponder will be commanded on for completion of the ground checks during a pass within reception range of [redacted] and [redacted]

A4.3 <u>Alternate Re-entry Selector</u>

The alternate re-entry selector will function as described in Paragraph 6.4.7 except that commands for alternate re-entry selector adjustment will not be transmitted when the satellite is between 70° and 55° N latitude, instead of 55° to 40° N latitude as previously used.

A4.4 <u>Impact Latitude</u>

Although the nominal impact latitude will be at 24° N latitude, under certain conditions it may be necessary to move the predicted impact latitude farther north to insure adequate [redacted] radar tracking of the capsule. Before issuing the first post-launch blossom prediction, the PAC will print out the [redacted] acquisition program for the recovery pass based on available data and determine that impact at 24° N latitude will enable at least 60 seconds of radar tracking after retro-rocket burnout. If the post-retro time-to-track is inadequate, the impact latitude may be moved as far north as 26° N latitude. The condition which would require moving the impact latitude north is a lower than nominal perigee combined with an orbit period greater than nominal (see Fig. A7-3).

A5 RECOVERY OPERATIONS

A5.1 General

A5.1.1 The nominal impact point for this operation will be moved to 24° N latitude and 158°53.4' W longitude, and the perigee altitude will be increased to 145 sm. The nominal impact point was established to provide [redacted] telemetry coverage of the parachute deployment sequence at the nominal latitude for all orbit periods within one minute of nominal. The perigee altitude, in conjunction with the impact latitude, will provide capsule separation at approximately the [redacted] latitude and will enable at least one minute of valid radar tracking data of the capsule after retro-rocket burnout for all orbit periods within 1-1/2 minutes of nominal.

A5.1.2 The surface and airborne recovery force will be deployed to cover an extended area. In general, six C-119J and two RC-121 aircraft and one surface ship will be deployed in the primary recovery area; the other Victory Ship, two or three C-119J, two RC-121, one WV-2, five telemetry-receiving, and one C-130 aircraft, and the Pvt. Joe E. Mann telemetry ship will be deployed to provide capsule detecting and telemetry receiving capabilities from the recovery area to 1800 nm downrange. A temporary telemetry receiving station will be installed on Christmas Island to further extend the capsule detecting and telemetry receiving range (Fig. A7-3).

A5.2 Capsule Separation and Re-entry Sequence

A5.2.1 The recovery phase of operations will commence at approximately [redacted] acquisition on the recovery pass when the orbital programmer will restart the SS/D timer. Significant events which will occur during the capsule separation, re-entry, and recovery sequences are listed in the following paragraphs with T = 0 defined as the time of capsule/Agena electrical disconnect.

A5.2.1.1 Capsule Separation Sequence

Time	Signal Source	Event
T - 10 min	Fairchild Orbital Timer	1. Capsule telemetry filaments "on" 2. S-band transponder "on"
T - 93 sec (±0.6 sec)	Fairchild Orbital Timer	1. Restart SS/D timer 2. Telemetry battery activated
T - 78 sec	SS/D Timer (arm signal)	1. Capsule telemetry plates "on" 2. Ignite thermal relays to arm thrust cone programmer 3. Capsule radio beacon "on" 4. Command - 40°/min pitch rate 5. Start tape recorder
T - 1 sec (±0.1 sec)	SS/D Timer (transfer signal)	1. Command + 4°/min pitch rate 2. Ignite electrical disconnect delay pyro (delay tolerance 500 to 1320 milliseconds) 3. Ignite thrust cone programmer thermal batteries 4. Ignite recovery system thermal battery 2A8 5. Ignite pyro switches 2A4A2S1 and S2 to arm thermal battery 2A7BT-1
T - 0 sec (-0.5 + 0.32 sec)	Electrical Disconnect Pyro Fires	1. Capsule/satellite cable disconnected 2. Thrust cone programmer started (ground loop lifted)
T + 0.5 sec (±0.1 sec)	SS/D Timer (separation signal)	1. Pin-puller squibs ignited (0 to 7 milliseconds delay) 2. Four springs push off capsule to about 1.7 ft/sec
T + 1.5 sec (±0.06 sec)	T/C Programmer Event 1	1. Spin rockets ignited, capsule spins up to about 60 rpm in 0.8 sec
T + 2.75 sec (±0.11 sec)	T/C Programmer Event 2	1. Retro rocket ignited, capsule receives approximately 4-g acceleration for approximately 9 sec

Time	Signal Source	Event
T + 13.75 sec (±0.5 sec)	T/C Programmer Event 3	1. De-spin rockets ignited, capsule de-spins to about 10 rpm
T + 15.75 sec (±0.6 sec)	T/C Programmer Event 4	1. Ignite electrical disconnect and explosive separation bolts.

A5.2.1.2. Capsule Re-entry Sequence

Time	Approximate Altitude	Event
T + 362 sec	350,000 ft	1. RF blackout begins
T + 453 sec	200,000 ft	1. 5-g switch closes, permitting battery 2A8 to ignite thermal battery BT-1, which in turn fires: (a) Dimple motors to start mechanical timer (b) Pyro switches to allow 28v from thermal battery 2A8 to feed the timer switch, removes squib of thermal battery 2A7BT1 from thermal battery 2A8, and arms thermal batteries 2A7BT2 and 2A7BT3
T + 507 sec	135,000 ft	1. RF blackout ends.

A5.2.1.3 Capsule Recovery Sequence

Time	Approximate Altitude	Event
T + 600 sec (nominal) (5-g switch closure + 126 sec(± 2 sec))	55,000 ft	1. Battery 2A8 ignites thermal batteries 2A7BT2 and BT3, and delay pyro switches 2A4A1S1 and S2 (1 sec delay). 2. The delay pyro switches disconnect their own squibs, the squibs of the thermal batteries, unshort the squibs of pyro switches 2A4A1S3 and S4, and unshort the chute cover ejection pistons.

Time	Approximate Altitude	Event
		3. The action of switches S1 and S2 also permits batteries BT2 and 3 to ignite the ejection pistons and pyro switches 2A4A1S3 and S4.
		4. The ejection pistons blow off the chute cover, which pulls out the pilot chute, which in turn pulls out the main chute bag. The main chute bag brings out the chute in a reefed condition.
		5. Time delay pyrotechnic cutter disreefs the main chute and permits deployment (4 sec).
		6. As the chute system decelerates the capsule, the ablative shell, released from the capsule when the ejection pistons fired, falls clear of the capsule.
		7. Actuation of pyro switches S3 and S4 apply +12v (from batteries contained in the radio beacon) to the light beacon.
		8. Radar reflective chaff, packed with the chute, falls free as the chute emerges from its bag.

A5.2.2 The recovery capsule GE acquisition transmitter signal can be identified by its 1000-cps pulse repetition rate. The pulse width will be 35 microseconds.

A5.3 [redacted] Tracking Station Recovery Pass Operations

A5.3.1 For the recovery pass, the PAC will include the predicted system time of separation in the [redacted] acquisition message. At approximately two minutes before predicted capsule separation, or immediately after acquisition, the [redacted] will transmit Command 4, switch to VERLORT pulse spacing No. 5 thirty seconds later, and the radar will be locked on to the capsule S-band transponder signal. Tracking on this signal will be maintained until fade, with the tracking data punched on teletype tape.

A5.3.2 The [redacted] will read out the real-time telemetry quantities listed in Table A8-1 and report them to the STC over the voice line immediately as they occur. After thrust cone ejection or twenty seconds after capsule separation, whichever is first, the [redacted] will read out the capsule telemetered separation events that will be recorded on an oscillograph/Datarite. Every attempt will be made to determine the system time of capsule separation and to qualitatively assess the capsule separation and retro sequence before signal fade so that the real-time telemetry data can be transmitted to the STC by voice without delaying transmittal of the radar data. [redacted] will also record the capsule separation telemetry on magnetic tape from the output of the tape recorder (Channels 14 and 16) after a two-minute time delay. The real-time telemetry data readouts required before radar data transmittal will be identified by using the appropriate code word for separation, followed by the event number shown below.

Event No.	Function
1	Spin I
2	Spin II
3	Retro rocket
4	De-spin I
5	De-spin II
6	Thrust cone electrical disconnect
7	Thrust cone separation

If all events appear normal, the [redacted] verbal report will consist of the system time of separation (with the appropriate code word) followed by a statement that all events were normal. Event numbers will only be referenced for negative reporting.

A5. 3. 3 Immediately after completion of the radar data transmittal, [redacted] will submit a quantitative separation data report to the STC that will include the post-pass items in Table A8-1. If the capsule is recovered or at least visually acquired before these data are available, the requirement for these data may be waived by the STC.

A5. 4 [redacted] Recovery Operations

A5. 4. 1 Approximately fifteen minutes before acquisition on the recovery pass, the [redacted] will search the frequency range from 223 to 247 mc and log the frequency, azimuth, and type of modulation of any signals received to reduce the possibility of confusion from interference signals.

A5.4.2 On the recovery pass, [redacted] will track the vehicle telemetry signals with the tri-helix antenna and the capsule telemetry signals with the TLM-18 antenna. Acquisition of the vehicle telemetry signals with the tri-helix antenna will be accomplished using standard acquisition procedures. Procedures for acquisition of the capsule telemetry signals by the TLM-18 antenna will vary as a function of the actual orbit and predicted impact point. In general, the TLM-18 will be positioned at the impact point azimuth using a sector scan. The amplitude of the sector scan will be 20° (±10°) for impact azimuths between 345° and 15°. The scan amplitude will be increased 3/4° for each 1° of azimuth over 15° for the eastern sector or under 345° in the western sector.

The TLM-18 antenna acquisition elevation will be 2°. Until acquisition of the capsule signals, one receiver, operating on signals from the tri-helix, will be tuned to the 228.2-mc capsule telemetry signal. In the event the capsule telemetry signal is acquired with the tri-helix before TLM-18 acquisition, the tri-helix will be positioned on the capsule signal until TLM-18 acquisition after which the tri-helix will resume tracking on the vehicle telemetry signals. TLM-18 angle data recorded after auto track has been established will be transmitted to the PAC when requested by the System Test Director.

A5.4.3 For initial acquisition by the VERLORT radar, the antenna will be positioned at the acquisition azimuth with a ±10° azimuth scan and 2° elevation. The radar pulse spacing will be in position No. 5 to acquire on the capsule transponder in the event the re-entry trajectory is shallow, and the capsule thrust cone has not entered the ionization layer before reaching [redacted] line-of-sight range. This mode of operation will be maintained until ETA + 90 seconds after which the VERLORT radar will track the vehicle. If the radar acquires on the capsule transponder, auto track will be maintained until fade. The capsule radar tracking data will be transmitted to the PAC when requested by the System Test Director.

A5.4.4 All capsule telemetry will be recorded on magnetic tape. Subsequent to [redacted] acquisition of the capsule telemetry signals, [redacted] will report telemetered recovery events as listed in Table A8-1 to the STC immediately. These real-time telemetry data readouts will be identified by using the appropriate code word for recovery, followed by the event number shown below:

Event No.	Function
1	G switch closure
2	Timer switch closure
3	Parachute cover off
4	Parachute deployed
5	Ablative shell off

A5.4.5 When the TLM-18 azimuth rate approaches 0° per second or when the telemetered capsule recovery events are received, [redacted] will report antenna azimuth and elevation to the STC and the HCC.

A5.5 <u>Surface Ship Operations</u>

A5.5.1 Each of the two Victory Ships in the Recovery Force will be equipped with a manually operated quad-helix antenna and one additional telemetry receiver to augment their telemetry receiving capabilities. The surface ship deployment is shown in Figure A7-2.

A5.5.1.1 The <u>Haiti Victory</u> will be positioned 10 nm west of the nominal impact point and will receive and record recovery telemetry if the capsule impacts in the predicted recovery area. The quad-helix antenna will scan the northern half of the recovery area at the rate of once per five seconds beginning at ETPD - 5 minutes. From ETPD - 5 minutes until ETPD - 60 seconds the antenna elevation will be maintained at 10°. After ETPD - 60 seconds, the antenna elevation will be increased 20° per scan from 10° to 70°. After ETPD + 20 seconds, the scan mode will rotate 180° to scan the southern sector. If the capsule signals are not acquired by ETPD + 2 minutes, the antenna elevation will be fixed at 30° and a 360° azimuth scan will be initiated at a slewing rate of 30° per second and continued for two minutes. If the capsule signals are not acquired by ETPD + 4 minutes, the antenna will be positioned at 180° azimuth and 10° elevation and the telemetry receivers monitored until ETPD + 30 minutes. When the capsule signals are acquired, the antenna will begin manual tracking as a function of maximum signal strength and all telemetry and beacon signals will be recorded on magnetic tape. The D/F equipment will be operated normally and used to obtain refined capsule directional data after acquisition. When the capsule bearing becomes steady, the Haiti Victory will report position and capsule bearing to the northern Command RC-121 over UHF and to the HCC through PMR immediately and proceed in the direction of the acquired signals. If the capsule signals are not acquired, the Haiti Victory will so report over SSB radio through PMR to the HCC at ETPD + 30 minutes.

A5.5.1.2 The Dalton Victory will be positioned at 14° N latitude directly under the satellite path on the recovery pass to provide telemetry reception and capsule detection capability between [redacted] and the Pvt. Joe E. Mann. The quad-helix antenna will scan ±90° about 360° azimuth at 10° elevation at the rate of once per five seconds from ETPD - 0 until ETPD + 3 minutes. From ETPD + 3 minutes until ETPD + 5 minutes, the quad-helix antenna will scan ±90° about 360° azimuth with the antenna elevation increasing and decreasing from 10° to 160° to 10° in 20° increments. The scan rate will be once per five seconds. After ETPD + 5 minutes the antenna will be positioned at 10° elevation and 180° azimuth. In the event the Dalton Victory acquires the capsule signals, the telemetry will be recorded on magnetic tape, and antenna acquisition and bearing will be immediately reported through PMR to the HCC. When the parachute deployment telemetry sequence is received, or when the antenna azimuth becomes constant, whichever is first, the Dalton Victory will so report orally over SSB radio through PMR to the HCC and provide ship position and antenna azimuth and elevation. If no capsule signals are acquired by the Dalton Victory, a negative oral report will be submitted over SSB radio through PMR to the HCC at ETPD + 30 minutes.

A5.5.2 The Pvt. Joe E. Mann telemetry ship will be stationed at 7° N latitude directly under the orbiting satellite on the recovery pass to extend the capsule detection and telemetry reception range to Christmas Island (see Fig. A7-3). The telemetry ship will initiate search operations on the recovery pass at ETPD - 0 with the forward and aft tri-helix antennas positioned at 10° elevation. The forward tri-helix antenna will scan the azimuth range from 270° to 90° at the maximum slewing rate (approximately 30° per second). The aft tri-helix will scan the azimuth range from 90° to 270° at the maximum slewing rate. The single helix antenna will search with an elevation scan from 90° azimuth to 270° azimuth at the rate of once per five seconds. All antennas should search for the 228.2-mc capsule telemetry signal.

A5.5.2.1 The search mode will continue from ETPD - 0 until ETPD + 30 minutes. If the capsule signals are acquired, all antennas will track the capsule until fade, and the acquired telemetry data will be recorded on magnetic tape with significant parameters listed in Table A8-1 recorded on an oscillograph/Datarite for real-time presentation. Immediately after the signals fade or after the parachute deployment telemetry is acquired, whichever is first, the Pvt. Joe E. Mann will report by voice ship position, capsule bearing, and real-time telemetry data to the HCC over the SSB radio. After the parachute deployment sequence has been received, the Pvt. Joe E. Mann will proceed in the direction of the capsule signals and effect water recovery. Any visual acquisitions, regardless of whether capsule is airborne or in the water, will be immediately reported by voice to the HCC over SSB radio.

A5.5.2.2 During the recovery and search operation, the LMSD personnel on board the Pvt. Joe E. Mann will maintain communication with the telemetry aircraft over the assigned UHF frequencies. The ship and aircraft will exchange acquisition and tracking data for mutual benefit. Since the Pvt. Joe E. Mann is not able to transmit SSB while receiving telemetry signals, the pass commentary will be transmitted over UHF to a telemetry aircraft for relay to Christmas Island where it will be relayed to the HCC over SSB radio.

A5.6 Airborne Recovery Force Deployment

A5.6.1 The Airborne Recovery Force deployment for a nominal orbit period and periods differing from nominal by 1-1/2 minutes is presented in Figure A7-3. The force will be deployed with sufficient search and recovery aircraft in the 60 x 200 nm nominal impact area to insure aerial recovery capabilities.

The capsule detection range will be extended 400 nm south of the impact area by redeploying those C-119, RC-121, and C-130 aircraft not required in the impact area. Air retrieval will be attempted in this area, but emphasis will be on detection and surface recovery.

A5.6.2 The RC-121 search radar aircraft will be deployed to provide dual radar coverage of the primary recovery area and the extended recovery area (see Fig. A7-4). Each of the RC-121 aircraft will be equipped with SSB radio for direct communications with the HCC without compromising HF communications with the C-119 and C-130 aircraft on the "command net" and "telling net." Due to the extended deployment of the recovery aircraft, there will be two command RC-121 aircraft and two pairs of HF telling net and command net frequencies; one for the northern sector and one for the southern sector. The frequencies for the command and telling nets will be assigned by the HCC.

A5.6.3 The recovery aircraft will be deployed with six C-119 aircraft in the primary recovery area spaced at 40-nm intervals along the satellite path. The remaining two or three C-119 and the C-130 aircraft will be deployed in the extended recovery range at 100-nm intervals. The recovery aircraft deployment is shown in Figure A7-5.

A5.6.3.1 The C-119 aircraft operating procedures will remain much the same as in the previous operations. The mission of the C-119 aircraft in the primary recovery area will remain acquisition and aerial recovery of the capsule. The mission of the C-119 and C-130 aircraft in the extended recovery area will be primarily capsule acquisition with aerial recovery secondary since insufficient aircraft are available to provide adequate retrieval capability.

A5.6.3.2 All C-119 and C-130 aircraft will search for and use the D/F equipment on the capsule beacon signal. [redacted] will report the frequency deviation of the capsule beacon to the HCC through the STC. The HCC will relay the frequency deviation to the recovery aircraft through the Command RC-121's. This will permit the FLR-2 operators to search ±3 mc about the reported frequency. If the capsule beacon signals are not acquired by ETPD + 60 seconds, the frequency scan will be increased to ±12 mc. If the RC-121 aircraft obtain solid radar returns from the capsule parachute and the chaff but the C-119 aircraft are unable to acquire the capsule beacon signal, the FLR-2 operators will search for and use the D/F equipment on the 8-watt, 228.2-mc, FM telemetry signal.

A5.6.4 The WV-2 will perform an FIC survey of the predicted impact area and will assume a final position 120 nm south and 100 nm west of the predicted impact point by ETPD - 30 minutes. The WV-2 will communicate with the Recovery Force on the command and telling nets. The WV-2 will search for all three capsule signals and attempt to derive a D/F bearing from any of the signals acquired. All telemetry signals received will be recorded.

Signal acquisitions, frequency deviations, and bearings will be reported as directed by the "HCC On-the-Scene Test Controller" aboard the WV-2.

A5.6.5 The telemetry aircraft will be deployed along the vehicle flight path in relation to ship and island telemetry installations to insure continuous telemetry reception from the primary impact area to south of the equator. The nominal deployment is shown in Figure A7-3. Telemetry reception range of these aircraft is expected to be 120 to 150 nm. Placement of these aircraft for a nominal orbit in order of position priority will be as follows:

Aircraft No.	Position
1	480 nm south of Pvt. Joe E. Mann
2	Midway between Dalton Victory and Pvt. Joe E. Mann
3	Midway between two southern C-119 aircraft
4	240 nm south of Pvt. Joe E. Mann
5	720 nm south of Pvt. Joe E. Mann

Aircraft No. 2 and No. 3 will be staged from Hickam Air Force Base to insure a backup capability in the northern area. The remaining aircraft will be staged from Christmas Island. All aircraft will be on station by ETPD-1 hour.

A5.6.5.1 The two telemetry aircraft positioned north of the Pvt. Joe E. Mann will be under the direction of the southern area Command RC-121 and will establish communication with this aircraft on the assigned HF telling and control nets. The aircraft staged from Christmas Island will be under direction of the HCC and will establish communications with the HCC through the telemetry station at Christmas Island over the assigned UHF frequency. If actual positions do not permit using UHF, due to distance, communication will be established between Christmas Island and the telemetry aircraft over the assigned HF frequency. This will be accomplished by operating the HF SSB equipment at Christmas Island in the AM mode. All transmissions from the telemetry aircraft to Christmas Island will be relayed as soon as possible to the HCC over the SSB link. An alternate means of communicating from the telemetry aircraft to the HCC will be through the telemetry ship Pvt. Joe E. Mann over assigned UHF or HF frequencies.

A5.7 Airborne Recovery Force Operations

A5.7.1 The RC-121 aircraft will search for the chaff as the first radar return. After receiving the first radar return, the airborne Test Controller will notify the nearest C-119J and then vector the C-119J to an intercept flight path. The C-119J pilot will follow the RC-121 vectoring and use the D/F for homing. All returns from the Recovery Force radars and direction finders will be verified as soon as possible to eliminate possible "bogeys." Direction finder acquisitions by the C-119J, C-130, and WV-2 aircraft will be plotted to verify that only one intersect point exists and also will be checked against radar returns of the RC-121 aircraft and bearings from the surface stations. If bogey signals still appear to exist after verification, the airborne Test Controller will conduct a systematic visual search for the source of each signal.

A5. 7. 2 When the recovery aircraft makes visual contact with the capsule parachute, an air recovery will be accomplished. Repeat passes will be made, if necessary, until recovery is successful or until the capsule impacts in the water. The C-119J aircraft completing recovery will return to Hawaii as directed by the HCC and will be escorted by either a C-119J, an RC-121, or an SC-54 (Air Rescue) aircraft. The remainder of Recovery Forces will return to Hawaii as directed by the HCC.

A5. 7. 3 If the air recovery is unsuccessful, the C-119J aircraft will circle the area of water impact and drop a smoke bomb while the airborne Test Controller vectors the surface ships into position to effect water recovery. The capsule beacon and flashing light operation will continue for 20 to 36 hours. If the capsule impacts in the water, the northern or southern C-130 will, at the direction of the HCC, drop a RATU marker buoy to aid in surface recovery. The northern C-130 aircraft is not a part of the Recovery Force and will be used only to drop marker buoys.

A5. 7. 4 If recovery operational conditions permit, the northern Command RC-121, or alternate, will transmit brief best available information reports to the HCC over SSB radio at ETPD + 10 and 20 minutes (±2 minutes); similarly, the southern Command RC-121 will submit brief best available information reports to the HCC at ETPD + 15 and 25 minutes (±2 minutes). If the re-entry capsule is not sighted before ETPD + 30 minutes, the northern Command RC-121 will report a brief recap of most reliable received signal data to the HCC for relay to the STC at that time. Similarly, southern Command RC-121 recap will be submitted at ETPD + 35 minutes. The data to be reported are aircraft station position, magnetic signal bearing, and local time for each reliable signal acquisition. Range and azimuth with local time and aircraft station position will be reported for each valid radar return. The report shall also contain the Controller's conclusions regarding the quality of reported signals and bearings, results of triangulation attempts, and most probable impact location. These data will be relayed to the STC, immediately upon receipt by the HCC, to enable the PAC to determine the most productive search areas.

A5.7.5 If the capsule has not been located by ETPD + 30 minutes in the northern area or ETPD + 35 minutes in the southern area, the Airborne Recovery Forces will initiate a corridor search south along the probable impact trajectory. At the discretion of the HCC, or as directed by the STC, a complete recap may be requested. The Forces will continue the southerly search, within fuel limitation, unless the HCC directs a search of the most probable impact areas as determined from tracking triangulation and other available data.

A5.7.6 The southern telemetry aircraft will maintain UHF communications with Christmas Island and the Pvt. Joe E. Mann, if possible during the recovery operation for exchange of acquisition and tracking data. All acquisition data received from either of the surface stations will be relayed to the other station. Since the Pvt. Joe E. Mann is unable to transmit SSB while receiving telemetry signals all Pvt. Joe E. Mann commentaries after acquisition will be relayed by one of the telemetry aircraft to Christmas Island.

A5.7.6.1 The telemetry aircraft will search for both capsule telemetry signals and the beacon signal. All capsule signals acquired will be recorded on magnetic tape with a timing signal. Capsule signal acquisitions will be reported immediately to the southern Command RC-121 over the HF telling net and to the Pvt. Joe E. Mann and Christmas Island over UHF.

When the parachute deployment telemetry sequence is received, it will be reported over the HF telling net. The telemetry aircraft will attempt to determine the capsule bearing at fade or at parachute deployment. If this can be accomplished, the bearing and aircraft position will be reported to the Command RC-121.

A5.7.6.2 If one of the telemetry aircraft visually acquires the capsule in the air or in the water, the position will be reported immediately to the Command RC-121 and the Pvt. Joe E. Mann. The telemetry aircraft will circle the capsule while maintaining 100 percent visual lock-on until arrival of a surface vessel or until fuel supply requires return to Christmas Island. While hovering over the floating capsule the telemetry aircraft will attempt to provide a transmission compatible with the receiving equipment on the telemetry ship and Christmas Island so that by triangulation the capsule position may be more accurately determined. If Christmas Island or the Pvt. Joe E. Mann reports the parachute deployment sequence and antenna bearing, all of the telemetry aircraft will initiate search operations as directed by the HCC.

A5.8 South Point,Hawaii Telemetry Installation

A5.8.1 For this operation, a quad-helix antenna and two Nems-Clarke 1302A receivers will be installed at the PMR facility at South Point, Hawaii. Existing communications, recording, and timing systems will be used.

A5.8.1.1 If the orbit period is such as to permit nominal re-entry, or reentry east o[redacted] South Point will scan ± 80° about a 270° azimuth at an antenna elevation of 10° at the rate of once per five seconds from ETPD - 0 until ETPD + 3 minutes.

A5.8.1.2 If the satellite path is between [redacted] nd South Point, the quad-helix antenna will scan ± 90° about a 180° azimuth at the rate of once per five seconds from ETPD - 0 until ETPD + 5 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.8.1.3 If the satellite path is east of South Point, the quad-helix antenna will scan ± 90° about a 90° azimuth at the rate of once per five seconds from ETPD - 0 until ETPD + 5 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.8.2 If no capsule signals are acquired before ETPD + 5 minutes, the quad-helix antenna will be positioned at 180° azimuth and 10° elevation, and the telemetry receivers will be monitored until ETPD + 30 minutes. If [redacted] cquires the capsule signals, it will provide South Point with acquisition information.

A5.8.3 Once acquisition is achieved with the quad-helix antenna, the 60-ft antenna will attempt to track the capsule, using the narrower beamwidth to obtain more accurate bearings at and after parachute deployment. All acquisitions will be reported immediately to the HCC through the [redacted] The capsule parachute deployment telemetry sequence and the antenna azimuth will be reported as they are received. If the parachute telemetry sequence is not received before signal fade, the system time of fade and the antenna azimuth and elevation will be reported. Subsequent to acquisition, South Point will report antenna bearings to [redacted] very thirty seconds through parachute deployment or fade.

A5.9 Christmas Island Telemetry Installation

A5.9.1 For this operation a quad-helix antenna, three Nems-Clarke 1302A receivers, a 7-track magnetic tape recorder, a timing system, and a communication system will be temporarily installed on Christmas Island to provide telemetry reception and capsule detection capabilities near the equator.

A5.9.1.1 If the satellite path is east of Christmas Island, the quad-helix antenna will scan ± 90° about a 90° azimuth at the rate of once per five seconds from ETPD + 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.9.1.2 If the satellite path is west of Christmas Island, the quad-helix antenna will scan ± 90° about a 270° azimuth from ETPD + 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.9.1.3 If the satellite path is a near overhead pass at Christmas Island (± 2° W longitude), the quad-helix antenna will scan 360° in azimuth at the rate of once per ten seconds from ETPD ± 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per 360° azimuth.

A5.9.2 The Christmas Island facility will maintain continuous UHF communications with all of the telemetry aircraft in the area for exchange of acquisition and tracking information. The telemetry aircraft will relay Pvt. Joe E. Mann tracking data to Christmas Island.

A5.9.3 If no capsule signals are acquired before ETPD + 8 minutes, the quad-helix antenna will be positioned at 180° azimuth and 10° elevation and the telemetry receivers will be monitored until ETPD + 30 minutes. If no signals are acquired before ETPD + 30 minutes, a negative report will be submitted to the HCC over SSB radio.

A5.9.4 Once acquisition is achieved, the quad-helix will manually track the capsule, and the telemetry and beacon signals will be recorded on magnetic tape. Immediately after the parachute deployment telemetry sequence is recorded, Christmas Island will so report to the HCC over the SSB radio. The antenna azimuth will be reported to the telemetry aircraft over UHF radio immediately after acquisition and at parachute deployment.

The telemetry aircraft will perform search operations to locate the descending capsule. If the capsule signals fade before the parachute deployment telemetry sequence is received, Christmas Island will report the antenna fade azimuth and elevation to the HCC over SSB radio.

A5.10 <u>Barking Sands, Kauai Telemetry Facility</u>

A5.10.1 The PMR facility at Barking Sands, Kauai, will be augmented by the addition of an LMSD tri-helix antenna. Barking Sands will maintain communication with [redacted] a toll telephone for exchange of tracking and acquisition data. At ETPD - 15 minutes, Barking Sands will position the tri-helix antenna at the acquisition azimuth and 10° elevation. From ETPD - 5 minutes until ETPD + 5 minutes, the Barking Sands tri-helix antenna will scan the azimuth range from 270° to 90° at the rate of 30° per second. Barking Sands will search for both capsule telemetry signals. All acquired capsule telemetry signals will be recorded on magnetic tape with a timing signal.

A5.10.2 Subsequent to acquisition, Barking Sands will report the antenna bearing to [redacted] every thirty seconds [redacted] will plot the Barking Sands bearings, with the South Point bearings and their own bearings, to determine the approximate capsule trajectory.

A5.11 <u>Hawaiian Control Center Recovery Operations and Communications</u>

A5.11.1 The HCC - STC communications will be augmented by the addition of two voice lines (toll telephone) that will be effective from ETPD - 1 hour until ETPD + 4 hours.

A5.11.2 The HCC will direct and control acquisition, recovery, and search operations of the Christmas Island facilities, the <u>Pvt. Joe E. Mann</u>, the telemetry receiving aircraft, and the Recovery Forces. The primary communication link between the HCC and the surface elements will be the SSB radio. The <u>Pvt. Joe E. Mann</u>, the RC-121 aircraft, and the installation at Christmas Island will communicate with the HCC over the same SSB frequency. The two Victory Ships will communicate with the HCC through PMR and the PMR representative at the HCC.

A5.11.3 The HCC will relay all data reported to the STC immediately. Additionally, the HCC will maintain a real-time analysis for integration of all incoming data to determine the most probable impact point and subsequent search areas.

A6. POST-RECOVERY OPERATIONS

A6.1 Data Pickup

A6.1.1 After termination of the search operation, the Pvt. Joe E. Mann will proceed toward Pearl Harbor at the best speed of advance. If capsule telemetry data have been acquired by the telemetry ship, an aircraft may be dispatched at the discretion of the HCC to accomplish aerial pickup of the data. The aerial pickup will be scheduled for the day of the recovery operation, if sufficient daylight remains after termination of the search operation. If aerial pickup of the data on the day of the recovery operation is not possible, then an aerial pickup may be scheduled for the following morning.

A6.1.2 If the Dalton Victory acquires telemetry data from the capsule, the aircraft may pick up the data while enroute to the Pvt. Joe E. Mann.

A6.1.3 The Haiti Victory will proceed toward Pearl Harbor at the best speed of advance immediately after termination of the search operation. If capsule telemetry data have been acquired, the two HRS-3 helicopters will fly it to the HCC as soon as the ship reaches HRS-3 range of Hickam Air Force Base.

A6.1.4 The telemetry aircraft will land at Christmas Island after termination of the search operation to refuel before returning to Hickam AFB. One of the telemetry aircraft will pick up any capsule telemetry data acquired by the Christmas Island facility and fly it to Hickam AFB the same day as the recovery operations.

A6.1.5 The telemetry data acquired by South Point will be flown to Hickam AFB by a PMR aircraft.

A6.1.6 All capsule telemetry data acquired by the receiving facilities in the recovery region will be hand-carried to Flight Data Reports, 61-44, on the first available commercial airline flight.

Table A 2-1

NOMINAL FLIGHT PLANNING DATA

Items	Data
DISCOVERER	
S/N	1053
Payload	Diagnostic
Fuel	UDMH, 1865 lb
Oxidizer	IRFNA, 4767 lb
Launch weight	8544 lb
THOR	
S/N	160
Launch weight	117,315 lb (includes payload)
Fuel	RJ-1
Oxidizer	Liquid oxygen
LAUNCH	
Site	VAFB, SM-75-3, Pad 4
Date	June 1960
Pad azimuth	181.48°
Launch azimuth	172°
Nominal airborne command	20 seconds
Orbital boost time	117 seconds
Downrange T/M Ship Location (King County)	16°00'N 117°43'W
Downrange T/M ship heading	353°T
Programmer setting	5610 seconds (Step setting 22)
INJECTION	
Time	T + 387.5
Location	24.1°N 118.84°W
Altitude	145 sm
Azimuth	171.6°
Nominal velocity	25,884 ft/sec
ORBIT	
Period	93.48 min (5609 sec)
Apogee	413 sm
Perigee	145 sm
Eccentricity	0.032
Average regression rate (17 passes)	23.52°
Reset latitudes	23°N (for northbound passes over [redacted] 30°N (for northbound passes over [redacted] 60°N (for southbound passes)
Inclination angle	81.6°
Pvt. Joe E. Mann initial location	90°N 157°24'W
RECOVERY	
Aircraft (type and quantity)	C-130 (1), JC-54 (5) C-119's (9) and RC-121's (4)
Surface ships (recovery)	Dalton Victory and Haiti Victory
Surface ship initial locations	16°N, 158°06'W and 24°N, 159°04'W
Surface ship helicopters	HRS-3 (2 on each ship)
Recovery pass	17 nominal - 15, 16, or 18 by special command
Predicted impact area center	24°N, 158°53.4'W
ETPD	T + 26.6 hr

Table A2-2
NOMINAL ACQUISITION TIMES

Pass	Station	Acquisition Time (minutes)	Fadeout Time (minutes)	Duration Time (minutes)
Launch	[redacted]	0.5	8.1	7.6
	[redacted]	0.0	7.9	7.9
	T/M Ship	4.6	13.0	8.4
1	[redacted]	87.3	95.1	7.8
2	[redacted]	182.8	187.5	4.7
	[redacted]	191.2	197.2	6.0
8	[redacted]	717.7	728.9	11.2
9	[redacted]	811.1	815.3	4.2
	[redacted]	811.7	823.4	11.7
	[redacted]	818.9	826.9	8.0
10	[redacted]	900.4	913.5	13.1
	[redacted]	910.9	922.1	11.2
*11	[redacted]	998.1	1005.2	7.1
	[redacted]	1006.3	1019.1	12.8
*12	[redacted]	1104.9	1108.8	3.9
15	[redacted]	1395.7	1399.8	4.1
	[redacted]	1402.4	1408.8	6.4
16	[redacted]	1489.3	1496.9	7.6
	[redacted]	1498.9	1500.5	1.6
17	[redacted]	1584.2	1590.4	6.2
	[redacted]	1592.8	1599.6	6.8
*23	[redacted]	2120.9	2129.7	8.8
24	[redacted]	2222.7	2227.6	4.9

*Acquisition only - no T/M readout

Table A 4-1

INSTRUMENTATION AND CAPSULE EQUIPMENT REQUIRED TO BE OPERATIVE AT LAUNCH

Agena Telemetry Channels

12 Subcarrier must be present

15 Subcarrier and commutator points 9, 15, 17 must be present

16 Subcarrier and commutator points 2, 4, 6, 8, 10, 22, 24, 25, and 26 must be present.**

Capsule Equipment Transmissions

(1) Acquisition beacon with 1.5 mc of nominal frequency

(2) All telemetry channels and commutators on both transmitters operating within specifications

(3) S-band transponder operating on pulse spacing No. 5.

** Channel 1 is an acceptable substitution for Channel 16, commutator points 24 and/or 26. Channel 11 is an acceptable substitution for Channel 16, commutator points 2, 4, 6, and/or 8. Channel 13 is an acceptable substitution for Channel 16-25. Channel 14 is an acceptable substitution for Channel 16-22. Channel 18 is an acceptable substitution for Channel 16-10.

Table A5-1

SS/D SEQUENCE FOR DISCOVERER VEHICLE SERIAL 2205-1053

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
	-0.1	Timer reset
0	0.	Start SS/D timer
0.1	0.1	Timer reset
0.1	0.1	Timer safety circuit
167	167	De-energize K30, 31, 32 (uncage gyros)
167	167	Programmed destruct lockout
178.5	178.5	Isolate K24 from Beacon 5
178	178	Vehicle pneumatic control
178	178	Open pneumatics valve and spare
178	178	Fire explosive bolts
178	178	Fire explosive bolts
179	179	Start orbital programmer (paralleled)
179	179	Fire retro-rockets (paralleled)
179	179	Arm pitch and yaw control
179	179	Arm integrator correction
192	192	Command -45^{o}/min pitch rate (pitchover 21.75)
192	192	Arm roll H/S command
192	192	Fire H/S cover squib
192	192	Break 28V to N_2 valve, shut down separation monitor
192	192	Fire H/S cover squib
204	204	+28V to SS/D for brake control (not effective until 221 sec. S5D-NO)
221	221	Command -2^{o}/min pitch rate from integ. pot.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
221	221	Connect pitch H/S command
221	221	Arm Beacon #5 timer brake control
221	221	Arm integ. uncaging circuit
221	221	Arm K21 hold-in circuit, latch up K1 to start delay via orbital programmer
221	221	Roll H/S signal shunt
*221	221	Timer brake hold-in control or integ. corr. respectively (isolated by S5C-NO)
241	221	Stop SS/D timer delay (nominally 20 sec)
254	234	Fire ullage rockets
254	234	Fire ullage rockets
254	234	Preactivate hydraulics
254	234	Deactivate Beacon 5 timer brake control
254	234	K21 hold-in
269	249	Arm gas generator squib. Energize K28 (Pitch and Yaw Pneu. Off)
269	249	Fire helium valve and gas gen. squib (par.)
269	249	Engine ignition
269	249	Connect accelerometer to integrator
270	250	Pneumatic off backup (pitch and yaw)
270	250	Open gas gen. fire and He squib circuits
270	250	Start P.G. offset corr. (disconnected)
270	250	Open gas generator squib arm circuit
270	250	Close circuit to T/M off switch
270	250	Start thrust M/A Corr. (disconnected)

* This sequence is based upon a nominal trajectory: Orbital programmer set for 21-sec timer brake delay and no timer brake modification from beacon channel #5 or #6.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
270.5	250.5	Steady state thrust
370	350	Stop Thrust M/A corr. (disconnected)
370	350	Stop P.G. offset corr. (disconnected)
385	365	Arm pneumatic (pitch and yaw)
385	365	Engine cut-off safety switch
388	(368)	Test isolation (no flight function)
**388	(368)	Disconnect accel. from integrator
388	(368)	Engine shut down by integ.
388	(368)	Activate pneumatic controls (de-energize K-28)
394	374	SS/L +28VDC unreg.
394	374	Hydraulic controls shut down; shut off ullage rockets and de-energize K34 (Par.)
394	374	Command +40/min yaw rate
394	374	Command 0°/min pitch rate
394	374	Fire oxidizer, helium, fuel vent valves (paralleled)
394	374	De-energize K21
492	472	Calibrate T/M
492	472	Connect K24 to Beacon 5 (inoperative)
492	472	Heater ampl. excitation
502	482	Stop calibrate
502	482	Open engine shut down circuit and switch ant.
502	482	Enable Command 5 and 6. Alternate recovery pass capability
664	644	Command $+3.55^{\circ}$/min pitch rate

** The dial reading of the integrator when caged is 1725 representing a velocity-to-be-gained of 13,800 ft/sec.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
664	644	Connect roll H/S to yaw gyro
664	644	Roll accel. output grounded
664	644	Shut down +28V reg. ascent only power (paralleled)
664	644	Aux. heater on
664	644	De-energize K33, switch out 0.1% reg.
664	644	Integ. pot. ground to pitch corr. Mode (inoperative)
664	644	Flight control gain change
664	644	Integ. shut down (latch down K4, K5, K6)
890	870	Phase balance ∅ A
890	870	Arm tape recorder
890	870	Phase balance ∅ B
890	870	Recage integrator (inoperative)
890	870	Set K21 for pitch rate correction (inoperative)
890	870	Accelerometer power amp return
890	870	Telemetry Off
890	870	Pulse latch K7 (SS/D timer off) H/S to tow gain
890	870	Open integ. recage (inoperative)
890	870	Arm SS/D timer for recovery phase
890	870	Stop integrator caging (inoperative)
890	870	Spare
*X	870	Pulse latch K7, K14, K17, K18 (SS/D timer on H/S off)
X + 15	885	Command -45°/min pitch rate
X + 15	885	Fire payload battery heater squibs

* Time of initiation of recovery phase

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
X + 18	888	Arm Capsule ejection (squib)
X + 92	962	Command 3.55°/min pitch rate
X + 92	962	SS/L Transfer Circuit #1
X + 92	962	SS/L Transfer Circuit #2
X + 92	962	Disconnect capsule from electrical P.S.
X + 93.5	963.5	Shut down SS/D timer
X + 93.5	963.5	Command eject (paralleled)

Table A6-1

NOMINAL ORBIT SCHEDULE: DISCOVERER SERIAL NO. 2205-1053

(Based on a 93.5 Minute Period)

Phase	Event	Time T (min)	Location N Latitude (deg)
Launch	Launch	0	34.8
	Separation	2.98 (179 sec)	- - -
	Start orbital timer	2.98 (179 sec)	- - -
	Nominal fire time	4.48 (269 sec)	- - -
	Nominal burnout and orbit injection	6.47 (388 sec)	- - -
	First crossing of equator	12.37 (742 sec)	0
	Beacon and T/M off	14.83 (890 sec)	12 (S)
Pass 1 (N-S)	Beacon and T/M on - reset enable	86.9	74
	Acquire [redacted]	87.3	72.7
	65°N latitude (ref.)	89.5	65
	Reset signal/command	91.1	60
	57.6°N latitude (ref.) [redacted]	91.5	57.6
	Beacon and T/M off - reset disable	103.3	10
	End of Orbit 1	153.4	0
Pass 2 (N-S)	Beacon and T/M on - reset enable	180.5	74
	Acquire [redacted]	182.8	65.7
	Reset signal/command	184.4	60
	57.6°N latitude (ref) [redacted]	185.0	57.6
	Acquire [redacted]	191.2	32.3
	21.6°N latitude (ref.) [redacted]	194.0	21.6
	Beacon and T/M off - reset disable	196.8	10
	End of Orbit 2	246.9	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 3 thru 7	End of Orbit 3	340.4	0
	End of Orbit 4	433.9	0
	End of Orbit 5	527.4	0
	End of Orbit 6	620.9	0
	End of Orbit 7	714.4	0
Pass 8 (S-N)	Acquire [redacted]	717.7	12.7
	Beacon [redacted]/M on - reset enable	718.8	16
	Reset signal/command [redacted]	722.7	30
	34.8°N latitude(ref) [redacted]	724.0	34.8
	Beacon and T/M off - reset disable	727.1	46
	End of Orbit 8	807.9	0
Pass 9 (S-N)	Acquire [redacted]	811.1	12.3
	Acquire [redacted]	811.7	14.7
	Beacon and T/M on - reset enable	812.3	16
	21.6°N latitude(ref [redacted]	813.8	21.6
	Reset signal/command	816.1	30
	Acquire [redacted]	818.9	40.2
	57.6°N l[redacted]titude(ref [redacted]	823.6	57.6
	Beacon and T/M off - reset disable	826.2	66
	End of Orbit 9	901.3	0
Pass 10 (S-N)	Acquire [redacted]	902.1	2.7
	Beacon [redacted] T/M on - reset enable	903.0	6
	Reset signal/command [redacted]	906.9	20
	21.6°N la[redacted]ude(ref [redacted]	907.3	21.6
	Acquire [redacted]	910.9	35
	57.6°N latitude(ref [redacted]	916.8	57.6
	Beacon and T/M off - reset disable	918.5	62
	End of Orbit 10	994.8	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 11 thru 13	End of Orbit 11	1088.3	0
	End of Orbit 12	1181.8	0
	End of Orbit 13	1275.2	0
Pass 14 (N-S)	57.6°N latitude(ref [redacted]	1306.8	57.6
	Beacon and T/M on - reset enable	1307.1	56
	Reset signal/command	1311.2	40
	34.8°N latitude(ref [redacted]	1312.3	34.8
	Beacon and T/M off - reset disable	1315.1	24
	End of Orbit 14	1368.7	0
Pass 15 (N-S)	Beacon and T/M on - reset [redacted]	1395.5	74
	Acquire [redacted]	1395.7	73.5
	Reset signal/command	1399.7	60
	57.6°N latitude(ref [redacted]	1400.3	57.6
	Acquire [redacted]	1402.4	48.5
	34.8°N latitude(ref [redacted]	1405.8	34.8
	Beacon and T/M off - reset disable	1408.6	24
	End of Orbit 15	1462.2	0
Pass 16 (N-S)	Beacon and T/M on - reset [redacted]	1489.2	74
	Acquire [redacted]	1489.3	72.7
	Reset signal/command	1493.1	60
	57.6°N latitude(ref [redacted]	1493.8	57.6
	Acquire [redacted]	1498.9	37.3
	34.8°N latitude(ref [redacted]	1499.4	34.8
	Beacon and T/M off - reset disable	1502.1	24
	End of Orbit 16	1555.7	0
Pass 17 (N-S)	Beacon and T/M on, reset [redacted]	1582.7	74
	Acquire [redacted]	1584.2	67.6
	Reset signal/command	1586.6	60
	57.6°N latitude(ref [redacted]	1587.3	57.6
	Acquire [redacted]	1592.8	34.2

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 17 (N-S) (Con'td)	21.6°N latitude(ref [redacted] Beacon and T/M off - reset disable End of Orbit 17	1595.7 1598.9 1649.2	21.6 10 0
Pass 18 (N-S)	Beacon and T/M on - reset enable Reset signal/command 57.6°N latitude(ref [redacted] 21.6°N latitude(ref [redacted] Beacon and T/M off - reset disable End of Orbit 18	1676.2 1680.1 1680.8 1689.2 1692.4 1742.7	74 60 57.6 21.6 10 0

Table A6-2

FIRST-PASS PROGRAMMER CORRECTION BASED ON TIME OF CROSSING (LAUNCH ORBITAL PROGRAMMER SETTING - 5610 SECONDS)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
5376	Decrease 22 steps	5152		5262		5749		5794	
5400	Decrease 20 steps	5175		5285		5774		5819	
5460	Decrease 14 steps	5228		5340		5834		5880	
5520	Decrease 8 steps	5281		5394		5894		5940	
5580	No change	5334		5449		5954		6001	
5640	No change	5388		5503		6014		6061	
5700	Increase 8 steps	5441		5558		6074		6121	
5760	Increase 14 steps	5494		5612		6134		6182	
5820	Increase 20 steps	5547		5667		6194		6242	
5880	Increase 25 steps	5600		5722		6254		6302	
5940	Increase 31 steps	5654		5776		6313		6363	
6000	Increase 37 steps	5707		5830		6373		6423	
6060	Increase 42 steps	5760		5885		6343		6483	
6120	Increase 48 steps	5813		5939		6493		6544	
6180	Increase 53 steps	5866		5994		6553		6605	

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude)							
		65°N		57.6°N		25°N		22°N	
		T From Launch Time (sec)	T + Launch System Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)
6240	Increase 59 steps	5919		6048		6613		6665	
6300	Increase 65 steps	5973		6103		6673		6725	
6360	Increase 70 steps	6026		6157		6733		6786	
6420	Increase 76 steps	6079		6211		6792		6846	
6480	As directed	6133		6266		6852		6906	
6540	As directed	6186		6321		6912		6967	
6600	As directed	6239		6375		6972		7027	
6660	As directed	6292		6429		7032		7088	
6720	As directed	6346		6484		7092		7148	
6780	As directed	6399		6539		7152		7208	
6840	As directed	6452		6593		7212		7269	
6900	As directed	6505		6647		7272		7329	
6960	As directed	6558		6701		7332		7390	
7020	As directed	6612		6756		7392		7450	
7080	As directed	6665		6810		7452		7511	
7140	As directed	6718		6865		7512		7571	
7200	As directed	6772		6920		7572		7632	

Table A8-1

REAL TIME DATA REQUIREMENTS

	MEASUREMENT		CHANNEL	PRIORITY	TIME* READOUT REQUIRED	REPORT** TO STC BY VOICE	PASS	TRACKING STATION				T/M SHIP***		NOTE
	NAME	NUMBER						[redacted]				KING COUNTY	PVT. JOE. E. MANN	
LAUNCH	Liftoff Signal	---	---	1	RT	X	Ascent	X	X					
	Thor Main Engine Cutoff	---	Thor 12	1	RT	X	Ascent	X	X					
	Agena Engine Ignition and Cutoff	B6	14	1	RT	X	Ascent	X	X			X		
	Tone Verifications A, B, C, D	H64, 65, 66, 67	16-2, -4, -6, -8	1	RT		Ascent	X	X					
	Command Verifications 1, 2, 3, 4	H112	11	1	RT	X	Ascent	X	X					
	Programmer Step Readout (Console)	H108, 109	16-24, -26	1	RT	X	Ascent	X	X					
	10-Second Step Switch Position	H108	16-24	1	RT		Ascent	X	X			X		
	100-Second Step Switch Position	H109	16-26	1	RT		Ascent	X	X			X		
	Increase/Decrease Switch Position	H107	14, 16-22	1	RT	X	Ascent	X	X			X		
ORBIT	Tone Verifications A, B C, D	H64, 65, 66, 67	16-2, -4, -6, -8	1	RT		1 thru 16	X	X	X	X			
	Command Verifications 1, 2, 3, 4	H112	11	1	RT	X	1 thru 16	X	X	X	X			
	Programmer Period Read-out (Console or Remote)	H110	1, 2	2	RT		1 thru 16	X	X	X	X			
	Programmer Step Readout (Console)	H108, 109	16-24, -26	1	RT	X	1 thru 16	X	X	X	X			
	10-Second Step Switch Position	H108	16-24	1	RT		1 thru 16	X	X	X	X			
	100-Second Step Switch Position	H109	16-26	1	RT		1 thru 16	X	X	X	X			

*RT - Read in real time
PP1 - Read immediately after pass, priority 1
PP2 - Read immediately after pass, priority 2

** All data are also to be reported to the STC by 60-wpm teletype as soon as possible

*** T/M ships will transmit real-time data immediately after signal fade so no interference with the vehicle telemetry signal will be generated

Table A8-1 (Continued)

	MEASUREMENT		CHANNEL	PRI-ORITY	TIME* READOUT REQUIRED	REPORT** TO STC BY VOICE	PASS	TRACKING STATION				T/M SHIP***		NOTE
	NAME	NUMBER						[redacted]				KING COUNTY	PVT. JOE. E. MANN	
ORBIT (Continued)	Increase/Decrease Switch Position	H107	14	1	RT	X	1 thru 16	X	X	X	X			
	Reset Monitor Signal	H70	18	1	RT	X	1 thru 16	X	X	X	X			
	Re-entry Selector Switch Position	C22	13	1	RT	X	1 thru 16	X	X	X	X			1
	Control Gas Supply Pressure	D95	12-38	2	PP1		2, 10, 16			X	X			
	Battery Bus Voltage	C1	16-15	2	PP1		2, 10, 16			X	X			
	Horizon Scanner - Pitch	D37	17-22	3	PP2		2, 10, 16			X	X			2
	Horizon Scanner - Roll	D39	17-26	3	PP2		2, 10, 16			X	X			2
	SPI Temperature	D130	15-9	3	PP2		2			X	X			3
	SPI Pitch Angle - No. 1	D128	15-15	3	PP2		2			X	X			3
	SPI Yaw Angle - No. 1	D127	15-17	3	PP2		2			X	X			3
	SPI Pitch Angle - No. 2	D138	17-7	3	PP2		2			X	X			3
	SPI Yaw Angle - No. 2	D139	17-21	3	PP2		2			X	X			3
RE-ENTRY	Programmer Period Readout (Console or Remote)	H110	1, 2	3	RT		Recovery Pass			X	X			
	Programmer Step Readout (Console)	H108, 109	16-24, -26	2	RT	X	↑			X	X			
	Reset Monitor Signal (Console)	H70	18	1	RT	X					X			
	Re-entry Selector Switch Position	C22	13	1	RT	X				X	X		X	1
	Battery Bus Voltage	C1	16-15	3	PP1						X			
	Horizon Scanner - Pitch	D37	17-22	1	PP2						X			2
	Horizon Scanner - Roll	D39	17-26	1	PP2						X			2
	SPI Pitch Angle - No. 1	D128	15-15	2	See Note 4						X			4
	SPI Yaw Angle - No. 1	D127	15-17	2	See Note 4						X			4
	SPI Pitch Angle - No. 2	D138	17-7	1	PP2						X			4
	SPI Yaw Angle - No. 2	D139	17-21	1	PP2						X			4
	SS/D Timer Restart Event	D85	12-54	1	RT	X	↓				X			5
	Pitch Programmer	D41	17-20	2	PP1		Recovery Pass				X			6

Table A8-1 (Continued)

	MEASUREMENT		CHANNEL	PRI-ORITY	TIME* READOUT REQUIRED	REPORT** TO STC BY VOICE	PASS	TRACKING STATION				T/M SHIP***		NOTE
	NAME	NUMBER						[redacted]				KING COUNTY	PVT. JOE. E. MANN	
RE-ENTRY (Continued)	Capsule Separation No. 1 Event	L33	7	1	RT		Recovery Pass				X			5, 7
	Capsule Separation Event	L10	16-21	1	RT	X	↑				X			5, 8
	Spin Rocket No. 1 Event - Quad. III	P39	Cap 18-18	1	RT, PP1	X					X			9
	Spin Rocket No. 2 Event - Quad. I	P40	Cap 18-4	1	RT, PP1	X					X			9
	Roll Rate - Spinup	P9	Cap 18-41	1	PP2						X			10
	Retro Rocket Fire Event	P37	Cap 18-40	1	RT	X					X			5
	Axial Acceleration	P48	Cap 11	1	RT, PP1	X				X	X		X	11
	Axial Acceleration	P2	Cap 18-19/53	1	PP2						X			10
	Pitch Rate - Retro	P11	Cap 18-54	1	PP2						X			10
	Yaw Rate - Retro	P10	Cap 18-56	1	PP2						X			10
	Despin Rocket No. 1 Event - Quad. II	P41 P41	Cap 18-20/ 55	1	RT, PP1	X					X			9
	Despin Rocket No. 2 Event - Quad. IV	P42	Cap 18-21/ 38	1	RT, PP1	X					X			9
	Thrust Cone Electrical Disconnect Event	P31	Cap 18-17	1 KTS 2 HTS	RT, PP1					X	X		X	12, 13
	Thrust Cone Separation Event	P38	Cap 18-42	1 KTS 2 HTS	RT, PP1	X				X	X		X	12
	G Switch Closure Event	P57	Cap 16-12	1	RT	X				X			X	5
	Mechanical Timer Switch Closure Event	P34	Cap 18-16/ 49	1	RT	X				X			X	5
	Parachute Cover Off Event	P61	Cap 18-13	1	RT, PP1	X				X			X	9
	Ablative Shell Release Event	P62	Cap 18-15	1	RT, PP1	X				X			X	9
	Roll Rate - Despin and Re-entry	P6	Cap 18-3/ 23/44	2	PP1					X			X	14
	GE Beacon Battery Voltage	P43	Cap 18-33	1	RT	X	↓			X			X	5, 15
	Afterbody Cover Temperature	P23	Cap 14-37/38	3	PP1		Recovery			X			X	16
	Parachute Well Temperature	P66	Cap 14-33/34	3	PP1		Pass			X			X	16

Table A8-1 (Continued)

NOTES:

1. Reads 1 volt for normal Pass 17 re-entry, 4 volts for alternate re-entry.
2. Read at least 2 points at approximately 5-second intervals to determine the degree of attitude stabilization. Read system time of turnoff on the recovery pass if SS/D restart event, D85, is invalid.
3. Read 3 times at approximately 2-minute intervals. Correlate with system time. [redacted]transmits data on Channels 15 and 17 to SV on 100-wpm/voice line after pass 2; 3 10-second data samples at 2-minute intervals required.
4. Read at 1-minute intervals before reorientation, 20-second intervals during reorientation, and immediately prior to separation. If data on Channel 17 does not appear to be valid on flight, Channel 15 data will be read instead. [redacted]transmits data on Channels 15 and 17 to SV on 100-wpm/voice line after pass; 10-second data sample starting at separation minus 110 seconds[redacted]continuous transmission from separation minus 30 seconds to separation plus 20 seconds.
5. System time required.
6. Read system time at start and finish of reorientation, voltage level prior to start of reorientation, and average voltage level during reorientation.
7. Read L-33 only if L-10 readout is invalid. L-33 reads 5 volts prior to separation, 0 volts after separation.
8. Reads 4.67 volts prior to separation, 1.33 volts after separation. Correlation within 2 seconds of exact system time is satisfactory for initial report.
9. Event verification required as RT readout. System time of event required as PP1 readout.
10. Detailed data readout required.
11. [redacted]eads average value and duration as PP1 readout[redacted]and JEM read values 5 seconds prior to, at, and 5 seconds after parachute deployment [redacted] readout.
12. Event verification required i[redacted]RT readout. System time of event required a[redacted]PP1 readout.[redacted]and JEM verify that events have occurred by voltage level check in P[redacted]dout.
13. A[redacted]read P-31 only if P-38 readout is invalid.
14. Read at 5 seconds before and 5 seconds after parachute deployment.
15. Read first and last available values.
16. Read peak value during re-entry.

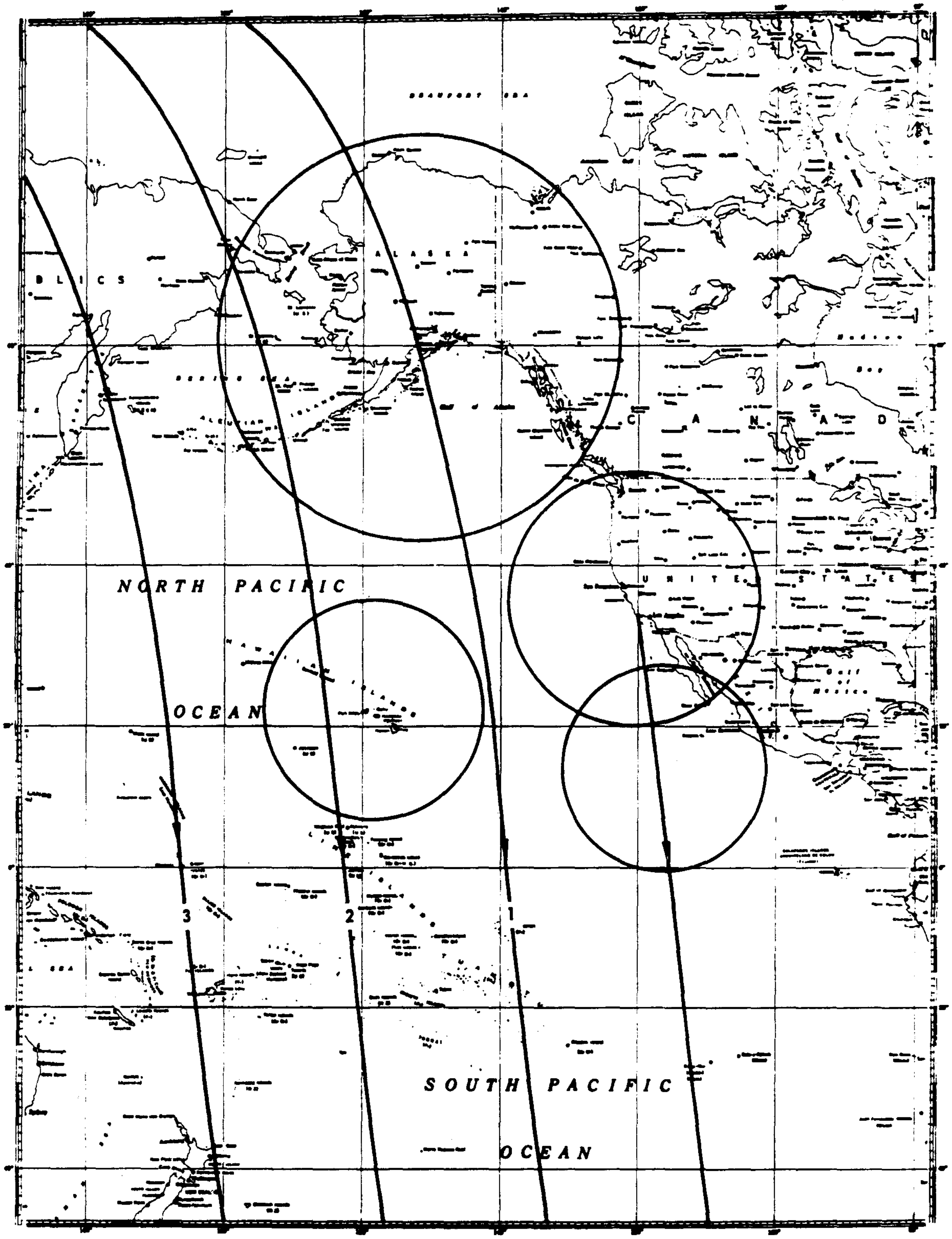


Figure A2-1 Nominal Orbit Traces – Passes 1 Through 3

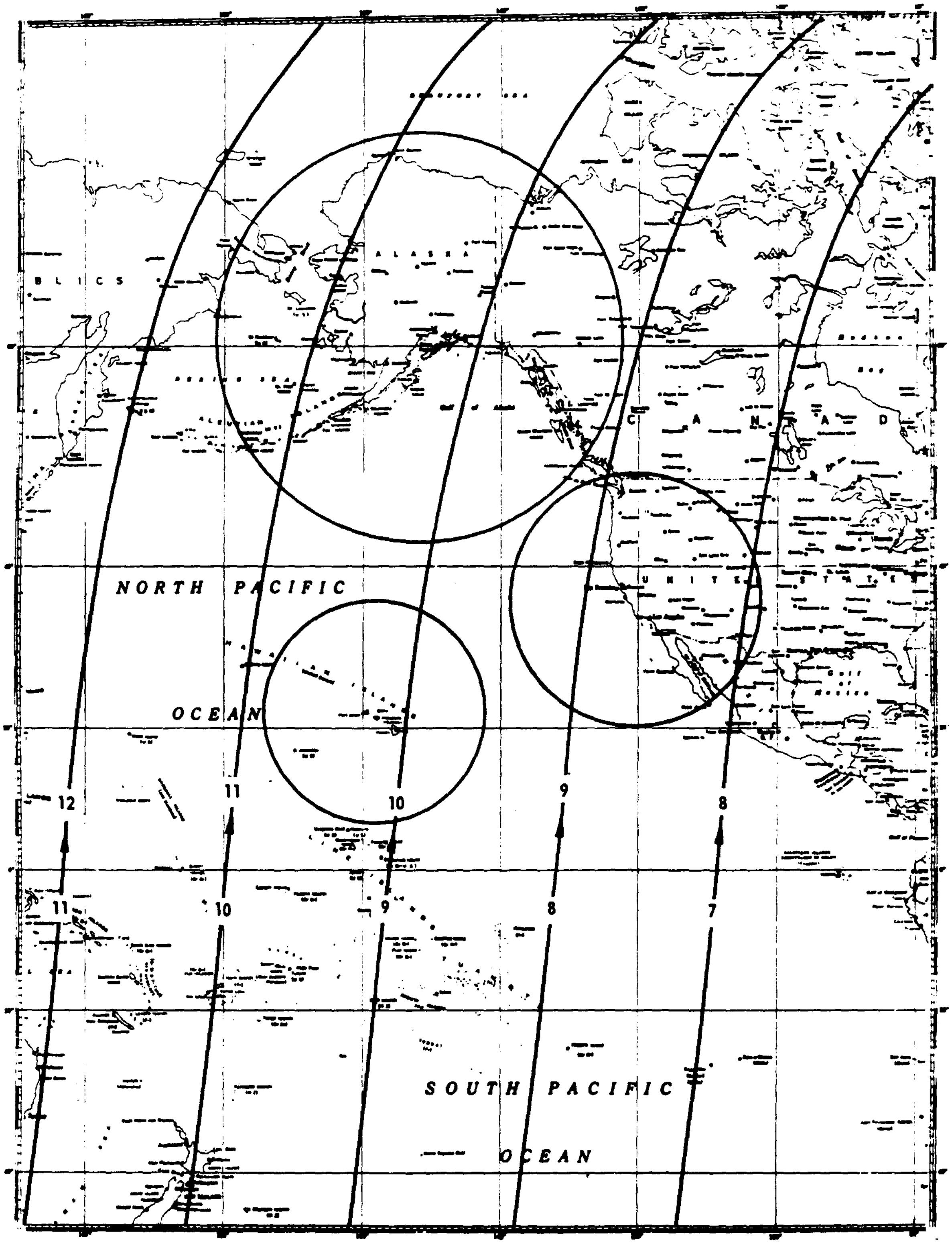


Figure A2-2 Nominal Orbit Traces – Passes 8 Through 12

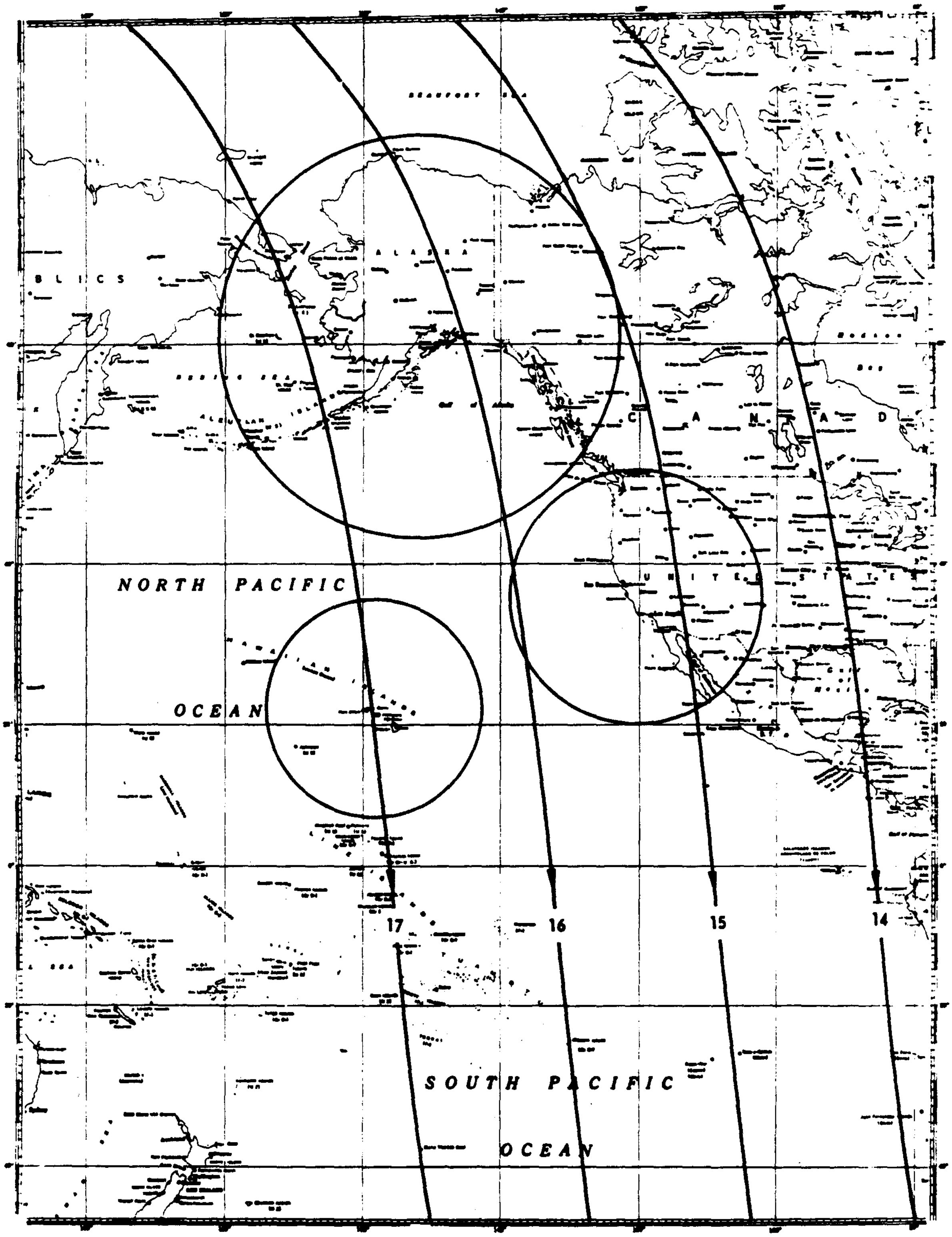
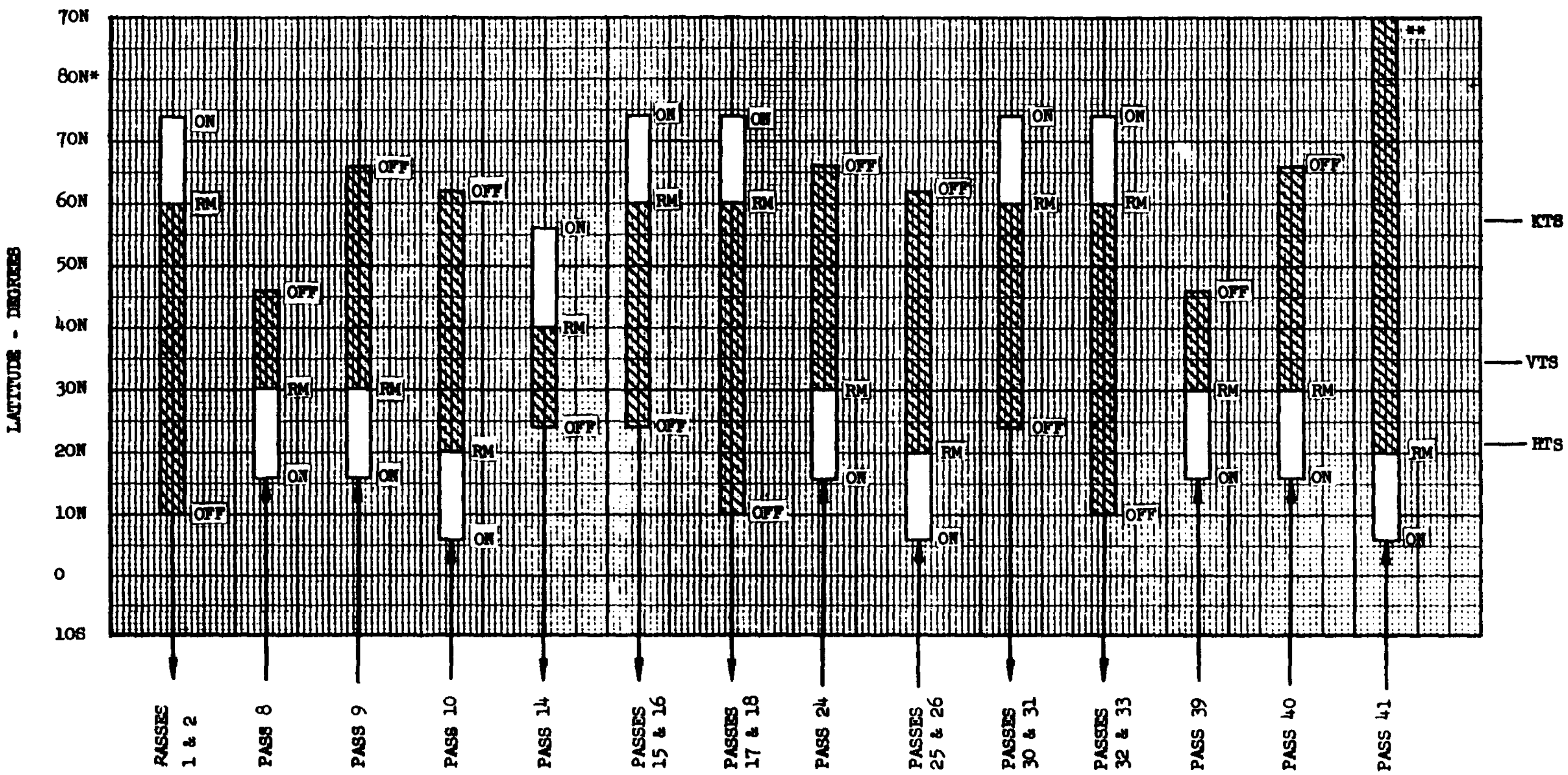


Figure A2-3. Nominal Orbit Traces — Passes 14 Through 17



ON = RESET ENABLE, RADAR PULSE BEACON ON, TELEMETRY PLATES ON

OFF = RESET DISABLE, RADAR PULSE BEACON OFF, TELEMETRY PLATES OFF

ON THRU OFF = RESET COMMAND CAPABILITY

[white box] = RESET MONITOR (RM) SIGNAL OFF

[hatched box] = RESET MONITOR (RM) SIGNAL ON

* = MAXIMUM LATITUDE REACHED WITH ORBIT PLANE INCLINATION IS APPROXIMATELY 81.6° N

** = RESET ENABLE, RADAR PULSE BEACON, AND TELEMETRY PLATES REMAIN ON AFTER PASS 41

Figure A2-7 Readout and Reset Programming

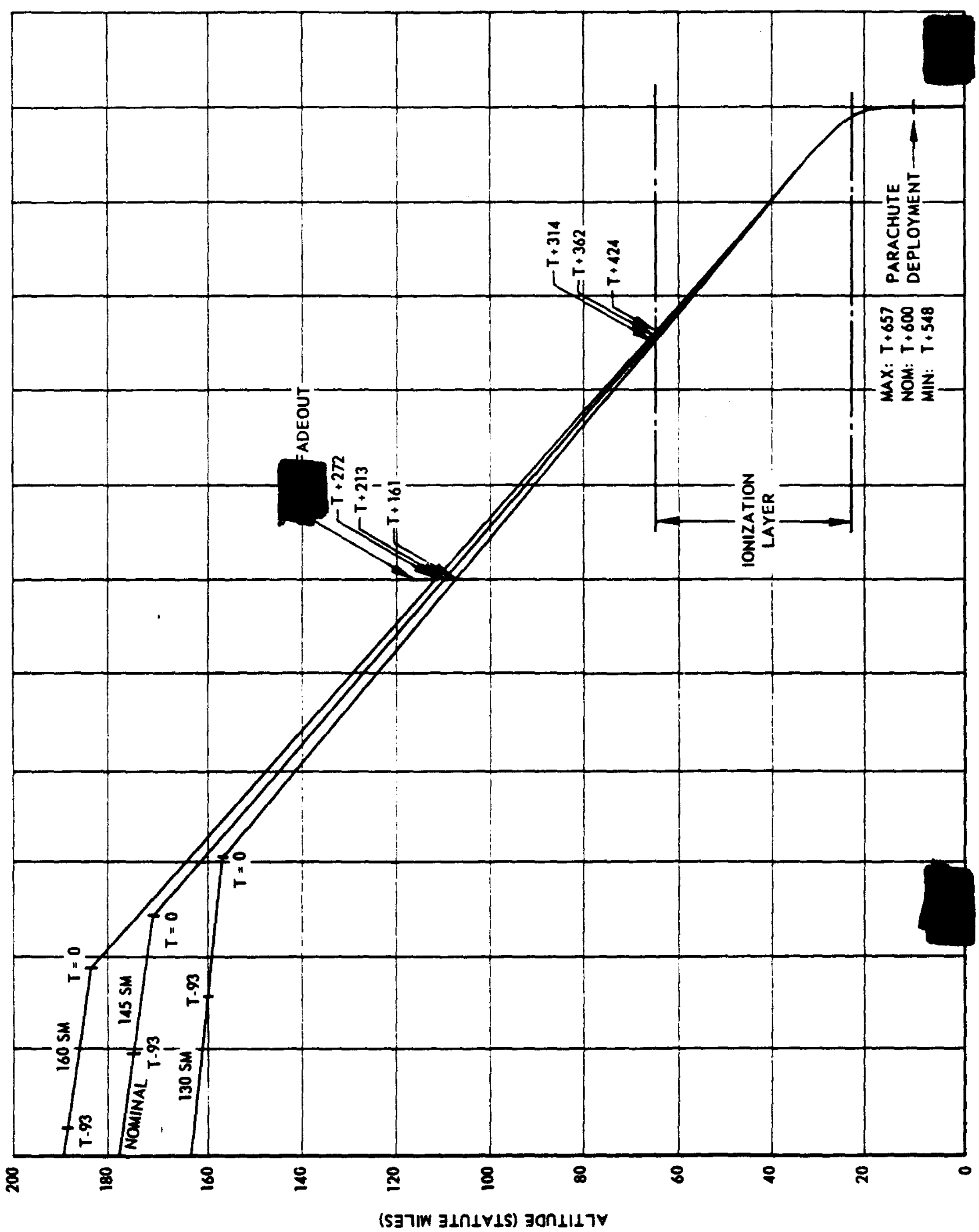


Figure A7-1 Capsule Re-entry Trajectory

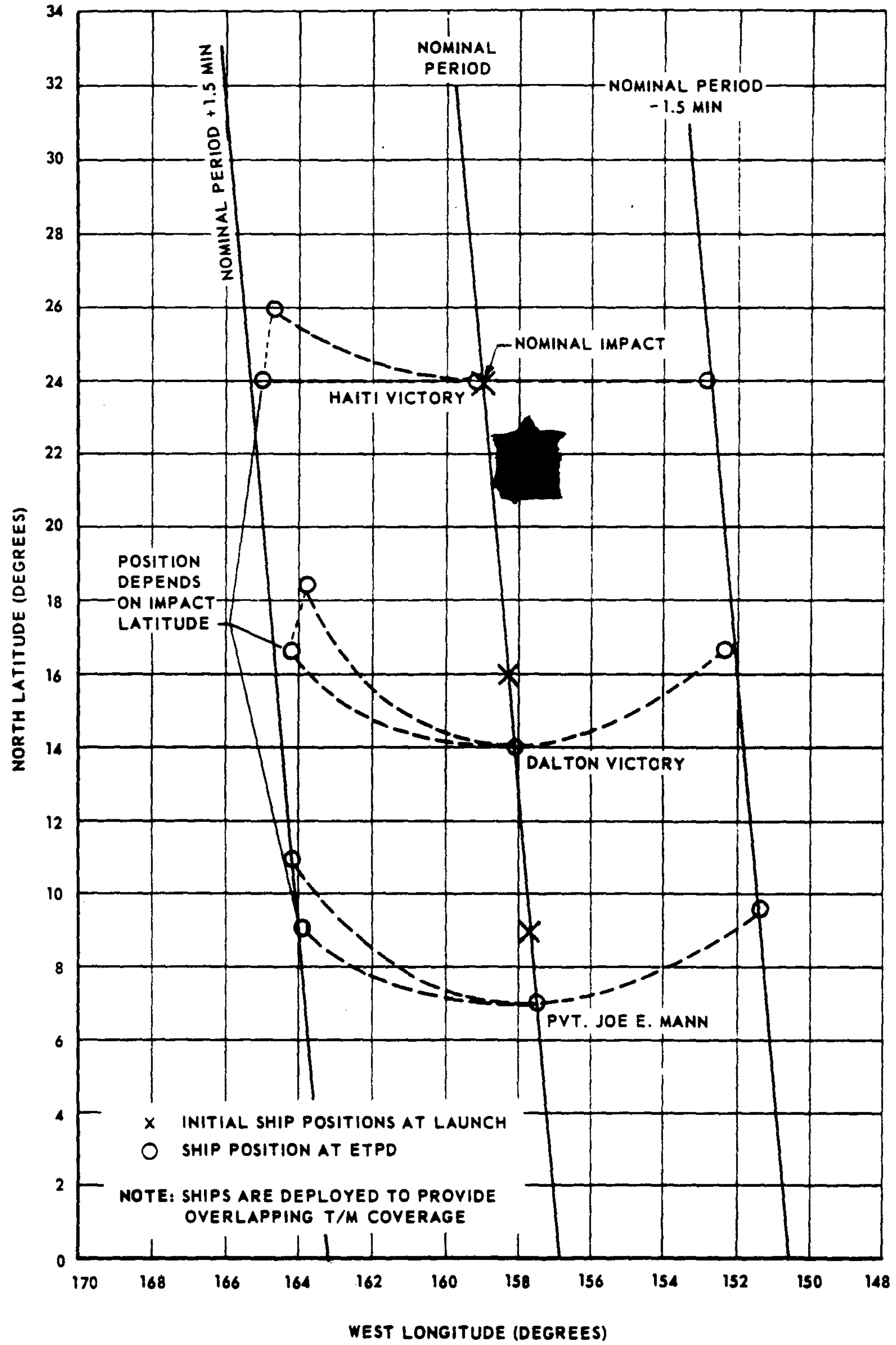


Figure A7-2 Surface Force Deployment

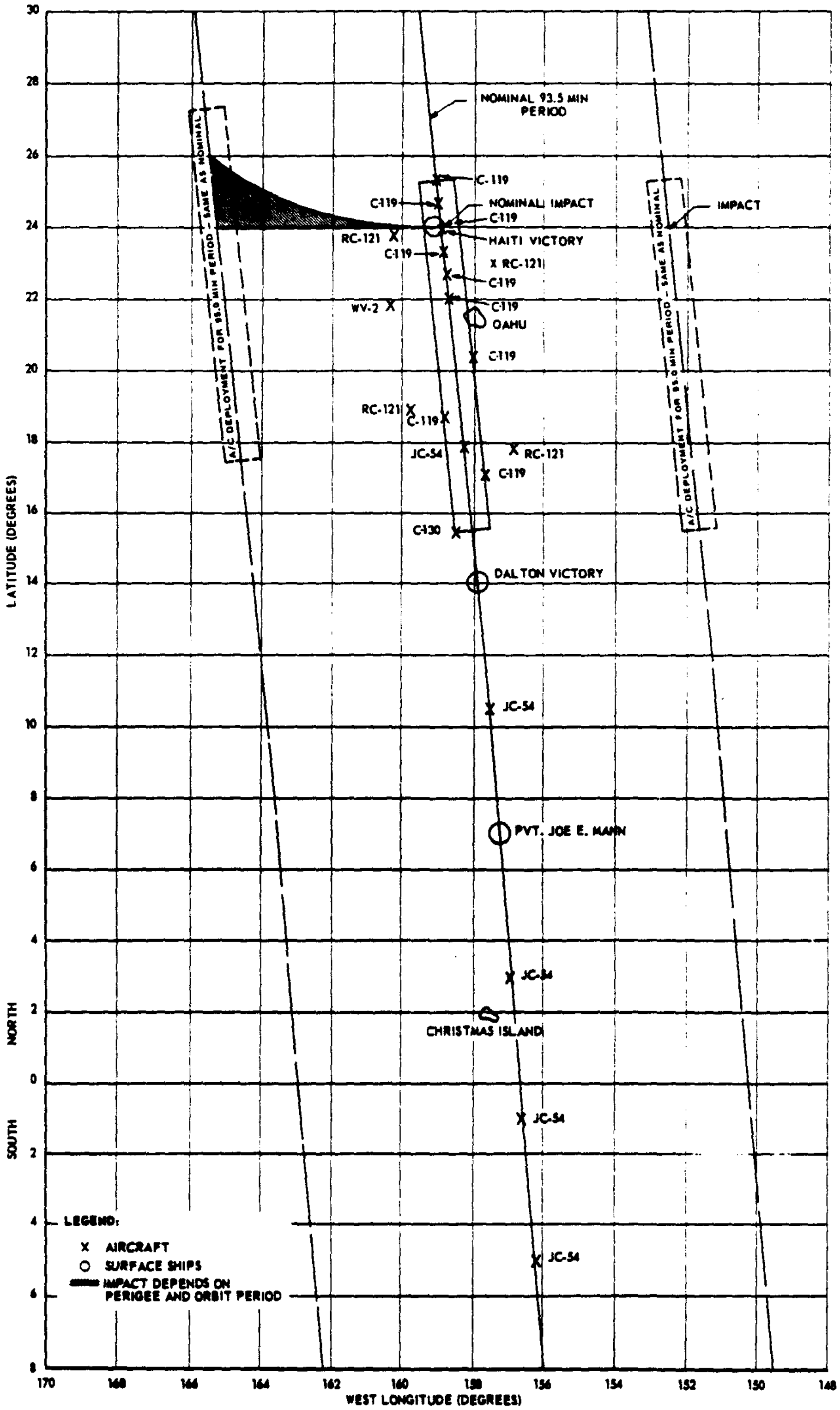
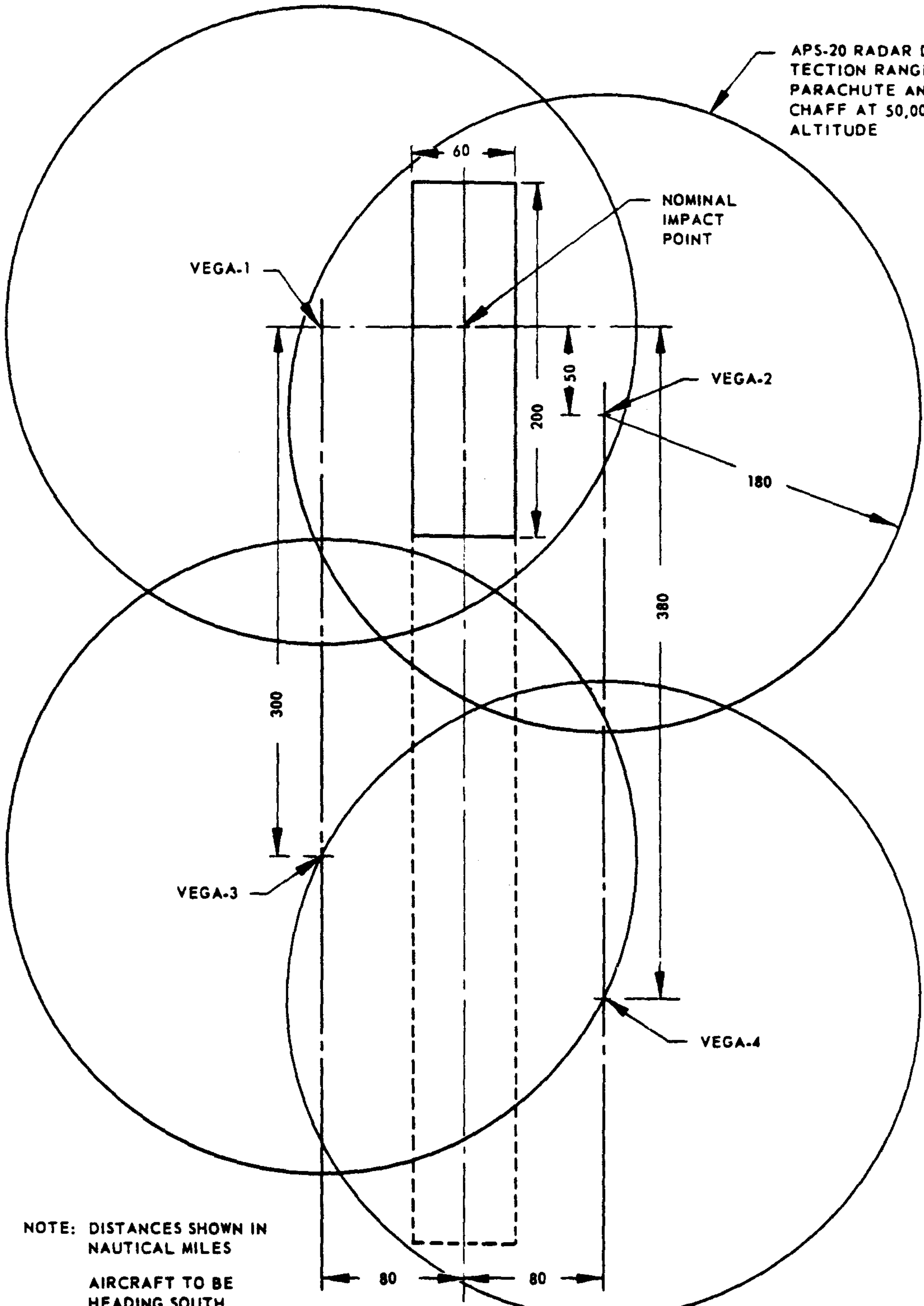


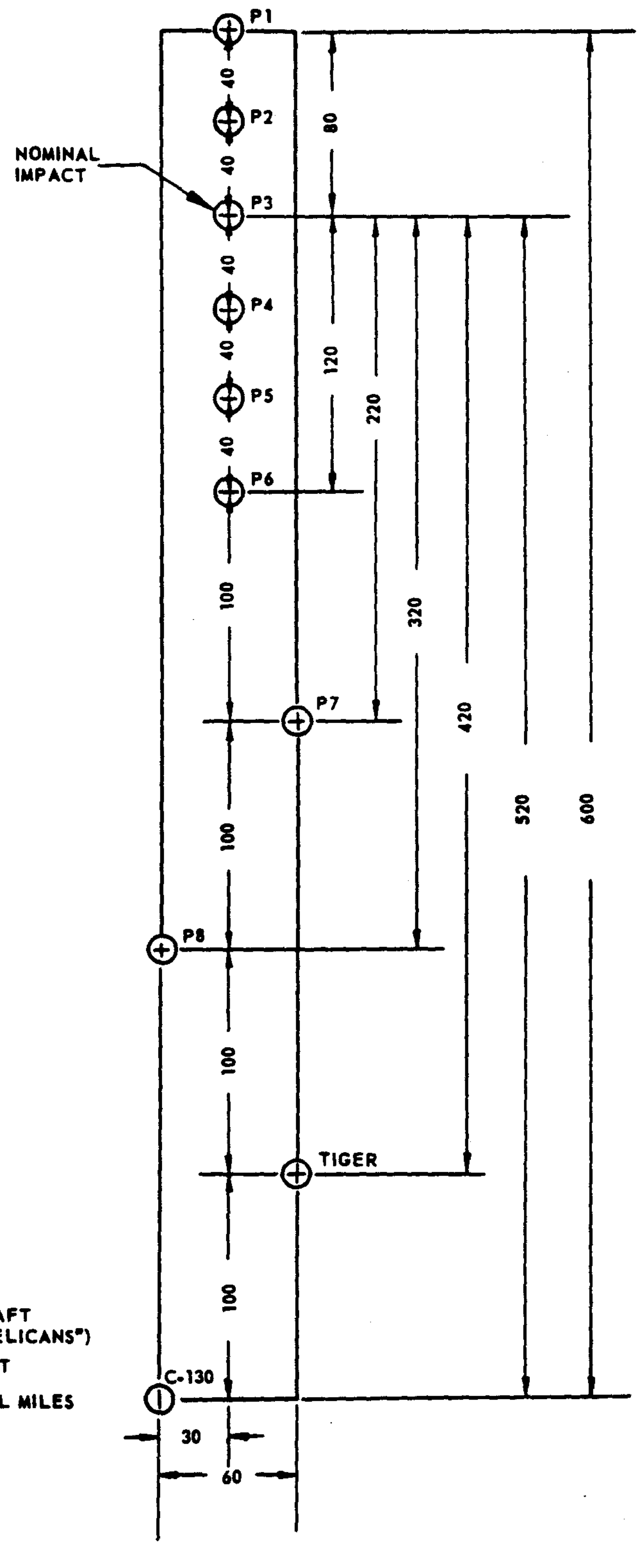
Figure A7-3 Recovery Force Deployment



NOTE: DISTANCES SHOWN IN NAUTICAL MILES

AIRCRAFT TO BE HEADING SOUTH AT ETPD

Figure A7-4 RC-121 Aircraft Deployment



P1, P2, P3, ETC = C-119 AIRCRAFT (CALLED "PELICANS")
TIGER = SPARE C-119 AIRCRAFT
DISTANCES SHOWN IN NAUTICAL MILES

Figure A7-5 C-119 and C-130 Aircraft Deployment

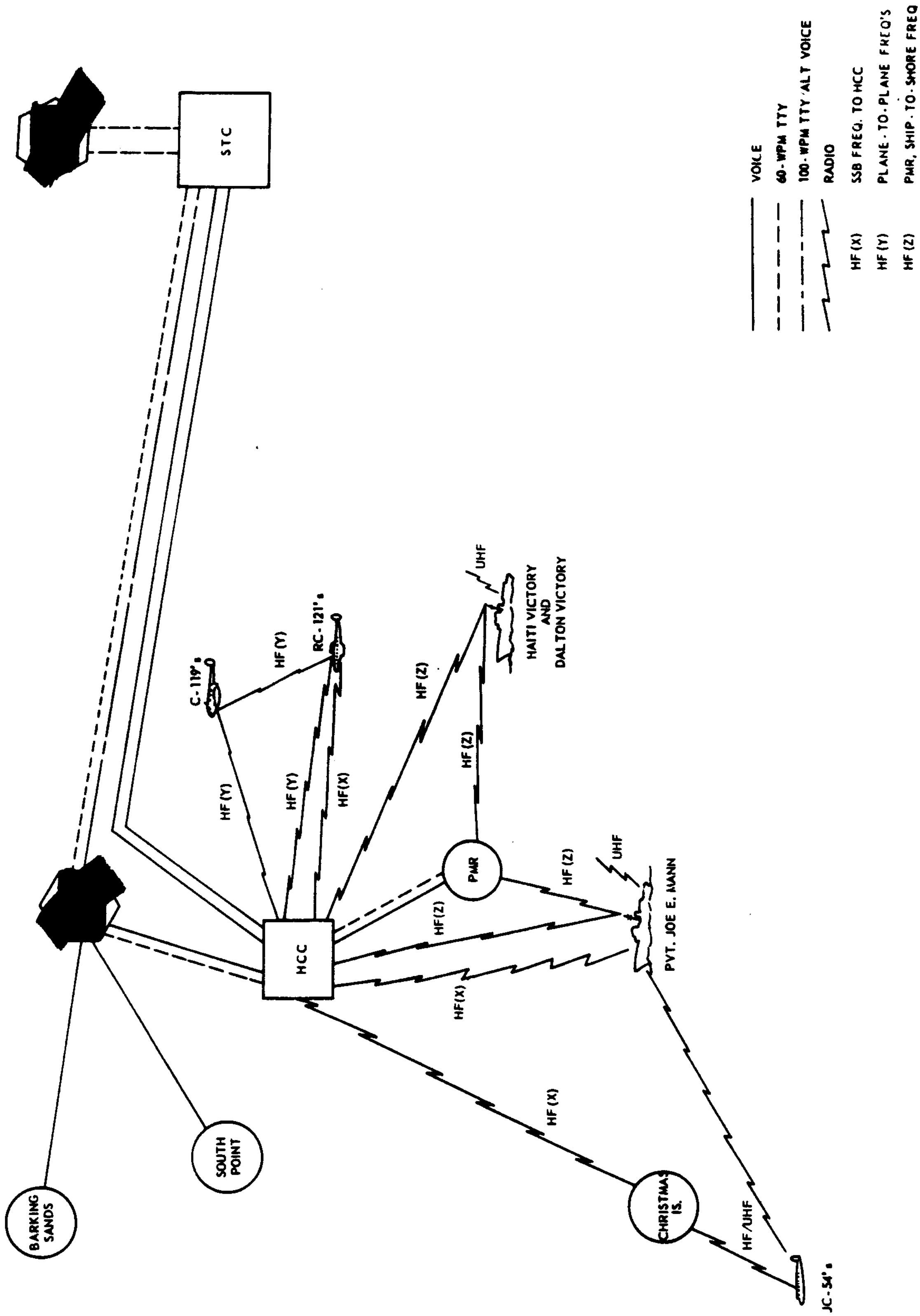


Figure A7-6 Recovery Operations Communication

[redacted]

DISTRIBUTION LIST

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[redacted]

DISTRIBUTION LIST (Continued)

No.	Addressee
[redacted]	

Notice of Page Substitution

Tab 4 - Appendix A
Vehicle 1055/Booster 234

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

DISCOVERER
SYSTEM TEST DIRECTIVE
TAB 4 APPENDIX A
FOR
AGENA VEHICLE 1055/ THOR BOOSTER 234

This document has been prepared by Systems Operations Planning, 61-41

Approved: [redacted], Manager
Systems Operations
Satellite Systems

Approved: [redacted]
Lt. Col. USAF
6594th Test Wing (Satellite)
Chairman, STWG

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Division
Sunnyvale, California

APPENDIX A, TAB 4
SUPPLEMENTAL TEST INFORMATION

CONTENTS

TABLES

ILLUSTRATIONS

FOREWORD

The basic System Test Directive, [redacted] purposely omits detailed variable flight-to-flight data but contains information of a permanent nature applicable to all flights of the initial Discoverer series. Detailed data and directives are presented in this Appendix A tab for the Agena 1055/Thor 234 combination and are applicable to this configuration only.

Engineering and procedural changes pertinent to the Agena 1055/Thor 234 combination are summarized as follows:

a. The APL Doppler acquisition transmitter and tracking lights will be incorporated for this flight.

b. The [redacted] tracking station at South Point, Hawaii, will be employed during the recovery operation.

c. C-119J aircraft assignments concerning the monitoring of capsule beacon and T/M frequencies have been modified.

d. Command 4 (Payload Function Selector) will be effective for this flight and all subsequent flights. The procedures have been included in the 7 March 1960 revision to the general text.

APPENDIX A
SUPPLEMENTAL TEST INFORMATION

A1 GENERAL

A1.1 This section contains descriptive material which supplements the text of the general STD for this flight only. Material presented herein may also correct or supersede material in the general STD for this flight only if necessary. General STD changes of a permanent nature will be effected by replacement pages in the main text at the earliest possible date. Reference will not be made to this Appendix for subsequent flight operations. The following material is divided into general sections, with parenthetical references to relative paragraphs in the main text provided where beneficial.

A2 ORBIT OPERATIONS

A2.1 APL Doppler Evaluation

A2.1.1 An additional transmitter will be employed on Agena Vehicle 1055 for evaluation purposes. This transmitter will operate continuously on 162 mc and 216 mc and may be used as an acquisition aid in the event the CWAT becomes inoperative. LMSD tracking stations will receive the signals on 162 mc and 216 mc on all passes except the recovery pass to verify that the transmitter is operative; no attempt will be made to record intelligible data. APL Doppler tracking stations will receive the beacon signals and record Doppler data on teletype tape for post flight evaluation.

A2.1.2 An optical beacon will also be installed on Agena Vehicle 1055. The beacon will be turned on by the orbital programmer while the satellite is within reception range of Smithsonian stations equipped with Baker-Nunn cameras.

A3 RECOVERY PHASE OPERATIONS

A3.1 Capsule Telemetry

Capsule telemetry Channels 7 and 8 will measure one set of events during the re-entry sequence and another set of events during the recovery sequence. The oscillator inputs will be switched when the thrust cone is separated. Channel 11 will measure axial acceleration during both the re-entry sequence and the recovery sequence. The subcarrier for Channel 7 will be turned off after thrust cone separation and will be turned on again at 5 G switch closure. Channels 8 and 11 will transmit data continuously throughout the descent trajectory. Figure A8-1 shows the nominal voltage levels which indicate that normal re-entry and recovery sequences have occurred.

A3.2 Tracking Station Operations

A3.2.1 The TLM-18 type antenna at the [redacted] tracking station on South Point, Hawaii, will be employed in this flight to provide a triangulation with [redacted] on the recovery pass for determining the capsule location at parachute deployment. The antenna will be positioned as a function of maximum signal strength; the azimuth, elevation, and system time will be recorded each time the positioning errors are minimum. At these times, the azimuth and elevation will be reported over the telephone line to [redacted] so the data can be manually plotted and triangulation effected. When the capsule enters the ionization layer and the telemetry signal disappears, South Point will reposition the antenna to the parachute deployment azimuth and elevation, as directed by the [redacted] positioning will be in South Point coordinates and is based on [redacted] tracking data extrapolated to the blossom point.

When the South Point Station re-acquires, after parachute deployment, the antenna movement will be slight so that an accurate azimuth can be determined; this will be reported to [redacted] The South Point Station will record the T/M signal received for later evaluation.

A3.3 Recovery Force Procedures

A3.3.1 Assignments of C-119J aircraft to monitor the capsule telemetry and beacon frequencies during the recovery operation have been modified to optimize the possibility of successful recovery operations and to minimize requirements for ground-to-aircraft communications.

During the nominal search configuration, the C-119J aircraft in positions 2, 4, 6, and 8 will monitor the capsule telemetry frequency on 228.2 mc in the 300 kc AM mode; the remaining aircraft sweep from 223 mc to 247 mc will be employed in search for the capsule beacon signal. These assignments will continue from search initiation until either ETPD + 25 minutes or until two or more aircraft report a solid acquisition. If the search has continued through ETPD + 25 minutes and no signals have been reported, all aircraft will search for the capsule beacon signal. If two or more aircraft report a solid acquisition on the same signal, all remaining aircraft will search for the reported signal. If solid acquisition of both signals is reported, aircraft which have not acquired will search for the capsule beacon signal. Aircraft which have solidly acquired the capsule T/M signal will perform the D/F homing operation on that signal and will attempt to keep the signal locked-in until either visual acquisition of the capsule or until the signal disappears at about ETPD + 25 minutes.

If a nominal orbit is achieved [redacted]hould acquire the capsule 375 seconds before ETPD. Upon acquisitio[redacted]ill determine the condition of the capsule T/M and beacon signals in the shortest possible time and report this information over the 100 wpm/voice line to the HCC and all stations. If the capsule beacon is not transmitting, the HCC will inform the Command RC-121 which will instruct the C-119J aircraft in positions 1 and 5 to join the C-119J aircraft in positions 2, 4, 6, and 8 in search for the capsule T/M signal. The C-119J aircraft in positions 3, 7, and 9 will continue in search for the capsule beacon signal.

A3.3.2 Should the re-entry capsule not be sighted before ETPD + 25 minutes, the Command RC-121 will report all signal data received to the HCC for relay to the STC. The data to be reported are aircraft position-at-time-of-signal-acquisition, signal bearing, and local time for each acquiring aircraft and ship. Range and azimuth with local time and aircraft position will be reported for each valid radar return. The report shall also contain the controller's conclusions regarding the quality of reported signals and bearings, results of triangulation attempts, and most probable impact location. These data will be relayed to the STC immediately upon receipt by the HCC to enable the PAC to determine the most productive search areas.

A4 TABLES AND ILLUSTRATIONS

The following tables and illustrations are applicable to Flight 1055/234 only. Each table or figure is given the basic number of the section of the general STD to which it applies, the letter A to denote appendix material, and a number to sequence items in the same category.

Table A2-1

NOMINAL FLIGHT PLANNING DATA

Item	Data
DISCOVERER	
S/N	1055
Payload	GFE
Fuel	UDMH
Oxidizer	IRFNA
Launch weight	8616
THOR	
S/N	234
Launch weight	109,022
Fuel	RJ-1
Oxidizer	Liquid oxygen
LAUNCH	
Site	VAFB, SM-75-3, Pad No. 5
Date	March 1960
Time	1100 to 1430 PST
Pad azimuth	218° 24' 17.24"
Launch azimuth	172°
Nominal airborne Command #5 backup	20 sec
Orbital boost time	117.5 sec
Downrange T/M ship location (King County)	16° 00'N 117° 43'W
Downrange T/M ship heading	353°T
Programmer setting	5610 seconds (Step 22)
Payload setting	6 (0101 Gray Code)
INJECTION	
Time	T + 387.5 sec
Location	24.1°N 118.84°W
Altitude	120 sm
Azimuth	171.6°
Nominal velocity	26,037 ft/sec
ORBIT	
Period	93.48 min (5609 sec)
Apogee	438 sm
Perigee	120 sm
Eccentricity	0.036
Average regression rate (17 passes)	23.52°
Reset latitudes	25°N (Resets over [redacted]) 30°N (Resets over [redacted]) 60°N (Resets over [redacted])
Inclination angle	79.89°
Re-entry T/M ship location (Pvt. Joe E. Mann)	39° 35'N 161° 45'W
RECOVERY	
Aircraft (type and quantity)	C-119's (9) and RC-121's (4)
Surface ships (recovery)	Dalton Victory and Haiti Victory
Surface ship initial locations	17°N, 153° 45'W and 17°N, 162° 15'W
Surface ship helicopters	HRS-3 (2 on each ship)
Recovery pass	17
Predicted impact area center	17°N, 158°W
ETPD	T + 27 hr

Table A2-2

NOMINAL ACQUISITION TIMES

Pass	Station	Acquisition Time (minutes)	Fadeout Time (minutes)	Duration Time (minutes)
Launch	[redacted]	0.5	8.1	7.6
	[redacted]	0.0	7.9	7.9
	T/M Ship	4.6	13.0	8.4
1	[redacted]	87.3	95.1	7.8
2	[redacted]	182.8	187.5	4.7
	[redacted]	191.2	197.2	6.0
8	[redacted]	717.7	728.9	11.2
9	[redacted]	811.1	815.3	4.2
	[redacted]	811.7	823.4	11.7
	[redacted]	818.9	826.9	8.0
10	[redacted]	900.4	913.5	13.1
	[redacted]	910.9	922.1	11.2
*11	[redacted]	998.1	1005.2	7.1
	[redacted]	1006.3	1019.1	12.8
*12	[redacted]	1104.9	1108.8	3.9
15	[redacted]	1395.7	1399.8	4.1
	[redacted]	1402.4	1408.8	6.4
16	[redacted]	1489.3	1496.9	7.6
	[redacted]	1498.9	1500.5	1.6
17	[redacted]	1584.2	1590.4	6.2
	[redacted]	1592.8	1599.6	6.8
*23	[redacted]	2120.9	2129.7	8.8
24	[redacted]	2222.7	2227.6	4.9

*Acquisition only - no T/M readout

Table A5-1

SS/D SEQUENCE FOR DISCOVERER VEHICLE SERIAL 2205-1053

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
	-0.1	Timer reset
0	0	Start SS/D timer
0.1	0.1	Timer reset
0.1	0.1	Timer safety circuit
167	167	De-energize K30, 31, 32 (uncage gyros)
167	167	Programmed destruct lockout
178.5	178.5	Isolate K24 from Beacon #5
178	178	Vehicle pneumatic control
178	178	Open pneumatics valve and spare
178	178	Fire explosive bolts
178	178	Fire explosive bolts
179	179	Start orbital programmer (paralleled)
179	179	Fire retro-rockets (paralleled)
179	179	Arm pitch and yaw control
179	179	Arm integrator correction
192	192	Command -45°/min pitch rate (pitchover 21.75)
192	192	Arm roll H/S command
192	192	Fire H/S cover squib
192	192	Break 28V to N_2 valve, shut down separation monitor
192	192	Fire H/S cover squib
204	204	+28V to SS/D for brake control (not effective until 221 sec. S5D-NO)
221	221	Command -2°/min pitch rate from integ. pot.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
221	221	Connect pitch H/S command
221	221	Arm Beacon #5 timer brake control
221	221	Arm integ. uncaging circuit
221	221	Arm K21 hold-in circuit, latch up K1 to start delay via orbital programmer
221	221	Roll H/S signal shunt
*221	221	Timer brake hold-in control or integ. corr. respectively (isolated by S5C-NO)
241	221	Stop SS/D timer delay (nominally 20 sec)
254	234	Fire ullage rockets
254	234	Fire ullage rockets
254	234	Preactivate hydraulics
254	234	Deactivate Beacon #5 timer brake control
254	234	K21 hold-in
269	249	Arm gas generator squib. Energize K28 (Pitch and Yaw Pneu. Off)
269	249	Fire helium valve and gas gen. squib (par.)
269	249	Engine ignition
269	249	Connect accelerometer to integrator
270	250	Pneumatic off backup (pitch and yaw)
270	250	Open gas gen. fire and He squib circuits
270	250	Start P.G. offset corr. (disconnected)
270	250	Open gas generator squib arm circuit
270	250	Close circuit to T/M off switch
270	250	Start thrust M/A Corr. (disconnected)

* This sequence is based upon a nominal trajectory: Orbital programmer set for 21-sec timer brake delay and no timer brake modification from beacon channel #5 or #6.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
270.5	250.5	Steady state thrust
370	350	Stop Thrust M/A corr. (disconnected)
370	350	Stop P.G. offset corr. (disconnected)
385	365	Arm pneumatic (pitch and yaw)
385	365	Engine cut-off safety switch
388	(368)	Test isolation (no flight function)
**388	(368)	Disconnect accel. from integrator
388	(368)	Engine shut down by integ.
388	(368)	Activate pneumatic controls (de-energize K-28)
394	374	SS/L +28VDC unreg.
394	374	Hydraulic controls shut down; shut off ullage rockets and de-energize K34 (Par.)
394	374	Command +40/min yaw rate
394	374	Command 0^{o}/min pitch rate
394	374	Fire oxidizer, helium, fuel vent valves (paralleled)
394	374	De-energize K21
492	472	Calibrate T/M
492	472	Connect K24 to Beacon #5 (inoperative)
492	472	Heater ampl. excitation
502	482	Stop calibrate
502	482	Open engine shut down circuit and switch ant.
502	482	Enable Command #5 and #6. Alternate recovery pass capability
664	644	Command $+3.55^{o}$/min pitch rate

** The dial reading of the integrator when caged is 1725 representing a velocity-to-be-gained of 13,800 ft/sec.

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
664	644	Connect roll H/S to yaw gyro
664	644	Roll accel. output grounded
664	644	Shut down +28V reg. ascent only power (paralleled)
664	644	Aux. heater on
664	644	De-energize K33, switch out 0.1% reg.
664	644	Integ. pot. ground to pitch corr. Mode (inoperative)
664	644	Flight control gain change
664	644	Integ. shut down (latch down K4, K5, K6)
890	870	Phase balance Ø A
890	870	Arm tape recorder
890	870	Phase balance Ø B
890	870	Recage integrator (inoperative)
890	870	Set K21 for pitch rate correction (inoperative)
890	870	Accelerometer power amp return
890	870	Telemetry Off
890	870	Pulse latch K7 (SS/D timer off) H/S to low gain
890	870	Open integ. recage (inoperative)
890	870	Arm SS/D timer for recovery phase
890	870	Stop integrator caging (inoperative)
890	870	Spare
*X	870	Pulse latch K7, K14, K17, K18 (SS/D timer on H/S off)
X + 15	885	Command -45°/min pitch rate
X + 15	885	Fire payload battery heater squibs

* Time of initiation of recovery phase

Table A5-1 (Continued)

TIME (SEC)		SIGNAL CONTROL FUNCTION
Nominal Time From Launch	Computer Running Time	
X + 18	888	Arm Capsule ejection (squib)
X + 92	962	Command 3.55°/min pitch rate
X + 92	962	SS/L Transfer Circuit #1
X + 92	962	SS/L Transfer Circuit #2
X + 92	962	Disconnect capsule from electrical P.S.
X + 93.5	963.5	Shut down SS/D timer
X + 93.5	963.5	Command eject (paralleled)

Table A6-1

NOMINAL ORBIT SCHEDULE: DISCOVERER SERIAL NO. 2205-1055

(Based on a 93.5 Minute Period)

Phase	Event	Time T (min)	Location N Latitude (deg)
Launch	Launch	0	34.8
	Separation	2.98 (179 sec)	- - -
	Start orbital timer	2.98 (179 sec)	- - -
	Nominal fire time	4.5 (270 sec)	- - -
	Nominal burnout and orbit injection	6.43 (385.9 sec)	- - -
	First crossing of equator	12.3 (736 sec)	- - -
	Beacon and T/M off	15.2 (913 sec)	12 (S)
Pass 1 (N-S)	Beacon and T/M on	83.3	79
	Reset enable	87.0	74
	Acquire [redacted]	87.3	72.7
	65°N latitude (ref.)	89.3	65
	Reset signal/command	90.9	60
	57.6°N latitude (ref.) [redacted]	91.5	57.6
	Reset disable	102.8	12
	Beacon and T/M off	103.3	10
	End of orbit 1	152.2	0 (S)
Pass 2 (N-S)	Beacon and T/M on	178.3	79
	Reset enable	180.4	74
	Acquire [redacted]	182.8	65.7
	Reset signal/command	184.4	60
	57.6°N latitude (ref) [redacted]	184.9	57.6
	Acquire [redacted]	191.2	32.3
	21.6°N latitude (ref.) [redacted]	193.9	21.6
	Beacon and T/M off	195.4	16
	Beacon and T/M on	195.9	14
	Reset disable	196.3	12
	Beacon and T/M off	197.3	8
	End of orbit 2	245.6	0 (S)

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 3 thru 7	End of orbit 3	339.1	0 (S)
	End of orbit 4	432.5	0 (S)
	End of orbit 5	526.1	0 (S)
	End of orbit 6	619.6	0 (S)
	End of orbit 7	713.	0 (S)
Pass 8 (S-N)	Beacon and T/M on	718.3	14
	Reset enable	718.9	16
	Acquire [redacted]	717.7	12.7
	Reset signal/command	722.8	30
	34.8°N latitude(ref [redacted]	723.8	34.8
	Beacon and T/M off	726.6	44
	Beacon and T/M on	727.1	46
	Reset disable	728.2	50
	Beacon and T/M off	728.8	52
	End of Orbit 8	806.5	0 (S)
Pass 9 (S-N)	Beacon and T/M on	810.1	8
	Reset en[redacted]	812.1	16
	Acquire [redacted]	811.1	12.3
	Acquire [redacted]	811.7	14.7
	21.6°N latitude(ref [redacted]	813.8	21.6
	Reset si[redacted]/command	816.1	30
	Acquire [redacted]	818.9	40.2
	57.6°N latitude(ref [redacted]	823.6	57.6
	Beacon and T/M off	824.5	60
	Beacon and T/M on	825	62
	Reset disable	827.3	70
	Beacon and T/M off	829.3	76
	End of orbit 9	900.0	0 (S)
Pass 10 (S-N)	Acquire [redacted]	900.4	2.7
	Beacon and T/M on	903.6	8
	Reset enable	904.4	11
	21.6°N latitude(ref [redacted]	907.3	21.6
	Reset si[redacted]/command	908.3	25
	Acquire [redacted]	910.9	35

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 10 (S-N) (Cont'd)	57.6°N latitude(ref[redacted]	916.8	57.6
	Beacon and T/M off	918	60
	Beacon and T/M on	918.5	62
	Reset disable	920.8	70
	Beacon and T/M off	922.8	76
	End of orbit 10	993.5	0 (S)
Passes 11 thru 13	End of orbit 11	1087.0	0 (S)
	End of orbit 12	1180.4	0 (S)
	End of orbit 13	1273.9	0 (S)
Pass 14 (N-S)	Beacon and T/M on	1301.6	76
	Reset enable	1302.3	74
	Reset signal/command[redacted]	1306.2	60
	57.6°N latitude(ref[redacted]	1306.8	57.6
	Reset disable	1307.7	54.0
	Reset enable	1309.7	46.0
	34.8°N latitude(ref[redacted]	1312.3	34.8
	Reset signal/command[redacted]	1313.7	30
	Reset disable	1316.2	20
	Beacon and T/M off	1316.7	18
	End of orbit 14	1367.4	0 (S)
Pass 15 (N-S)	Beacon and T/M on	1395	76
	Reset en[redacted]ble	1395.9	74
	Acquire [redacted]	1396.2	73.5
	Reset si[redacted]/command[redacted]	1399.7	60
	57.6°N latitude(ref[redacted]	1400.3	57.6
	Reset di[redacted]le	1401.2	54
	Acquire [redacted]	1402.4	48.5
	Reset enab[redacted]	1403.2	46
	34.8°N latitude(ref[redacted]	1405.8	34.8
	Reset signal/command[redacted]	1407.2	30
	Beacon and T/M off	1408.1	26
	Beacon and T/M on	1408.6	24
	Reset disable	1409.6	20
	Beacon and T/M off	1412.6	8
	End of orbit 15	1460.9	0 (S)

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 16	Beacon and T/M on	1488.5	76
	Reset enable	1489.2	74
	Acquire [redacted]	1489.3	72.7
	Reset signal/command [redacted]	1493.1	60
	57.6°N latitude (ref [redacted]	1493.8	57.6
	Acquire [redacted]	1498.9	37.3
	34.8°N latitude (ref [redacted]	1499.4	34.8
	Beacon and T/M off	1501.6	26
	Beacon and T/M on	1502.1	24
	Reset disable	1505	12
	Beacon and T/M off	1506	8
	End of orbit 16	1554.4	0 (S)
Pass 17 (N-S)	Beacon and T/M on	1582	76
	Reset enable	1582.7	74
	Acquire [redacted]	1584.2	67.6
	Reset signal/command [redacted]	1586.6	60
	57.6°N latitude (ref [redacted]	1586.8	57.6
	Acquire [redacted]	1592.8	34.2
	21.6°N latitude (ref [redacted]	1595.7	21.6
	Beacon and T/M off	1597.5	16
	Beacon and T/M on	1598.0	14
	Reset disable	1598.5	12
	Beacon and T/M off	1599.5	8
	End of orbit 17	1647.8	0 (S)
Pass 18 (N-S)	Beacon and T/M on	1675.4	76
	Reset enable	1676.2	74
	Reset Signal/command	1680.1	60
	57.6°N latitude (ref [redacted]	1680.3	57.6
	21.6°N latitude (ref [redacted]	1689.2	21.6
	Beacon and T/M off	1691.0	16
	Beacon and T/M on	1691.5	14
	Reset disable	1692.0	12
	Beacon and T/M off	1692.9	8
	End of Orbit 18	1741.3	0 (S)

Table A6-2

FIRST-PASS PROGRAMMER CORRECTION BASED ON TIME OF CROSSING

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
5340	Decrease 21 steps	5122		5230		5714		5759	
5400	Decrease 20 steps	5175		5285		5774		5819	
5460	Decrease 14 steps	5228		5340		5834		5880	
5520	Decrease 8 steps	5281		5394		5894		5940	
5580	No change	5334		5449		5954		6001	
5640	No change	5388		5503		6014		6061	
5700	Increase 8 steps	5441		5558		6074		6121	
5760	Increase 14 steps	5494		5612		6134		6182	
5820	Increase 20 steps	5547		5667		6194		6242	
5880	Increase 25 steps	5600		5722		6254		6302	
5940	Increase 31 steps	5654		5776		6313		6363	
6000	Increase 37 steps	5707		5830		6373		6423	
6060	42	5760		5885		6343		6483	
6120	48	5813		5939		6493		6544	
6180	53	5866		5994		6553		6605	

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N		57.6°N		25°N		22°N	
		T From Launch Time (sec)	T + Launch System Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)
6240	59	5919		6048		6613		6665	
6300	65	5973		6103		6673		6725	
6360	70	6026		6157		6733		6786	
6420	76	6079		6211		6792		6846	
6480	As directed	6133		6266		6852		6906	
6540	As directed	6186		6321		6912		6967	
6600	As directed	6239		6375		6972		7027	
6660	As directed	6292		6429		7032		7088	
6720	As directed	6346		6484		7092		7148	
6780	As directed	6399		6539		7152		7208	
6840	As directed	6452		6593		7212		7269	
6900	As directed	6505		6647		7272		7329	
6960	As directed	6558		6701		7332		7390	
7020	As directed	6612		6756		7392		7450	
7080	As directed	6665		6810		7452		7511	
7140	As directed	6718		6865		7512		7571	
7200	As directed	6772		6920		7572		7632	

Table A7-1

RECEIVING EQUIPMENT ASSIGNMENTS AND SETTINGS DURING RE-ENTRY AND RECOVERY PASS

LOCATION	SIGNAL	ANTENNA (GAIN)	MULTI-COUPLER	RECEIVER	BANDWIDTH (AM/FM)	MONITOR
[redacted]	VEH beacon VEH T/M	Tri-Helix (15)	Nems Clark	Motorola NC 1302 (2)	100 cps CW 300 CK (FM)	Pan adapter
	Cap beacon Cap T/M Cap T/M or beac	TLM-18 (28)	Nems Clark	NC 1302 NC 1302 NC 1401	300 KC (AM) 300 KC (FM) 100 KC (FM)	Pan adapter
Pvt. Joe E. Mann	VEH beacon VEH T/M	AFT-Tri-Helix (15)	Nems Clark	NC 1302	300 KC (AM) 300 KC (FM)	Pan adapter Audio or SS meter
	Cap beacon Cap T/M	FWD-Tri-Helix (15)	Nems Clark	NC 1302 NC 1403	300 KC (AM) 100 KC (FM)	Pan adapter SS meter or audio
Dalton Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 Pan adapter
Haiti Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 SS meter or audio
C 119	Cap beacon Cap T/M	YAGI (7)	None	NC 1302A	300 KC (AM)	FLR-2

Table A8-1

REAL TIME DATA REQUIREMENTS

	MEASUREMENT		Channel	Priority	Real Time Readout Required*	Pass	Tracking [redacted]				T/M Ship**		Note
	Name	Number					[redacted]				King [redacted]unty	Joe E. Mann	
Launch	Liftoff Signal	--	--	1	X	Ascent	X	X					
	Thor Main Engine Cutoff	--	Thor 12	1	X	Ascent	X	X					
	Agena Engine Ignition and Cutoff	B6	14	1	X	Ascent	X	X			X		
	Tone Verifications A,B,C,D	H64,65,66,67	16-2,-4,-6,-8	1	X	Ascent	X	X					
	Command Verifications 1,2,3,4	H112	11	1	X	Ascent	X	X					
	Programmer Period Readout(Console)	H110	1,2	2	X	Ascent	X	X					
	Programmer Step Readout(Console)	H108,109	16-24,-26	1	X	Ascent	X	X					
	10 Second Step Switch Position	H108	16-24	1	X	Ascent	X	X			X		
	100 Second Step Switch Position	H109	16-26	1	X	Ascent	X	X			X		
	Increase/Decrease Switch Position	H107	16-22	1	X	Ascent	X	X			X		
	Payload Function Selector Setting	AET 14/15,17/18,20/21,23/24	13-18 thru 13-24 13-48 thru 13-54	1	X	Ascent	X	X					
	Wave Train	AET 49	18	2		Ascent					X		12
	Wave Train	AET 50	8	2		Ascent					X		12
Orbit	Tone Verifications A,B,C,D	H64,65,66,67	16-2,-4,-6,-8	1	X	1 thru 16	X	X	X	X			
	Command Verifications 1,2,3,4	H112	11	1	X	1 thru 16	X	X	X	X			
	Programmer Period Readout(Console)	H110	1,2	2	X	1 thru 16	X	X	X	X			
	Programmer Step Readout (Console)	H108,109	16-24,-26	1	X	1 thru 16	X	X	X	X			
	10 Second Step Switch Position	H108	16-24	1	X	1 thru 16	X	X	X	X			
	100 Second Step Switch Position	H109	16-26	1	X	1 thru 16	X	X	X	X			
	Increase/Decrease Switch Position	H107	16-22	1	X	1 thru 16	X	X	X	X			
	Reset Monitor Signal	H70	16-10	1	X	1 thru 16	X	X	X	X			
	Re-entry Selector Switch Position	C22	16-25	1	X	1 thru 16	X	X	X	X			1
	Payload Function Selector Setting	AET 14/15,17/18,20/21,23/24	13-18 thru 13-24 13-48 thru 13-54	1	X	1 thru 16	X	X	X	X			
	Control Gas Supply Pressure	D95	12-38	2		2,10,16			X	X			
	Battery Bus Voltage	C1	16-15	3		2,10,16			X	X			
	Horizon Scanner - Pitch No. 1	D37	17-22	3		2,10,16			X	X			2
	Horizon Scanner - Roll No. 1	D39	17-26	3		2,10,16			X	X			2
	SPI Temperature	D130	15-9	3		2				X		X	3
	SPI Pitch Angle	D128	15-15	3		2				X		X	3
	SPI Yaw Angle	D127	15-17	3		2				X		X	3
	Wave Train	AET 49	18	2		1 thru 16	X		X	X			12
	Wave Train	AET 50	8	2		1 thru 16	X		X	X			12
	No Name Assigned	AET 26	12-2	2		9	X						13
	No Name Assigned	AET 32	12-5	2		9	X						13
	No Name Assigned	AET 36	12-7	2		9	X						13

Table A8-1 (Continued)

	MEASUREMENT Name	Number	Channel	Priority	Real Time Readout Required*	Pass	Tracking Station [redacted]		T/M Ship** King County	T/M Ship** Joe E. Mann	Note
Re-Entry	Programmer Period Readout (Console)	H110	1,2	3	X	Recovery Pass	X	X			
	Programmer Step Readout (Console	H108,109	16-24,-26	2	X		X	X			
	10 Second Step Switch Position	H108	16-24	2			X	X			
	100 Second Step Switch Position	H109	16-26	2			X	X			
	Reset Monitor Signal	H70	16-10	1	X		X	X			
	Re-entry Selector Switch Position	C22	16-25	1	X		X	X			1
	Battery Bus Voltage	C1	16-15	3			X	X			
	Horizon Scanner - Pitch No. 1	D37	17-22	3				X			2
	Horizon Scanner - Roll No. 1	D39	17-26	3				X			2
	SPI Temperature	D130	15-9	3				X		X	4
	SPI Pitch Angle	D128	15-15	3				X		X	4
	SPI Yaw Angle	D127	15-17	3				X		X	4
	Pitch Programmer	D41	17-20	1	X		X	X		X	5
	SS/D Timer Restart	D85	12-54	1	X		X	X		X	
	Capsule Separation Event	AET 51	16-21	1	X		X	X		X	6
	Payload Connector Disconnect	AET 26	12-2	2	X		X	X		X	7
	Payload Connector Disconnect	AET 28	12-3	2	X		X	X		X	7
	Payload Connector Disconnect	AET 30	12-4	2	X		X	X		X	7
	No Name Assigned	AET 35	12-19	1	X		X	X		X	8
	Spin Rocket 1 Ign., Spin Rocket 2 Ign., Retro-Rocket Ign., Despin Rocket 2 Ign., Electrical Disconnect/Thrust Cone Separation	--	Capsule 7	1	X		X	X		X	9
	Thrust Cone Thermal Battery Voltage, Despin Rocket 1 Ign., Electrical Disconnect/Thrust Cone Separation	--	Capsule 8	1	X		X	X		X	9
	Longitudinal Acceleration	--	Capsule 11	1	X		X	X		X	10
	5G Switch Closure, Parachute Cover Off, Cutters, Parachute Deployed, Ablative Shell Off	--	Capsule 7	1	X		X	X		X	9
	Thermal Battery 2 A8 Voltage, Timer Switch Closure	--	Capsule 8	1	X		X	X		X	9
	Capsule T/M Signal Strength	--	Capsule 7,8,11	2		Recovery Pass	X	X		X	11

NOTES:

1 Reads 1 volt for normal Pass 17 Re-entry, 4 volts for alternate re-entry.

2 Record at least 2 points at approximately 5-second intervals to determine the degree of attitude stabilization. Record system time at turnoff on Pass 17.

3 Record 3 times at approximately 2-minute intervals. Correlate with system time.

4 Record at 1-minute intervals before reorientation, 20-second intervals during reorientation and immediately after separation.

5 Record at start and finish of reorientation. [redacted] records at acquisition to determine vehicle attitude at separation. Correlate with system time and estim[redacted] accuracy of pitch programmer readout.

6 Reads 4.67 volts prior to separation, 1.33 volts after separation. Correlation within 2 seconds of exact system time is satisfactory for initial report.

7 Reads 1 volt prior to separation, out of band after separation.

8 Reads 4 volts prior to retro-rocket ignition, 1 volt after retro-rocket ignition.

9 Figure A8-1 presents nominal voltage levels. The verbal report will contain general comments on the sequence. The performance summary will contain the sequence of events to the nearest second of system time.

10 The verbal report will contain the system time of initiation, average value, and duration. The performance summary will contain readings every half second during the retro-burning period.

11 Provide a qualitative evaluation of signal reception.

12 A qualitative comparison with the wave train forms in Figure A8-2 with the system times of initiation and termination of the series of pulses is required.

13 Record voltage level at beginning, middle, and end of pass. Readout is to be accurate to at least 0.1 volt (2% bandwidth).

---

* Measurements to be read in real time and reported to the STC by voice are checked. Other measurements may be read after the pass. All data listed are to be reported to the STC by 60-wpm teletype as soon as possible.

** T/M ships will transmit real-time data immediately after signal fade so no interference with the vehicle telemetry signal will be generated.

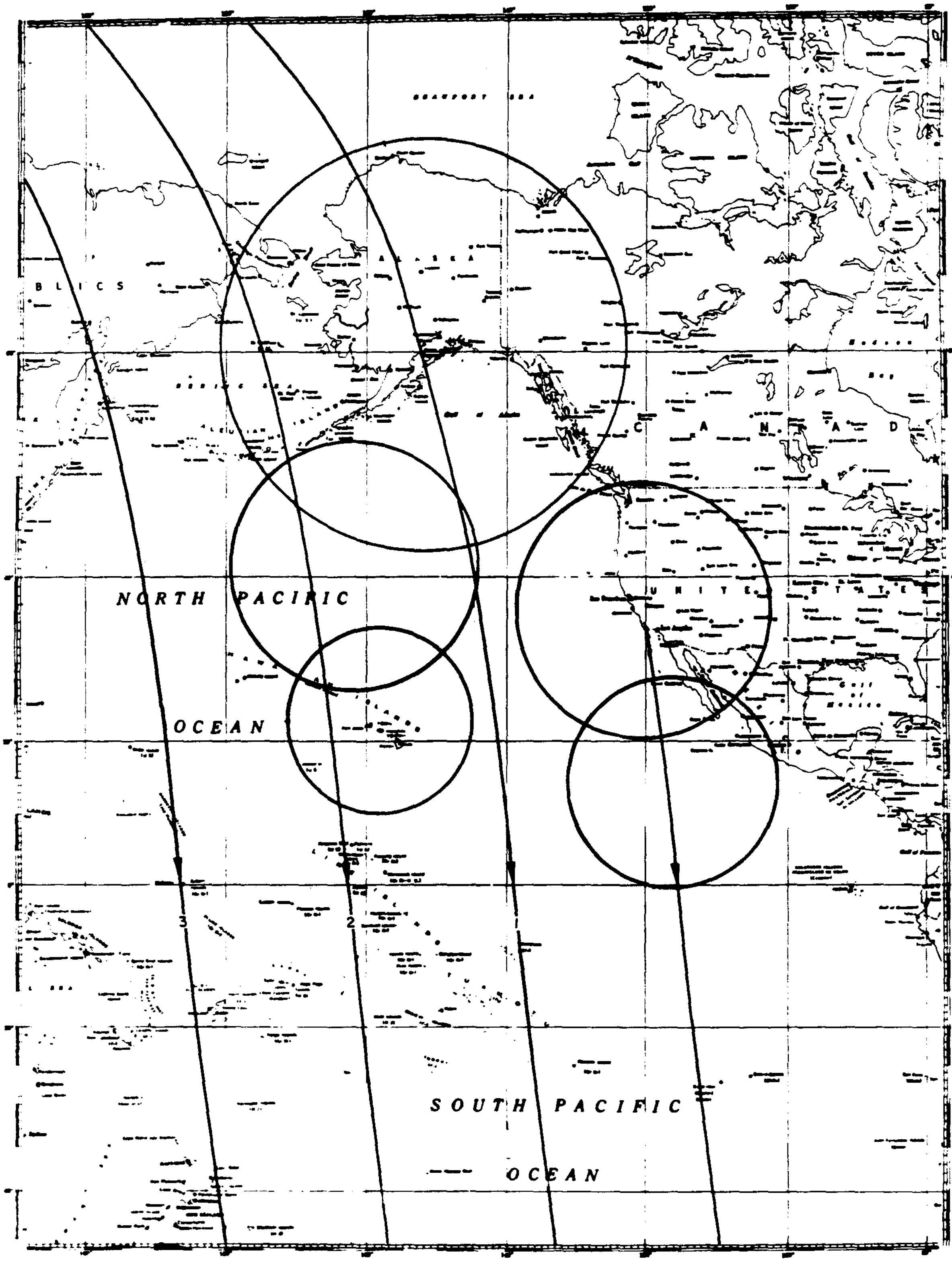


Figure A2-1 Nominal Orbit Traces - Passes 1 Through 3

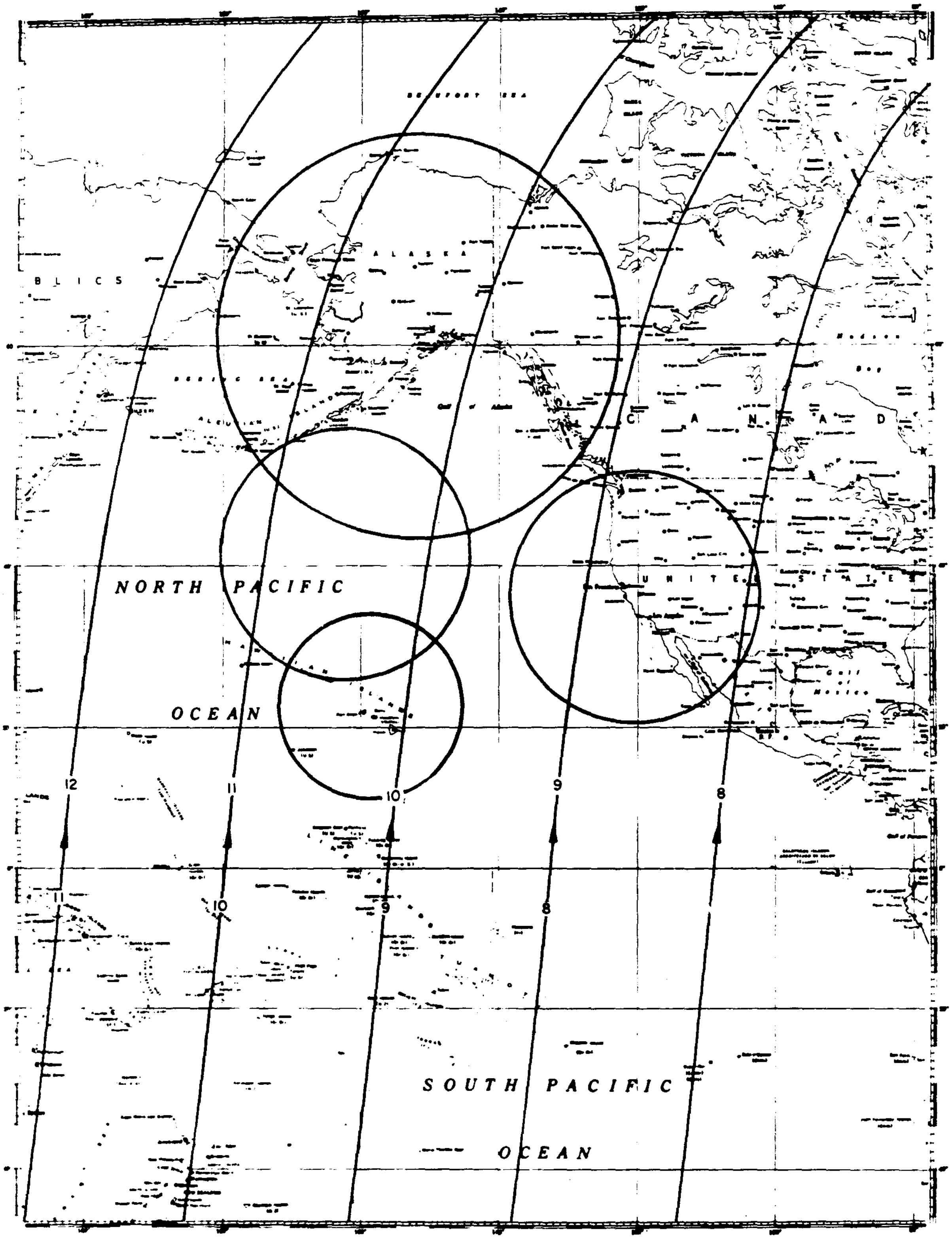


Figure A2-2 Nominal Orbit Traces - Passes 8 Through 12

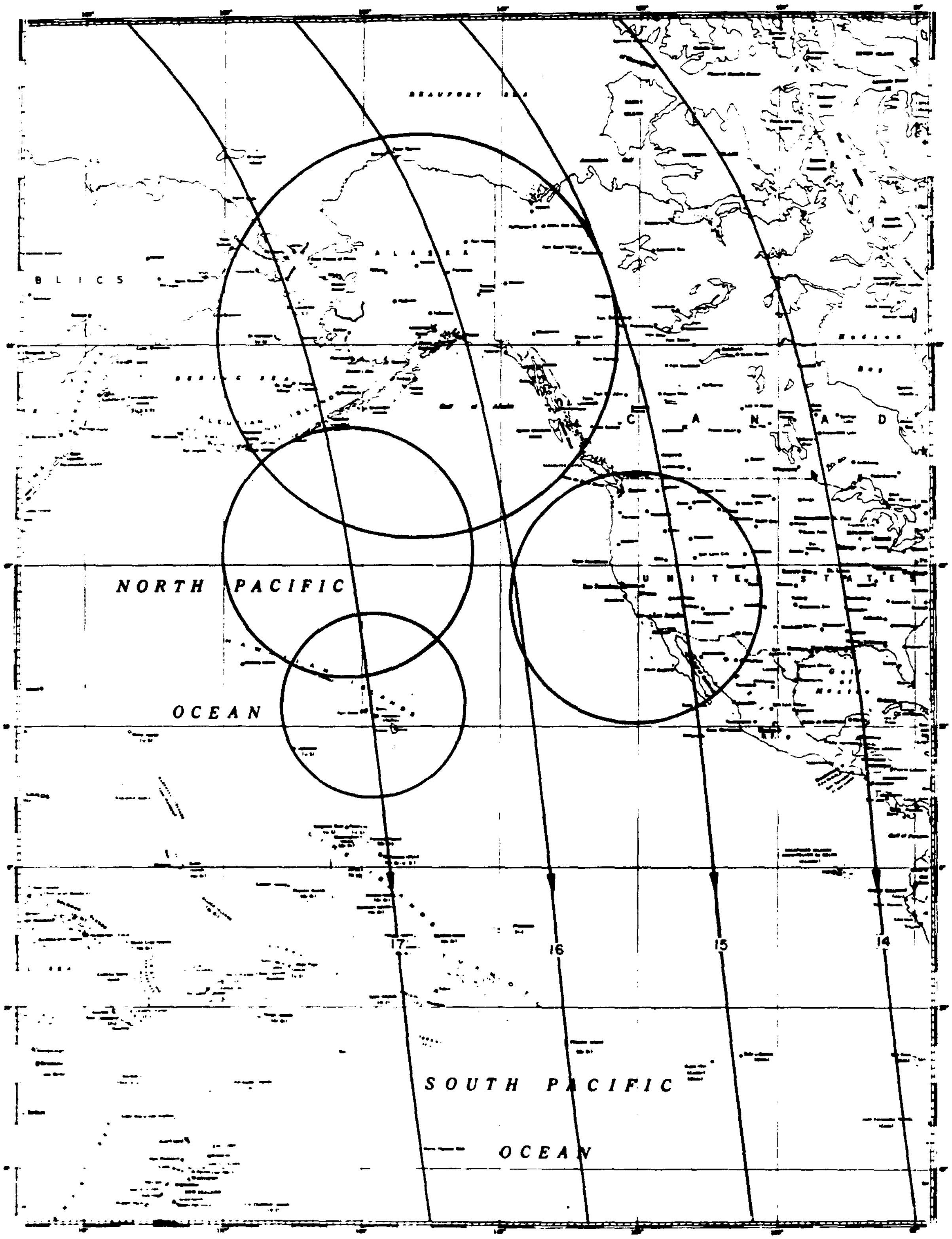
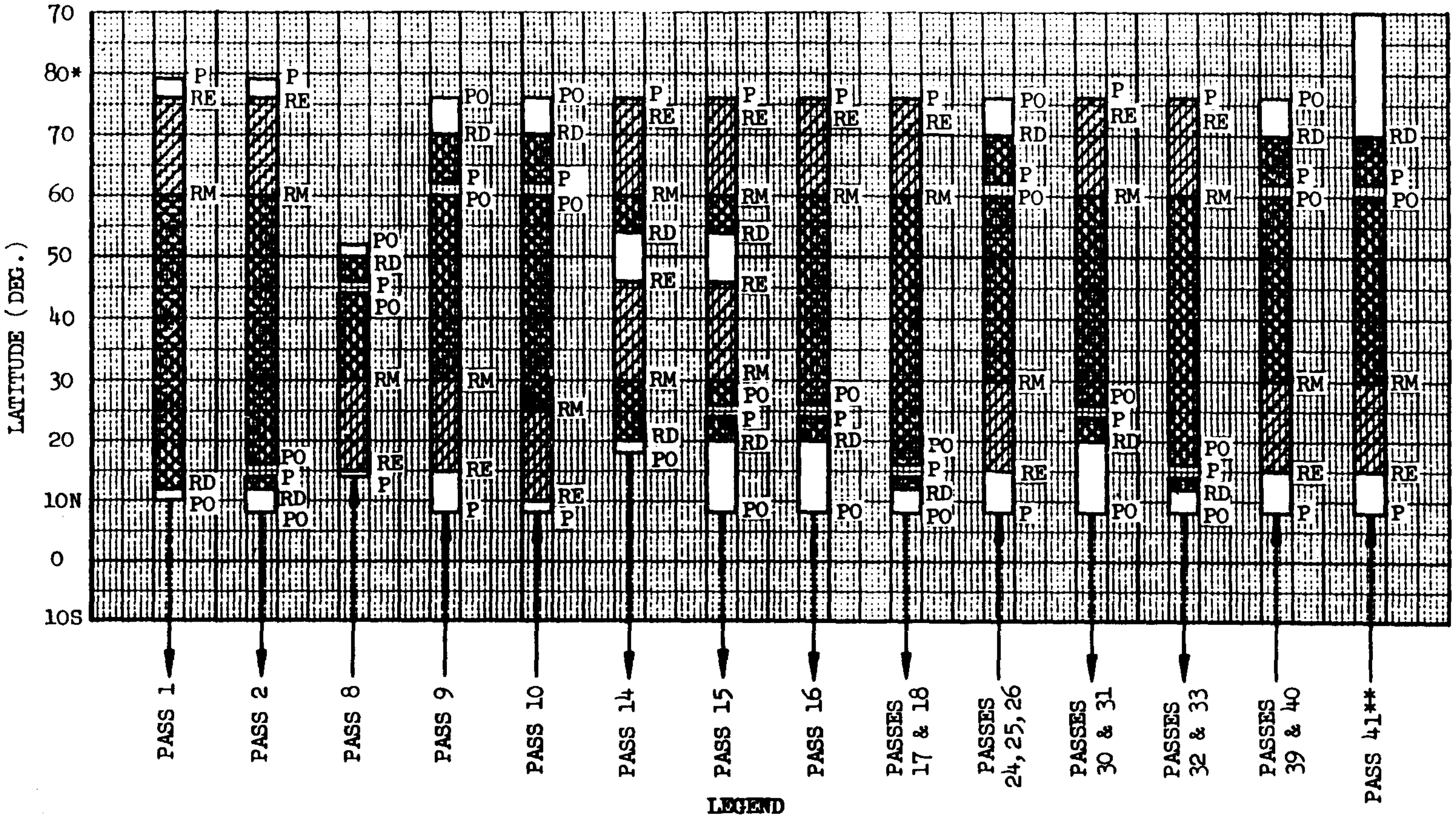


Figure A2-3 Nominal Orbit Traces - Passes 14 Through 17



LEGEND

P PLATES ON
RE RESET ENABLE
RM RESET MONITOR SIGNAL
RD RESET DISABLE
PO PLATES OFF
* REPRESENTS EAST LONGITUDE LOCATION (MAXIMUM LATITUDE REACHED WITH THIS ORBIT-PLANE INCLINATION IS APPROXIMATELY 79.9° N. Latitude)

** BEACON AND TELEMETRY REMAIN ON FROM PASS 40 ON

NO RESET CAPABILITY
RESET COMMAND CAPABILITY
RESET MONITOR SIGNAL ON

Figure A2-4 Readout and Reset Programming

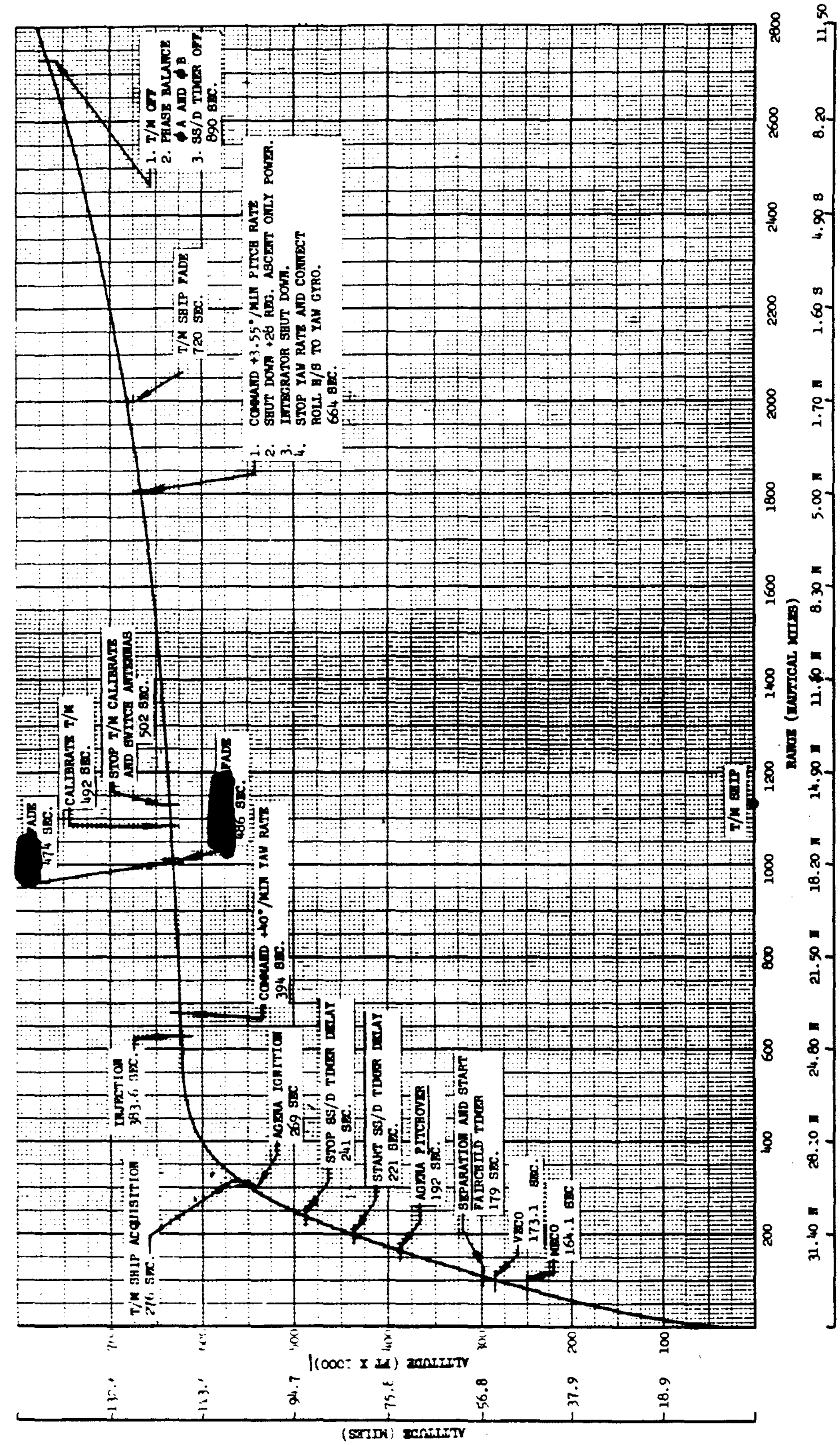


Figure A2-5 Launch Phase Nominal Time-Events Versus Location

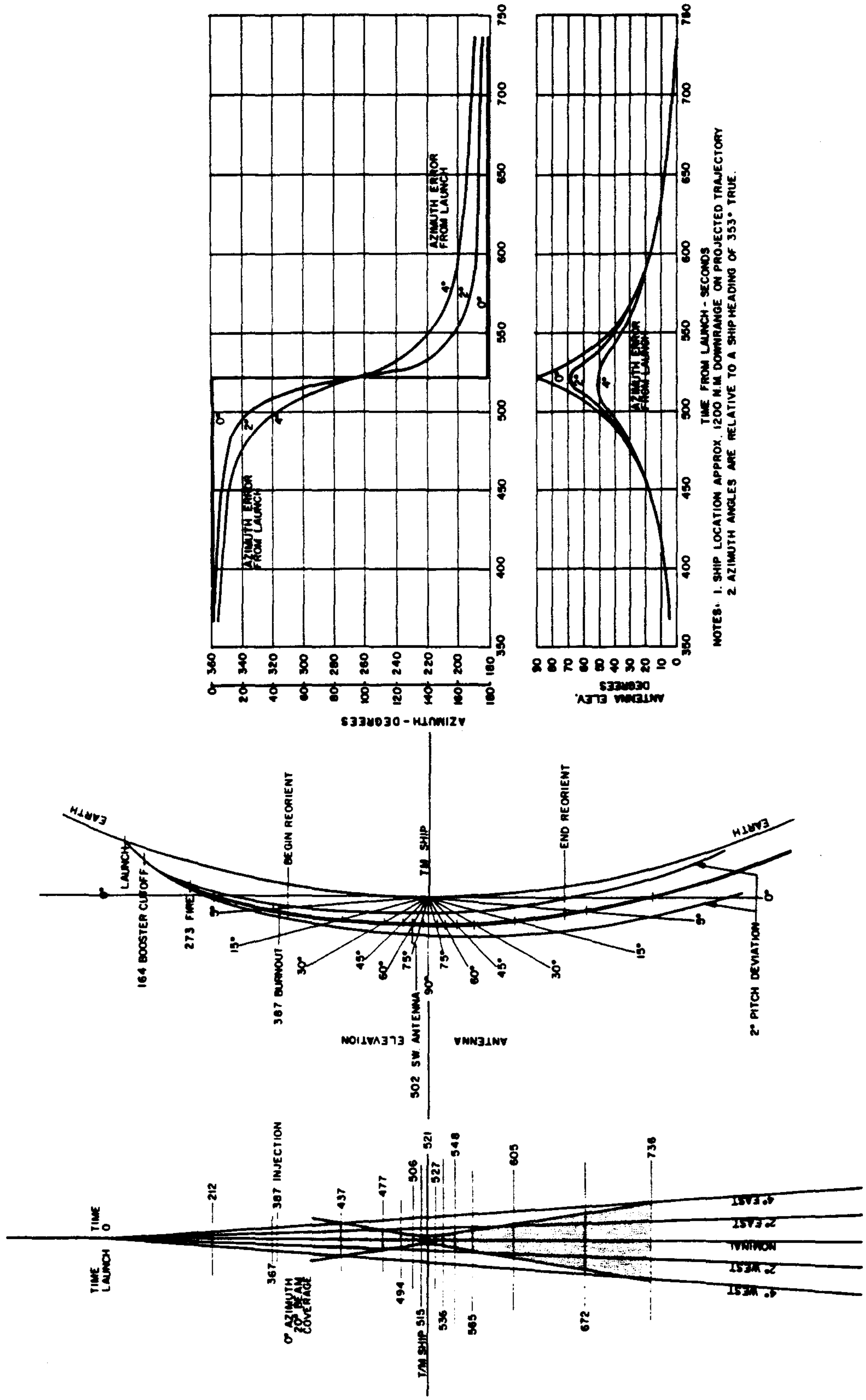


Figure A5-1 T/M Ship Antenna Positioning

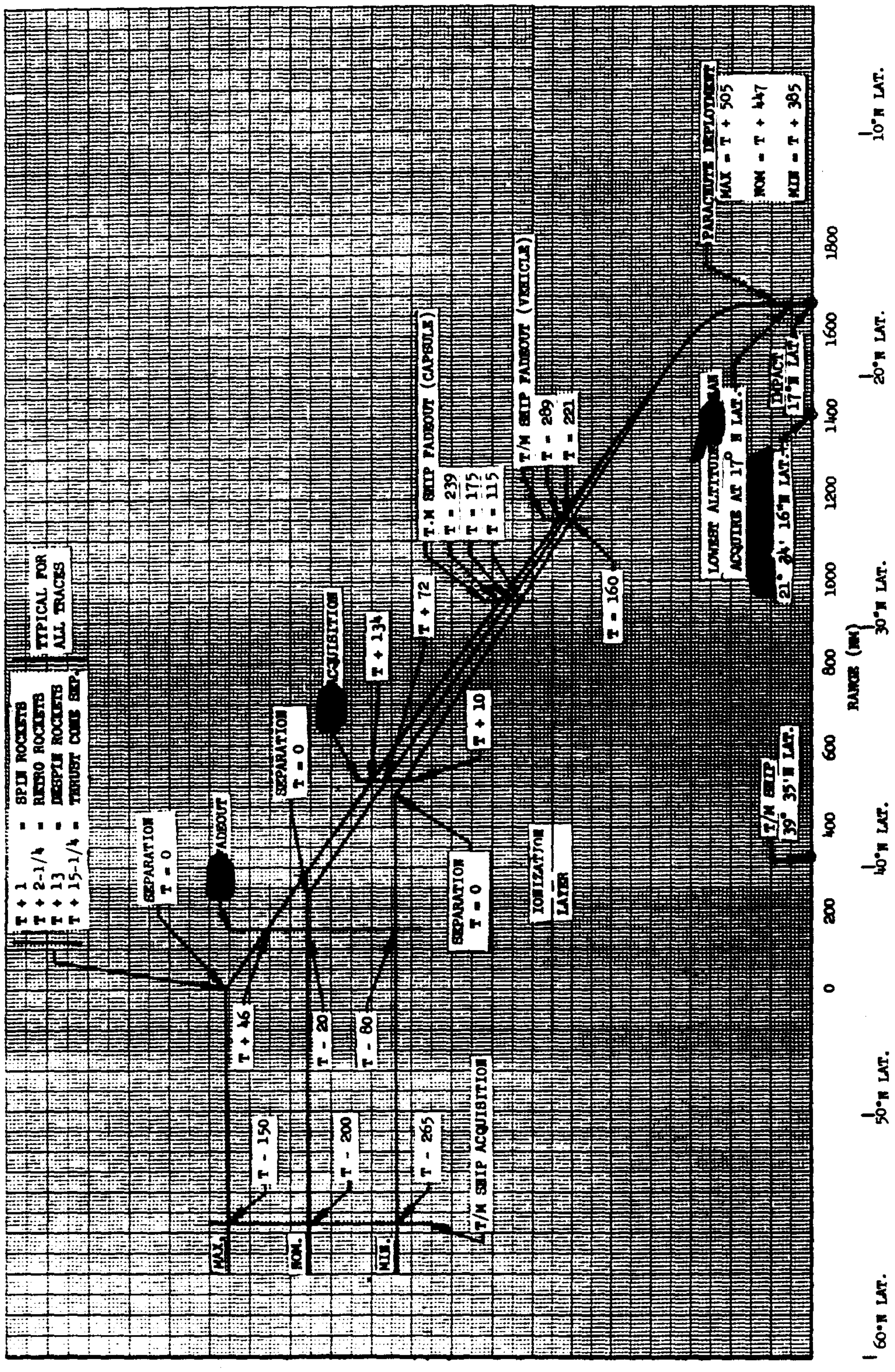
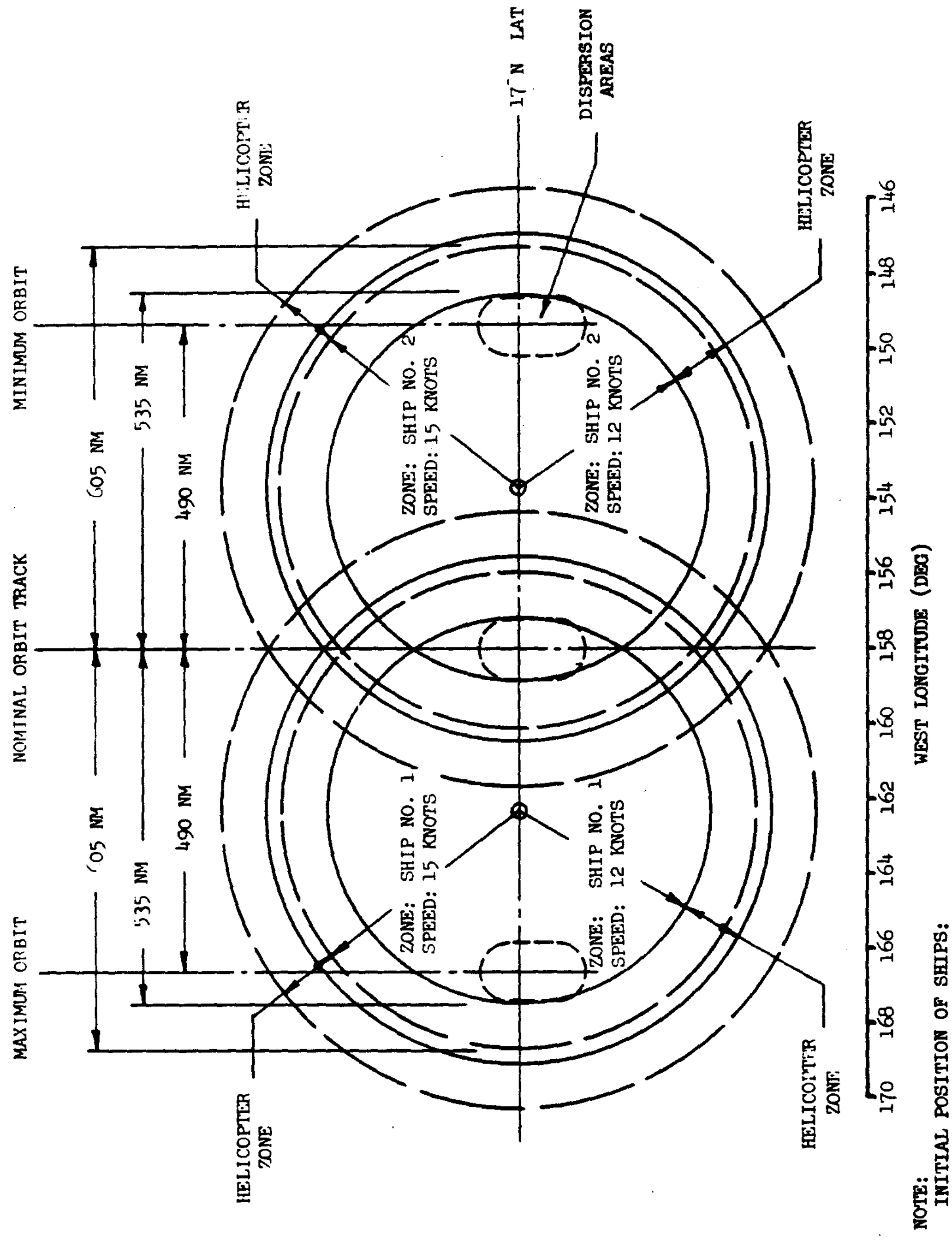


Figure A7-1 Re-Entry Trajectory



NOTE:
INITIAL POSITION OF SHIPS:
SHIP NO. 1 AT 162° 15' W LONG.
SHIP NO. 2 AT 153° 45' W LONG.
SHIP RANGE IN 24 HR:
AT 15 KNOTS: 360 NM
AT 12 KNOTS: 288 NM

Figure A7-2 Surface Ship Deployment

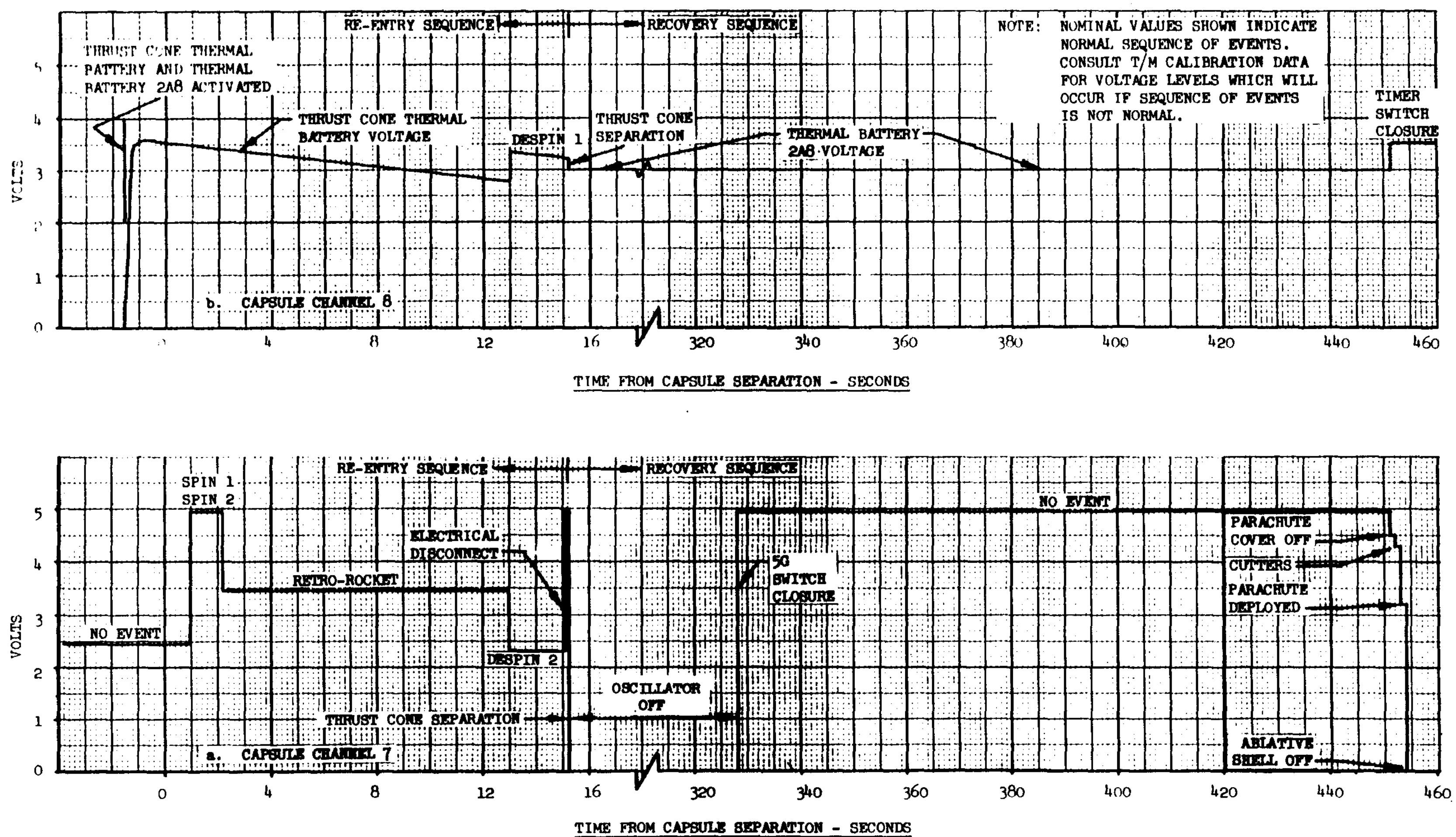
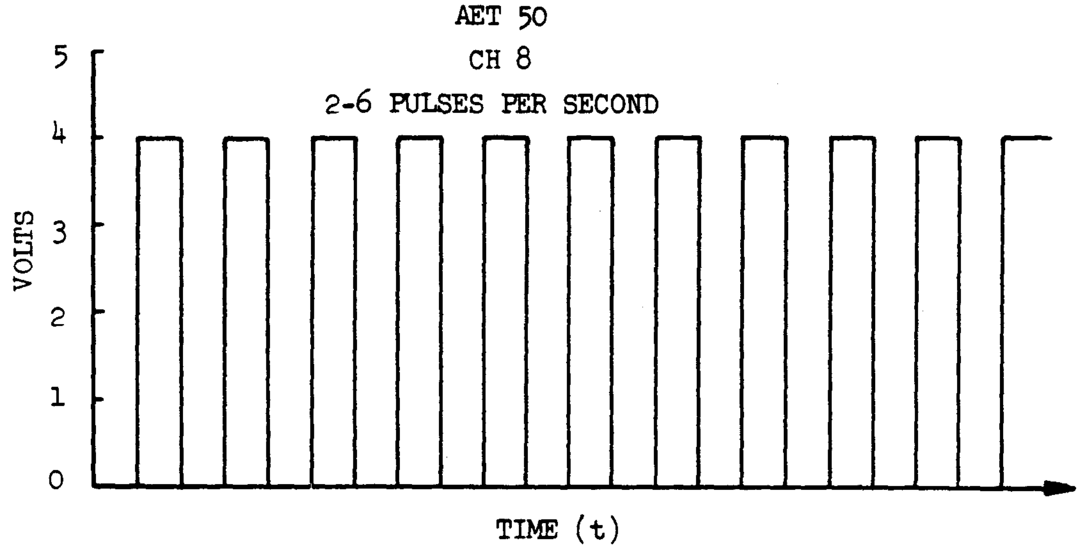


Figure A8-1 Nominal Capsule Telemetry Voltage Levels



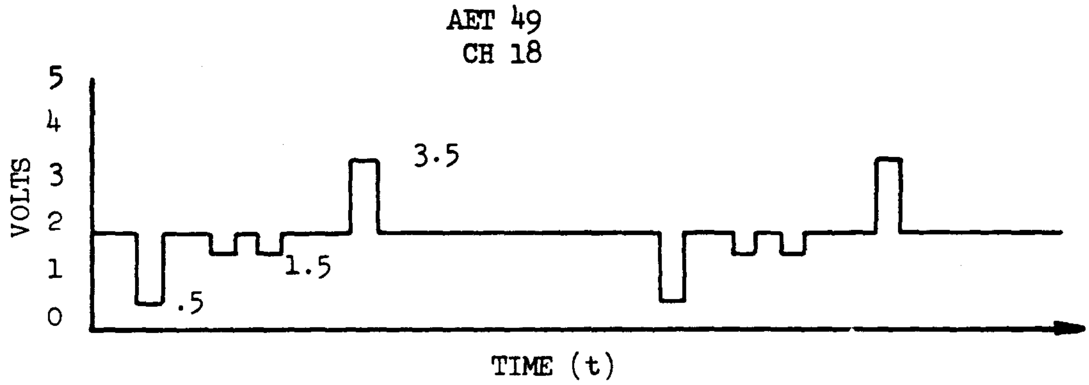


Figure A8-2 Nominal Payload Function Wave Trains

Notice of Page Substitution

Tab 5 - Appendix A
Vehicle 1056/Booster 237

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

[redacted]
1056/237
Revised Page
1 August 1960

DISCOVERER

SYSTEM TEST DIRECTIVE

TAB 5 - APPENDIX A

FOR

DISCOVERER SATELLITE 1056

DISCOVERER BOOSTER 237
(AET PAYLOAD)

This document has been prepared by Systems Operations Planning, D/61-41.

Approved: [redacted] /Manager
Systems Operations
Satellite Systems

Approved: [redacted]
Colonel, USAF
Chairman
System Test Working Group

APPENDIX A, TAB 5
SUPPLEMENTAL TEST INFORMATION

CONTENTS

TABLES

ILLUSTRATIONS

FOREWORD

The basic System Test Directive [redacted] purposely omits variable flight-to-flight data but contains information of a permanent nature applicable to all flights of the initial Discoverer series. Detailed data and directives are presented in this Appendix A tab for the Discoverer Satellite 1056/Discoverer Booster 237/AET Payload combination and are applicable to this configuration only.

Due to major operational changes, this Tab 5 of Appendix A supersedes the Tab 5 of Appendix A previously published and dated 4 April 1960. Engineering and procedural changes pertinent to this flight are as follows:

a. An AET payload will be installed.

b. The capsule nominal impact latitude is 24° N.

c. The Recovery Force deployment is revised. Primary emphasis on air retrieval has been retained in the 60 nm x 200 nm nominal impact area.

d. WV-2 Aircraft No. 13789 will be stationed north of Hawaii to record recovery capsule separation events.

e. Telemetry receiving facilities established at Christmas Island, South Point, Hawaii, and Barking Sands, Kauai, will be retained to aid in the recovery operation.

f. JC-54 telemetry receiving aircraft, if available, will be stationed south of the primary recovery area to aid in the recovery operation.

g. The RC-121 aircraft and the Hawaii Control Center will be equipped with single sideband radio equipment.

h. HCC-STC communications during the recovery operations will be augmented by the addition of two voice lines (toll telephone).

i. A JHU/APL Doppler transmitter and an optical beacon will be carried for conduct of the Precision Tracking System experiment.

APPENDIX A
SUPPLEMENTAL TEST INFORMATION

A1 INTRODUCTION

This section contains descriptive material which supplements the general text of the STD for this flight only. Material presented herein, which may conflict with information and/or procedures in the general text, has precedence due to operations peculiar to the mission of Discoverer Satellite 1056. Reference will not be made to this Appendix for subsequent flight operations.

A2 CONFIGURATION

A2.1 Discoverer Satellite

A2.1.1 A JHU/APL Doppler transmitter and an optical beacon will be carried for conduct of the Precision Tracking System experiment. The transmitter will operate continuously on 162 and 216 mc.

A2.1.2 A vehicle instrumentation list is included in the [redacted]

A2.2 Recovery Capsule

A2.2.1 An AET payload will be carried in the recovery capsule.

A2.2.2 A 1.2-watt telemetry transmitter in the recovery capsule will transmit information on the operation of capsule components. Telemetry channels 7, 8, and 11 will be used.

A2.3 Ground Stations

A2.3.1 The [redacted] is provided with a panadapter to aid in the acquisition of the AM capsule beacon transmitter signal and subsequent determination of the frequency deviation from nominal.

A2.3.2 Additional telemetry receiving equipment is installed at the PMR facility at South Point, Hawaii, to augment that station's telemetry acquisition and tracking capability. The PMR 60-ft antenna at South Point will be used for triangulation on the descending capsule. A quad-helix antenna is also installed for this operation with additional telemetry receivers since the 60-ft antenna does not have automatic tracking and has a narrow beam width.

A2.3.3 The PMR telemetry receiving and recording facility at Barking Sands, Kauai, will be used.

A2.3.4 The telemetry receiving station installed on Christmas Island will be used to extend the capsule detection and telemetry reception range below the equator. The Christmas Island facility has a quad-helix antenna, three Nems-Clarke 1302-A telemetry receivers, a timing system, recorders, and UHF, HF, and SSB communication equipment.

A2.4 Separation Sequence Telemetry Coverage

A2.4.1 [redacted] will probably record the separation sequence telemetry but the quality of the data received may be reduced because of the distance between the satellite and the [redacted] and the lower power transmitter. Therefore, the WV-2 telemetry aircraft No. 137890 will be used to provide assurance that satisfactory separation sequence telemetry data are obtained.

A2.4.2 The WV-2 telemetry aircraft No. 137890 is expected to be ready on or shortly after 1 August 1960. This aircraft will be equipped to perform this specific mission on Discoverer XIV and on future Discoverer flights.

A3 LAUNCH OPERATIONS

A3.1 Launch Criteria

With the exception of Paragraph 4.3.8, the launch criteria listed in Paragraph 4.3 of the basic STD are applicable for this flight operation. Paragraph 4.3.8 is revised so that the following minimum Recovery Force units with all search and recovery equipment operable will be met:

a. Four RC-121 radar aircraft
b. Eight C-119J recovery aircraft
c. Two surface ships.

A3.2 Launch Time

A3.2.1 In order to obtain adequate data from the sun position indicators, the time of launch will be between 1230 PDT and 1600 PDT.

A3.2.2 In order to obtain data with increased accuracy from the sun position indicators, the preferred time of launch is between 1300 PDT and 1500 PDT.

A3.2.3 A -5° yaw maneuver immediately following separation will be accomplished on this flight. This will be done to align the Discoverer Satellite with the Discoverer vehicle coast velocity vector to increase the resultant velocity at satellite burnout.

A4 ORBIT OPERATIONS

A4.1 Precision Tracking System Experiment

A4.1.1 The JHU/APL Doppler transmitter installed for evaluation purposes will operate continuously on 162 and 216 mc and may be used as an acquisition aid in the event the CWAT becomes inoperative. LMSD tracking stations will receive the signals on all passes except the recovery pass to verify that the transmitter is operative; no attempt will be made to record intelligible data. APL Doppler tracking stations will receive the beacon signals and record Doppler data on teletype tape for post-flight evaluation.

A4.1.2 The optical beacon will be turned on by the orbital programmer while the satellite is within reception range of Smithsonian stations equipped with Baker-Nunn cameras.

A4.2 Alternate Re-entry Selector

The alternate re-entry selector will function as described in Paragraph 6.4.7. However, the area between 64° and 48° N latitude should be avoided when transmitting alternate re-entry selector commands on Passes 15, 16, or 17 instead of the 55° to 40° N latitude range previously used.

A4.3 Recovery Force Tracking on Pass 2

All land and surface telemetry stations participating in recovery operations [redacted] Christmas Island, South Point, Barking Sands, Haiti Victory, and Dalton Victory) will track the satellite telemetry signal during Pass 2 and will report the following data to the HCC for correlation:

a. Time of acquisition
b. Signal direction (azimuth and elevation at acquisition, at one minute intervals, and at fade)
c. Strength of signal
d. Signal deviation from nominal frequency
e. Time of signal fade.

A5 RECOVERY OPERATIONS

A5.1 General

A5.1.1 The tracking stations will track the Discoverer Satellite two passes preceding the recovery pass and transmit the tracking data to PAC. The computer will calculate the correct time for transmission of the reset command on the pass preceding the recovery pass to provide a vernier time adjustment for the recovery sequence. The [redacted] Tracking Station will then transmit the reset command on the pass preceding the recovery pass in accordance with instructions received from the STC and will report the time of transmission of this command as well as the verification of receipt. Receipt of a proper reset command on the pass preceding the recovery pass by the satellite will result in final adjustment of the orbital programmer so the recovery sequence will be initiated at the proper time.

A5.1.2 Capsule separation will occur at approximately 49.6° N latitude and the nominal impact point will be 24° N latitude and 158° 48.7' W longitude. This nominal impact point was established to provide [redacted] telemetry coverage of the parachute deployment sequence at the nominal latitude for all orbit periods within one minute of nominal.

A5.1.3 The surface and airborne Recovery Force will be deployed to cover an extended area. In general, six C-119J and two RC-121 aircraft, and one Victory ship will be deployed in the primary recovery area; the other Victory ship, two or three C-119J's, two RC-121's, and five telemetry aircraft will be deployed to provide capsule detecting and telemetry receiving capabilities in the extended recovery area. A telemetry receiving station is installed on Christmas Island in the extended recovery area. Figure A7-3 shows the deployment of the Recovery Force for the nominal period and for periods varying 1-1/2 minutes from nominal.

A5.1.4 Telemetered data on the recovery pass are to be observed by the [redacted] and [redacted] Tracking Stations for indications of separation and reentry. The data to be observed are listed in Table A8-1. Some of these data will be reported to the STC by voice and all data listed will be transmitted to the STC by 60-wpm teletype following the pass to assist the HCC in the recovery operation.

A5.1.5 The following information is required from the elements of the Recovery Force and participating land facilities by the HCC if a signal from the capsule is acquired on the recovery pass: signal source, time of acquisition, signal direction (azimuth and elevation at acquisition, at one-minute intervals, and at fade), strength of signal, signal deviation from nominal frequency, time of signal fade, and visual sighting information. The Victory ships will also report the deployment and the status of their helicopters.

A5.1.6 The real-time data readouts and other references to the separation sequence of events or the recovery sequence of events will be identified by using the appropriate code word for separation or recovery, followed by the event numbers as specified in [redacted]

A5.1.7 The capsule beacon transmitter and flashing light will continue to operate for 20 hours. An errodable salt plug will permit the capsule to float for 40 hours.

A5.2 Recovery Capsule Sequence of Events and Instrumentation

A.5.2.1 The recovery phase of operations will commence within [redacted] telemetry range on the recovery pass when the orbital programmer restarts the SS/D timer. Significant events which will occur during the capsule separation, re-entry, and recovery sequences are listed in the following paragraphs with T = 0 defined as the time of capsule/Agena mechanical separation.

A5.2.1.1 Capsule Separation Sequence

Time	Signal Source	Event
T - 94.5 sec	Orbital Programmer	1. Restart SS/D timer
		2. Telemetry battery activated
		3. Capsule telemetry filaments "on"

Time	Signal Source	Event
T - 79.5 sec	SS/D Timer (arm signal)	1. Capsule telemetry plates "on" 2. Ignite thermal relays to arm thrust cone programmer 3. Capsule beacon "on" 4. Command - 45°/min pitch rate
T - 2.5 sec	SS/D Timer (transfer signal)	1. Command + 3.55°/min pitch rate 2. Ignite electrical disconnect delay pyro (delay tolerance 500 to 1320 milliseconds) 3. Ignite thrust cone programmer thermal batteries 4. Ignite recovery system thermal battery 2A8 5. Ignite pyro switches 2A4A2S1 and S2 to arm thermal battery 2A7BT-1
T - 1.5 sec	Electrical Disconnect Pyro Fires	1. Capsule/satellite cable disconnected 2. Thrust cone programmer started (ground loop lifted)
T - 0 sec	SS/D Timer (separation signal)	1. Pin-puller squibs ignited (0 to 7 milliseconds delay) 2. Four springs push off capsule to about 1.7 ft/sec
T + 1.9 sec	Thrust Cone Programmer Event 1	1. Spin valve actuated, capsule spins up to about 60 rpm in 0.8 sec
T + 3.15 sec	Thrust Cone Programmer Event 2	1. Retro-rocket ignited, capsule receives approximately 4-_g acceleration for approximately 9 sec

Time	Signal Source	Event
T + 13.9 sec	Thrust Cone Programmer Event 3	1. De-spin valve actuated, capsule de-spins to about 10 rpm
T + 15.4 sec	Thrust Cone Programmer Event 4	1. Ignite electrical disconnect and explosive separation bolts.

A5.2.1.2 Capsule Re-entry Sequence

Time	Approximate Altitude	Event
T + 235	350,000 ft	1. Ionization layer entered; RF blackout begins
T + 344 sec	186,000 ft	1. 5-g switch closes, permitting battery 2A8 to ignite thermal battery BT-1, which in turn fires: (a) Dimple motors to start mechanical timer (b) Pyro switches to allow 28v from thermal battery 2A8 to feed the timer switch, removes squib of thermal battery 2A7BT1 from thermal battery 2A8, and arms thermal batteries 2A7BT2 and 2A7BT3.
T + 393 sec	120,000 ft	1. Leave ionization layer; RF blackout ends.

A5.2.1.3 Capsule Recovery Sequence

Time	Approximate Altitude	Event
T + 470 sec (5-g switch closure + 126 sec ± 2 sec)	55,000 ft	1. Battery 2A8 ignites thermal batteries 2A7BT2 and BT3, and delay pyro switches 2A4A1S1 and S2 (1 sec delay)

Time	Approximate Altitude	Event
		2. The delay pyro switches disconnect their own squibs, the squibs of the thermal batteries, unshort the squibs of pyro switches 2A4A1S3 and S4, and unshort the chute cover ejection pistons
		3. The action of switches S1 and S2 also permits batteries BT2 and 3 to ignite the ejection pistons and pyro switches 2A4A1S3 and S4
		4. The ejection pistons blow off the chute cover, which pulls out the pilot chute, which in turn pulls out the main chute bag; the main chute bag brings out the chute in a reefed condition
		5. Time delay pyrotechnic cutter disreefs the main chute and permits deployment (4 sec)
		6. As the chute system decelerates the capsule, the ablative shell, released from the capsule when the ejection pistons fired, falls clear of the capsule
		7. Actuation of pyro switches S3 and S4 apply +12v (from batteries contained in the capsule beacon) to the light beacon
		8. Radar reflective chaff, packed with the chute, falls free as the chute emerges from its bag.

A5. 2. 2 Recovery capsule telemetry Channels 7, 8, and 11 will be used to obtain capsule performance information. Channels 7 and 8 will measure one set of events during the separation sequence and another set of events during the recovery sequence. The oscillator inputs will be switched when the thrust cone is separated. Channel 11 will measure axial acceleration during both the separation sequence and the recovery sequence. The sub-carrier for Channel 7 will be turned off after thrust cone separation and will be turned on again at 5-g switch closure. Channels 8 and 11 will transmit data continuously throughout the descent trajectory. Figure A8-1 shows the nominal voltage levels which indicate that normal separation and recovery sequences have occurred.

A5. 3 [redacted] Tracking Station Recovery Operations

A5. 3. 1 On the selected recovery pas[redacted]will receive the Discoverer Satellite CW acquisition transmitter signal on 232. 4 mc and the Discoverer Satellite telemetry signal on 237. 8 mc as usual. In addition, receiving equipment will be tuned to 228. 2 mc to receive the capsule telemetry signal and to 235. 0 mc (with a ± 12 mc search scan) to receive the capsule beacon transmitter signal.

A5. 3. 2 The[redacted]will read out real-time telemetry quantities listed in Table A8-1 and report them to the STC over the voice line immediately as they occur. After thrust cone ejection or twenty seconds after capsule separation, whichever is first, th[redacted]will read out additional capsule separation data that will be recorded on an oscillograph/Datarite. Every attempt will be made to determine the system time of capsule separation and to qualitatively assess the capsule separation and retro sequence before signal fade. If all events appear normal, the [redacted] real-time verbal report will consist of the system time of separation (with the appropriate code word) followed by a statement that all events were normal.

A5. 3. 3 Immediately after completion of the pass, [redacted] will submit a quantitative separation data report to the STC. If the capsule is recovered or at least visually acquired before these data are available, the requirement for these data may be waived by the STC.

A5.4 If available for this operation, WV-2 Aircraft No. 137890 will be positioned under the recovery pass orbit track at 48° 54' N latitude, 164° 49' W longitude to record the telemetered separation sequence of events and the capsule beacon signal. SSB communications with [redacted] will be maintained on 11214.0 kc, but radio silence will be observed when telemetered data are recorded. Immediately after fade on the recovery pass, the WV-2 will report the capsule signals which were acquired, the times of acquisition and fade, and the deviations from the nominal capsule frequencies to the STC via [redacted]

A5.5 [redacted] Tracking Station Recovery Operations

A5.5.1 Approximately fifteen minutes before acquisition on the recovery pass. The [redacted] ill search the frequency range from 223 to 247 mc and log the frequency, azimuth, and type of modulation of any signals received to reduce the possibility of confusion from interference signals.

A5.5.2 On the recovery pass, the [redacted] will track the Agena telemetry signals with the tri-helix antenna and the capsule telemetry signal with the TLM-18 antenna. Acquisition of the Agena telemetry signal with the tri-helix antenna will be accomplished using standard acquisition procedures. Procedures for acquisition of the capsule telemetry signal by the TLM-18 antenna will vary as a function of the actual orbit and predicted impact point. In general, the TLM-18 will be positioned at the impact point azimuth using a sector scan. The amplitude of the sector scan will be 20° (±10°) for impact azimuths between 345° and 15°. The scan amplitude will be increased 3/4° for each 1° of azimuth over 15° for the eastern sector or under 345° in the western sector.

The TLM-18 antenna acquisition elevation will be 2°. Until acquisition of the capsule signal by the TLM-18, one receiver operating on signals from the tri-helix will be tuned to the 228.2-mc capsule telemetry signal. If the capsule telemetry signal is acquired with the tri-helix before TLM-18 acquisition, the tri-helix will be positioned on the capsule until TLM-18 acquisition after which the tri-helix will resume tracking on the satellite telemetry signal. TLM-18 angle data recorded after auto track has been established will be transmitted to the PAC when requested by the System Test Director.

A5.5.3 [redacted] will report the system time of acquisition and deviations from nominal frequencies to the STC as soon as possible. When the TLM-18 azimuth rate approaches 0° per second or when the telemetered capsule recovery events are received, [redacted] will report antenna azimuth and elevation to the STC and the HCC. [redacted] will also report confirmation of capsule separation and telemetered recovery events to the STC as specified in Table A8-1 and record all capsule telemetry signals on magnetic tape.

A5.6 South Point Facility Recovery Operations

A5.6.1 For this operation, either the manually slewed Canoga or the motor-driven Radiation quad-helix antenna and two Nems-Clarke 1302-A receivers will be utilized at the PMR facility at South Point, Hawaii. Existing communications, recording, and timing systems will be used.

A5.6.1.1 If the orbit period is such as to permit nominal re-entry or re-entry west of [redacted] South Point will scan ±90° about a 270° azimuth at an antenna elevation of 10° at the rate of 5° per second from ETPD - 0 until ETPD + 3 minutes.

A5.6.1.2 If the satellite path is between [redacted] and South Point, the quad-helix antenna will scan ±90° about a 180° azimuth at the rate of 5° per second from ETPD - 0 until ETPD + 5 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.6.1.3 If the satellite path is east of South Point, the quad-helix antenna will scan ±90° about a 90° azimuth at the rate of 5° per second from

ETPD - 0 until ETPD + 5 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.6.2 If no capsule signals are acquired before ETPD + 5 minutes, the quad-helix antenna will be positioned at 180° azimuth and 10° elevation, and the telemetry receivers will be monitored until ETPD + 30 minutes. If [redacted] acquires the capsule signals, it will provide South Point with acquisition information.

A5.6.3 Once acquisition is achieved with the quad-helix antenna, the 60-ft antenna will attempt to track the capsule, using the narrower beamwidth to obtain more accurate bearings at and after parachute deployment. All signals acquired will be recorded on magnetic tape with a timing signal and will be reported immediately to the HCC through the [redacted] The capsule parachute deployment telemetry sequence and the antenna azimuth will be reported as they are received. If the parachute telemetry sequence is not received before signal fade, the system time of fade and the antenna azimuth and elevation will be reported. Subsequent to acquisition, South Point will report antenna bearings to [redacted] the direction of the [redacted]

A5.7 Barking Sands Facility Recovery Operations

A5.7.1 The PMR facility at Barking Sands, Kauai, will be augmented by the addition of an LMSD tri-helix antenna. Barking Sands will maintain communication with [redacted] via toll telephone for exchange of tracking and acquisition data. At ETPD - 15 minutes, Barking Sands will position the tri-helix antenna at the acquisition azimuth and 10° elevation. From ETPD - 5 minutes until ETPD + 5 minutes, the Barking Sands tri-helix antenna will scan the azimuth range from 270° to 90° at the scan rate of 5° per second. Barking Sands will search for the capsule telemetry signal. All acquired capsule telemetry signals will be recorded on magnetic tape with a timing signal. Barking Sands is directed not to activate any tracking radars during the operation.

A5.7.2 Subsequent to acquisition, Barking Sands will report the antenna bearing t[redacted]t the direction of the [redacted] will plot the Barking Sands bearings, with the South Point bearings and their own bearings, to determine the approximate capsule trajectory and relay these data to the STC and HCC over the voice control line.

A5.8 <u>Christmas Island Facility Recovery Operations</u>

A5.8.1 For this operation a quad-helix antenna, three Nems-Clarke 1302A receivers, a 7-track magnetic tape recorder, a timing system, and a communication system will be temporarily installed on Christmas Island to provide telemetry reception and capsule detection capabilities near the equator.

A5.8.1.1 If the satellite path is east of Christmas Island, the quad-helix antenna will scan $\pm 90^{\circ}$ about a 90° azimuth at the rate of 5° per second from ETPD + 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.8.1.2 If the satellite path is west of Christmas Island, the quad-helix antenna will scan $\pm 90^{\circ}$ about a 270° azimuth from ETPD + 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.8.1.3 If the satellite path is a near overhead pass at Christmas Island ($\pm 2^{\circ}$ W longitude), the quad-helix antenna will scan 360° in azimuth at the rate of 5° per second from ETPD ± 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10^{0} in 20° steps at the rate of one step per 360° azimuth.

A5.8.2 The Christmas Island facility will maintain continuous UHF or HF communications with all of the telemetry aircraft in the area for exhange of acquisition and tracking information and will relay this information to the HCC as soon as possible over the SSB radio.

A5.8.3 If no capsule signals are acquired before ETPD + 8 minutes, the quad-helix antenna will be positioned at 180° azimuth and 10° elevation and the telemetry receivers will be monitored until ETPD + 30 minutes. If no signals are acquired before ETPD + 30 minutes, a negative report will be submitted to the HCC over SSB radio.

A5.8.4 Once acquisition is achieved, the quad-helix will manually track the capsule, and the telemetry and beacon signals will be recorded on magnetic tape. Immediately after the parachute deployment telemetry sequence is recorded, Christmas Island will so report to the HCC over the SSB radio. The antenna azimuth will be reported to the telemetry aircraft over UHF or HF radio immediately after acquisition and at parachute deployment.

A5.9 Victory Ship Recovery Operations

A5.9.1 Each of the two Victory ships in the Recovery Force will be equipped with a manually operated quad-helix antenna and one additional telemetry receiver to augment their telemetry receiving capabilities. The Victory ship deployment is shown in Figures A7-3 and A7-4.

A5.9.1.1 The Haiti Victory will be positioned 10 nm west of the nominal impact point and will receive and record capsule telemetry if the capsule impacts in the predicted recovery area. The quad-helix antenna, until acquisition, will scan +90° about 360° azimuth at the rate of 5° per second beginning at ETPD - 5 minutes. From ETPD - 5 minutes until ETPD - 60 seconds, the antenna elevation will be maintained at 10°. After ETPD - 60 seconds, the antenna elevation will be increased 20° per scan from 10° to 70°. At ETPD + 15 seconds, the scan mode will rotate 180° to scan the southern sector. The antenna elevation will be decreased from 70° to 10° at the rate of 20° for each 15-second scan during this search of the southern sector. If the capsule signals are not acquired by ETPD + 2 minutes, the antenna elevation will be raised from 10° to 30°, and a 360° azimuth scan will be initiated at the slewing rate of 10° per second and continued for two minutes.

If the capsule signals are not acquired by ETPD + 4 minutes, the antenna will be positioned at 180° azimuth and 10° elevation and the telemetry receivers monitored until ETPD + 30 minutes. When the capsule signals are acquired, the antenna will begin manual tracking as a function of maximum signal strength and all telemetry and beacon signals will be recorded on magnetic tape. The D/F equipment will be operated normally and used to obtain refined capsule directional data after acquisition. When the capsule bearing becomes steady, the Haiti Victory will report position and capsule bearing to the northern Command RC-121 over UHF and to the HCC through PMR immediately and proceed in the direction of the acquired signals. If the capsule signals are not acquired, the Haiti Victory will so report over SSB radio through PMR to the HCC at ETPD + 30 minutes.

A5.9.1.2 The Dalton Victory will be positioned at 14° N latitude for the nominal case directly under the satellite path on the recovery pass to enable reception of the capsule telemeter signal and the capsule beacon signal between [redacted]nd Christmas Island. The quad-helix antenna, until acquisition, will scan ±90° about 360° azimuth at 10° elevation at the rate of 5° per second from ETPD - 0 until ETPD + 3 minutes. From ETPD + 3 minutes until ETPD + 5 minutes, the quad-helix antenna will give full area coverage by scanning ±90° about 360° azimuth with antenna elevation increasing and decreasing from 10° to 170° to 10° in increments of 20° per scan. The scan rate will be once per 15 seconds. After ETPD + 5 minutes the antenna will be positioned at 10° elevation and 180° azimuth. In the event the Dalton Victory acquires the capsule signals, the telemetry will be recorded on magnetic tape, and antenna acquisition and bearing will be immediately reported through PMR to the HCC. When the parachute deployment telemetry sequence is received, or when the antenna azimuth becomes constant, whichever is first, the Dalton Victory will so report verbally over SSB radio through PMR to the HCC and provide ship position and antenna azimuth and elevation. If no capsule signals are acquired by the Dalton Victory, a negative verbal report will be submitted over SSB radio through PMR to the HCC at ETPD + 30 minutes.

A5. 10 Airborne Recovery Force Deployment

A5. 10. 1 The Airborne Recovery Force deployment for a nominal orbit period and periods differing from nominal by one and a half minutes is presented in Figure A7-3. The force will be deployed with sufficient search and recovery aircraft in the 60 nm x 200 nm nominal impact area to ensure aerial recovery capabilities. The capsule detection range will be extended 400 nm south of the impact area by redeploying those C-119 and RC-121 aircraft not required in the impact area. Air retrieval will be attempted in this area, but emphasis will be on detection and surface recovery.

A5. 10. 2 The RC-121 search radar aircraft will be deployed to provide dual radar coverage of the primary recovery area and the extended recovery area (see Fig. A7-5). Each of the RC-121 aircraft will be equipped with SSB radio for direct communication with the HCC without compromising HF communications with the C-119 aircraft on the "command net" and "telling net." Due to the extended deployment of the recovery aircraft, there will be two command RC-121 aircraft and two pairs of HF telling net and command net frequencies; one for the northern sector and one for the southern sector. The frequencies for the command and telling nets will be assigned by the HCC. A B-47 will depart for Hickam AFB from AFFTC following confirmation of successful orbit injection. This aircraft will fly a radar peaking mission for the on-station RC-121 aircraft prior to the recovery pass.

A5. 10. 3 Six C-119J recovery aircraft will be deployed in the primary recovery area and spaced at 40-nm intervals along the satellite path. The remaining two or three C-119 aircraft will be deployed in the extended recovery range at 100-nm intervals. The recovery aircraft deployment is shown in Figure A7-6.

A5. 10. 3. 1 The C-119 aircraft operating procedures will remain much the same as in previous operations. The mission of the C-119 aircraft in the primary recovery area will remain acquisition and aerial recovery of the capsule. The mission of the C-119 aircraft in the extended recovery area will be primarily capsule acquisition with aerial recovery secondary since insufficient aircraft are available to provide adequate retrieval capability.

A5. 10. 3. 2 All C-119 aircraft will search for and use the D/F equipment on the capsule beacon signal. [redacted] will report the frequency deviation of the capsule beacon to the HCC through the STC. The HCC will relay the frequency deviation to the recovery aircraft through the Command RC-121's. This will permit the FLR-2 operators to search ±3 mc about the reported frequency. If the capsule beacon signals are not acquired by ETPD + 60 seconds, the frequency scan will be increased to ±12 mc. If the RC-121 aircraft obtain solid radar returns from the capsule parachute and the chaff but the C-119 aircraft are unable to acquire the capsule beacon signal, the FLR-2 operators will search for and use the D/F equipment on the capsule telemetry signal.

A5. 10. 4 A WV-2 will perform an FIC survey of the predicted impact area and will assume a final position 120 nm south and 100 nm west of the predicted impact point by ETPD - 30 minutes. This WV-2 will communicate with the Recovery Force on the command and telling nets, will search for the capsule signals, and will attempt to derive a D/F bearing from any of the signals acquired. All telemetry signals received will be recorded. Signal acquisitions, frequency deviations, and bearings will be reported as directed by the HCC "On-the-Scene Test Controller" aboard the WV-2.

A5. 10. 5 The telemetry aircraft, if available, will be deployed along the satellite flight path in relation to ship and island telemetry installations to ensure continuous telemetry reception from the primary impact area to south of the equator. The nominal deployment is shown in Figure A7-3. Telemetry reception range of these aircraft is expected to be 120 nm to 150 nm. Placement of these aircraft for a nominal orbit will be as follows:

Aircraft No.	Position Priority	Nominal Position
1	3	210 nm North of Dalton Victory
2	1	330 nm South of Dalton Victory
3	2	570 nm South of Dalton Victory
4	4	900 nm South of Dalton Victory
5	5	1140 nm South of Dalton Victory

Aircraft No. 1 and No. 2 will be staged from Hickam Air Force Base to ensure a backup capability in the northern area. The remaining aircraft will be staged from Christmas Island. All aircraft will be on station by ETPD - 1 hour. For orbits other than nominal, the telemetry aircraft will be positioned to provide continuous telemetry coverage south of the predicted impact point as shown in Figure A7-3.

A5.10.5.1 The telemetry aircraft positioned north of the Dalton Victory will be under the direction of the southern area Command RC-121 and will establish communications with this aircraft on the assigned HF telling and control nets. The aircraft staged south of the Dalton Victory will be under direction of the HCC and will establish communications with the HCC through the telemetry station at Christmas Island over the assigned UHF or HF frequency. If actual positions do not permit using UHF because of distance, communications will be established between Christmas Island and the telemetry aircraft over the assigned HF frequency. Backup reception may be accomplished by operating one of the SSB receivers at Christmas Island in the AM mode. All transmissions from the telemetry aircraft to Christmas Island will be relayed as soon as possible to the HCC over the SSB link.

A5.11 Airborne Recovery Force Operations

A5.11.1 The RC-121 aircraft will search for the chaff as the first radar return. After receiving the first radar return, the airborne Test Controller will notify the nearest C-119J and then vector the C-119J to an intercept flight path. The C-119J pilot will follow the RC-121 vectoring instructions and use the D/F for homing. All returns from the Recovery Force radars and direction finders will be verified as soon as possible to eliminate possible "bogeys." Direction finding acquisitions by the C-119J and the FIC WV-2 aircraft will be plotted to verify that only one intersect point exists and also will be checked against radar returns of the RC-121 aircraft and bearings from the surface stations. If bogey signals still appear to exist after verification, the Airborne Test Controller will conduct a systematic visual search for the source of each signal.

A5.11.2 When the recovery aircraft makes visual contact with the capsule parachute, an air recovery will be accomplished. Repeat passes will be made, if necessary, until recovery is successful or until the capsule impacts in the water. The C-119J aircraft completing recovery will return to Hawaii as directed by the HCC and will be escorted by either a C-119J, an RC-121, or an SC-54 (Air Rescue) aircraft. The remainder of Recovery Forces will return to Hawaii as directed by the HCC.

A5.11.3 If air recovery is unsuccessful, the recovery aircraft will circle the area of water impact and assist in direction of the surface ships to effect water recovery. The capsule beacon and flashing flight operation will continue for 20 hours and the capsule will float for 40 hours. Five RADARC drop marker buoys will be distributed among the recovery aircraft and will at the direction of the HCC be dropped to aid in surface recovery. Each RADARC is equipped with an acquisition transmitter and flashing light having the following specifications:

<u>Acquisition Transmitter</u>

Frequency	235 mc
Pulse Width	30 microseconds ±3 microseconds
Repetition Frequency	500 cps + 75 cps - 0 cps
Power Output	65 watts peak, 1.25 watts average power
Operating Life	48 hours continuous

<u>Zeon Flashing Light</u>

Flash Frequency	1 pps ±20 percent
Operating Life	48 hours continuous

A5.11.4 If recovery operational conditions permit, the north Command RC-121, or alternate, will transmit brief best available information reports to the HCC over SSB radio at ETPD + 10 and 20 minutes (±2 minutes); similarly, the southern Command RC-121 will submit brief best available information reports to the HCC at ETPD + 15 and 25 minutes (±2 minutes). If the re-entry capsule is not sighted before ETPD + 30 minutes, the northern Command RC-121 will report a brief recap of most reliable received signal data to the HCC for relay to the STC at that time. Similarly, southern Command RC-121 recap will be submitted at ETPD + 35 minutes. The data to be reported are aircraft station position, magnetic signal bearing, and local time for each reliable signal acquisition. Range and azimuth with local time and aircraft station position will be reported for each valid radar return. The report shall also contain the Controller's conclusions regarding the quality of reported signals and bearings, results of triangulation attempts, and most probable impact location. These data will be relayed to the STC, immediately upon receipt by the HCC, to enable the PAC to determine the most productive search areas.

A5.11.5 If the capsule has not been located by ETPD + 30 minutes in the northern area or ETPD + 35 minutes in the southern area, the airborne Recovery Forces will initiate a corridor search south along the probable impact trajectory. At the discretion of the HCC, or as directed by the STC, a complete recap may be requested. The forces will continue the southerly search, within fuel limitation, unless the HCC directs a search of the most probable impact areas as determined from tracking triangulation and other available data.

A5.11.6 The southern telemetry aircraft will maintain UHF and HF communications with Christmas Island, if possible, during the recovery operation for exchange of acquisition and tracking data.

A5.11.6.1 The telemetry aircraft will search for capsule telemetry signals and the beacon signal. All capsule signals acquired will be recorded on magnetic tape with a timing signal. Capsule signal acquisitions will be reported immediately to the southern Command RC-121 over the HF telling net and to Christmas Island over UHF or HF.

When the parachute deployment telemetry sequence is received, it will be reported over the HF telling net. The telemetry aircraft will attempt to determine the capsule bearing at fade or at parachute deployment. If this can be accomplished, the bearing and aircraft position will be reported to the Command RC-121 or Christmas Island.

A5.11.6.2 If one of the telemetry aircraft visually acquires the capsule in the air or in the water, the position will be reported immediately to the Command RC-121 or Christmas Island. The telemetry aircraft will circle the capsule while maintaining 100 percent visual lock-on until arrival of a surface vessel or until fuel supply requires return to Christmas Island. While hovering over the floating capsule the telemetry aircraft will attempt to provide a transmission compatible with the receiving equipment on Christmas Island so that the capsule bearing from Christmas Island may be more accurately determined. If Christmas Island reports the parachute deployment sequence and antenna bearing, all of the telemetry aircraft will initiate search operations as directed by the HCC.

A5.12 <u>Hawaiian Control Center Recovery Operations and Communications</u>

A5.12.1 The HCC-STC communications will be augmented by the addition of two voice lines (toll telephone) that will be effective from ETPD - 1 hour until ETPD + 4 hours.

A5.12.2 The HCC will direct and control acquisition, recovery, and search operations of the Christmas Island facilities, the telemetry receiving aircraft, and the Recovery Forces. The primary communication link between the HCC and the surface elements will be the SSB frequency. The two Victory ships will communicate with the HCC through PMR and the PMR representative at the HCC.

A5.12.3 The HCC will immediately relay all data reported to the STC. Additionally, the HCC will maintain a real-time analysis for integration of all incoming data to determine the most probable impact point and subsequent search areas. Bearings from Barking Sands, South Point, and [redacted] will be plotted to determine the approximate capsule trajectory and will be relayed immediately to the HCC.

A6 POST-RECOVERY OPERATIONS

A6.1 Dalton Victory Data

A6.1.1 If the Dalton Victory acquires telemetry data from the capsule, an aircraft may pick up the data. This will be done at the discretion of the STC.

A6.2 Haiti Victory Data

A6.2.1 The Haiti Victory will proceed toward Pearl Harbor at the best speed of advance immediately after termination of the search operation. If capsule telemetry data have been acquired, the two HRS-3 helicopters will fly it to the HCC as soon as the ship reaches HRS-3 range of Hickam Air Force Base.

A6.3 Christmas Island and Telemetry Aircraft Data

A6.3.1 The telemetry aircraft will land at Christmas Island after termination of the search operation to refuel before returning to Hickam AFB. One of the telemetry aircraft will pick up any capsule telemetry data acquired by the Christmas Island facility and fly it to Hickam AFB on the day of the recovery operations.

A6.4 South Point and Barking Sands Data

A6.4.1 Data from South Point and Barking Sands Tracking Stations, including magnetic tapes, set-up sheets, maps and/or logs of the tracking operation will be hand-carried by PMR personnel, flown to Hickam AFB, and delivered to the HCC (LMSD/61-81). The data will be submitted to the representative from LMSD/61-44 at the HCC for subsequent delivery to Sunnyvale.

A6.5 Transport of Data to Sunnyvale

A6.5.1 All capsule telemetry data acquired by the receiving facilities in the recovery region will be hand-carried to Flight Data Reports, 61-44, on the first available commercial airline flight.

A6.6 Tracking Station Post-Recovery Operations

A6.6.1 The tracking stations will continue observations of the Discoverer Satellite S-band beacon and telemetry transmission until the battery power is exhausted. The orbital programmer is programmed as shown in Figure A2-7. Command transmission and tracking after the recovery pass will be at the direction of the STC.

A7 PERSONNEL SUBSYSTEM EVALUATION

Observation of personnel subsystem operations will be required at STC, [redacted] and [redacted] The data collected will concern:

a. Operational procedures for which no manuals or other documentation exist

b. Any disparities in operational procedures among the various stations, or among the various procedures manuals or documents

c. Certain critical operations pertaining to tracking, commanding and data acquisition wherein a failure in the personnel subsystem could result in serious degradation in Discoverer system performance.

The specific procedures and operations to be observed will be determined by LMSD Personnel Subsystem with the concurrence of Operations Integration. Additional required data will be obtained from the various voice tapes.

A8 TABLES AND ILLUSTRATIONS

The following tables and illustrations are applicable to the flight of Discoverer Satellite 1056/Discoverer Booster 237/AET Payload only. Each table or figure is given the basic number of the section of the general STD to which it applies, the letter A to denote appendix material, and a number to sequence items in the same category.

Table A2-1

NOMINAL FLIGHT PLANNING DATA

Item	Data
DISCOVERER	
S/N	1056
Payload	AET
Fuel	UDMH
Oxidizer	IRFNA
Launch Weight	8653
THOR	
S/N	237
Launch Weight	109,208
Fuel	RJ-1
Oxidizer	Liquid Oxygen
LAUNCH	
Site	VAFB, SM-75-3, Pad No. 4
Date	August, 1960
Pad azimuth	181°28'53.86"
Launch azimuth	172°
Nominal airborne Command 5 backup	20 sec
Orbital boost time	117.5 sec
Downrange T/M ship location (FS Ship AG-161)	16°00'N, 117°43'W
Downrange T/M ship heading	353°T
Programmer setting	5610 seconds (Step setting 22)
INJECTION	
Time	T + 3P3
Location	24.26°N, 119.2°W
Altitude	117 sm
Azimuth (inertial)	168.6°
Nominal velocity	26,036 ft/sec
ORBIT	
Period	93.5 min (5610 sec)
Apogee	438 sm
Perigee	117 sm
Eccentricity	0.0375
Average regression rate (17 passes)	23.52[redacted]
Reset latitudes	20°N [redacted] 30°N [redacted]orthbound) or 40°N[redacted]southbound) 60°N [redacted]
Inclination angle	79.41[redacted]
Re-entry T/M aircraft location (WV-2 No. 137890)	48°54'N, 164°49'W
RECOVERY	
Aircraft (type and quantity)	C-119's (9), RC-121's (4), and telemetry receiving (5)
Surface ships (recovery)	Dalton Victory and Haiti Victory
Surface ship initial locations	16°N, 157°39'W and 24°N, 158°48.7'W
Surface ship helicopters	HRS-3 (2 on each ship)
Recovery pass	17 nominal – 15, 16, or 18 by special command
Predicted impact area center	24°N, 158°48.7'W
ETPD	T + 26.6 hours

Table A2-2

NOMINAL ACQUISITION TIMES

Pass	Station	Acquisition Time (minutes)	Fadeout Time (minutes)	Duration Time (minutes)
Launch	[redacted]	0.5	8.1	7.6
	[redacted]	0.0	7.9	7.9
	T/M Ship	4.6	13.0	8.4
1	[redacted]	87.3	95.1	7.8
2	[redacted]	182.8	187.5	4.7
	[redacted]	191.2	197.2	6.0
8	[redacted]	717.7	728.9	11.2
9	[redacted]	811.1	815.3	4.2
	[redacted]	811.7	823.4	11.7
	[redacted]	818.9	826.9	8.0
10	[redacted]	902.1	915.2	13.1
	[redacted]	910.9	922.1	11.2
*11	[redacted]	998.1	1005.2	7.1
	[redacted]	1006.3	1019.1	12.8
*12	[redacted]	1104.9	1108.8	3.9
15	[redacted]	1395.7	1399.8	4.1
	[redacted]	1402.4	1408.8	6.4
16	[redacted]	1489.3	1496.9	7.6
	[redacted]	1498.9	1500.5	1.6
17	[redacted]	1584.2	1590.4	6.2
	[redacted]	1592.8	1599.6	6.8
*23	[redacted]	2120.9	2129.7	8.8
24	[redacted]	2222.7	2227.6	4.9

*Acquisition only - no T/M readout

Table A4-1

INSTRUMENTATION AND CAPSULE EQUIPMENT REQUIRED TO BE OPERATIVE AT LAUNCH

1. Agena Telemetry

   a. Continuous Channels:

      7 - Payload quantity. Subcarrier must be present

      9 - Payload quantity. Subcarrier must be present

      10 - Payload quantity. Subcarrier must be present

      18 - Payload quantity. Subcarrier must be present

   b. Commutated Channels

      12 - Subcarrier must be present and commutator running; point 38 must be present

      13 - Subcarrier must be present and commutator running

      15 - Subcarrier must be present and commutator running; points 9, 15, and 17 must be present. Channel 17, commutator points 7 and 21 are an acceptable substitution for Channel 15, commutator points 15 and/or 17.

      16 - Subcarrier must be present and commutator running; points 2, 4, 6, 8, 10, 22, 25, and 26 must be present. Channel 3 is an acceptable substitution for Channel 16, points 24 and/or 26. Channel 11 is an acceptable substitution for Channel 16 points 2, and/or 4, 6, 8.

      17 - Subcarrier must be present and commutator running

2. Capsule Telemetry and Equipment

   a. Continuous Telemetry Channels

      7 - Subcarrier must be present

      8 - Subcarrier must be present

      11 - Subcarrier must be present

   b. Acquisition Beacon

      The frequency must be within 1.5 mc of the nominal frequency

Table A5-1

SS/D SEQUENCE FOR DISCOVERER VEHICLE SERIAL 2205-1056

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
	-0.1	Timer reset
0	0	Start SS/D timer
0.1	0.1	Timer reset
0.1	0.1	Timer safety circuit
167	167	Uncage gyros
167	167	Programmed destruct lockout
179	179	Start orbital programmer (paralleled)
181	181	Command 28°/min yaw rate (5.0° yaw left)
181	181	Isolate K24 from Beacon 5
181	181	Vehicle pneumatic control
181	181	Open pneumatics valve and spare
181	181	Fire explosive bolts
181	181	Fire explosive bolts
181.5	181.5	Fire retro-rockets (paralleled)
181.5	181.5	Arm pitch and yaw control
181.5	181.5	Arm integrator correction
192	192	Remove 28°/min yaw rate
192	192	Command -45°/min pitch rate (pitchover 20.8°)
192	192	Arm roll H/S command
192	192	Fire H/S cover squib
192	192	Break 28v to N_2 valve, shut down separation monitor
192	192	Fire H/S cover squib
204	204	+28v to SS/D for brake control (not effective until 221 sec)
221	221	Command -2°/min pitch rate from integ. potentiometer (stop - 45°/min pitch rate)

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
221	221	Connect pitch H/S command
221	221	Arm Beacon 5 timer brake control
221	221	Arm integ. uncaging circuit
221	221	Actuate delay via orbital programmer
221	221	Roll H/S signal shunt
*221	221	Programmed SS/D timer delay
223		Initiate ground Commands 5 or 6
241	221	Stop SS/D timer delay (nominally 20 sec)
257	237	Fire ullage rockets
257	237	Preactivate hydraulics
257	237	Deactivate Beacon 5 timer brake control
257	237	K21 hold-in (Commands 5 and 6 interlock)
269	249	Arm gas generator squib. Energize K28 (pitch and yaw pneumatic Off)
269	249	Connect accelerometer to integrator
269	249	Fire helium valve and gas gen. squib (par.)
269	249	Engine ignition
270	250	Pitch and yaw pneumatic off (backup)
270	250	Open gas gen. fire and He squib fire circuits
270	250	Open gas generator squib arm circuit
270	250	Close circuit to T/M off switch

*This sequence is based upon a nominal trajectory: Orbital programmer set for 20-sec timer brake delay and no timer brake modification from Beacon Channel 5 or 6.

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
270.5	250.5	Steady state thrust
379.5	359.5	Arm pneumatic (pitch and yaw)
379.5	359.5	Engine cut-off safety switch
**383	363	Disconnect accelerometer from integrator
383	363	Engine shut down by integrator
383	363	Activate pneumatic controls (de-energize K28)
394	374	SS/L +28v dc unregulated
394	374	Hydraulic controls shut down; shut off ullage rockets and de-energize K34 (paralleled)
394	374	Command -40°/min yaw rate
394	374	Command 0°/min pitch rate
394	374	Fire oxidizer, helium, fuel vent valves (paralleled)
394	374	De-energize K21
492	472	Calibrate T/M
502	482	Stop calibrate
502	482	Open engine shut down circuit and switch antenna
502	482	Enable Commands 5 and 6. Alternate recovery pass capability
664	644	Command +3.55°/min pitch rate
664	644	Connect roll H/S to yaw gyro, yaw command complete
664	644	Roll accel. output grounded
664	644	Shut down +28v reg. ascent only power (paralleled)
664	644	Auxiliary heater on
664	644	Flight control gain change

**The dial reading of the integrator when caged is 1775 representing a velocity-to-be-gained of 14,200 ± 30 ft/sec.

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
664	644	Integrator shut down (latch down K4, K5, K6)
890	870	Phase balance Ø A
890	870	Phase balance Ø B
890	870	Accelerometer power amp return
890	870	Telemetry Off
890	870	SS/D timer off
890	870	Arm SS/D timer for recovery phase
890	870	Stop integrator caging
*X	870	SS/D timer on, H/S off
X + 15	885	Command -45°/min pitch rate (stop +3.5°/min pitch rate)
X + 15	885	Arm capsule ejection (squib)
X + 92	962	Command 3.55°/min pitch rate (stop -45°/min pitch rate)
X + 92	962	SS/L Transfer Circuit 1
X + 92	962	SS/L Transfer Circuit 2
X + 92	962	Disconnect capsule from electrical P.S.
X + 94.5	964.5	Shut down SS/D timer
X + 94.5	964.5	Command eject (paralleled)

*Time of initiation of recovery phase

Table A6-1

NOMINAL ORBIT SCHEDULE

(Based on a 93.5 Minute Period)

Phase	Event	Time T (min)	Location N Latitude (deg)
Launch	Launch	0	34.8
	Separation	2.98 (179 sec)	- - -
	Start orbital timer	2.98 (179 sec)	- - -
	Nominal fire time	4.48 (269 sec)	- - -
	Nominal burnout and orbit injection	6.38 (383 sec)	- - -
	First crossing of equator	12.37 (742 sec)	0
	Beacon and T/M off	14.83 (890 sec)	12 (S)
Pass 1 (N-S)	Beacon and T/M on - reset enable	86.9	74
	Acquire [redacted]	87.3	72.7
	65°N latitude (ref.)	89.5	65
	Reset signal/command	91.1	60
	57.6°N latitude (ref.) [redacted]	91.5	57.6
	Beacon and T/M off - reset disable	103.3	10
	End of Orbit 1	153.4	0
Pass 2 (N-S)	Beacon and T/M on - reset enable	180.5	74
	Acquire [redacted]	182.8	65.7
	Reset signal/command	184.4	60
	57.6°N latitude (ref) [redacted]	185.0	57.6
	Acquire [redacted]	191.2	32.3
	21.6°N latitude (ref.) [redacted]	194.0	21.6
	Beacon and T/M off - reset disable	196.8	10
	End of Orbit 2	246.9	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 3 thru 7	End of Orbit 3	340.4	0
	End of Orbit 4	433.9	0
	End of Orbit 5	527.4	0
	End of Orbit 6	620.9	0
	End of Orbit 7	714.4	0
Pass 8 (S-N)	Acquire [redacted]	717.7	12.7
	Beacon and T/M on - reset enable	718.8	16
	Reset signal/command [redacted]	722.7	30
	34.8°N latitude(ref [redacted]	724.0	34.8
	Beacon and T/M off - reset disable	727.1	46
	End of Orbit 8	807.9	0
Pass 9 (S-N)	Acquire [redacted]	811.1	12.3
	Acquire [redacted]	811.7	14.7
	Beacon and T/M on - reset enable	812.3	16
	21.6°N latitude(ref [redacted]	813.8	21.6
	Reset signal/command	816.1	30
	Acquire [redacted]	818.9	40.2
	57.6°N latitude(ref [redacted]	823.6	57.6
	Beacon and T/M off - reset disable	826.2	66
	End of Orbit 9	901.3	0
Pass 10 (S-N)	Acquire [redacted]	902.1	2.7
	Beacon and T/M on - reset enable	903.0	6
	Reset signal/command [redacted]	906.9	20
	21.6°N latitude(ref [redacted]	907.3	21.6
	Acquire [redacted]	910.9	35
	57.6°N latitude(ref [redacted]	916.8	57.6
	Beacon and T/M off - reset disable	918.5	62
	End of Orbit 10	994.8	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 11 thru 13	End of Orbit 11	1088.3	0
	End of Orbit 12	1181.8	0
	End of Orbit 13	1275.2	0
Pass 14 (N-S)	57.6°N latitude(ref [redacted]	1306.8	57.6
	Beacon and T/M on - reset enable	1307.1	56
	Reset signal/command	1311.2	40
	34.8°N latitude(ref [redacted]	1312.3	34.8
	Beacon and T/M off reset disable	1315.1	24
	End of Orbit 14	1368.7	0
Pass 15 (N-S)	Beacon and T/M on - reset enable	1395.5	74
	Acquire [redacted]	1395.7	73.5
	Reset signal/command	1399.7	60
	57.6°N latitude(ref [redacted]	1400.3	57.6
	Acquire [redacted]	1402.4	48.5
	34.8°N latitude(ref [redacted]	1405.8	34.8
	Beacon and T/M off reset disable	1408.6	24
	End of Orbit 15	1462.2	0
Pass 16 (N-S)	Beacon and T/M on - reset enable	1489.2	74
	Acquire [redacted]	1489.3	72.7
	Reset signal/command	1493.1	60
	57.6°N latitude(ref [redacted]	1493.8	57.6
	Acquire [redacted]	1498.9	37.3
	34.8°N latitude(ref [redacted]	1499.4	34.8
	Beacon and T/M off - reset disable	1502.1	24
	End of Orbit 16	1555.7	0
Pass 17 (N-S)	Beacon and T/M on, reset enable	1582.7	74
	Acquire [redacted]	1584.2	67.6
	Reset signal/command	1586.6	60
	57.6°N latitude(ref [redacted]	1587.3	57.6
	Acquire [redacted]	1592.8	34.2

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 17 (N-S) (Con'td)	21.6°N latitude(ref [redacted]	1595.7	21.6
	Beacon and T/M off [redacted] reset disable	1598.9	10
	End of Orbit 17	1649.2	0
Pass 18 (N-S)	Beacon and T/M on - reset enable	1676.2	74
	Reset signal/command	1680.1	60
	57.6°N latitude(ref [redacted]	1680.8	57.6
	21.6°N latitude(ref [redacted]	1689.2	21.6
	Beacon and T/M off [redacted] reset disable	1692.4	10
	End of Orbit 18	1742.7	0

Table A6-2

FIRST-PASS PROGRAMMER CORRECTION BASED ON TIME OF CROSSING (LAUNCH ORBITAL PROGRAMMER SETTING - 5610 SECONDS)

		Cross Latitude (Reference Latitude)							
		65°N		57.6°N		25°N		22°N	
Period (sec)	Programmer Correction	T From Launch Time (sec)	T + Launch System Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)
5376	Decrease 22 steps	5152		5262		5749		5794	
5400	Decrease 20 steps	5175		5285		5774		5819	
5460	Decrease 14 steps	5228		5340		5834		5880	
5520	Decrease 8 steps	5281		5394		5894		5940	
5580	No change	5334		5449		5954		6001	
5640	No change	5388		5503		6014		6061	
5700	Increase 8 steps	5441		5558		6074		6121	
5760	Increase 14 steps	5494		5612		6134		6182	
5820	Increase 20 steps	5547		5667		6194		6242	
5880	Increase 25 steps	5600		5722		6254		6302	
5940	Increase 31 steps	5654		5776		6313		6363	
6000	Increase 37 steps	5707		5830		6373		6423	
6060	Increase 42 steps	5760		5885		6343		6483	
6120	Increase 48 steps	5813		5939		6493		6544	
6180	Increase 53 steps	5866		5994		6553		6605	

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
6240	Increase 59 steps	5919		6048		6613		6665	
6300	Increase 65 steps	5973		6103		6673		6725	
6360	Increase 70 steps	6026		6157		6733		6786	
6420	Increase 76 steps	6079		6211		6792		6846	
6480	As directed	6133		6266		6852		6906	
6540	As directed	6186		6321		6912		6967	
6600	As directed	6239		6375		6972		7027	
6660	As directed	6292		6429		7032		7088	
6720	As directed	6346		6484		7092		7148	
6780	As directed	6399		6539		7152		7208	
6840	As directed	6452		6593		7212		7269	
6900	As directed	6505		6647		7272		7329	
6960	As directed	6558		6701		7332		7390	
7020	As directed	6612		6756		7392		7450	
7080	As directed	6665		6810		7452		7511	
7140	As directed	6718		6865		7512		7571	
7200	As directed	6772		6920		7572		7632	

Table A8-1

REAL-TIME DATA READOUT AND REPORTING REQUIREMENTS

	MEASUREMENT		CHANNEL	PRIORITY	REAL TIME READOUT REQUIRED*	PASS	TRACKING STATION				T/M SHIP**	NOTE
	NAME	NUMBER					[redacted]				FS SHIP AG-161	
LAUNCH	Liftoff Signal	---	---	1	X	Ascent	X	X				
	Thor Main Engine Cutoff	---	Thor 12	1	X	Ascent	X	X				
	Agena Engine Ignition and Cutoff	B6	14	1	X	Ascent	X	X			X	
	Tone Verifications A, B, C, D	H64, 65, 66, 67	16-2, -4, -6, -8	1	X	Ascent	X	X				
	Command Verifications 1,2,3,4	H112	11	1	X	Ascent	X	X				
	Programmer Step Readout (Console)	H108, 109	16-24, -26	1	X	Ascent	X	X				
	10 Second Step Switch Position	H108	16-24	1	X	Ascent	X	X			X	
	100 Second Step Switch Position	H109	16-26	1	X	Ascent	X	X			X	
	Increase/Decrease Switch Position	H107	16-22	1	X	Ascent	X	X			X	
	Payload Function Selector Setting	AET 14/15, 17/ 18, 20/21, 23/24	13-18 thru 13-24 13-48 thru 13-54	1	X	Ascent	X	X				
	Wave Train	AET 49	18	2		Ascent					X	12
	Wave Train	AET 50	8	2		Ascent					X	12
ORBIT	Tone Verifications A,B,C,D	H64, 65, 66, 67	16-2, -4, -6, -8	1	X	1 thru 16	X	X	X	X		
	Command Verifications 1,2,3,4	H112	11	1	X	1 thru 16	X	X	X	X		
	Programmer Period Readout (Console or Remote)	H110	3	2	X	1 thru 16	X	X	X	X		
	Programmer Step Readout (Console)	H108, 109	16-24, -26	1	X	1 thru 16	X	X	X	X		
	10 Second Step Switch Position	H108	16-24	1	X	1 thru 16	X	X	X	X		
	100 Second Step Switch Position	H109	16-26	1	X	1 thru 16	X	X	X	X		
	Increase/Decrease Switch Position	H107	16-22	1	X	1 thru 16	X	X	X	X		
	Reset Monitor Signal	H70	16-10	1	X	1 thru 16	X	X	X	X		
	Re-entry Selector Switch Position	C22	16-25	1	X	1 thru 16	X	X	X	X		1
	Payload Function Selector Setting	AET 14/15, 17/ 18, 20/21, 23/24	13-18 thru 13-24 12-48 thru 13-54	1	X	1 thru 16	X	X	X	X		
	Control Gas Supply Pressure	D95	12-38	2		2, 10, 16			X	X		
	Bdttery Bus Voltage	C1	16-15	3		2, 10, 16			X	X		
	Horizon Scanner - Pitch	D37	17-22	3		2, 10, 16			X	X		2
	Horizon Scanner - Roll	D39	17-26	3		2, 10, 16			X	X		2
	SPI Temperature	D130	15-9	3		2, 9, 15	X		X	X		3
	SPI Pitch Angle - No. 1	D128	15-15	3		2, 9, 15	X		X	X		3
	SPI Yaw Angle - No. 1	D127	15-17	3		2, 9, 15	X		X	X		3
	SPI Pitch Angle - No. 2	D138	17-7	3		2, 9, 15	X		X	X		3
	SPI Yaw Angle - No. 2	D139	17-21	3		2, 9, 15	X		X	X		3
	Wave Train	AET 49	18	2		1 thru 16	X		X	X		12

Table A8-1 (Continued)

MEASUREMENT			CHANNEL	PRIORITY	REAL TIME READOUT REQUIRED*	PASS	TRACKING STATION				T/M SHIP**	NOTE
	NAME	NUMBER					[redacted]				FS SHIP AG-161	
ORBIT	Wave Train	AET 50	8	2		1 thru 16	X		X	X		12
	No Name Assigned	AET 26	12-2	2		9	X					13
	No Name Assigned	AET 32	12-5	2		9	X					13
	No Name Assigned	AET 36	12-7	2		9	X					13
RE-ENTRY	Programmer Period Readout (Console or Remote)	H110	3	3	X	Recovery Pass ↑			X	X		
	Programmer Step Readout (Console)	H108, 109	16-24, -26	2	X				X	X		
	10 Second Step Switch Position	H108	16-24	2					X	X		
	100 Second Step Switch Position	H109	16-26	2					X	X		
	Reset Monitor Signal	H70	16-10	1	X				X	X		
	Re-entry Selector Switch Position	C22	16-25	1	X				X	X		1
	Battery Bus Voltage	C1	16-15	3					X	X		
	Horizon Scanner - Pitch	D37	17-22	3						X		2
	Horizon Scanner - Roll	D39	17-26	3						X		2
	SPI Temperature	D130	15-9	3						X		4
	SPI Pitch Angle - No. 1	D128	15-15	3						X		4
	SPI Yaw Angle - No. 1	D127	15-17	3						X		4
	SPI Pitch Angle - No. 2	D138	17-7	3						X		4
	SPI Yaw Angle - No. 2	D139	17-21	3						X		4
	Pitch Programmer	D41	17-20	1	X					X		5
	SS/D Timer Restart	D85	12-54	1	X					X		
	Capsule Separation Event	AET 51	16-21	1	X				X	X		6
	Payload Connector Disconnect	AET 26	12-2	2	X				X	X		7
	Payload Connector Disconnect	AET 28	12-3	2	X				X	X		7
	Payload Connector Disconnect	AET 30	12-4	2	X				X	X		7
	No Name Assigned	AET 35	12-19	1	X					X		8
	Spin Valve Actuated, Retro-Rocket Ign., Electrical Disconnect/ Thrust Cone Separation	---	Capsule 7	1	X				X	X		9
	Thrust Cone Thermal Battery Volt., Despin Valve Actuated, Electrical Disconnect/Thrust Cone Separation	---	Capsule 8	1	X				X	X		9
	Longitudinal Acceleration	---	Capsule 11	1	X				X	X		10
	5G Switch Closure, Parachute Cover Off, Cutters, Parachute Deployed, Ablative Shell Off	---	Capsule 7	1	X				X	X		9
	Thermal Battery 2 A8 Voltage, Timer Switch Closure	---	Capsule 8	1	X	↓			X	X		9
	Capsule T/M Signal Strength	---	Capsule 7, 8, 11	2		Recovery Pass			X	X		11

Table A8-1 (Continued)

NOTES:

1. Reads 1 volt for normal Pass 17 re-entry, 4 volts for alternate re-entry.
2. Record at least 2 points at approximately 5-second intervals to determine the degree of attitude stabilization. Record system time of turnoff on the recovery pass if SS/D restart event, D85, is invalid.
3. [redacted]and[redacted]ead 3 times on Pass 2 at approximately 2-minute intervals correlated with system time. [redacted]eads on Pass 9 and on Pass 15; readings at one system time only are required on Pass 9. [redacted]ransmits data on Channels 15 and 17 to SV on 100-wpm/voice line after Pass 2; three 10-second data samples at 2-minute intervals required.
4. Read at 1-minute intervals before reorientation, 20-second intervals during reorientation and immediately prior to separation. If data on Channel 17 does not appear to be valid on flight, Channel 15 data will be read instead. [redacted]ansmits data on Channels 15 and 17 to SV on 100-wpm/voice line after pass; 10-second data sample starting at separation minus 110 seconds and continuous transmission from separation minus 30 seconds to separation.
5. Read system time at start and finish of reorientation, voltage level prior to start of reorientation, and average voltage level during reorientation.
6. Reads 4.67 volts prior to separation, 1.33 volts after separation. Correlation within 2 seconds of exact system time is satisfactory for initia[redacted] report. [redacted]erifies that event has occurred by voltage level check.
7. Reads 1 volt prior to separation, out of band after separation.
8. Reads 4 volts prior to retro-rocket ignition, 1 volt after retro-rocket ignition.
9. The verbal report will contain general comments on the sequence. The performance summary will contain the sequence of events to the nearest second of system time.
10. The[redacted]erbal report will contain the system time of initiation, average value, and duration. As soon as possible,[redacted]ill report a complete time history of acceleration which will include the system time of each data dropout and the time duration of dropou[redacted]eads values 5 seconds prior to, at, and 5 seconds after parachute deployment.
11. Provide a qualitative evaluation of signal reception.
12. A qualitative comparison with the wave train forms in Figure A8-2 with the system times of initiation and termination of the series of pulses is required.
13. Record voltage level at beginning, middle, and end of pass. Readout is to be accurate to at least 0.1 volt (2% bandwidth). Readout AET 32 and AET 36 after priority 1 items and report them to the STC by voice within 5 minutes after the pass.

---

* *Measurements to be read in real time and reported to the STC by voice are checked. Other measurements may be read after the pass. All data listed are to be reported to the STC by 60-wpm teletype as soon as possible.*

** *T/M ships will transmit real-time data immediately after signal fade so no interference with the telemetry signals will be generated.*

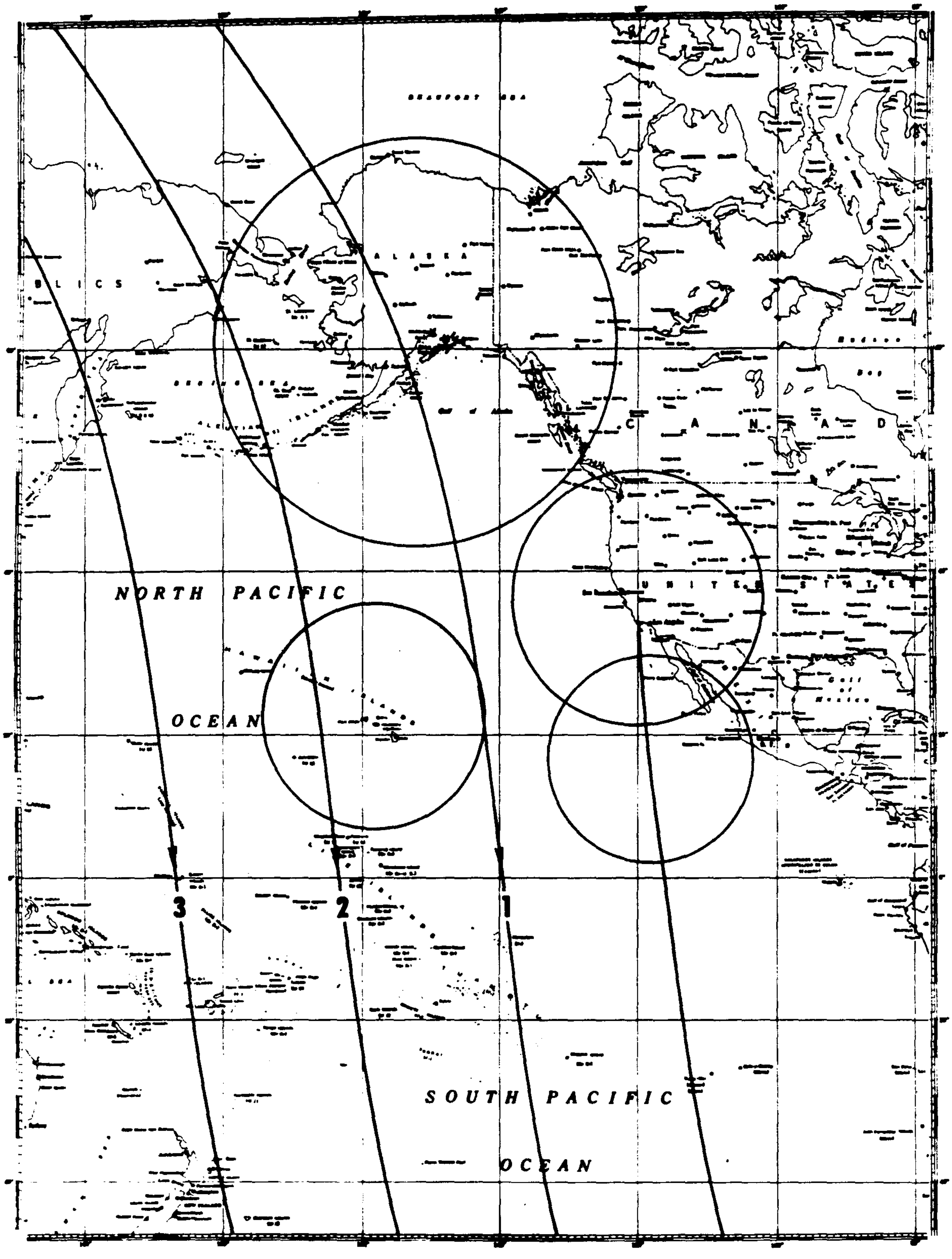


Figure A2-1 Nominal Orbit Traces – Passes 1 Through 3

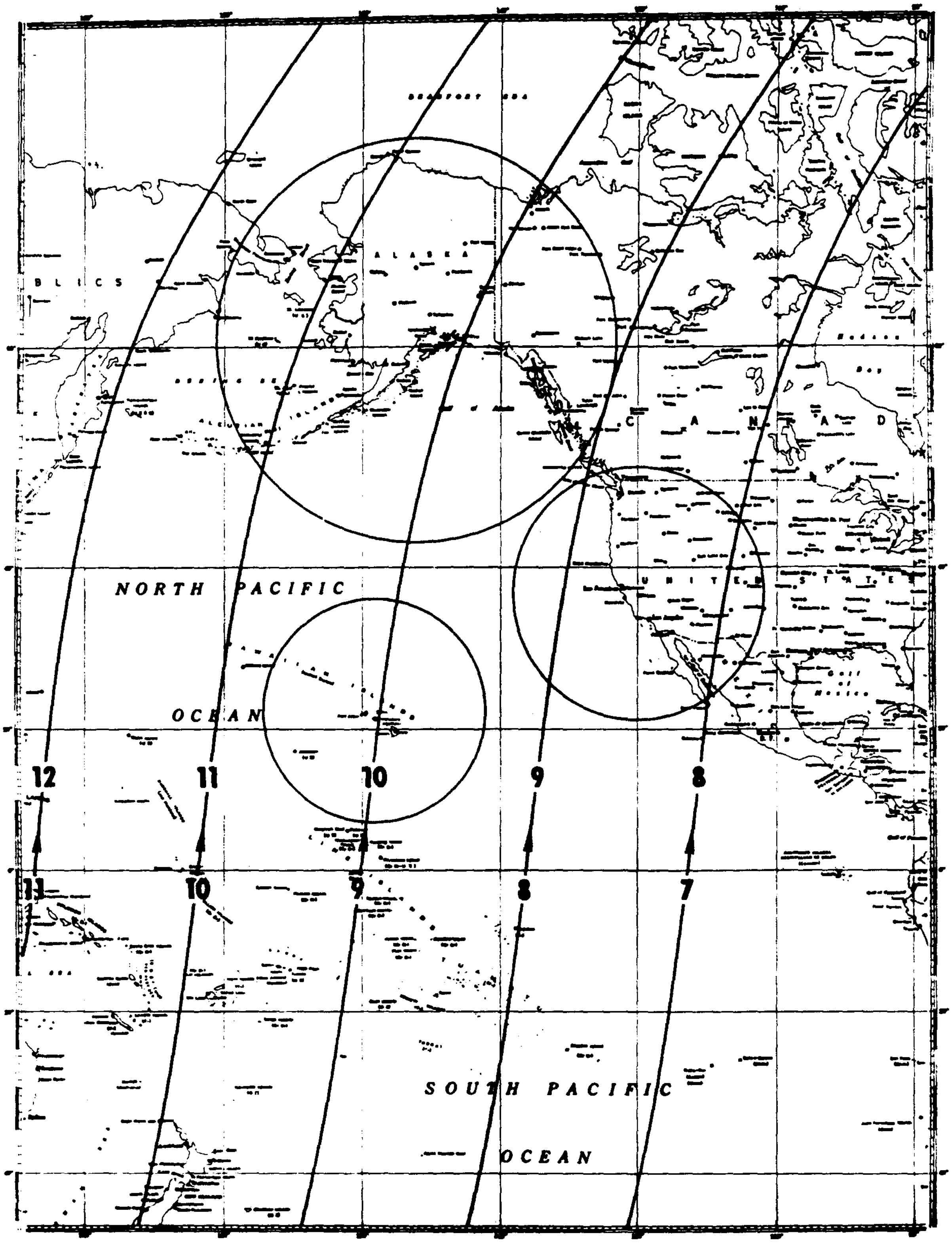


Figure A2-2 Nominal Orbit Traces – Passes 5 Through 12

[redacted]
1056/237
Revised Page
1 August 1960

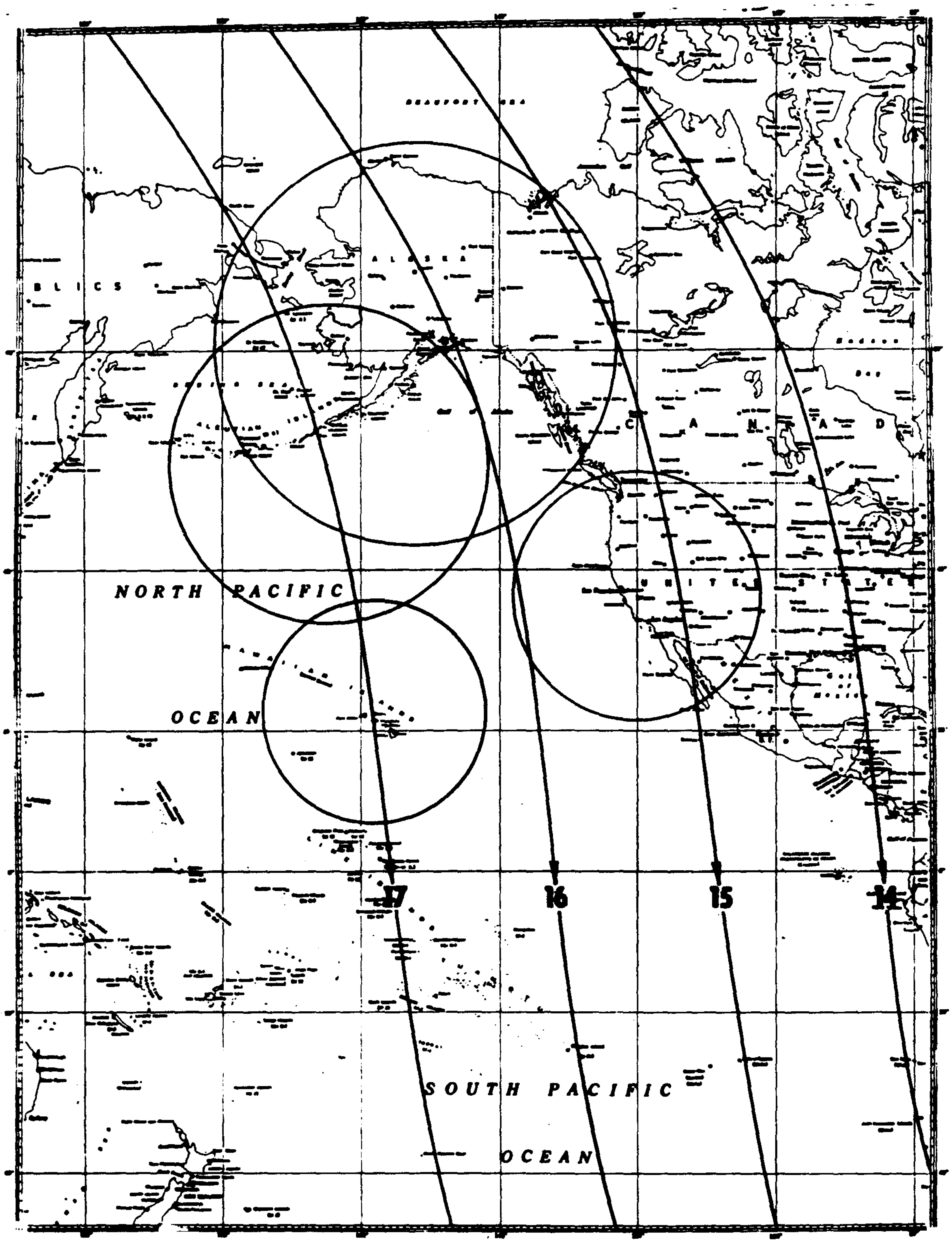
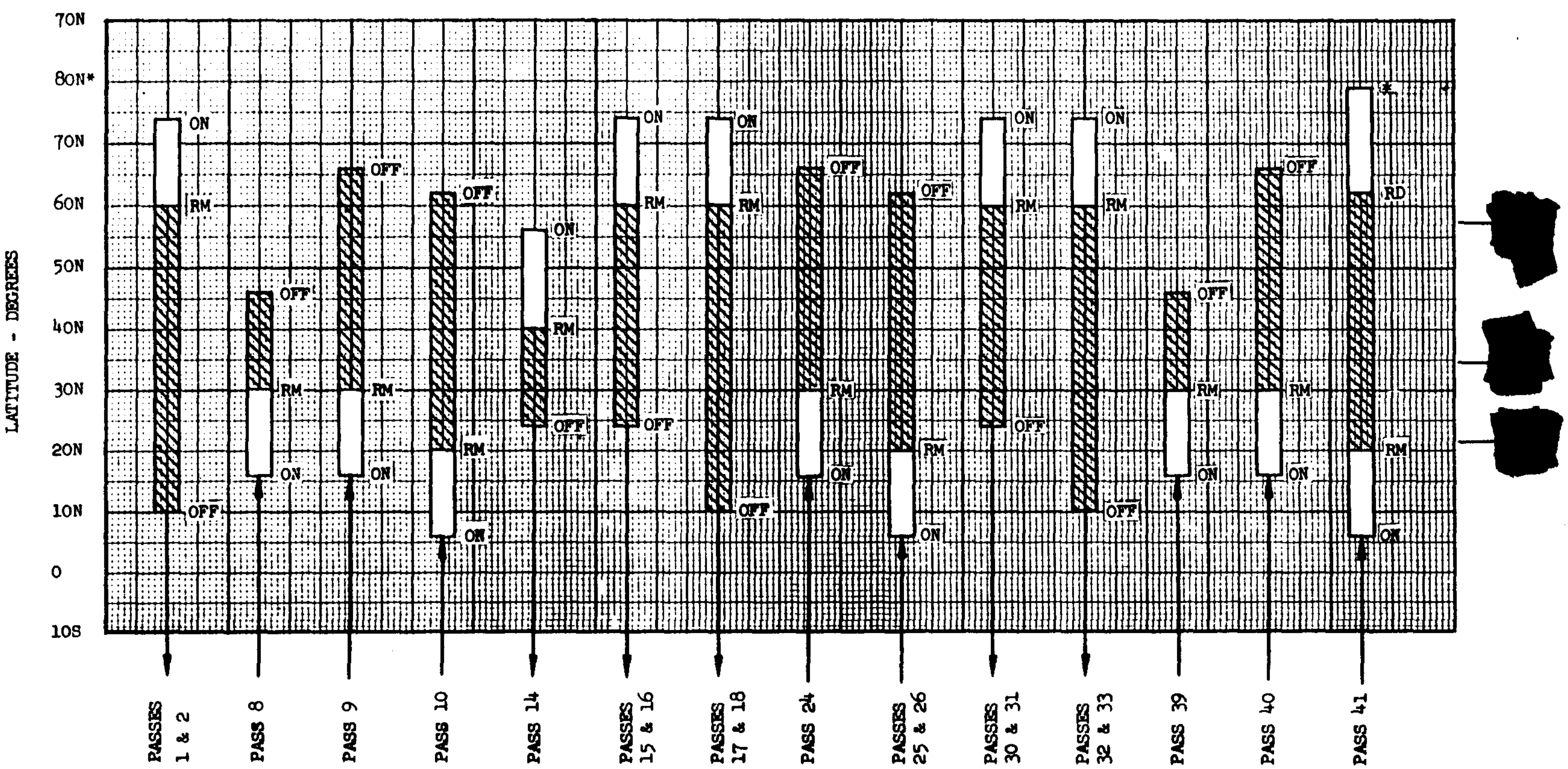


Figure A2-3 Nominal Orbit Traces – Passes 12 Through 18

[redacted]
1056/237
Revised Page
1 August 1960



ON = RESET ENABLE, RADAR PULSE BEACON ON, TELEMETRY PLATES ON

OFF = RESET DISABLE, RADAR PULSE BEACON OFF, TELEMETRY PLATES OFF

ON THRU OFF = RESET COMMAND CAPABILITY

(white bar) = RESET MONITOR (RM) SIGNAL OFF

(hatched bar) = RESET MONITOR (RM) SIGNAL ON

* = MAXIMUM LATITUDE REACHED WITH ORBIT PLANE INCLINATION IS APPROXIMATELY 79.4°N

RD = RESET DISABLE - RADAR PULSE BEACON AND TELEMETRY REMAIN ON AFTER PASS 41.

Figure A2-4 Readout and Reset Programming

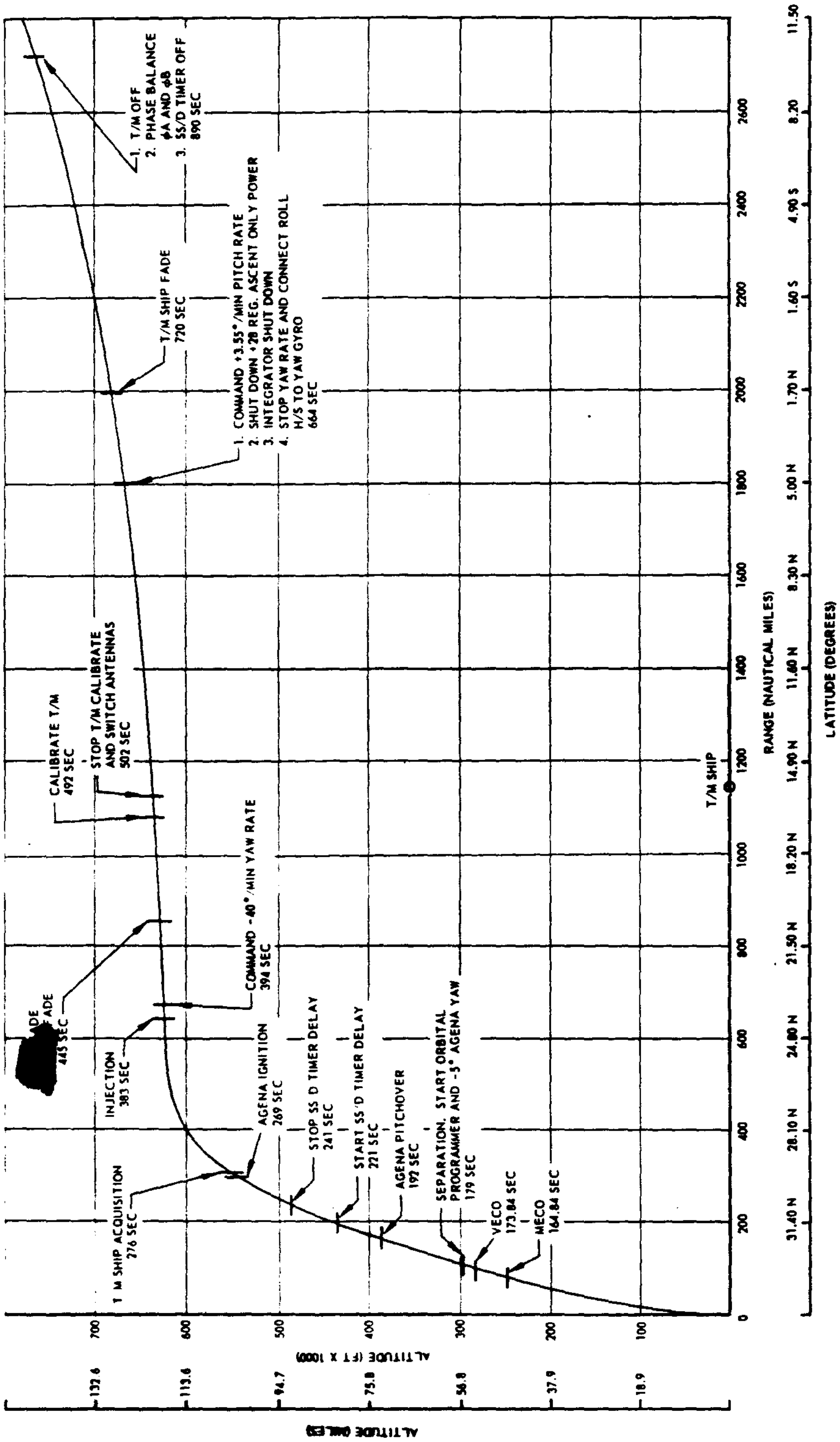


Figure A5-1 Launch Phase Nominal Trajectory

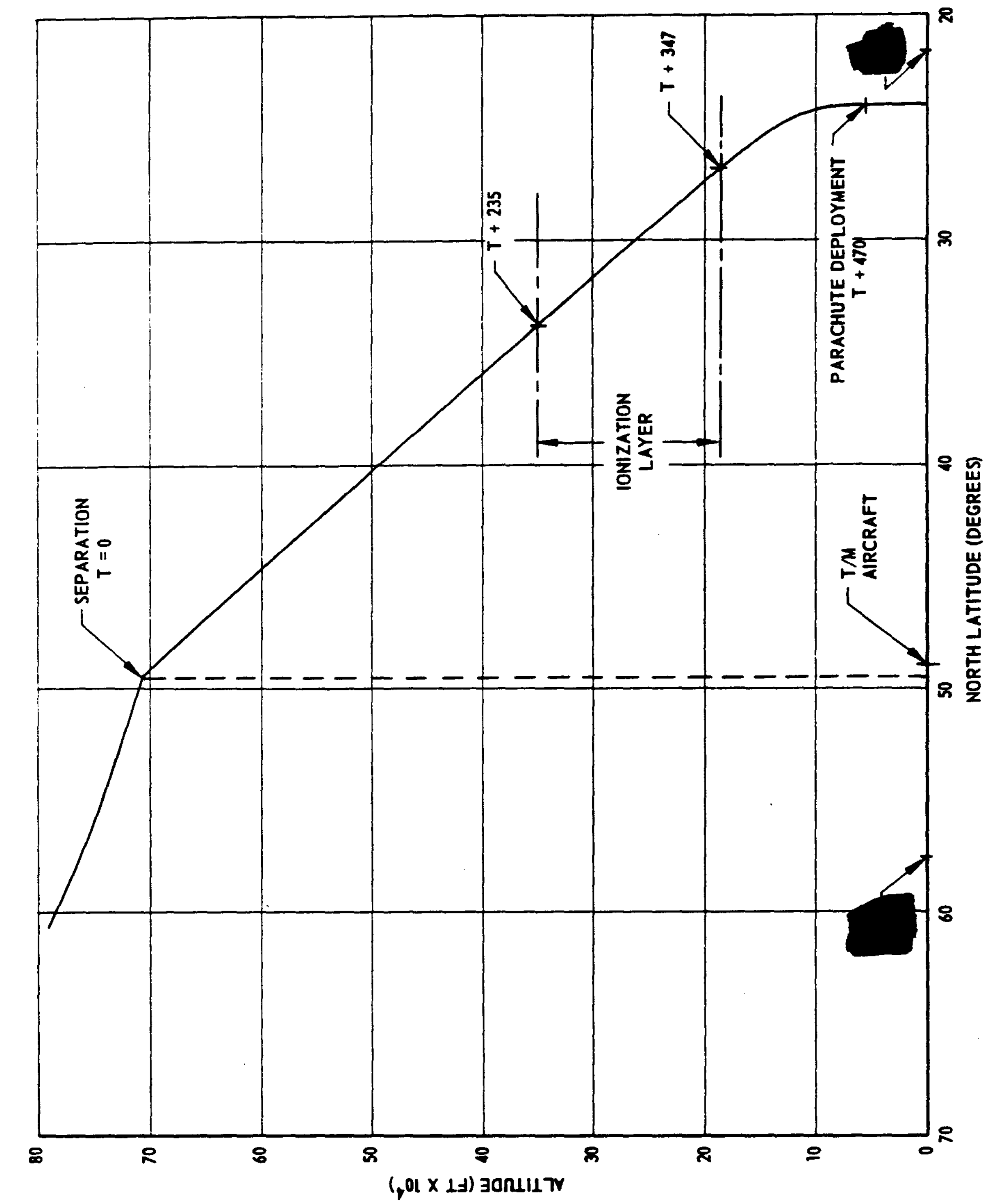


Figure A7-1 Capsule Re-entry Trajectory

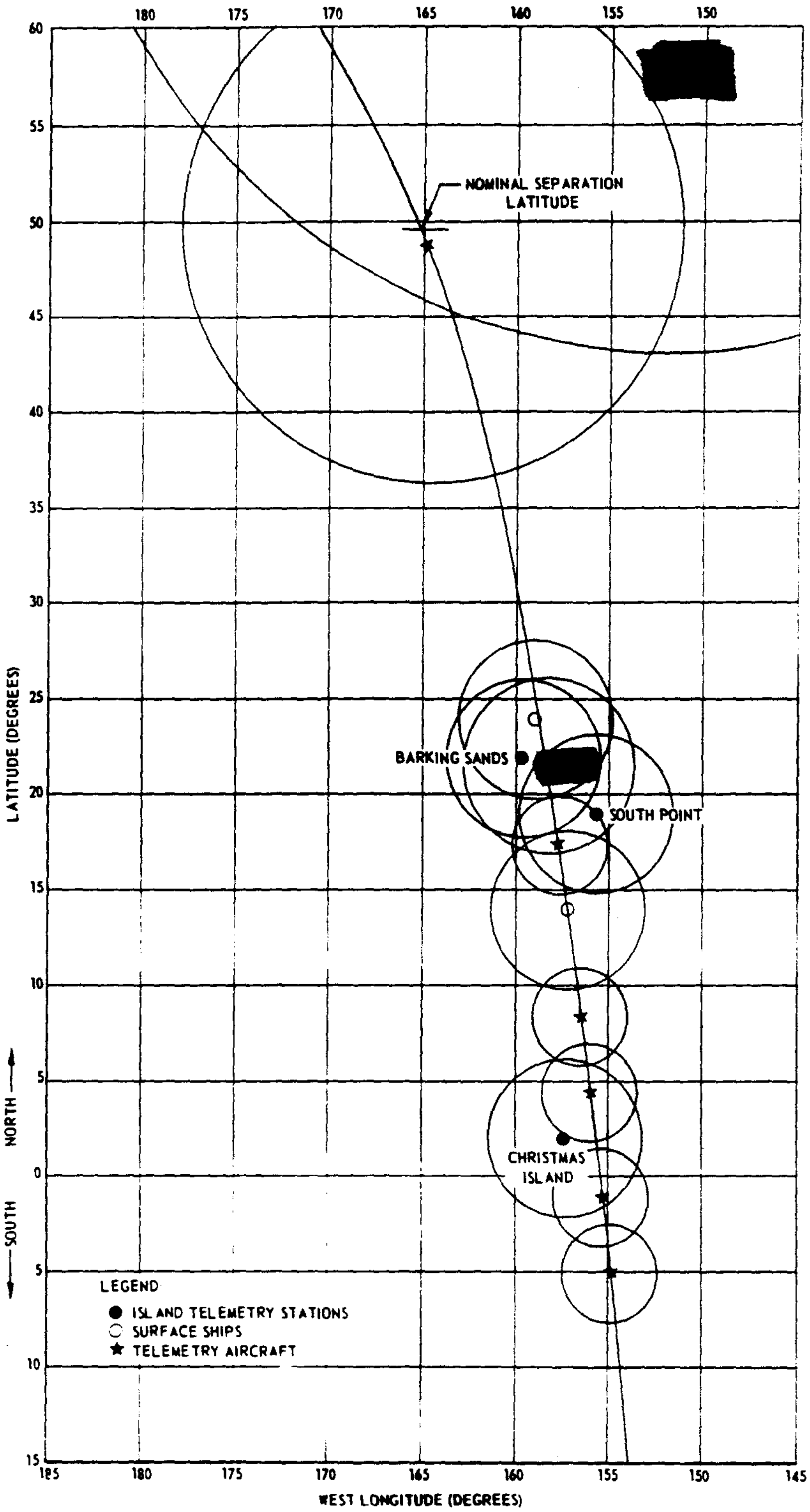


Figure A7-2 Recovery Pass Telemetry Coverage

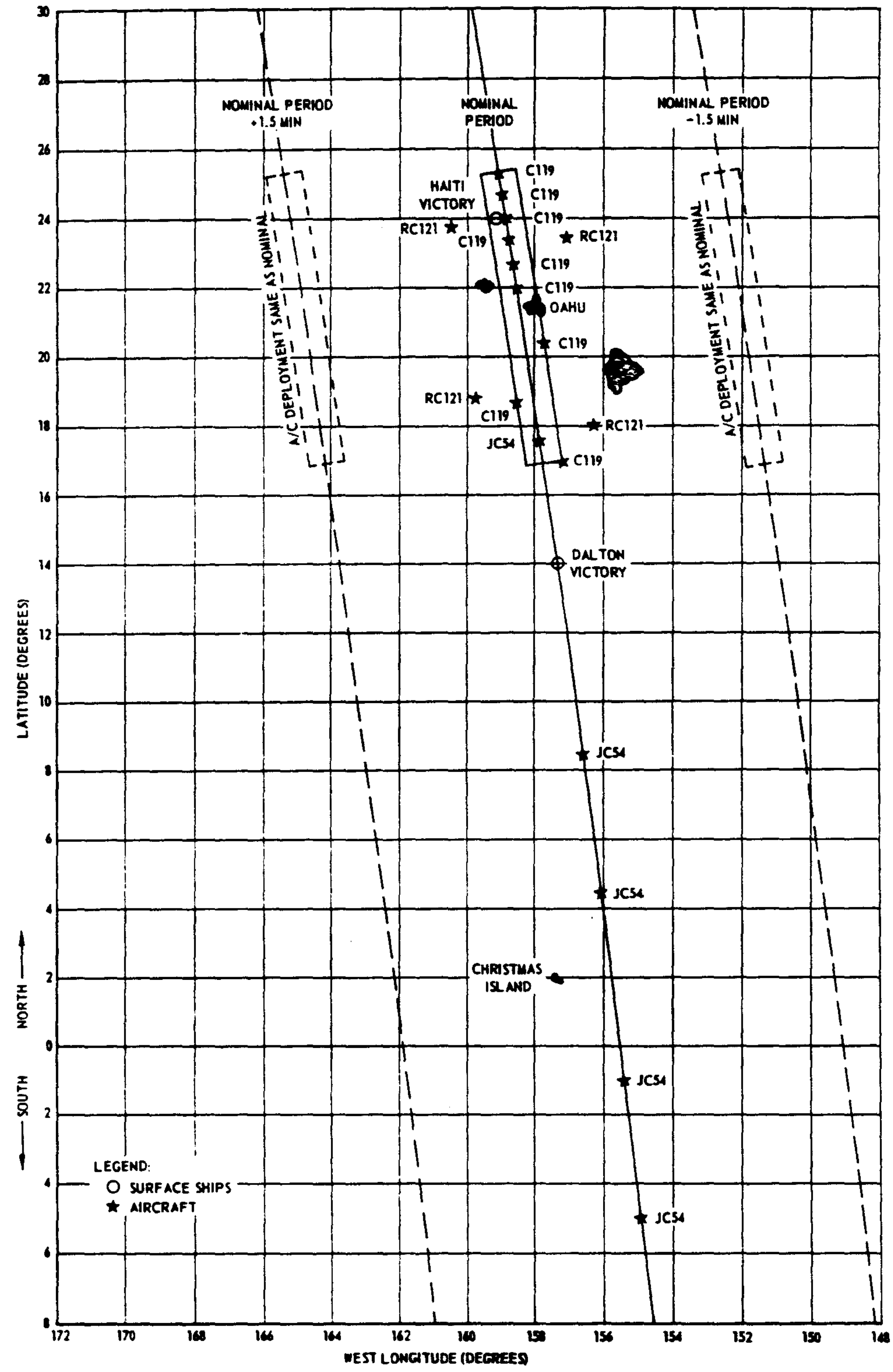


Figure A7-3 Recovery Force Deployment

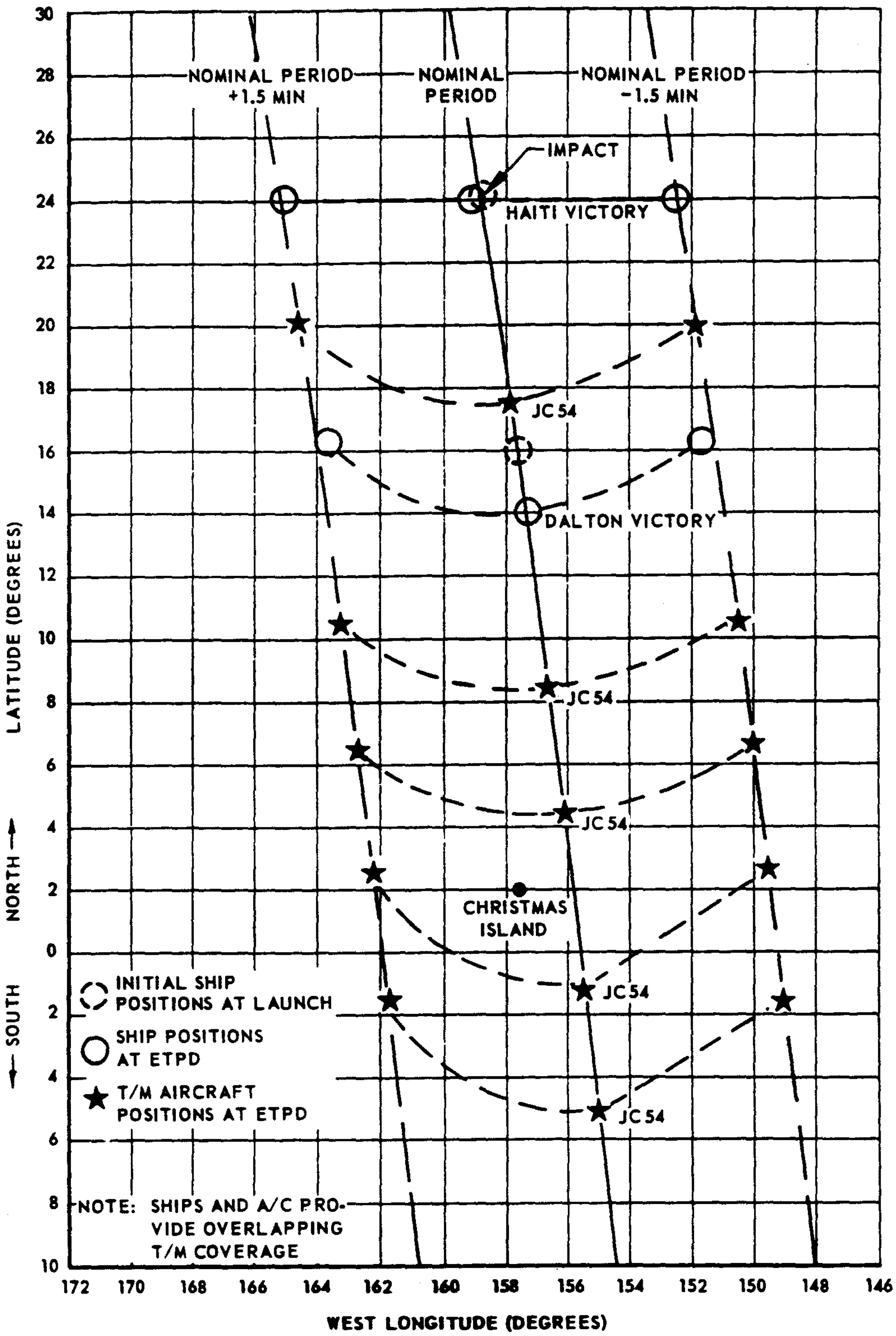


Figure A7-4 Recovery Surface Force and Telemetry Aircraft Deployment

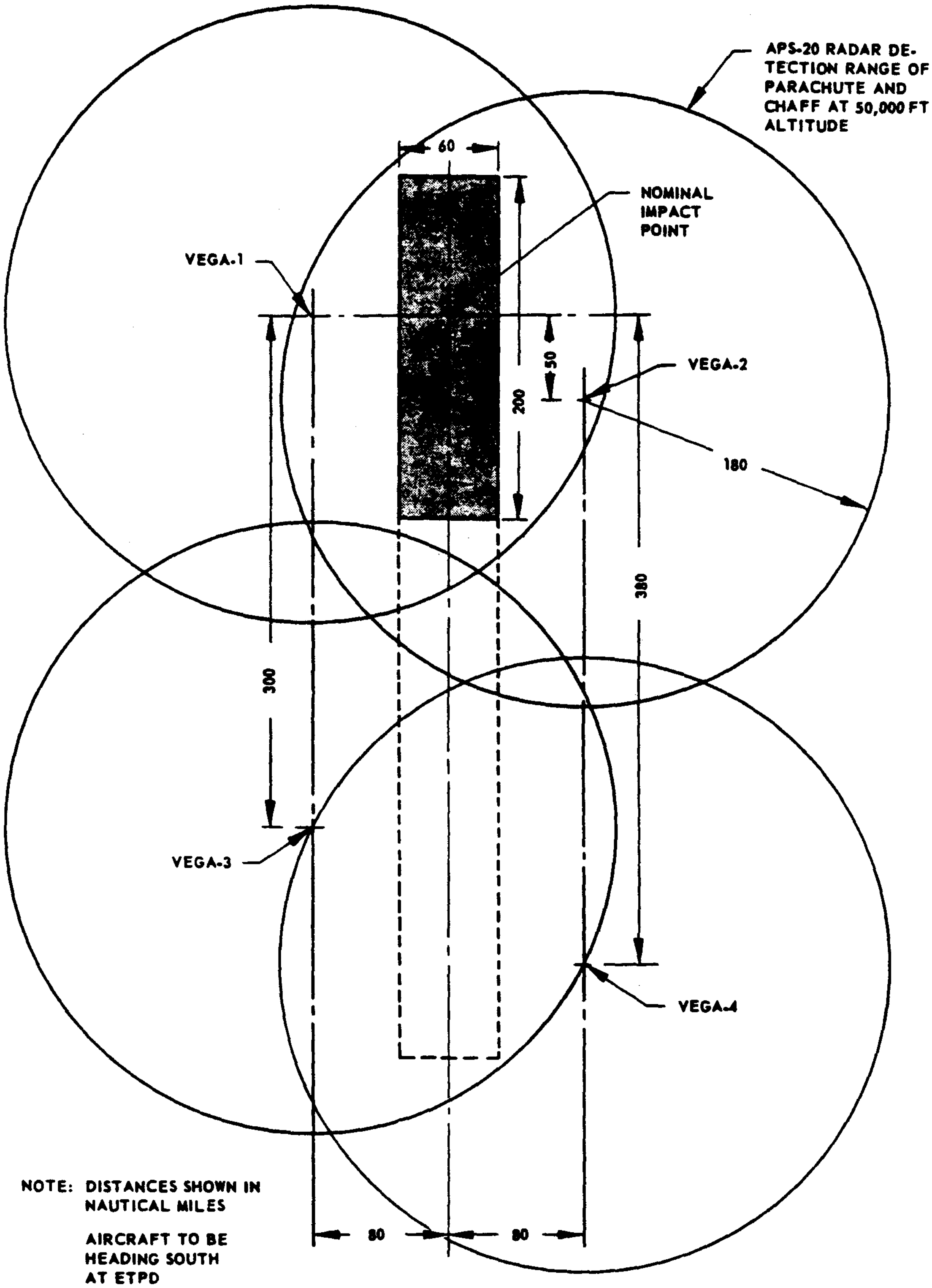


Figure A7-5 RC-121 Aircraft Deployment

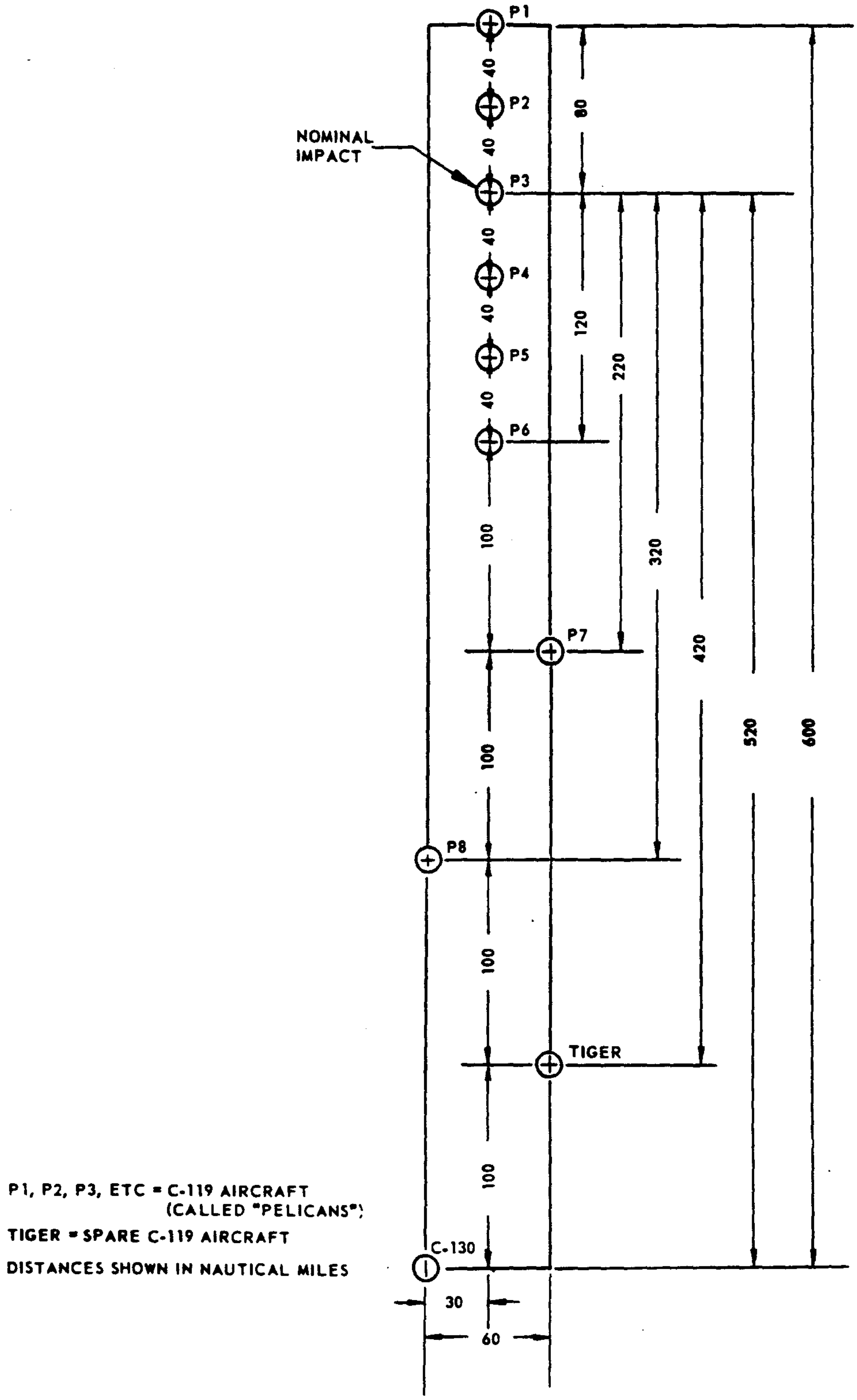


Figure A7-6 C-119 and C-130 Aircraft Deployment

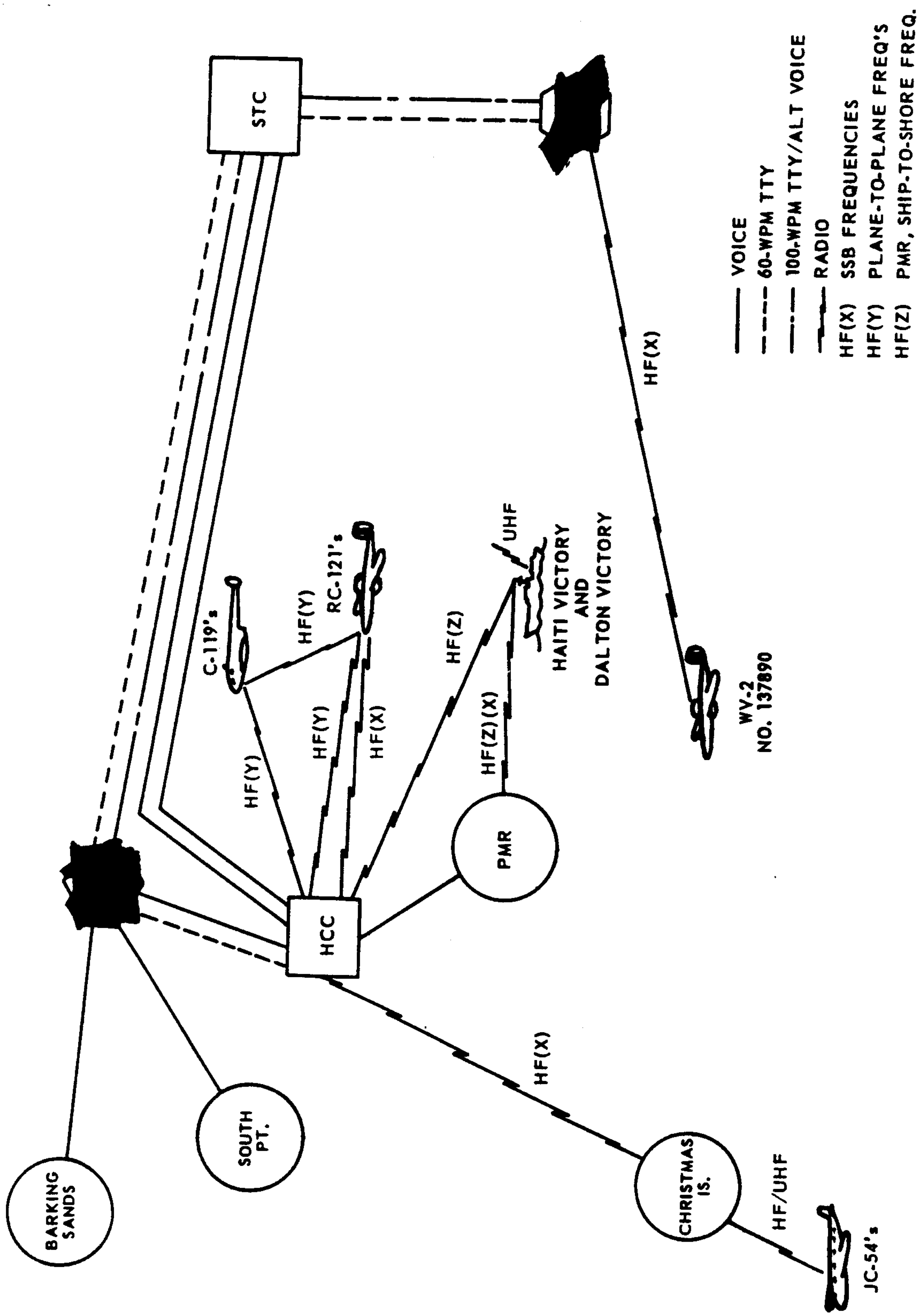
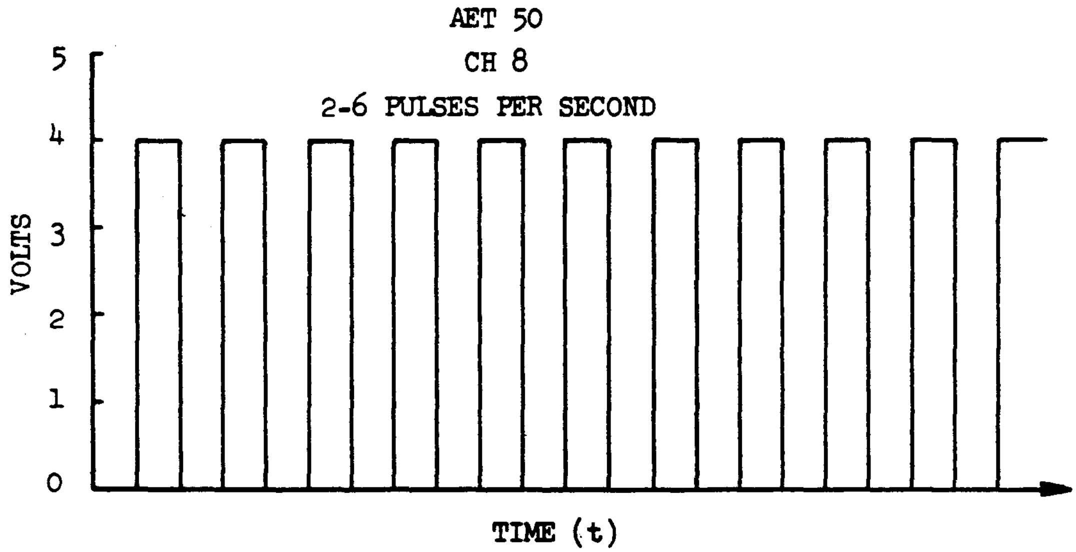


Figure A7-7 Recovery Operations Communication



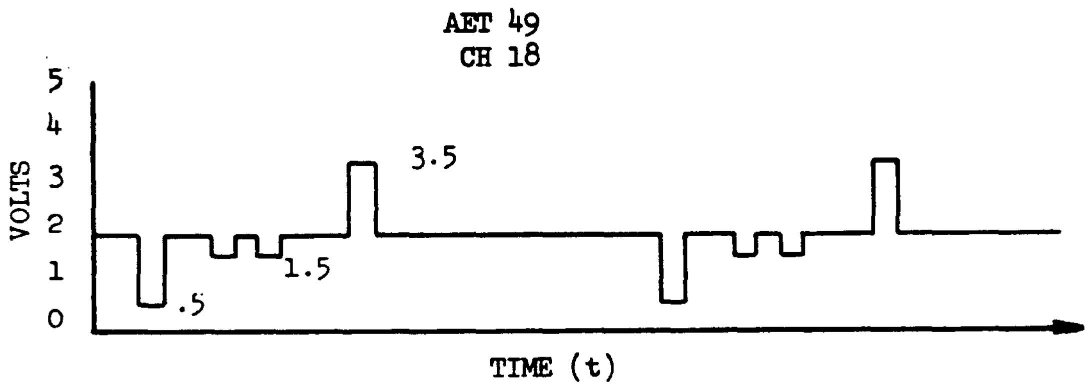


Figure A8-2 Nominal Payload Function Wave Trains

Notice of Page Substitution

Tab 6 - Appendix A
Vehicle 1057/Booster 231

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

[redacted]
1057/231
25 April 1960

DISCOVERER
SYSTEM TEST DIRECTIVE
TAB 6 APPENDIX A
FOR
AGENA VEHICLE 1057
THOR BOOSTER 231

This document has been prepared by Systems Operations Planning, 61-41

Approved:
[redacted] Manager
for Systems Operations
Satellite Systems

Approved:
[redacted]
FOR: Lt. Col. USAF
6594th Test Wing (Satellite)
Chairman, STWG

APPENDIX A, TAB 6
SUPPLEMENTAL TEST INFORMATION

CONTENTS

ILLUSTRATIONS

TABLES

FOREWORD

The basic System Test Directive, [redacted] purposely omits detailed variable flight-to-flight data but contains information of a permanent nature applicable to all flights of the initial Discoverer series. Detailed data and directives are presented in this Appendix A tab for the Agena 1057/Thor 231 combination and are applicable to this configuration only.

Engineering and procedural changes pertinent to the Agena 1057/Thor 231 combination are summarized as follows:

a. The APL Doppler acquisition transmitter and tracking lights will be incorporated for this flight.

b. The [redacted] tracking station at South Point, Hawaii, will be employed during the recovery operation.

c. C-119J aircraft assignments concerning the monitoring of capsule beacon and T/M frequencies have been modified.

d. The tape program of the orbital programmer has been changed.

e. The flight path azimuth will be altered by a programmed -5^{o} yaw maneuver of the Agena vehicle immediately following separation.

APPENDIX A
SUPPLEMENTAL TEST INFORMATION

A1 GENERAL

This section contains descriptive material which supplements the text of the general STD for this flight only. Material presented herein may also correct or supersede material in the general STD for this flight only if necessary. General STD changes of a permanent nature will be effected by replacement pages in the main text at the earliest possible date. Reference will not be made to this Appendix for subsequent flight operations. The following material is divided into general sections, with parenthetical references to relative paragraphs in the main text provided where beneficial.

A2 LAUNCH OPERATIONS

A2.1 Flight Path Azimuth

The flight path azimuth will be altered by a programmed -5° yaw maneuver of the Agena vehicle immediately following separation. The yaw maneuver will align the Agena vehicle with the Discoverer coast velocity vector and increase the resultant velocity at Agena burnout. This will provide assurance that the velocity required for orbit of the payload will be attained. Due to range safety considerations at Vandenberg Air Force Base, the launch azimuth of 172° East of North remains unchanged.

A3 ORBIT OPERATIONS

A3.1 APL Doppler Evaluation

A3.1.1 An additional transmitter will be employed on Agena vehicle 1057 for evaluation purposes. This transmitter will operate continuously on

162 mc and 216 mc and may be used as an acquisition aid in the event the CWAT becomes inoperative. LMSD tracking stations will receive the signals on 162 mc and 216 mc on all passes, except the recovery pass, to verify that the transmitter is operative; no attempt will be made to record intelligible data. APL Doppler tracking stations will receive the beacon signals and record Doppler data on teletype tape for post-flight evaluation.

A. 3. 1. 2 An optical beacon will also be installed on Agena vehicle 1057. The beacon will be turned on by the orbital programmer while the satellite is within reception range of Smithsonian stations equipped with Baker-Nunn cameras.

A3. 2 Orbital Programmer

The tape program of the orbital programmer has been changed, simplifying readout and reset operations (see Fig. A2-7). Reset "enable" and "disable" functions now occur simultaneously with radar pulse beacon and telemetry plates "turn-on" and "turn-off", and the dual reset capability is deleted. This allows additional command capability for payload functions.

A4 RECOVERY OPERATIONS

A4. 1 Capsule Telemetry

Capsule telemetry Channels 7 and 8 will measure one set of events during the re-entry sequence and another set of events during the recovery sequence. The oscillator inputs will be switched when the thrust cone is separated. Channel 11 will measure axial acceleration during both the re-entry sequence and the recovery sequence. The subcarrier for Channel 7 will be turned off after thrust cone separation and will be turned on again at 5-g switch closure. Channels 8 and 11 will transmit data continuously throughout the descent trajectory. Figure A8-1 shows the nominal voltage levels which indicate that normal re-entry and recovery sequences have occurred.

A4.2 Tracking Station Operations

A4.2.1 The TLM-18 type antenna at the [redacted] tracking station on South Point, Hawaii, will be employed in this flight to provide a triangulation with [redacted] on the recovery pass for determining the capsule location at parachute deployment. The antenna will be positioned as a function of maximum signal strength; the azimuth, elevation, and system time will be recorded each time the positioning errors are minimum. At these times, the azimuth and elevation will be reported over the telephone line to [redacted] so the data can be plotted manually and triangulation effected. When the capsule enters the ionization layer and the telemetry signal disappears, South Point will reposition the antenna to the parachute deployment azimuth and elevation, as directed by the [redacted]; positioning will be in South Point coordinates and will be based on [redacted] tracking data extrapolated to the blossom point.

When the South Point Station re-acquires, after parachute deployment, the antenna movement will be slight so that an accurate azimuth can be determined; this will be reported to [redacted]. The South Point Station will record the T/M signal received for later evaluation.

A4.3 Recovery Force Procedures

A4.3.1 Assignments of C-119J aircraft to monitor the capsule telemetry and beacon frequencies during the recovery operation have been modified to optimize the possibility of successful recovery operations and to minimize requirements for ground-to-aircraft communications.

During the nominal search configuration, the C-119J aircraft in Positions 2, 4, 6, and 8 will search for the capsule telemetry frequency on 228.2 mc in the 300 kc FM mode; the remaining aircraft will sweep frequencies from 223 mc to 247 mc in the 300-kc AM mode in search of the capsule beacon signal. These assignments will continue from search initiation until either ETPD + 25 minutes or until two or more aircraft report a solid acquisition. If the search has continued through ETPD + 25 minutes and no signals have been reported, all aircraft will search for the capsule beacon signal. If two or more aircraft report a solid acquisition on the same signal, all remaining aircraft will search for the reported signal. If solid acquisition of both signals is reported, aircraft which have not acquired will search for the capsule beacon signal. Aircraft which have solidly acquired the capsule T/M signal will perform the DF homing operation on that signal in the AM mode, detuning as necessary for optimum results, and will attempt to keep the signal locked-in until either visual acquisition of the capsule occurs or until the signal disappears at about ETPD + 25 minutes. Either the 300-kc AM or 10-kc AM setting may be used for DF, depending on existing conditions.

If a nominal orbit is achieved, [redacted] should acquire the capsule 375 seconds before ETPD. Upon acquisition, [redacted] will determine the condition of the capsule T/M and beacon signals in the shortest possible time and report this information over the 100-wpm/voice line to the HCC and all stations. If the capsule beacon is not transmitting, the HCC will inform the Command RC-121 which will instruct the C-119J aircraft in Positions 1 and 5 to join the C-119J aircraft in Positions 2, 4, 6, and 8 in search for the capsule T/M signal. The C-119J aircraft in Positions 3, 7, and 9 will continue in search for the capsule beacon signal.

A4.3.2 Should the re-entry capsule not be sighted before ETPD + 25 minutes, the Command RC-121 will report all signal data received to the HCC for relay to the STC. The data to be reported are aircraft or ship position, signal bearing, and local time for each acquiring aircraft and ship at the time of signal acquisition. Range and azimuth with local time and aircraft position will be reported for each valid radar return. The report shall also contain the controller's conclusions regarding the quality of reported signals and bearings, results of triangulation attempts, and most probable impact location. These data will be relayed to the STC immediately upon receipt by the HCC, to enable the PAC to determine the most productive search areas.

A5 TABLES AND ILLUSTRATIONS

The following tables and illustrations are applicable to the flight of Agena 1057/Thor 231 only. Each table or figure is given the basic number of the section of the general STD to which it applies, the letter A to denote appendix material, and a number to sequence items in the same category.

Table A2-1
NOMINAL FLIGHT PLANNING DATA

Item	Data
DISCOVERER	
S/N	1057
Payload	GFE
Fuel	UDMH
Oxidizer	IRFNA
Launch Weight	8651
THOR	
S/N	231
Launch Weight	109,284
Fuel	RJ-1
Oxidizer	Liquid Oxygen
LAUNCH	
Site	VAFB, SM-75-3, Pad No. 5
Date	May 1960
Time	1100 PST
Pad azimuth	218° 24' 17.24"
Launch azimuth	172°
Nominal airborne Command #5 backup	20 sec
Orbital boost time	117.5 sec
Downrange T/M ship location (King County)	16° 00'N, 117° 43'W
Downrange T/M ship heading	352°T
Programmer setting	5610 seconds (Step 22)
Payload setting	6 (0101 Gray Code)
INJECTION	
Time	T + 388 sec
Location	24° 12.7'N, 119° 7.1'W
Altitude	117 sm, 102 nm
Azimuth (inertial)	168° 52.2"
Nominal velocity	26,049 ft/sec
ORBIT	
Period	93.43 min (5606 sec)
Apogee	437 sm, 380 nm
Perigee	117 sm, 102 nm
Eccentricity	0.0377
Average regression rate (17 passes)	23.52°[redacted]
Reset latitudes	20°N [redacted] 30°N [redacted]rthbound) or 40°N [redacted]outhbound) 60°N [redacted]
Inclination angle	79.41[redacted]
Re-entry T/M ship location (Pvt. Joe E. Mann)	39° 35'N, 161° 45'W
RECOVERY	
Aircraft (type and quantity)	C-119's (9) and RC-121's (4)
Surface ships (recovery)	Dalton Victory and Haiti Victory
Surface ship initial locations	17°N, 153° 45'W and 17°N, 162° 15'W
Surface ship helicopters	HRS-3 (2 on each ship)
Recovery pass	17 nominal - 15, 16, or 18 by special command
Predicted impact area center	17°N, 158°W
ETPD	T + 26.6 Hours

Table A2-2
NOMINAL ACQUISITION TIMES

Pass	Station	Acquisition Time (minutes)	Fadeout Time (minutes)	Duration Time (minutes)
Launch	[redacted]	0.5	8.1	7.6
	[redacted]	0.0	7.9	7.9
	T/M Ship	4.6	12.0	7.4
1	[redacted]	87.3	95.1	7.8
2	[redacted]	182.8	187.5	4.7
	[redacted]	191.2	197.2	6.0
8	[redacted]	717.7	728.9	11.2
9	[redacted]	811.1	815.3	4.2
	[redacted]	811.7	823.4	11.7
	[redacted]	818.9	826.9	8.0
10	[redacted]	902.1	915.2	13.1
	[redacted]	910.9	922.1	11.2
*11	[redacted]	998.1	1005.2	7.1
	[redacted]	1006.3	1019.1	12.8
*12	[redacted]	1104.9	1108.8	3.9
15	[redacted]	1395.7	1399.8	4.1
	[redacted]	1402.4	1408.8	6.4
16	[redacted]	1489.3	1496.9	7.6
	[redacted]	1498.9	1500.5	1.6
17	[redacted]	1584.2	1590.4	6.2
	[redacted]	1592.8	1599.6	6.8
*23	[redacted]	2120.9	2129.7	8.8
24	[redacted]	2222.7	2227.6	4.9

*Acquisition only - no T/M readout

Table A4-1

TELEMETERED FUNCTIONS REQUIRED TO BE OPERATIVE AT LAUNCH

1. Vehicle Telemetry
   a. Continuous Channels:
      7 - Payload quantity. Subcarrier must be present
      9 - Payload quantity. Subcarrier must be present
      18 - Payload quantity. Subcarrier must be present
   b. Commutated Channels
      12 - Subcarrier must be present and commutator running
      13 - Subcarrier must be present and commutator running
      16 - Subcarrier must be present and commutator running (Points 2, 4, 6, 8, 10, 22, 24, 25, and 26 must be present. Timer motor frequency on Channel 1 is an acceptable substitution for Channel 16 points 24 and/or 26. Channel 11 is an acceptable substitution for Channel 16 points 2, 4, 6, and 8.)
      17 - Subcarrier must be present and commutator running
2. Capsule Telemetry
   a. Continuous Channels
      7 - Subcarrier must be present
      8 - Subcarrier must be present
      11 - Subcarrier must be present
   b. Acquisition Beacon
      The frequency must be within 1. 5 mc of the nominal value

Table A5-1

SS/D SEQUENCE FOR DISCOVERER VEHICLE SERIAL 2205-1057

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
	-0.1	Timer reset
0	0	Start SS/D timer
0.1	0.1	Timer reset
0.1	0.1	Timer safety circuit
167	167	Uncage gyros
167	167	Programmed destruct lockout
178.5	178.5	Isolate K24 from Beacon 5
178.5	178.5	Vehicle pneumatic control
178.5	178.5	Open pneumatics valve and spare
178.5	178.5	Fire explosive bolts
178.5	178.5	Fire explosive bolts
179	179	Start orbital programmer (paralleled)
179	179	Fire retro-rockets (paralleled)
179	179	Arm pitch and yaw control
179	179	Arm integrator correction
179	179	Command -5° yaw program
192	192	End -5° yaw program
192	192	Command -45°/min pitch rate (pitchover 20.8°)
192	192	Arm roll H/S command
192	192	Fire H/S cover squib
192	192	Break 28 v to N_2 valve, shut down separation monitor
192	192	Fire H/S cover squib
204	204	+28 v to SS/D for brake control (not effective until 221 sec)
221	221	Command -2°/min pitch rate from integ. potentiometer

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
221	221	Connect pitch H/S command
221	221	Arm Beacon 5 timer brake control
221	221	Arm integ. uncaging circuit
221	221	Actuate delay via orbital programmer
221	221	Roll H/S signal shunt
*221	221	Programmed SS/D timer delay
223		Initiate ground Commands 5 or 6
241	221	Stop SS/D timer delay (nominally 20 sec)
254	234	Fire ullage rockets
254	234	Preactive hydraulics
254	234	Deactivate Beacon 5 timer brake control
254	234	K21 hold-in (Commands 5 and 6 interlock)
269	249	Arm gas generator squib. Energize K28 (pitch and yaw pneumatic Off)
269	249	Connect accelerometer to integrator
269	249	Fire helium valve and gas gen. squib (par.)
269	249	Engine ignition
270	250	Pitch and yaw pneumatic off (backup)
270	250	Open gas gen. fire and He squib fire circuits
270	250	Open gas generator squib arm circuit
270	250	Close circuit to T/M off switch

*This sequence is based upon a nominal trajectory: Orbital programmer set for 20-sec timer brake delay and no timer brake modification from Beacon Channel 5 or 6.

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
270.5	250.5	Steady state thrust
385	365	Arm pneumatic (pitch and yaw)
385	365	Engine cut-off safety switch
**388	368	Disconnect accelerometer from integrator
388	368	Engine shut down by integrator
388	368	Activate pneumatic controls
394	374	SS/L +28v dc unregulated
394	374	Hydraulic controls shut down; shut off ullage rockets and de-energize K34 (paralleled)
394	374	Command -40°/min yaw rate
394	374	Command 0°/min pitch rate
394	374	Fire oxidizer, helium, fuel vent valves (paralleled)
394	374	De-energize K21
492	472	Calibrate T/M
502	482	Stop calibrate
502	482	Open engine shut down circuit and switch antenna
502	482	Enable Commands 5 and 6. Alternate recovery pass capability
664	644	Command +3.55°/min pitch rate
664	644	Connect roll H/S to yaw gyro, yaw command complete
664	644	Roll accel. output grounded
664	644	Shut down +28v reg. ascent only power (paralleled)
664	644	Auxiliary heater on
664	644	Flight control gain change

**The dial reading of the integrator when caged is 1725 representing a velocity-to-be-gained of 13,800 ft/sec.

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
664	644	Integrator shut down (latch down K4, K5, K6)
890	870	Phase balance Ø A
890	870	Arm tape recorder
890	870	Phase balance Ø B
890	870	Accelerometer power amp return
890	870	Telemetry Off
890	870	SS/D timer off
890	870	Arm SS/D timer for recovery phase
890	870	Stop integrator caging
*X	870	SS/D timer on, H/S off
X + 15	885	Command -45°/min pitch rate
X + 15	885	Fire payload battery heater squibs
X + 15	885	Arm capsule ejection (squib)
X + 92	962	Command 3.55°/min pitch rate
X + 92	962	SS/L Transfer Circuit 1
X + 92	962	SS/L Transfer Circuit 2
X + 92	962	Disconnect capsule from electrical P.S.
X + 93.5	963.5	Shut down SS/D timer
X + 93.5	963.5	Command eject (paralleled)

*Time of initiation of recovery phase

Table A6-1
NOMINAL ORBIT SCHEDULE: DISCOVERER SERIAL NO. 2205-1057
(Based on a 93.5 Minute Period)

Phase	Event	Time T (min)	Location N Latitude (deg)
Launch	Launch	0	34.8
	Separation	2.98 (179 sec)	- - -
	Start orbital timer	2.98 (179 sec)	- - -
	Nominal fire time	4.48 (269 sec)	- - -
	Nominal burnout and orbit injection	6.47 (388 sec)	- - -
	First crossing of equator	12.37 (742 sec)	0
	Beacon and T/M off	14.83 (890 sec)	12 (S)
Pass 1 (N-S)	Beacon and T/M on - reset enable	86.9	74
	Acquire [redacted]	87.3	72.7
	65°N latitude (ref.)	89.5	65
	Reset signal/command	91.1	60
	57.6°N latitude (ref.) [redacted]	91.5	57.6
	Beacon and T/M off - reset disable	103.3	10
	End of Orbit 1	153.4	0
Pass 2 (N-S)	Beacon and T/M on - reset enable	180.5	74
	Acquire [redacted]	182.8	65.7
	Reset signal/command	184.4	60
	57.6°N latitude (ref) [redacted]	185.0	57.6
	Acquire [redacted]	191.2	32.3
	21.6°N latitude (ref.) [redacted]	194.0	21.6
	Beacon and T/M off - reset disable	196.8	10
	End of Orbit 2	246.9	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 3 thru 7	End of Orbit 3	340.4	0
	End of Orbit 4	433.9	0
	End of Orbit 5	527.4	0
	End of Orbit 6	620.9	0
	End of Orbit 7	714.4	0
Pass 8 (S-N)	Acquire [redacted]	717.7	12.7
	Beacon and T/M on - reset enable	718.8	16
	Reset signal/command	722.7	30
	34.8°N latitude(ref) [redacted]	724.0	34.8
	Beacon and T/M off - reset disable	727.1	46
	End of Orbit 8	807.9	0
Pass 9 (S-N)	Acquire [redacted]	811.1	12.3
	Acquire [redacted]	811.7	14.7
	Beacon and T/M on - reset enable	812.3	16
	21.6°N latitude(ref) [redacted]	813.8	21.6
	Reset signal/command	816.1	30
	Acquire [redacted]	818.9	40.2
	57.6°N l[redacted]ude(ref) [redacted]	823.6	57.6
	Beacon and T/M off - reset disable	826.2	66
	End of Orbit 9	901.3	0
Pass 10 (S-N)	Acquire [redacted]	902.1	2.7
	Beacon and T/M on - reset enable	903.0	6
	Reset signal/command	906.9	20
	21.6°N latitude(ref) [redacted]	907.3	21.6
	Acquire [redacted]	910.9	35
	57.6°N l[redacted]titude(ref) [redacted]	916.8	57.6
	Beacon and T/M off - reset disable	918.5	62
	End of Orbit 10	994.8	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 11 thru 13	End of Orbit 11	1088.3	0
	End of Orbit 12	1181.8	0
	End of Orbit 13	1275.2	0
Pass 14 (N-S)	57.6°N latitude(ref [redacted]	1306.8	57.6
	Beacon and T/M on - reset enable	1307.1	56
	Reset signal/command	1311.2	40
	34.8°N latitude(ref [redacted]	1312.3	34.8
	Beacon and T/M off - reset disable	1315.1	24
	End of Orbit 14	1368.7	0
Pass 15 (N-S)	Beacon and T/M on - reset [redacted]le	1395.5	74
	Acquire [redacted]	1395.7	73.5
	Reset signal/command	1399.7	60
	57.6°N [redacted]tude(ref [redacted]	1400.3	57.6
	Acquire [redacted]	1402.4	48.5
	34.8°N latitude(ref [redacted]	1405.8	34.8
	Beacon and T/M off - reset disable	1408.6	24
	End of Orbit 15	1462.2	0
Pass 16 (N-S)	Beacon and T/M on - reset enable	1489.2	74
	Acquire [redacted]	1489.3	72.7
	Reset signal/command	1493.1	60
	57.6°N l[redacted]tude(ref [redacted]	1493.8	57.6
	Acquire [redacted]	1498.9	37.3
	34.8°N latitude(ref [redacted]	1499.4	34.8
	Beacon and T/M off - reset disable	1502.1	24
	End of Orbit 16	1555.7	0
Pass 17 (N-S)	Beacon and T/M on, reset en[redacted]le	1582.7	74
	Acquire [redacted]	1584.2	67.6
	Reset signal/command	1586.6	60
	57.6°N latitude(ref [redacted]	1587.3	57.6
	Acquire [redacted]	1592.8	34.2

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 17 (N-S) (Con'td)	21.6°N latitude(ref[redacted]	1595.7	21.6
	Beacon and T/M off [redacted] reset disable	1598.9	10
	End of Orbit 17	1649.2	0
Pass 18 (N-S)	Beacon and T/M on - reset enable	1676.2	74
	Reset signal/command[redacted]	1680.1	60
	57.6°N latitude(ref[redacted]	1680.8	57.6
	21.6°N latitude(ref[redacted]	1689.2	21.6
	Beacon and T/M off - reset disable	1692.4	10
	End of Orbit 18	1742.7	0

Table A6-2

FIRST-PASS PROGRAMMER CORRECTION BASED ON TIME OF CROSSING
(LAUNCH ORBITAL PROGRAMMER SETTING - 5610 SECONDS)

		Cross Latitude (Reference Latitude)							
		65°N		57.6°N		25°N		22°N	
Period (sec)	Programmer Correction	T From Launch Time (sec)	T + Launch System Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)
5376	Decrease 22 steps	5152		5262		5749		5794	
5400	Decrease 20 steps	5175		5285		5774		5819	
5460	Decrease 14 steps	5228		5340		5834		5880	
5520	Decrease 8 steps	5281		5394		5894		5940	
5580	No change	5334		5449		5954		6001	
5640	No change	5388		5503		6014		6061	
5700	Increase 8 steps	5441		5558		6074		6121	
5760	Increase 14 steps	5494		5612		6134		6182	
5820	Increase 20 steps	5547		5667		6194		6242	
5880	Increase 25 steps	5600		5722		6254		6302	
5940	Increase 31 steps	5654		5776		6313		6363	
6000	Increase 37 steps	5707		5830		6373		6423	
6060	Increase 42 steps	5760		5885		6343		6483	
6120	Increase 48 steps	5813		5939		6493		6544	
6180	Increase 53 steps	5866		5994		6553		6605	

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
6240	Increase 59 steps	5919		6048		6613		6665	
6300	Increase 65 steps	5973		6103		6673		6725	
6360	Increase 70 steps	6026		6157		6733		6786	
6420	Increase 76 steps	6079		6211		6792		6846	
6480	As directed	6133		6266		6852		6906	
6540	As directed	6186		6321		6912		6967	
6600	As directed	6239		6375		6972		7027	
6660	As directed	6292		6429		7032		7088	
6720	As directed	6346		5484		7092		7148	
6780	As directed	6399		6539		7152		7208	
6840	As directed	6452		6593		7212		7269	
6900	As directed	6505		6647		7272		7329	
6960	As directed	6558		6701		7332		7390	
7020	As directed	6612		6756		7392		7450	
7080	As directed	6665		6810		7452		7511	
7140	As directed	6718		6865		7512		7571	
7200	As directed	6772		6920		7572		7632	

Table A7-1

RECEIVING EQUIPMENT ASSIGNMENTS AND SETTINGS DURING RE-ENTRY AND RECOVERY PASS

LOCATION	SIGNAL	ANTENNA (GAIN)	MULTI-COUPLER	RECEIVER	BANDWIDTH (AM/FM)	MONITOR
[redacted]	VEH beacon VEH T/M Cap T/M	Tri-Helix (15)	Nems Clark	Motorola NC 1302 NC 1302	100 cps CW 300 KC (FM) 300 KC (FM)	Pan Adapter
	Cap beacon Cap T/M	TLM-18 (28)	Nems Clark	NC 1302 NC 1302	300 KC (AM) 300 KC (FM)	Pan Adapter
Pvt. Joe E. Mann	VEH beacon VEH T/M Cap T/M	AFT Tri-Helix (15)	Nems Clark	Motorola NC 1302 NC 1302	100 cps CW 300 KC (FM) 300 KC (FM)	Pan Adapter *SS meter or audio
	Cap beacon Cap T/M	FWD-Tri-Helix (15)	Nems Clark	NC 1302 NC 1401	300 KC (AM) 100 KC (FM)	Pan Adapter *SS meter or audio
	VEH T/M	Single Helix	None	NC 1302	300 KC (FM)	*SS meter or audio
Dalton Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 Pan Adapter
Haiti Victory	Cap beacon Cap T/M	YAGI (7) Helix (9)	None Nems Clark	NC 1302A NC 1403	300 KC (AM) 100 KC (FM)	FLR-2 * SS meter or audio
C119	Cap beacon Cap T/M	YAGI (7)	None	NC 1302A	300 KC (AM) 10 KC or 300 KC (FM)	FLR-2

*SS - Signal Strength

Table A8-1

REAL-TIME DATA REQUIREMENTS

	Measurement: Name	Measurement: Number	Channel	Priority	Real Time Readout Required*	Pass	Tracking Station: [redacted]				T/M Ship**: King County	T/M Ship**: Joe E. Mann	Note
Launch	Liftoff Signal	--	--	1	X	Ascent	X	X					
	Thor Main Engine Cutoff	--	Thor 12	1	X	Ascent	X	X					
	Agena Engine Ignition and Cutoff	B6	14	1	X	Ascent	X	X			X		
	Tone Verifications A,B,C,D	H64,65,66,67	16-2,-4,-6,-8	1	X	Ascent	X	X					
	Command Verifications 1,2,3,4	H112	11	1	X	Ascent	X	X					
	Programmer Step Readout(Console)	H108,109	16-24,-26	1	X	Ascent	X	X					
	10 Second Step Switch Position	H108	16-24	1	X	Ascent	X	X			X		
	100 Second Step Switch Position	H109	16-26	1	X	Ascent	X	X			X		
	Increase/Decrease Switch Position	H107	16-22	1	X	Ascent	X	X			X		
	Payload Function Selector Setting	AET 14/15,17/18,20/21,23/24	13-18 thru 13-24 13-48 thru 13-54	1	X	Ascent	X	X					
	Wave Train	AET 49	18	2		Ascent					X		12
	Wave Train	AET 50	8	2		Ascent					X		12
Orbit	Tone Verifications A,B,C,D	H64,65,66,67	16-2,-4,-6,-8	1	X	1 thru 16	X	X	X	X			
	Command Verifications 1,2,3,4	H112	11	1	X	1 thru 16	X	X	X	X			
	Programmer Period Readout	H110	1,2	2	X	1 thru 16	X	X	X	X			
	Programmer Step Readout (Console)	H108,109	16-24,-26	1	X	1 thru 16	X	X	X	X			
	10 Second Step Switch Position	H108	16-24	1	X	1 thru 16	X	X	X	X			
	100 Second Step Switch Position	H109	16-26	1	X	1 thru 16	X	X	X	X			
	Increase/Decrease Switch Position	H107	16-22	1	X	1 thru 16	X	X	X	X			
	Reset Monitor Signal	H70	16-10	1	X	1 thru 16	X	X	X	X			
	Re-entry Selector Switch Position	C22	16-25	1	X	1 thru 16	X	X	X	X			1
	Payload Function Selector Setting	AET 14/15,17/18,20/21,23/24	13-18 thru 13-24 13-48 thru 13-54	1	X	1 thru 16	X	X	X	X			
	Control Gas Supply Pressure	D95	12-38	2		2,10,16			X	X			
	Battery Bus Voltage	G1	16-15	3		2,10,16			X	X			
	Horizon Scanner - Pitch No. 1	D37	17-22	3		2,10,16			X	X			2
	Horizon Scanner - Roll No. 1	D39	17-26	3		2,10,16			X	X			2
	SPI Temperature	D130	15-9	3		2			X	X		X	3
	SPI Pitch Angle	D128	15-15	3		2			X	X		X	3
	SPI Yaw Angle	D127	15-17	3		2			X	X		X	3
	Wave Train	AET 49	18	2		1 thru 16	X		X	X			12
	Wave Train	AET 50	8	2		1 thru 16	X		X	X			12
	No Name Assigned	AET 26	12-2	2		9	X						13
	No Name Assigned	AET 32	12-5	2		9	X						13
	No Name Assigned	AET 36	12-7	2		9	X						13

Table A8-1 (Continued)

	MEASUREMENT						Tracking Station		T/M Ship**		
	Name	Number	Channel	Priority	Real Time Readout Required*	Pass	[redacted]		King County	Joe E. Mann	Note
Re-Entry	Programmer Period Readout	H110	1,2	3	X	Recovery Pass	X	X			
	Programmer Step Readout (Console)	H108,109	16-24,-26	2	X		X	X			
	10 Second Step Switch Position	H108	16-24	2			X	X			
	100 Second Step Switch Position	H109	16-26	2			X	X			
	Reset Monitor Signal	H70	16-10	1	X		X	X			
	Re-entry Selector Switch Position	C22	16-25	1	X		X	X			1
	Battery Bus Voltage	C1	16-15	3			X	X			
	Horizon Scanner - Pitch No. 1	D37	17-22	3				X			2
	Horizon Scanner - Roll No. 1	D39	17-26	3				X			2
	SPI Temperature	D130	15-9	3				X		X	4
	SPI Pitch Angle	D128	15-15	3				X		X	4
	SPI Yaw Angle	D127	15-17	3				X		X	4
	Pitch Programmer	D41	17-20	1	X		X	X		X	5
	SS'D Timer Restart	D85	12-54	1	X		X	X		X	
	Capsule Separation Event	AET 51	16-21	1	X		X	X		X	6
	Payload Connector Disconnect	AET 26	12-2	2	X		X	X		X	7
	Payload Connector Disconnect	AET 28	12-3	2	X		X	X		X	7
	Payload Connector Disconnect	AET 30	12-4	2	X		X	X		X	7
	No Name Assigned	AET 35	12-19	1	X		X	X		X	8
	Spin Rocket 1 Ign., Spin Rocket 2 Ign., Retro-Rocket Ign., Despin Rocket 2 Ign., Electrical Disconnect/Thrust Cone Separation	--	Capsule 7	1	X		X	X		X	9
	Thrust Cone Thermal Battery Voltage, Despin Rocket 1 Ign., Electrical Disconnect/Thrust Cone Separation	--	Capsule 8	1	X		X	X		X	9
	Longitudinal Acceleration	--	Capsule 11	1	X		X	X		X	10
	5G Switch Closure, Parachute Cover Off, Cutters, Parachute Deployed, Ablative Shell Off	--	Capsule 7	1	X		X	X		X	9
	Thermal Battery 2 A8 Voltage, Timer Switch Closure	--	Capsule 8	1	X		X	X		X	9
	Capsule T/M Signal Strength	--	Capsule 7,8,11	2		Recovery Pass	X	X		X	11

Table A8-1 (Continued)

NOTES:

1 Reads 1 volt for normal Pass 17 Re-entry, 4 volts for alternate re-entry.

2 Record at least 2 points at approximately 5-second intervals to determine the degree of attitude stabilization. Record system time at turnoff on the recovery pass.

3 Record 3 times at approximately 2-minute intervals. Correlate with system time. No readout required fro[redacted]

4 Record at 1-minute intervals before reorientation, 20-second intervals during reorientation and immediately after separation.

5 Record at start and finish of reorientation. [redacted] records at acquisition to determine vehicle attitude at separation. Correlate with system time and estimate accuracy of pitch programmer readout.

6 Reads 4.67 volts prior to separation, 1.33 volts after separation. Correlation within 2 seconds of exact system time is satisfactory for initial report.

7 Reads 1 volt prior to separation, out of band after separation.

8 Reads 4 volts prior to retro-rocket ignition, 1 volt after retro-rocket ignition.

9 Figure A8-1 presents nominal voltage levels. The verbal report will contain general comments on the sequence. The performance summary will contain the sequence of events to the nearest second of system time.

10 The verbal report will contain the system time of initiation, average value, and duration. The performance summary will contain readings every half second during the retro-burning period.

11 Provide a qualitative evaluation of signal reception.

12 A qualitative comparison with the wave train forms in Figure A8-2 with the system times of initiation and termination of the series of pulses is required.

13 Record voltage level at beginning, middle, and end of pass. Readout is to be accurate to at least 0.1 volt (2% bandwidth). Readout AET 32 and AET 36 after priority 1 items and report them to the STC by voice immediately after the pass.

---

* Measurements to be read in real time and reported to the STC by voice are checked. Other measurements may be read after the pass. All data listed are to be reported to the STC by 60-wpm teletype as soon as possible.

** T/M ships will transmit real-time data immediately after signal fade so no interference with the vehicle telemetry signal will be generated.

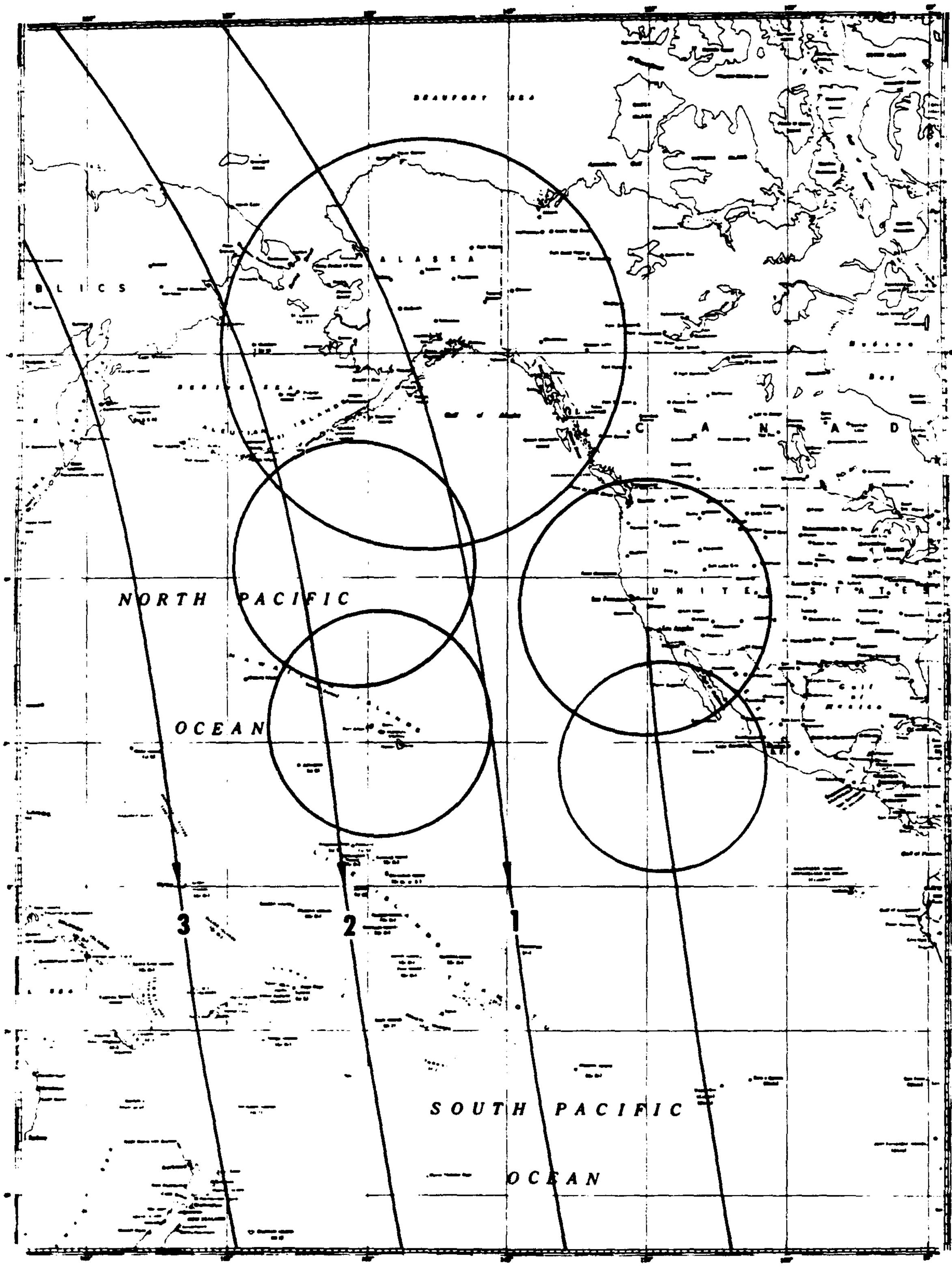


Figure A2-1 Nominal Orbit Traces - Passes 1 Through 3

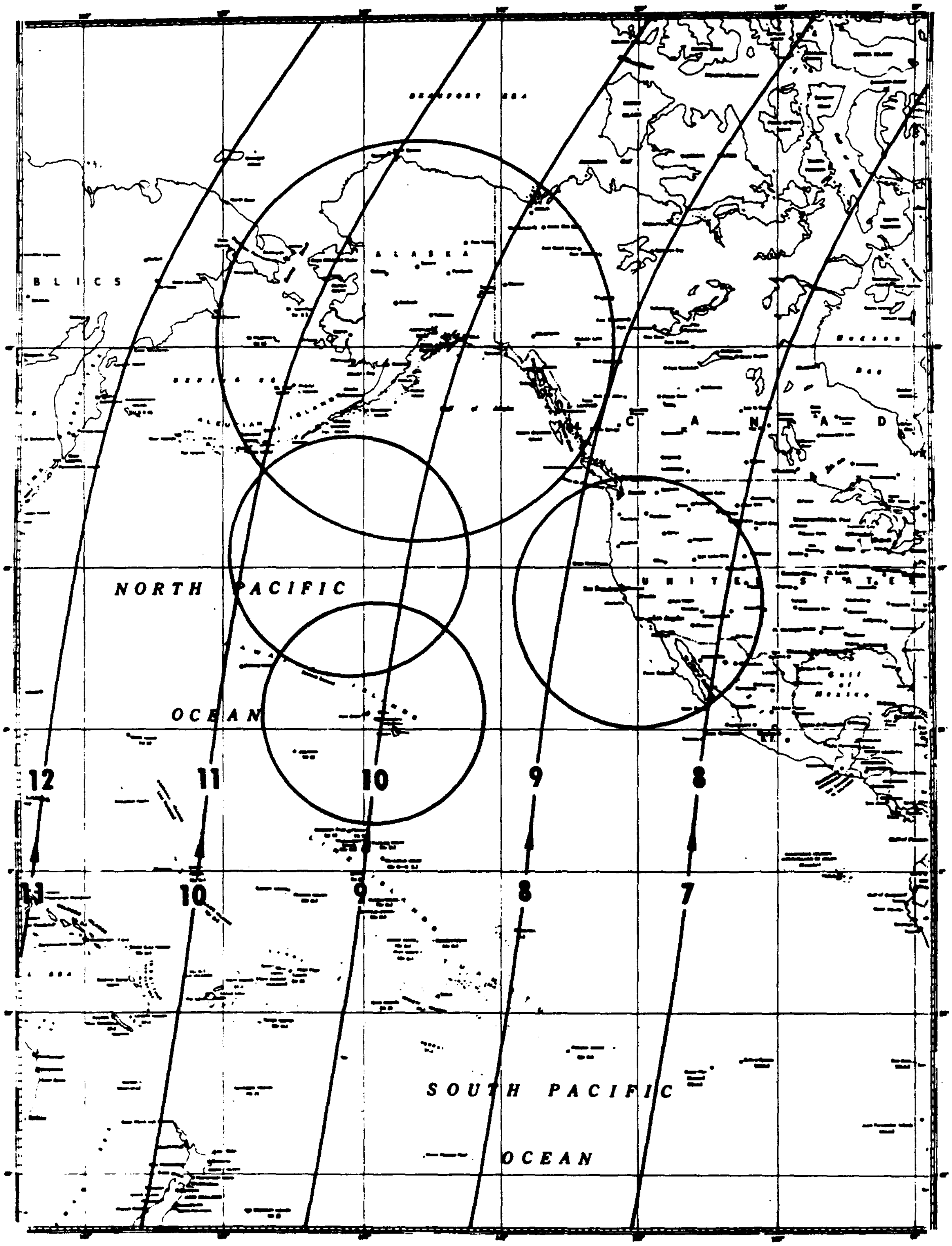


Figure A2-2 Nominal Orbit Traces - Passes 8 Through 12

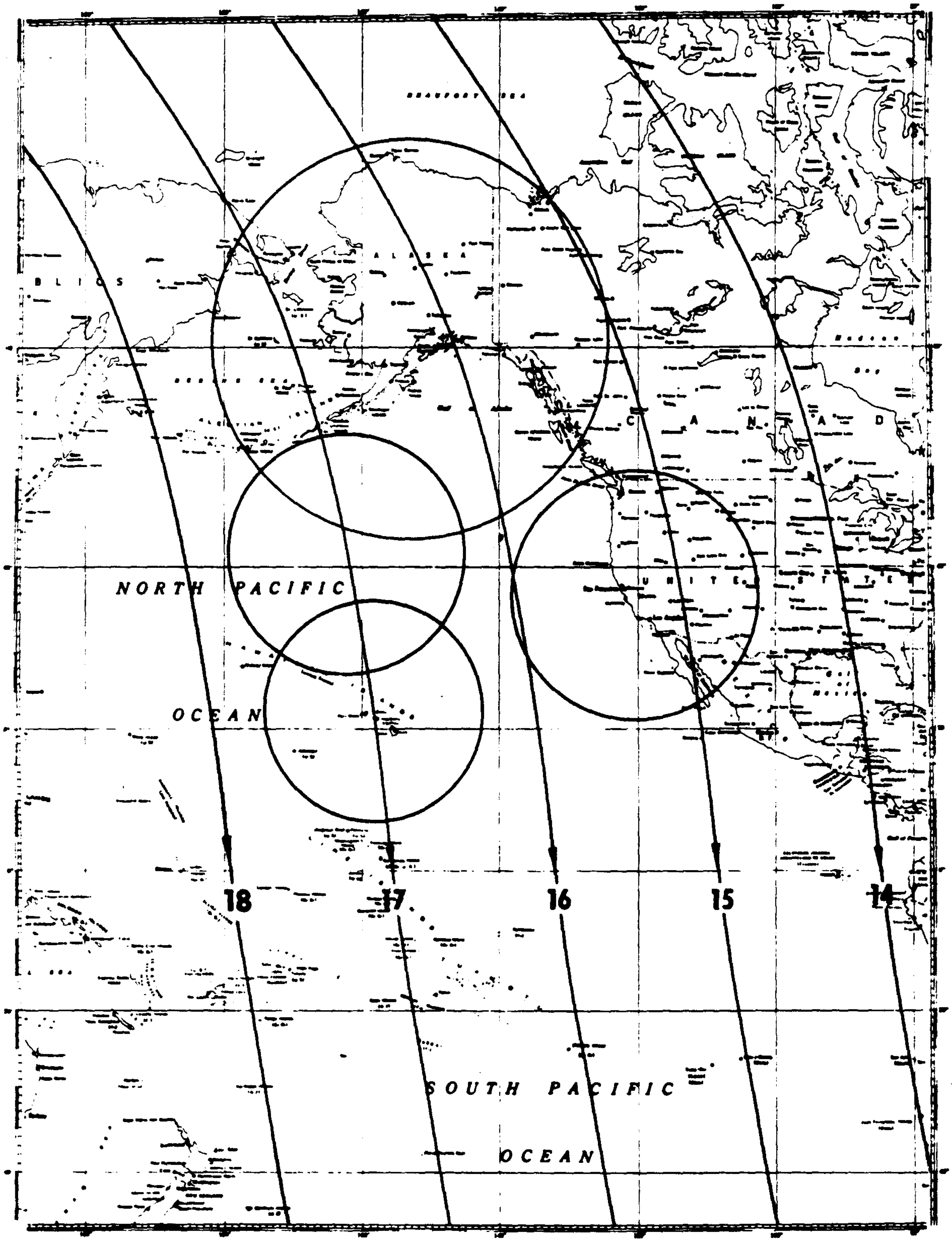


Figure A2-3 Nominal Orbit Traces - Passes 14 through 17

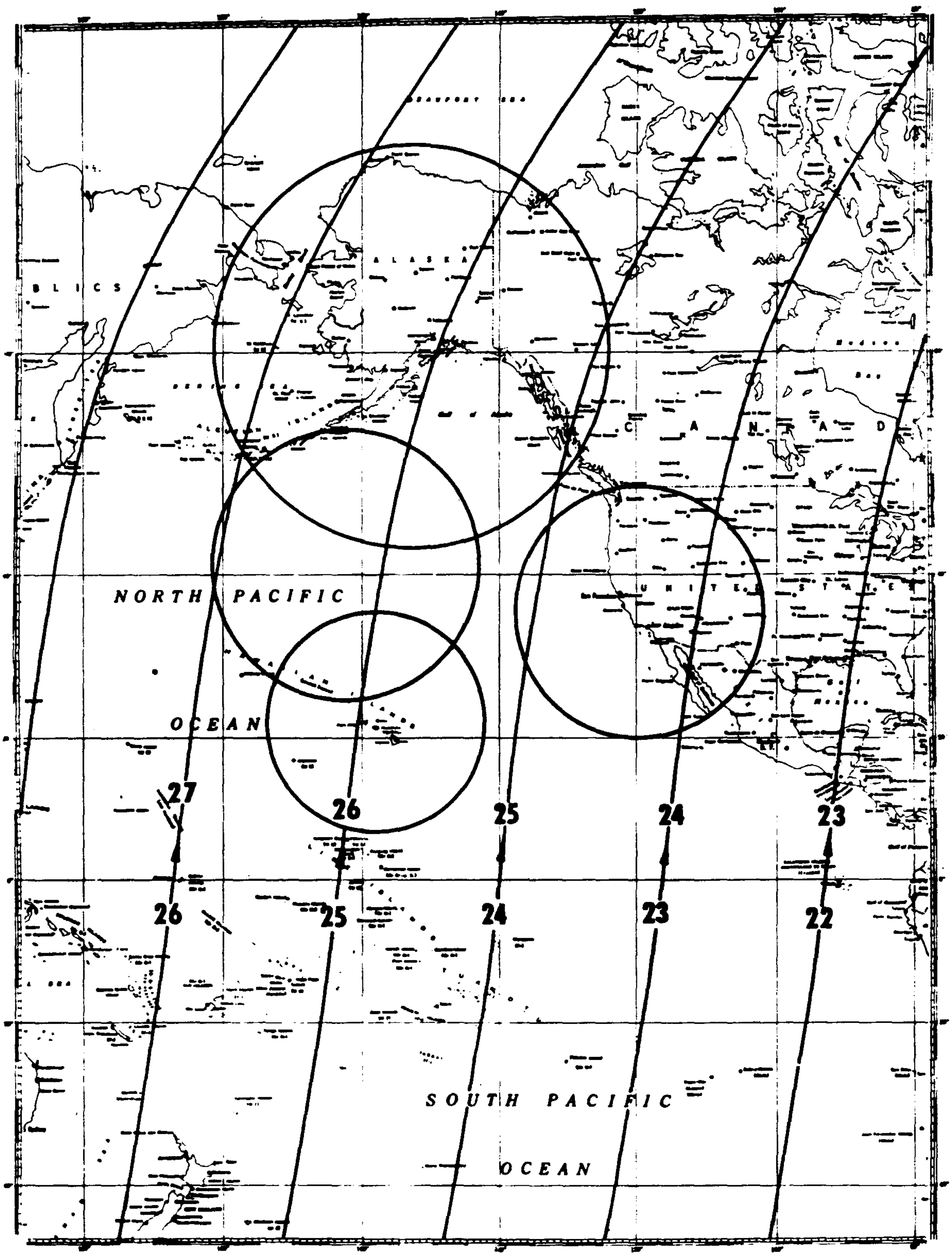


Figure A2-4 Nominal Orbit Traces - Passes 23 Through 27

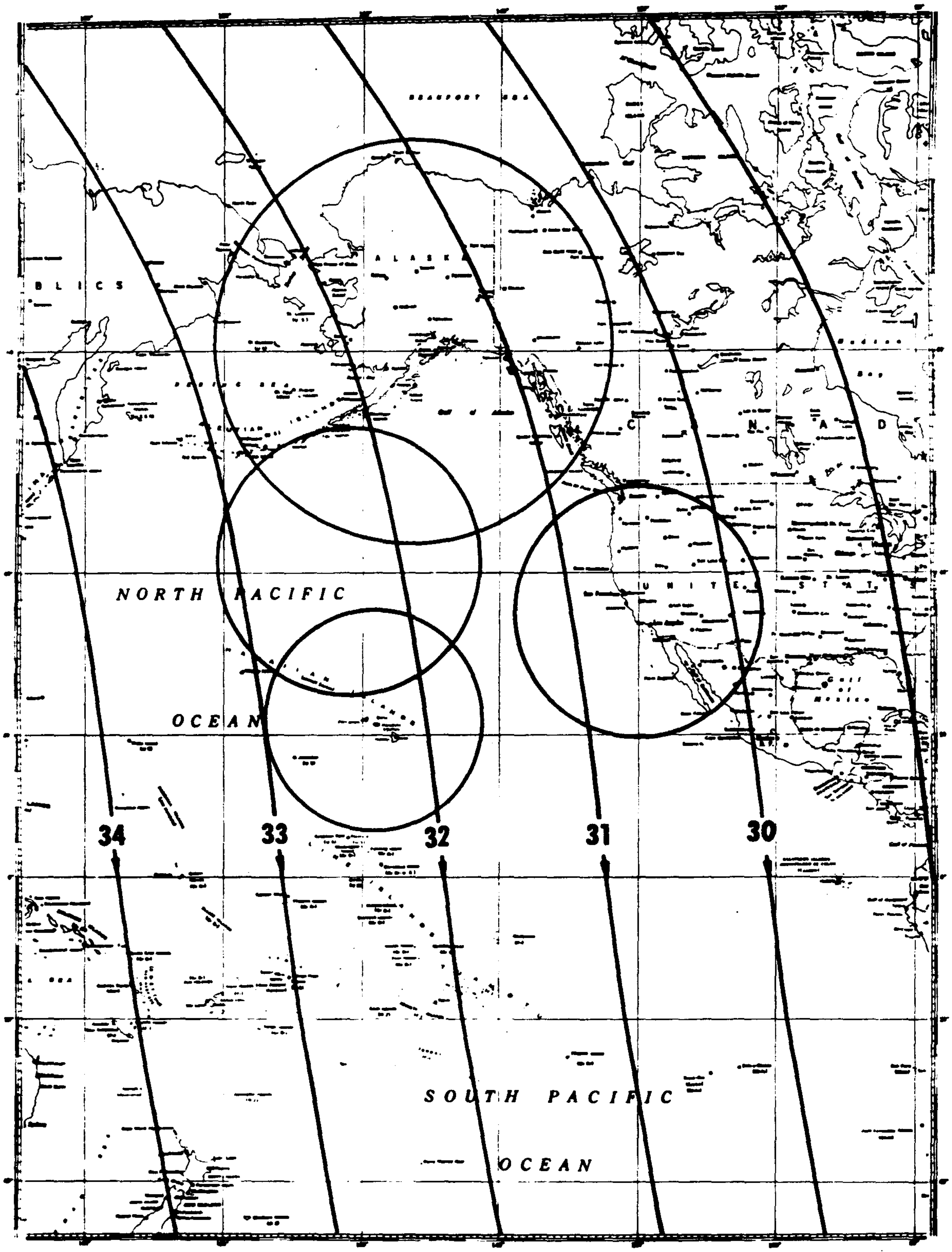


Figure A2-5 Nominal Orbit Traces - Passes 29 Through 34

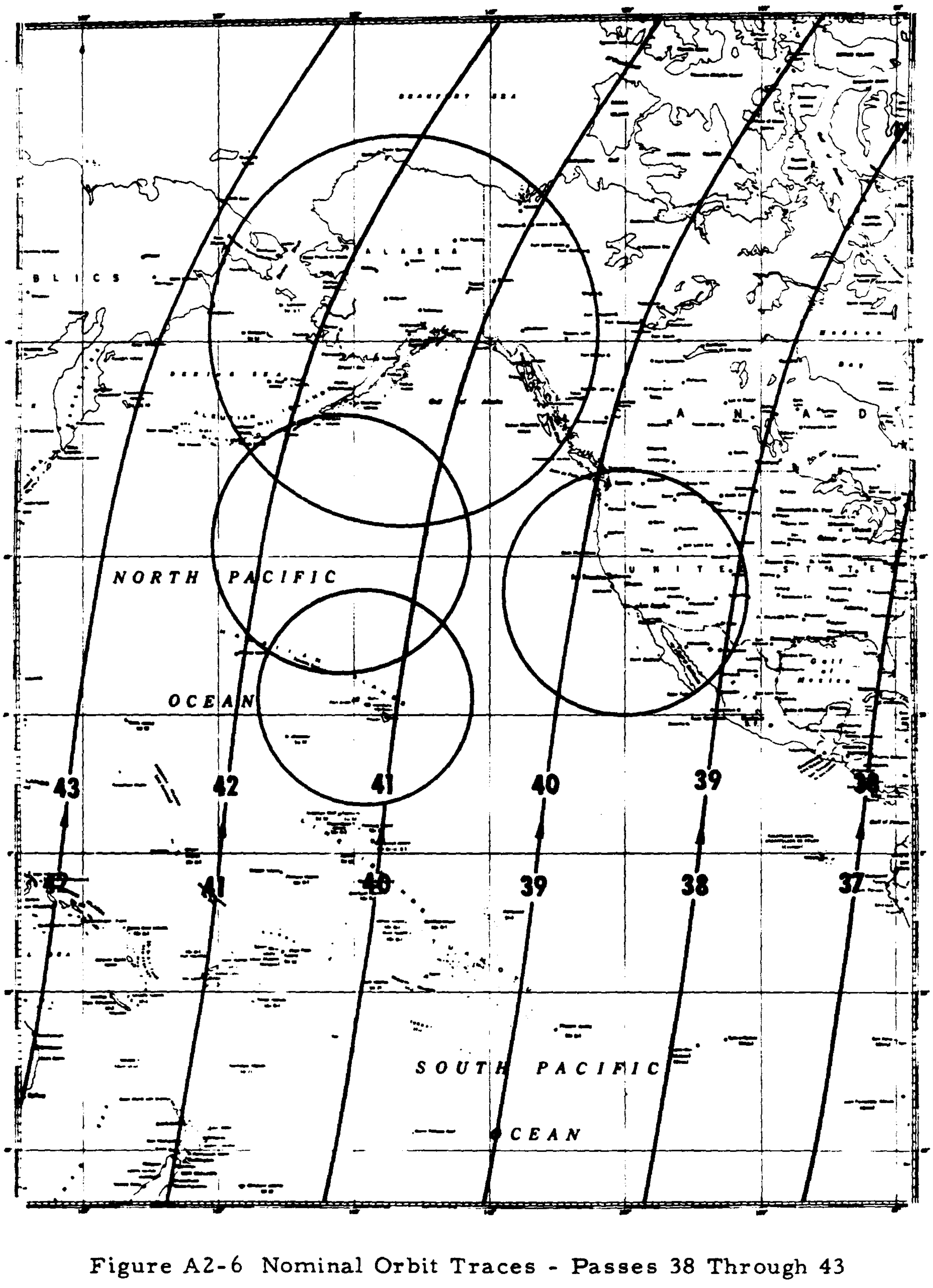
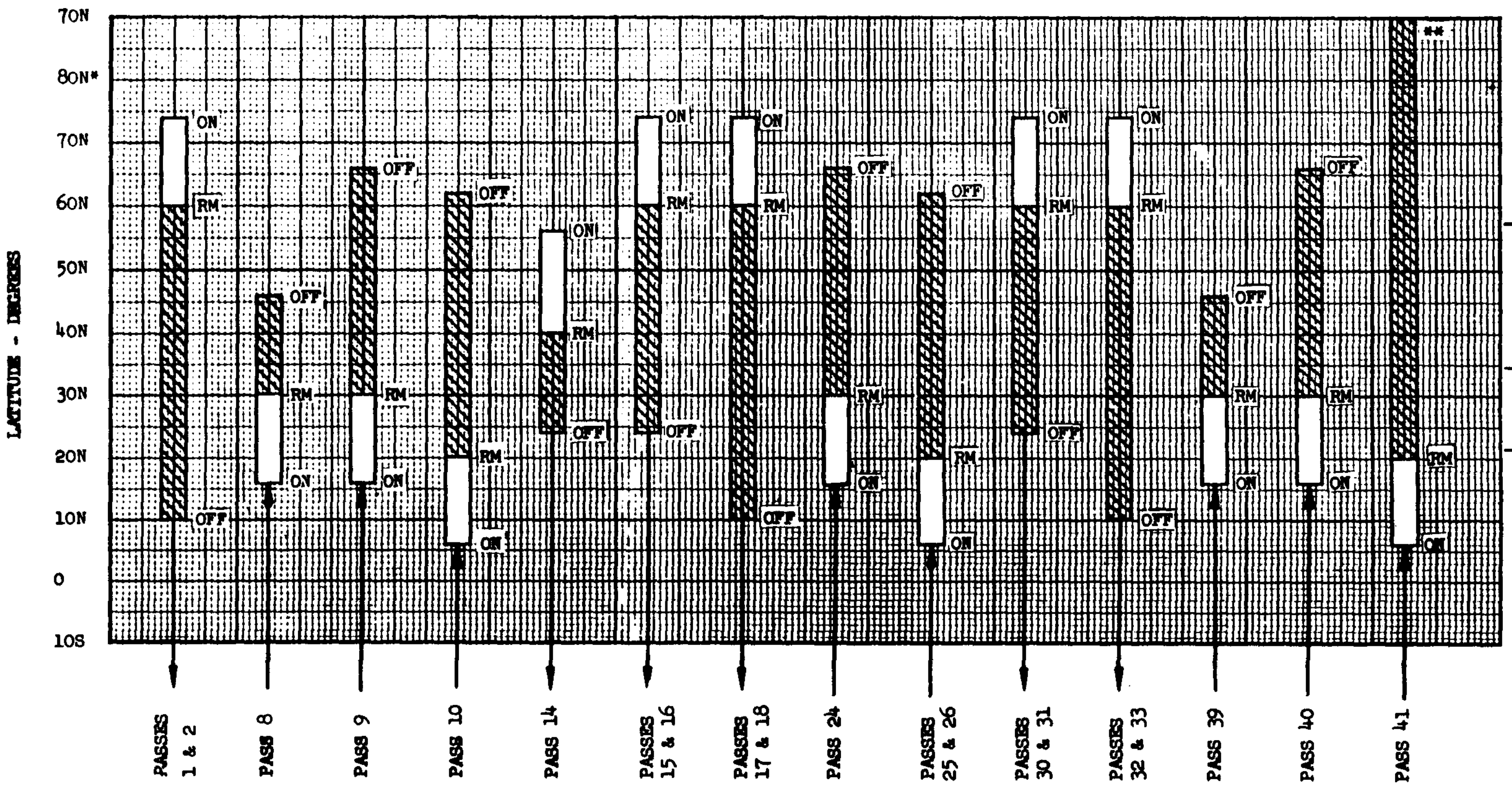


Figure A2-6 Nominal Orbit Traces - Passes 38 Through 43



ON = RESET ENABLE, RADAR PULSE BEACON ON, TELEMETRY PLATES ON

OFF = RESET DISABLE, RADAR PULSE BEACON OFF, TELEMETRY PLATES OFF

ON THRU OFF = RESET COMMAND CAPABILITY

= RESET MONITOR (RM) SIGNAL OFF

= RESET MONITOR (RM) SIGNAL ON

* = MAXIMUM LATITUDE REACHED WITH ORBIT PLANE INCLINATION IS APPROXIMATELY 79.4°N

** = RESET ENABLE, RADAR PULSE BEACON, AND TELEMETRY PLATES REMAIN ON AFTER PASS 41

Figure A2-7 Readout and Reset Programming

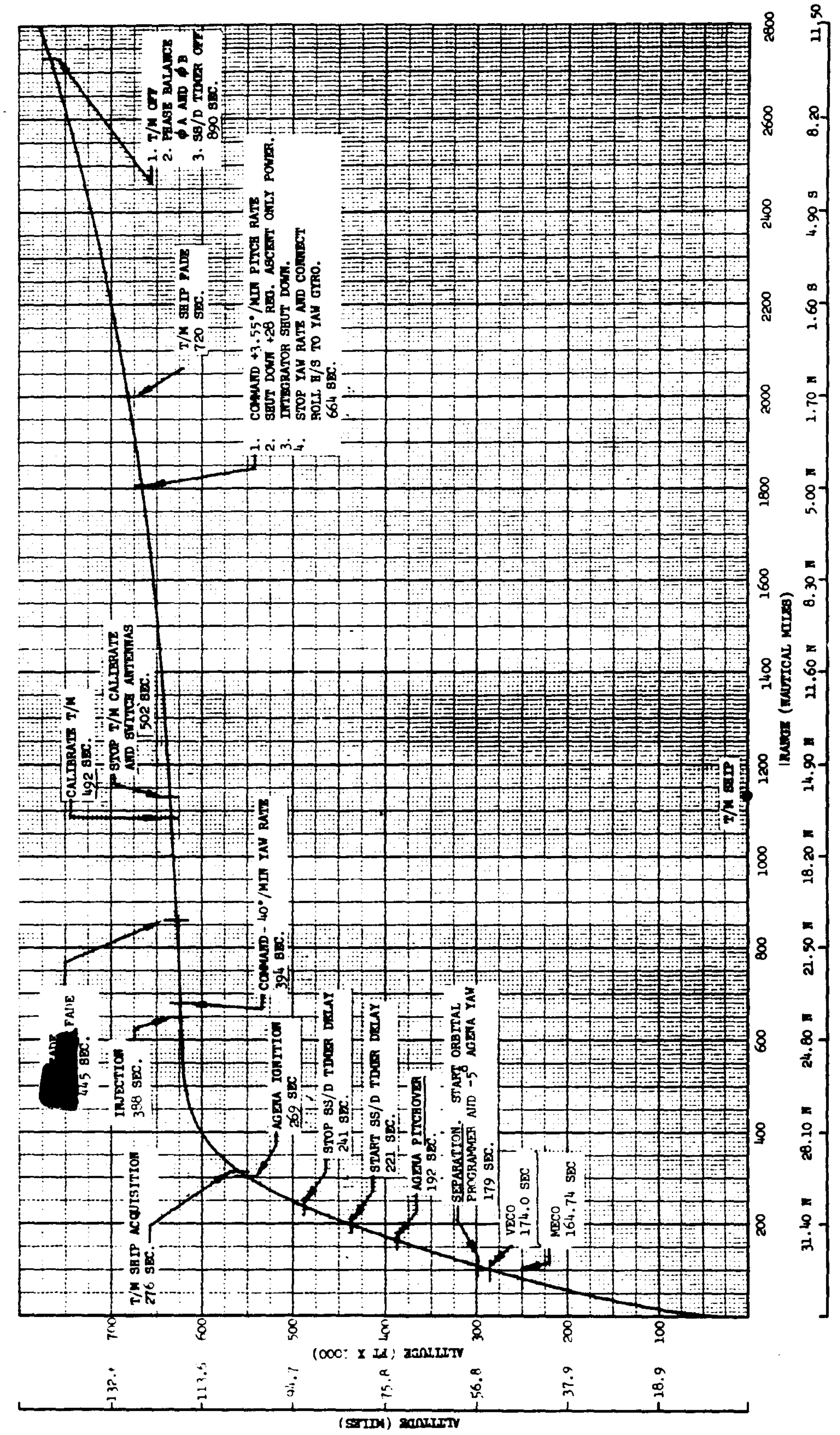


Figure A5-1 Launch Phase Nominal Trajectory

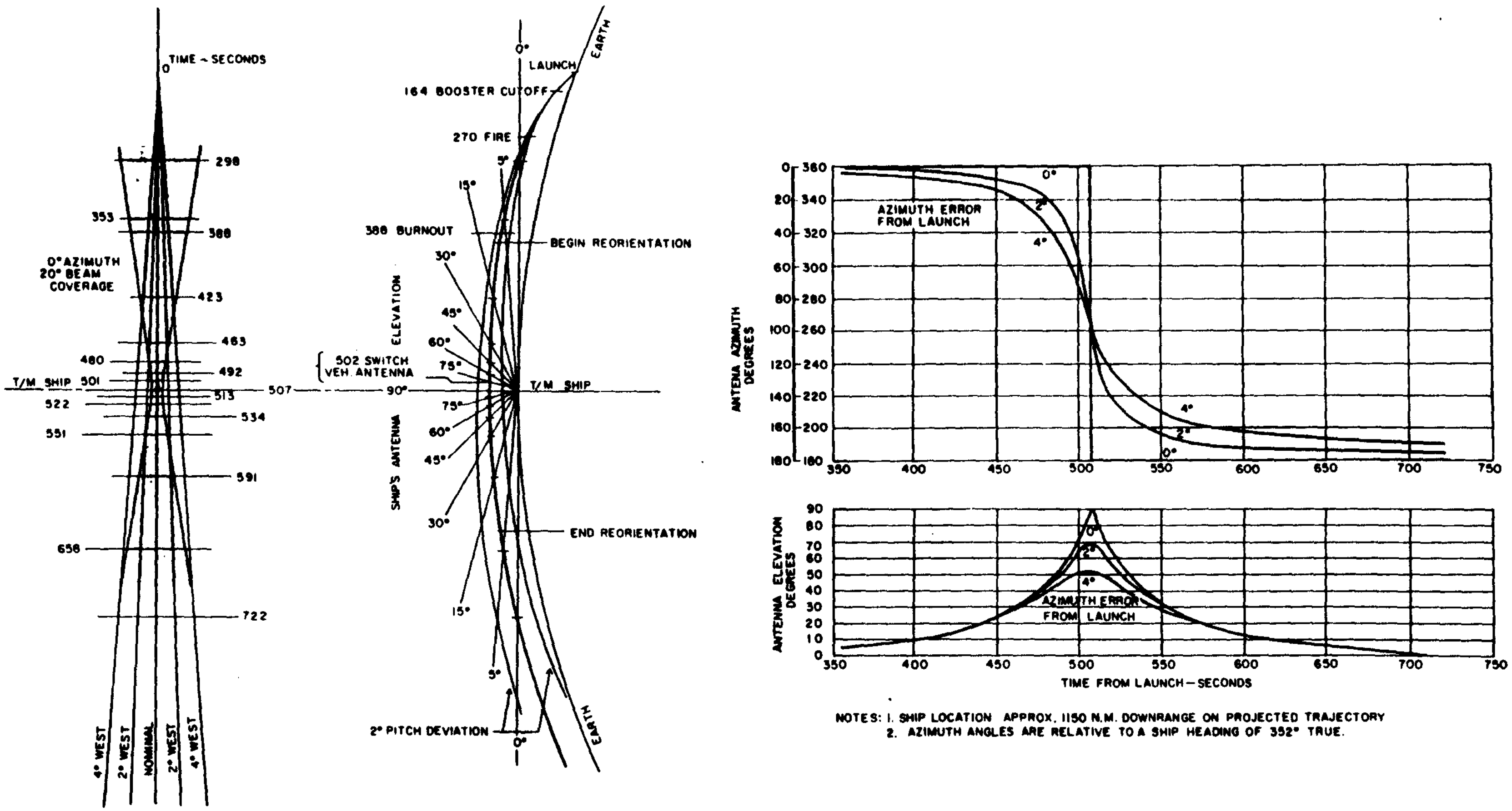


Figure A5-2 T/M Ship Antenna Positioning

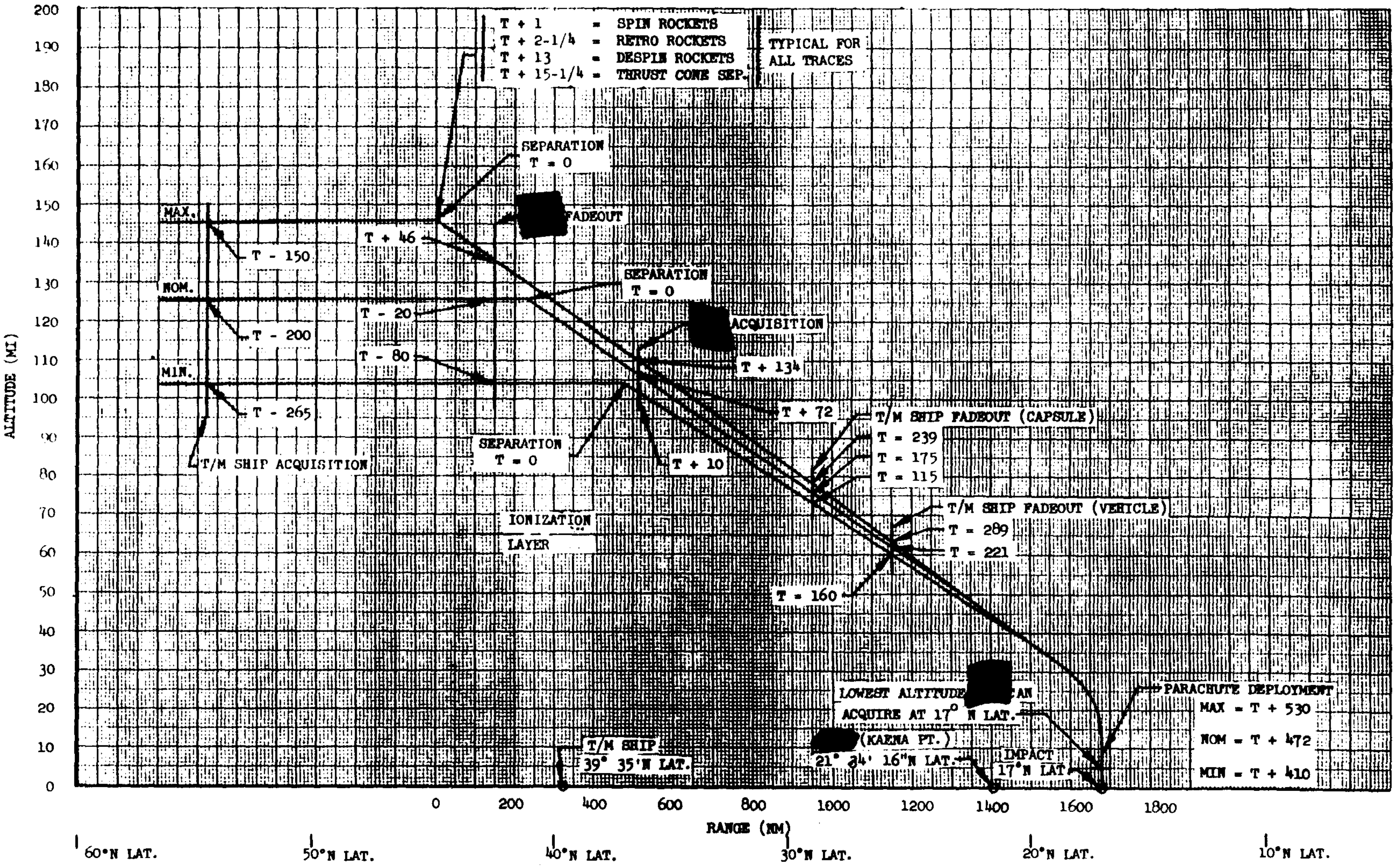


Figure A7-1 Re-Entry Trajectory

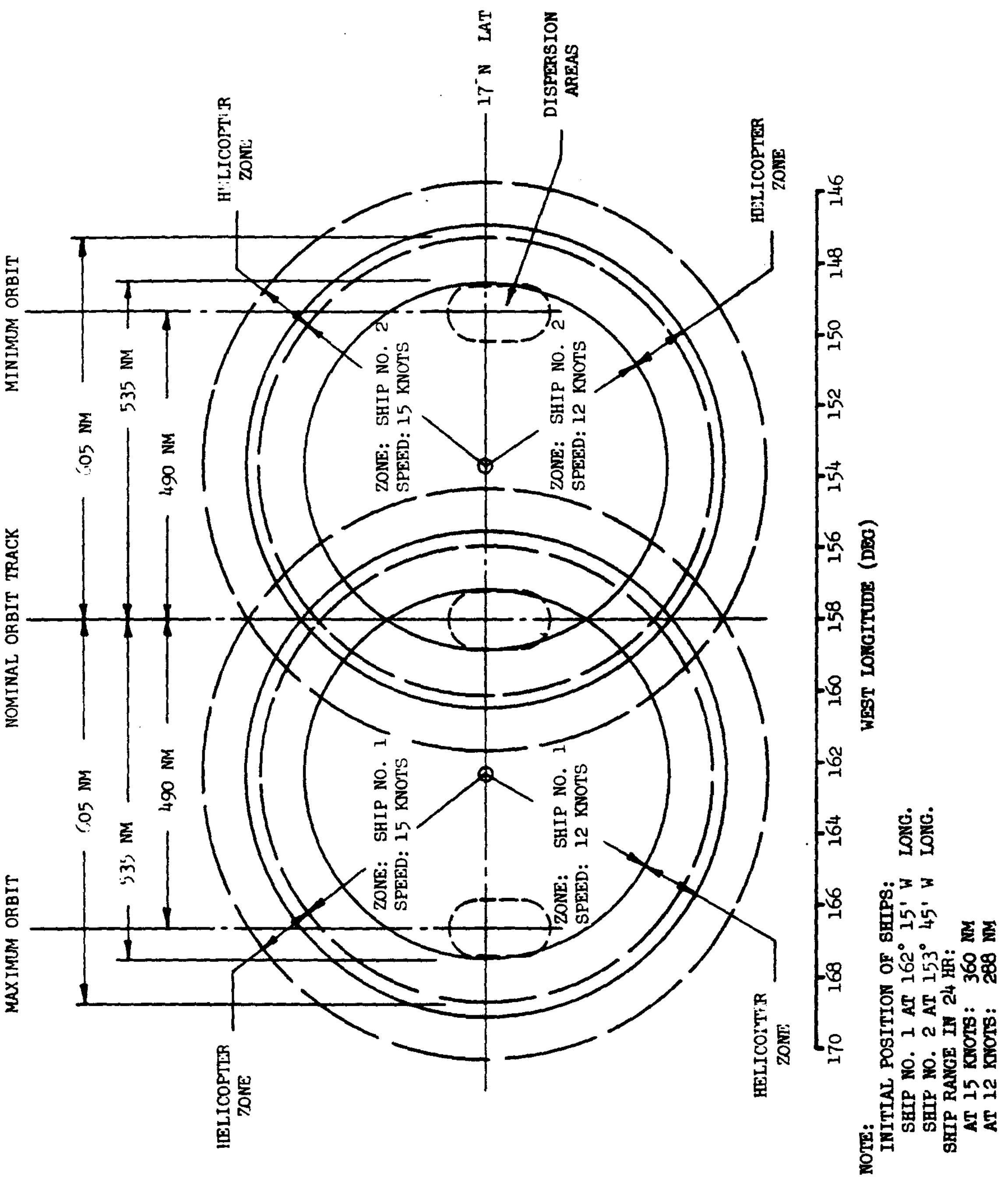


Figure A7-2 Initial Surface Ship Deployment

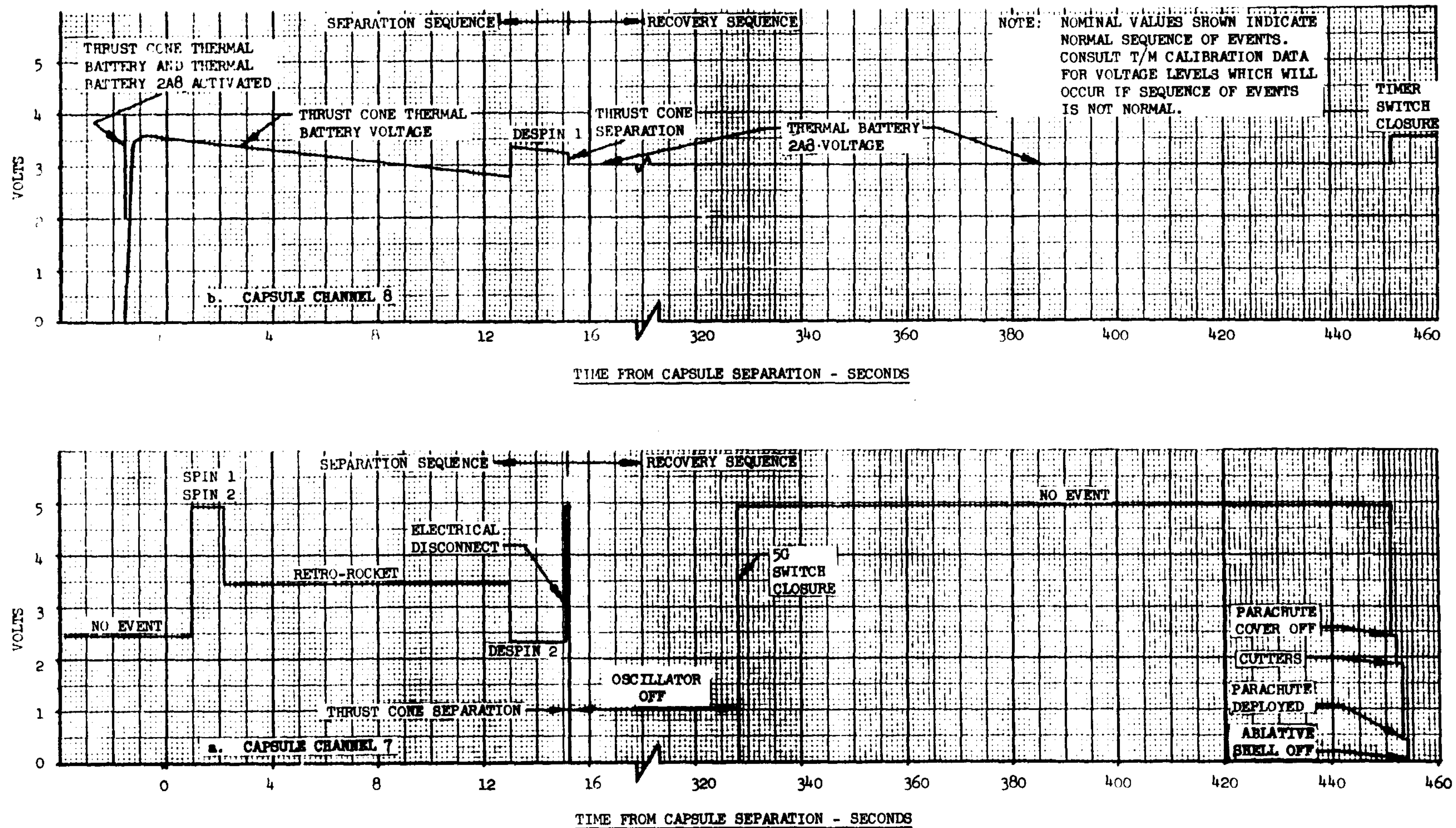
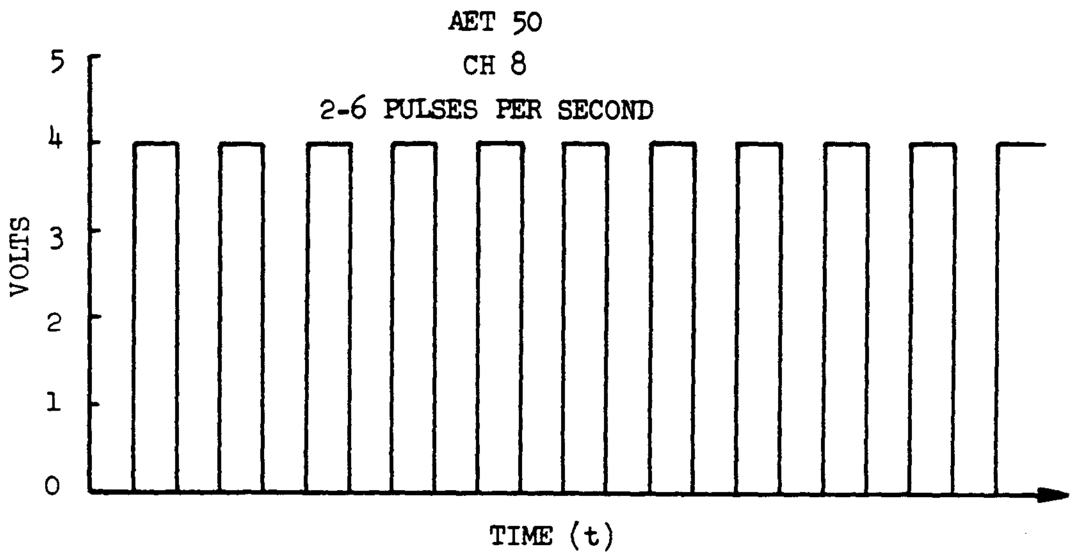


Figure A8-1 Nominal Capsule Telemetry Voltage Levels



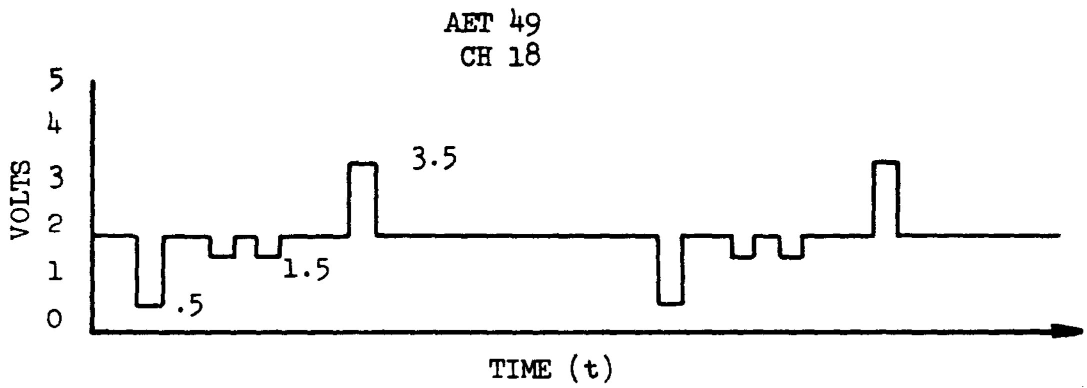


Figure A8-2 Nominal Payload Function Wave Trains

Notice of Page Substitution

Tab 7 - Appendix A
Vehicle 1058/Booster 246

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

[redacted]
1058/246
2 September 1960

TAB 7 – APPENDIX A
DISCOVERER
SYSTEM TEST DIRECTIVE
FOR
DISCOVERER SATELLITE 1058
DISCOVERER BOOSTER 246
(AET PAYLOAD)

This document has been prepared by Systems Operations Planning, 61-41.

Approved:
[redacted] Manager
Systems Operations
Satellite Systems

Approved:
[redacted]
for Colonel, USAF
Chairman
System Test Working Group

CONTENTS

APPENDIX A, TAB 7

SUPPLEMENTAL TEST INFORMATION

TABLES

ILLUSTRATIONS

FOREWORD

The basic System Test Directive purposely omits variable flight-to-flight data but contains information of a permanent nature applicable to all flights of the initial Discoverer series. Detailed data and directives are presented in this Appendix A tab for the Discoverer Satellite 1058/Discoverer Booster 246/AET Payload combination and are applicable to this configuration only.

Engineering and procedural changes pertinent to this flight are as follows:

a. An AET Payload will be installed

b. The capsule nominal impact latitude is 24°N

c. The Recovery Force deployment is revised. Primary emphasis on air retrieval has been retained in the 60 x 200 nautical mile nominal impact area

d. A WV-2 telemetry aircraft will be stationed southwest of [redacted] to record recovery capsule separation events

e. The Pvt. Joe E. Mann telemetry ship will not participate in this operation. All references to the Pvt. Joe E. Mann in the basic section will not be applicable for this Discoverer Vehicle

f. Telemetry receiving facilities established at Christmas Island, South Point, Hawaii, and Barking Sands, Kauai, will be retained to aid in the recovery operation

g. JC-54 telemetry receiving aircraft will be stationed south of the primary recovery area to aid in the recovery operation

h. The RC-121 aircraft and the HCC will be equipped with single sideband radio equipment

i. HCC-STC communications during the recovery operations will be augmented by the addition of two voice lines (toll telephone)

j. If available the C-130 aircraft from Edwards AFB will be incorporated as part of the Recovery Force

k. The JHU/APL Doppler transmitter will not be carried on this vehicle

l. The optical beacon will be programmed on over twelve Smithsonian Astronomical Observatory camera stations

m. The [redacted] Tracking Station [redacted] will be utilized as an [redacted]ng and telemetry [redacted]ing station.

APPENDIX A
SUPPLEMENTAL TEST INFORMATION

A1 INTRODUCTION

This section contains descriptive material which supplements the general text of the STD for this flight only. Material presented herein which may conflict with information and/or procedures in the general text has precedence due to operations peculiar to the mission of Discoverer Satellite 1058. Reference will not be made to this Appendix for subsequent flight operations.

A2 CONFIGURATION

A2. 1 Discoverer Satellite

A vehicle instrumentation list is included in the Detailed Test Objectives, Appendix F, Tab 7, [redacted]

A2. 2 Recovery Capsule

A2. 2. 1 An AET Payload will be carried in the recovery capsule.

A2. 2. 2 A 1. 2-watt telemetry transmitter in the recovery capsule will transmit information on the operation of capsule components. Telemetry Channels 7, 8, and 11 will be used.

A2. 3 Ground Stations

A2. 3. 1 The [redacted] Tracking Station [redacted] will be utilized as an active tracking and telemetry recording station. [redacted] will have a VERLORT Radar and a tri-helix antenna with capability to slave either antenna system to the other. The equipment consists of the complete [redacted] Tracking Station, thus having complete command and telemetry readout and recording capability.

A2. 3. 2 The [redacted] is provided with a panadapter to aid in the acquisition of the AM capsule beacon transmitter signal and subsequent determination of the frequency deviation from nominal.

A2. 3. 3 Additional telemetry receiving equipment is installed at the PMR facility at South Point, Hawaii, to augment that station's telemetry acquisition and tracking capability. The [redacted] 60-foot antenna at South Point will be used for triangulation on the descending capsule. A quad-helix antenna is also installed for this operation with additional telemetry receivers as the 60-foot antenna does not have automatic tracking and has a narrow beam width which decreases the 60-foot antenna's ability to acquire the capsule.

A2. 3. 4 The PMR telemetry receiving facility at Barking Sands, Kauai, will be used.

A2. 3. 5 The telemetry receiving station installed on Christmas Island will be used for capsule detection and telemetry reception range near the equator. The Christmas Island facility has a quad-helix antenna, three Nems-Clarke 1302-A telemetry receivers, a timing system, recorders, and UHF, HF, and SSB communication equipment.

A2. 3. 6 The optical beacon will be turned on over twelve Smithsonian Astronomical Observatory camera stations during this flight. A TWX has been sent to AFBMD defining the beacon programming and referencing the station reporting procedures contained in the APL Doppler supplement prepared for Discoverer XIV.

A3 LAUNCH OPERATIONS

A3. 1 Launch Time

A3. 1. 1 In order to obtain adequate data from the sun position indicators, the time of launch should be between 1200 PDT and 1600 PDT.

A3. 1. 2 In order to obtain data with increased accuracy from the sun position indicators, the preferred time of launch is between 1300 PDT and 1500 PDT.

A3. 2 Recovery Force Readiness Launch Criteria

A3. 2. 1 With the exception of Paragraph 4. 3. 8, the launch criteria listed in Section 4. 3 of the basic STD are applicable to this flight operation. Paragraph 4. 3. 8 is revised so that the following minimum Recovery Force with all search and recovery equipment operable must be met:

- a. Four RC-121 radar aircraft
- b. Eight C-119J recovery aircraft
- c. Two surface ships
- d. WV-2 aircraft No. 137890.

A3. 3 Telemetry Calibrations

Telemetry calibration data for real-time measurements are included in the notes of Table A8-1. These data are to be checked by LMSD/61-71 and verified in a TWX to LMSD/61-41 and the STC not later than two days prior to launch.

A4 ORBIT OPERATIONS

A4. 1 Alternate Re-entry Selector

The alternate re-entry selector will function as described in Paragraph 6. 4. 7. However, the area between 64° and 48°N latitude should be avoided when transmitting alternate re-entry selector commands on Passes 15, 16, or 17 instead of the 55° to 40°N latitude range previously used.

A4. 2 Recovery Force Tracking on Pass 2

All land and surface telemetry stations participating in recovery operations [redacted] Christmas Island, South Point, Barking Sands, Haiti Victory, and Dalton Victory) will track the satellite telemetry signal during Pass 2 and will report the following data to the HCC for correlation:

a. Time of acquisition
b. Signal direction (azimuth and elevation at acquisition, at one-minute intervals, and at fade)
c. Strength of signal
d. Signal deviation from nominal frequency
e. Time of signal fade.

A5 RECOVERY OPERATIONS

A5. 1 General

The tracking stations will track the Discoverer Satellite two passes preceding the recovery pass and transmit the tracking data to PAC. The computer will calculate the correct time for transmission of the reset command on the pass preceding the recovery pass to provide a vernier time adjustment for the recovery sequence. The [redacted] will then transmit the reset command on the pass preceding the recovery pass in accordance with instructions received from the STC and will report the time of transmission of this command as well as the verification of receipt. Receipt of a reset command, by the satellite, on the pass preceding the recovery pass, will result in final adjustment of the orbital programmer so the recovery sequence will be initiated at the proper time.

A5. 1. 2 Capsule separation will occur at approximately 49. 4° N latitude and the nominal impact point will be 24° N latitude and 158° 48. 7' W longitude. This nominal impact point was established to provide [redacted] telemetry coverage of the parachute deployment sequence at the nominal latitude for all orbit periods within one minute of nominal.

A5. 1. 3 The surface and airborne Recovery Force will be deployed to cover an extended area. In general, six C-119J and two RC-121 aircraft and one victory ship will be deployed in the primary recovery area; the other victory ship, three or four C-119J, two RC-121, two telemetry aircraft, and one C-130 aircraft, if available, will be deployed to provide capsule detecting and telemetry receiving capabilities in the extended recovery area. A telemetry receiving station is installed on Christmas Island in the extended recovery area. Figure A7-3 shows the deployment of the Recovery Force for the nominal period and for periods varying one and one half minutes from nominal.

A5. 1. 4 Telemetered data on the recovery pass are to be observed by the [redacted] and [redacted] Tracking Stations and the WV-2 aircraft No. 137890 for indications of separation and re-entry. The data to be observed are listed in Table A8-1. Some of these data will be reported to the STC by voice and all data listed will be transmitted to the STC by 60-wpm teletype, following the pass, to assist the HCC in the recovery operation.

A5. 1. 5 The following information is required from the elements of the Recovery Force and participating land facilities by the HCC if a signal from the capsule is acquired on the recovery pass: signal source, time of acquisition, signal direction, strength of signal, signal deviation from nominal frequency, time of fade, and visual sighting information. The signal direction (azimuth and elevation) is to be given at acquisition, at one-minute intervals, and at fade. The victory ships will also report the deployment and the status of their helicopters.

A5. 1. 6 The real-time data readout and other references to the separation sequence of events or the recovery sequence of events will be identified by using the appropriate code word for separation or recovery, followed by the event numbers as specified in [redacted]

A5. 1. 7 The capsule beacon transmitter and flashing light will continue to operate for 20 hours. A soluble salt plug will ensure that the capsule will sink if not recovered within 48 ±8 hours after water impact.

A5. 2 Recovery Capsule Sequence of Events and Instrumentation

A5. 2. 1 The recovery phase of operations will commence within [redacted] elemetry range on the recovery pass when the orbital programmer restarts the SS/D timer. Significant events which will occur during the capsule separation, re-entry, and recovery sequences are listed in the following paragraphs with T = 0 defined as the time of capsule/Agena mechanical separation.

A5. 2. 1. 1 Capsule Separation Sequence

Time	Signal Source	Event
T - 94. 5 sec	Orbital Programmer	1. Restart SS/D timer
		2. Telemetry battery activated
		3. Capsule telemetry filaments "on"
T - 79. 5 sec	SS/D Timer (arm signal)	1. Capsule telemetry plates "on"
		2. Ignite thermal relays to arm thrust cone programmer
		3. Capsule beacon "on"
		4. Command -45°/ min pitch rate

Time	Signal Source	Event
T - 2.5 sec	SS/D Timer (transfer signal)	1. Command +3.55°/ min pitch rate 2. Ignite electrical disconnect delay pyro (delay tolerance 500 to 1320 milliseconds) 3. Ignite thrust cone programmer thermal batteries 4. Ignite recovery system thermal battery 2A8 5. Ignite pyro switches 2A4A2S1 and S2 to arm thermal battery 2A7BT-1
T - 1.5 sec	Electrical Disconnect Pyro Fires	1. Capsule/satellite cable disconnected 2. Thrust cone programmer started (ground loop lifted)
T - 0 sec	SS/D Timer (separation signal)	1. Pin-puller squibs ignited (0 to 7 milliseconds delay) 2. Four springs push off capsule to about 1.7 ft/sec
T + 1.9 sec	T/C Programmer Event 1	1. Spin valve actuated. capsule spins up to about 60 rpm in 0.8 sec
T + 3.15 sec	T/C Programmer Event 2	1. Retro-rocket ignited, capsule receives approximately 4-g acceleration for approximately 9 sec
T + 13.9 sec	T/C Programmer Event 3	1. De-spin valve actuated, capsule de-spins to about 10 rpm
T + 15.4 sec	T/C Programmer Event 4	1. Ignite electrical disconnect and explosive separation bolts

A5.2.1.2 Capsule Re-entry Sequence

Time	Approximate Altitude	Event
T + 235 sec	350,000 ft	1. Ionization layer entered; RF blackout begins
T + 344 sec	186,000 ft	1. 5-g switch closes permitting battery 248 to ignite thermal battery BT-1 which in turn fires: (a) Dimple motors to start mechanical timer (b) Pyro switches to allow 28v from thermal battery 248 to feed the timer switch, removes squib of thermal battery 2A7BT1 from thermal battery 2A8, and arms thermal batteries 2A7BT2 and 2A7BT3
T + 393 sec	120,000 ft	1. Leave ionization layer; RF blackout ends

A5.2.1.3 Capsule Recovery Sequence

Time	Approximate Altitude	Event
T + 470 sec (5-g switch closure +126 sec ±2 sec)	55,000 ft	1. Battery 2A8 ignites thermal batteries 2A7BT2 and BT3, and delay pyro switches 2A4A1S1 and S2 (1 sec delay)
		2. The delay pyro switches disconnect their own squibs, the squibs of the thermal batteries unshort the squibs of pyro switches 2A4A1S3 and S4, and unshort the chute cover ejection pistons

Time	Approximate Altitude	Event
		3. The action of switches S1 and S2 also permits batteries BT2 and 3 to ignite the ejection pistons and pyro switches 2A4A1S3 and S4
		4. The ejection pistons blow off the chute cover, which pulls out the pilot chute, which in turn pulls out the main chute bag. The main chute bag brings out the chute in a reefed condition
		5. Time delay pyrotechnic cutter disreefs the main chute and permits deployment (4 sec).
		6. As the chute system decelerates the capsule, the ablative shell, released from the capsule when the ejection pistons fired, falls clear of the capsule
		7. Actuation of pyro switches S3 and S4 apply +12v (from batteries contained in the capsule beacon) to the light beacon
		8. Radar reflective chaff, packed with the chute, falls free as the chute emerges from its bag.

A5.2.2 Recovery capsule telemetry Channels 7, 8, and 11 will be used to obtain capsule performance information. Channels 7 and 8 will measure one set of events during the separation sequence and another set of events during the recovery sequence. The oscillator inputs will be switched when the thrust cone is separated. Channel 11 will measure axial acceleration during both the separation sequence and the recovery sequence.

The subcarrier for Channel 7 will be turned off after thrust cone separation and will be turned on again at 5-g switch closure. Channels 8 and 11 will transmit data continuously throughout the descent trajectory.

Figure A8-1 shows the nominal voltage levels which indicate that normal separation and recovery sequences have occurred. The capsule telemetry signal has a bandwidth of ±50kc; capsule telemetry receivers are to be adjusted accordingly. The capsule telemetry battery will supply power for at least 15 minutes.

A5. 3 [redacted] Tracking Station Recovery Operations

A5. 3. 1 On the selected recovery pass [redacted] will receive the Discoverer Satellite CW acquisition transmitter signal on 232. 4 mc and the Discoverer Satellite telemetry signal on 237. 8 mc as usual. In addition, receiving equipment will be tuned to 228. 2 mc to receive the capsule telemetry signal and to 235. 0 mc (with a ±12-mc search scan) to receive the capsule beacon transmitter signal.

A5. 3. 2 The [redacted] will read out real-time telemetry quantities listed in Table A8-1 and report them to the STC over the voice line immediately as they occur. After thrust cone ejection or twenty seconds after capsule separation, whichever is first, the [redacted] will read out additional capsule separation data that will be recorded on an oscillograph/Datarite. Every attempt will be made to determine the system time of capsule separation and to qualitatively assess the capsule separation and retro sequence before signal fade. If all events appear normal, the [redacted] eal time verbal report will consist of the system time of separation (with the appropriate code word) followed by a statement that all events were normal.

A5. 3. 3 Immediately after completion of the pass [redacted] will submit a complete separation data report to the STC. If the capsule is recovered or at least visually acquired before these data are available, the requirement for these data may be waived by the STC.

A5.4 <u>Re-entry Telemetry Aircraft Operations (WV-2 No. 137890)</u>

A5.4.1 The re-entry telemetry aircraft, WV-2 No. 137890, will be positioned approximately 30 nautical miles south of the capsule separation point, directly under the orbiting satellite on the recovery pass to receive recovery capsule telemetry signals during satellite re-orientation, capsule separation, and the initial re-entry trajectory. The nominal on-station position of this aircraft at capsule separation will be 48° 54' N latitude and 164° 49' W longitude with an aircraft course of 163° true. However, immediately following computation of the actual orbit ephemeris, the STC will determine the actual separation time and the deviations from nominal aircraft position and course required to place the aircraft 30 nautical miles south of the separation point and parallel to the orbit path, and will transmit this information to [redacted] for relay to the aircraft commander.

A5.4.2 The re-entry telemetry aircraft will depart with sufficient time to arrive on station no later than separation time (T) -30 minutes. Single sideband radio communications will be established with [redacted] on the following operational frequencies for an equipment status report at T - 30 minutes, for acquisition instructions, and for data relay:

a. 17624.0 kc -- primary
b. 6741.0 kc -- secondary (1)
c. 11214.0 kc -- secondary (2).

Alternate single sideband communications may be established with the HCC on 11214.0 kc if the [redacted] net becomes inoperative. However, transmissions by the telemetry aircraft on 11214.0 kc should be avoided after T + 5 minutes due to possible interference with Recovery Force communications. Radio silence will be maintained by the re-entry telemetry aircraft while receiving telemetry signals to avoid r-f interference with data recording.

A5.4.3 At T - 10 minutes, the re-entry telemetry aircraft will assume an inbound course (nominal 163° true) designed to cross the on-station position at T - 0. This heading will be varied to optimize maximum signal strength.

A5.4.4 Search operations will be initiated at T - 10 minutes with the single helix antenna operating at an elevation scan of $\pm 30^\circ$ about a mid-point of 120° (0° elevation reference with antenna horizontal and pointing toward the nose of the aircraft). The telemetry aircraft will search for the capsule telemetry signal on 228.2 mc. However, the vehicle telemetry signal at 237.8 mc may be received first, in which case the single helix will track on the vehicle telemetry until acquisition of the capsule telemetry signal. If no signals are received by T-0, the antenna search elevation scan midpoint will be decreased 10°/minute until T + 5 minutes; at T + 5 minutes the antenna will be fixed at 30° elevation. Tracking or search operations will be terminated at signal fade or at T + 10 minutes if no signals are received.

A5.4.5 Immediately following fade of the telemetry signal, the re-entry telemetry aircraft will advise the [redacted] via SSB radio the time of signal acquisition and fade to the nearest second in GMT, and the deviations from nominal frequencies. The real-time data readout and reporting requirements are listed in Table A8-1. [redacted]ill relay this information to the STC.

A5.5 [redacted]racking Station Recovery Operations

A5.5.1 Approximately fifteen minutes before acquisition on the recovery pass, the [redacted]ill search the frequency range from 223 to 247 mc and log the frequency, azimuth, and type of modulation of any signals received to reduce the possibility of confusion from interference signals.

A5.5.2 On the recovery pass, the [redacted]will track the Agena telemetry signal with the tri-helix antenna and the capsule telemetry signal with the TLM-18 antenna. Acquisition of the Agena telemetry signal with the tri-helix antenna will be accomplished using standard acquisition procedures. Procedures for acquisition of the capsule telemetry signal by the TLM-18 antenna will vary as a function of the actual orbit and predicted impact point. In general, the TLM-18 will be positioned at the impact point azimuth using a sector scan. The amplitude of the sector scan will be 20° (±10°) for impact azimuths between 345° and 15°. The scan amplitude will be increased 3/4° for each 1° of azimuth over 15° for the eastern sector or under 345° in the western sector.

The TLM-18 antenna acquisition elevation will be 2°. Until acquisition of the capsule signal by the TLM-18, one receiver operating on signals from the tri-helix will be tuned to the 228.2-mc capsule telemetry signal. If the capsule telemetry signal is acquired with the tri-helix before TLM-18 acquisition, the tri-helix will be positioned on the capsule until definite TLM-18 acquisition after which the tri-helix will resume tracking on the satellite telemetry signal. If the TLM-18 loses the capsule signal, the tri-helix will be positioned to assist in reacquiring the capsule signals. TLM-18 angle data recorded after auto track has been established will be transmitted to the PAC when requested by the System Test Director.

A5.5.3 [redacted] will report the system time of acquisition and deviations from nominal frequencies to the STC as soon as possible. When the TLM-18 azimuth rate approaches 0°/second or when the telemetered capsule recovery events are received, [redacted] will report antenna azimuth and elevation immediately to the STC and the HCC. [redacted] will also report confirmation of capsule separation and telemetered recovery events to the STC as specified in Table A8-1 and record all capsule telemetry signals on magnetic tape.

A5.5.4 All antenna bearings from South Point and Barking Sands, subsequent to acquisition, will be reported to [redacted] These bearings will be relayed immediately to the STC and the HCC by [redacted] [redacted] will plot the South Point bearings, the Barking Sands bearings, and its own bearings to determine the approximate capsule trajectory and will relay these data to the STC and the HCC over the voice control line.

A5.6 South Point Facility Recovery Operations

A5.6.1 For this operation either the manually-slewed Canoga or the motor-driven radiation quad-helix antenna and two Nems-Clarke 1302-A receivers will be utilized at the PMR facility at South Point, Hawaii. Existing communications, recording, and timing systems will be used.

A5.6.1.1 If the orbit period is such as to permit nominal re-entry or re-entry west of [redacted] South Point will scan ±90° about a 270° azimuth at an antenna elevation of 10° at the rate of once per 15 seconds from ETPD - 0 until ETPD + 3 minutes.

A5.6.1.2 If the satellite path is between [redacted] and South Point, the quad-helix antenna will scan ±90° about a 180° azimuth at the rate of once per 15 seconds from ETPD - 0 until ETPD + 5 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.6.1.3 If the satellite path is east of South Point, the quad-helix antenna will scan ±90° about a 90° azimuth at the rate of once per 15 seconds from ETPD - 0 until ETPD + 5 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.6.2 If no capsule signals are acquired before ETPD + 5 minutes, the quad-helix antenna will be positioned at 180° azimuth and 10° elevation, and the telemetry receivers will be monitored until ETPD + 30 minutes. If [redacted] acquires the capsule signals, it will provide South Point with acquisition information.

A5. 6. 3 Once acquisition is achieved with the quad-helix antenna, the 60-foot antenna will attempt to track the capsule, using the narrower beamwidth to obtain more accurate bearings at and after parachute deployment. All acquisitions will be reported immediately to [redacted] The capsule parachute deployment telemetry sequence and the antenna azimuth at parachute deployment will be reported. If the parachute telemetry sequence is not received before signal fade, the system time of fade and the antenna azimuth and elevation will be reported. Subsequent to acquisition, South Point will report antenna bearings to [redacted] All 60-foot antenna data, position azimuth and elevation, and suitable timing signal will be recorded on magnetic tape as this tape will be delivered to the HCC for transmittal to Sunnyvale.

A5. 7 <u>Barking Sands Facility Recovery Operations</u>

A5. 7. 1 The PMR facility at Barking Sands, Kauai, will be augmented by the addition of an LMSD tri-helix antenna. Barking Sands will maintain communication with [redacted] via toll telephone for exchange of tracking and acquisition data. At ETPD - 15 minutes, Barking Sands will position the tri-helix antenna at the acquisition azimuth and 10° elevation. From ETPD - 5 minutes until ETPD + 5 minutes, the Barking Sands tri-helix antenna will scan ±90° about a 0° azimuth at the scan rate of 10° per second. Barking Sands will search for the capsule telemetry signal. Barking Sands is directed not to activate any tracking radars during the operation.

A5. 7. 2 Subsequent to acquisition, Barking Sands will report antenna bearings to [redacted] All acquired capsule telemetry signals will be recorded on magnetic tape with a timing signal.

A5.8 Christmas Island Facility Recovery Operations

A5.8.1 A quad-helix antenna, three Nems-Clarke 1302-A receivers, a seven-track magnetic tape recorder, a timing system, and a communication system are temporarily installed on Christmas Island to provide telemetry reception and capsule capabilities near the equator.

A5.8.1.1 If the satellite path is east of Christmas Island, the quad-helix antenna will scan ±90° about a 90° azimuth at the rate of once per 15 seconds from ETPD + 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.8.12 If the satellite path is west of Christmas Island, the quad-helix antenna will scan ±90° about a 270° azimuth from ETPD + 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per scan.

A5.8.1.3 If the satellite path is a near overhead pass at Christmas Island (±2° W longitude), the quad-helix antenna will scan 360° in azimuth at the rate of once per 30 seconds from ETPD + 3 minutes until ETPD + 8 minutes. The antenna elevation will be varied cyclically from 10° to 70° to 10° in 20° steps at the rate of one step per 360° azimuth.

A5.8.2 The Christmas Island Facility will maintain continuous UHF and HF communications with the southern JC-54 telemetry aircraft for exchange of acquisition and tracking information and will relay this information to the HCC as soon as possible over the SSB radio.

A5.8.3 If no capsule signals are acquired before ETPD + 8 minutes, the quad-helix antenna will be positioned at 180° azimuth and 10° elevation and the telemetry receivers will be monitored until ETPD + 30 minutes. If no signals are acquired before ETPD + 30 minutes, a negative report will be submitted to the HCC over SSB radio.

A5. 8. 4 Once acquisition is achieved, the quad-helix will manually track the capsule, and the telemetry and beacon signals will be recorded on magnetic tape. Immediately after the parachute deployment telemetry sequence is recorded, Christmas Island will so report to the HCC over the SSB radio. The antenna azimuth will be reported to the telemetry aircraft over UHF or HF radio immediately after acquisition and at parachute deployment.

A5. 9 <u>Victory Ship Recovery Operations</u>

A5. 9. 1 Each of the two Victory Ships in the Recovery Force will be equipped with a manually-operated quad-helix antenna and one additional telemetry receiver to augment its telemetry receiving capabilities. The Victory Ship deployment is shown in Figures A7-3 and A7-4.

A5. 9. 1. 1 The <u>Haiti Victory</u> will be positioned 10 nautical miles west of the nominal impact point and will receive and record capsule telemetry if the capsule impacts in the predicted recovery area. The quad-helix antenna, until acquisition, will scan $\pm 90^{\circ}$ about 360° azimuth at the rate of once per 15 seconds beginning at EPTD - 5 minutes. From ETPD - 5 minutes until ETPD - 60 seconds, the antenna elevation will be maintained at 10°. After ETPD - 60 seconds, the antenna elevation will be increased 20° per scan from 10° to 70°. At ETPD + 15 seconds, the scan mode will rotate 180° to scan the southern sector. The antenna elevation will be decreased from 70° to 10° at the rate of 20° for each 15-second scan during this search of the southern sector. If the capsule signals are not acquired by ETPD +2 minutes, the antenna elevation will be raised from 10° to 30°, and a 360° azimuth scan will be initiated at the slewing rate of 10° per second and continued for two minutes.

If the capsule signals are not acquired by ETPD + 4 minutes, the antenna will be positioned at 180° azimuth and 10° elevation and the telemetry receivers monitored until ETPD + 30 minutes. When the capsule signals are acquired, the antenna will begin manual tracking as a function of maximum signal strength and all telemetry and beacon signals will be recorded on magnetic tape. The D/F equipment will be operated normally and used to obtain refined capsule directional data after acquisition. When the capsule bearing becomes steady, the Haiti Victory will report position and capsule bearing to the northern Command RC-121 over UHF and to the HCC through PMR immediately and proceed in the direction of the acquired signals. If the capsule signals are not acquired, the Haiti Victory will so report over SSB radio through PMR to the HCC at ETPD + 30 minutes.

A5.9.1.2 The Dalton Victory will be positioned at 14° N latitude for the nominal case directly under the satellite path on the recovery pass to enable reception of the capsule telemeter signal and the capsule beacon signal between [redacted] and Christmas Island. The quad-helix antenna, until acquisition, will scan $\pm 90^\circ$ about 360° azimuth at 10° elevation at the rate of once per 15 seconds from ETPD - 0 until ETPD + 3 minutes. From ETPD + 3 minutes until ETPD + 5 minutes, the quad-helix antenna will give full area coverage by scanning $\pm 90^\circ$ about 360° azimuth with antenna elevation increasing and decreasing from 10° to 170° to 10° in increments of 20° per scan. The scan rate will be once per 15 minutes. After ETPD + 5 minutes the antenna will be positioned at 10° elevation and 180° azimuth. In the event the Dalton Victory acquires the capsule signals, the telemetry will be recorded on magnetic tape, and antenna acquisition and bearing will be immediately reported through PMR to the HCC. When the parachute deployment telemetry sequence is received, or when the antenna azimuth becomes constant, whichever is first, the Dalton Victory will so report verbally over SSB radio through PMR to the HCC and provide ship position and antenna azimuth and elevation. If no capsule signals are acquired by the Dalton Victory, a negative verbal report will be submitted over SSB radio through PMR to the HCC at ETPD + 30 minutes.

A5.10 Airborne Recovery Force Deployment

A5.10.1 The Airborne Recovery Force deployment for a nominal orbit period and periods differing from nominal by one and one-half minutes is presented in Figure A7-3. The Force will be deployed with sufficient search and recovery aircraft in the 60 x 200-nautical mile nominal impact area to ensure aerial recovery capabilities.

The capsule detection range will be extended south of the nominal impact area by redeploying those C-119, RC-121, and C-130 aircraft not required in the nominal impact area. It will be extended 400 nautical miles south of the nominal impact area if Pelican 10 is a C-119 aircraft and 440 nautical miles south if the C-130 aircraft is available to serve as Pelican 10. Air retrieval will be attempted in this area, but emphasis will be on detection and surface recovery.

A5. 10. 2 The RC-121 search radar aircraft will be deployed to provide dual radar coverage of the primary recovery area and the extended recovery area (see Fig. A7-5). Each of the RC-121 aircraft will be equipped with SSB radio for direct communication with the HCC without compromising HF communication with the C-119 and C-130 aircraft. Due to the extended deployment of the recovery aircraft, there will be two Command RC-121 aircraft and two primary HF frequencies: one for the northern sector and one for the southern sector. The two primary HF frequencies will be assigned by the HCC. A B-47 aircraft will depart for Hickam AFB from AFFTC following confirmation of successful orbit injection. This aircraft will fly a radar peaking mission for the on-station RC-121 aircraft prior to the recovery pass.

A5. 10. 3 Six C-119J recovery aircraft will be deployed in the primary recovery area 10 nautical miles from the satellite path at 40-nautical mile intervals along the satellite path. The remaining three or four C-119's and the C-130 aircraft, if available, will be deployed in the extended recovery area. The recovery aircraft deployment is shown in Figure A7-6.

A5. 10. 3. 1 The C-119 aircraft operating procedures will remain much the same as in previous operations. The mission of the C-119 aircraft in the primary recovery area will remain acquisition and aerial recovery of the capsule. The mission of the C-119 aircraft and C-130 aircraft, if available, in the extended recovery area will be primarily capsule acquisition, with aerial recovery secondary since insufficient aircraft are available to provide adequate retrieval capability. If used as Pelican 10, the C-130 aircraft will be positioned at the highest altitude consistent with gross weight and proper cruise control and will not attempt aerial recovery above 15,000 feet.

A5.10.3.2 All C-119 and C-130 aircraft will search for and use the D/F equipment on the capsule beacon signal. [redacted] will report the frequency deviation of the capsule beacon to the HCC through the STC. The HCC will relay the frequency deviation to the recovery aircraft through the Command RC-121's. This will permit the FLR-2 operators to search ±3 mc about the reported frequency. If the capsule beacon signals are not acquired by ETPD + 60 seconds, the frequency scan will be increased to ±12 mc. If the RC-121 aircraft obtain solid radar returns from the capsule parachute and the chaff but the C-119 aircraft are unable to acquire the capsule beacon signal, the FLR-2 operators will search for and use the D/F equipment on the capsule telemetry signal.

A5.10.4 The WV-2 will perform an FIC survey of the predicted impact area and will assume a final position 120 nautical miles south and 100 nautical miles west of the predicted impact point by ETPD - 30 minutes. This WV-2 will communicate with the Recovery Force on the northern primary HF frequency, will search for the capsule signals, and will attempt to derive a D/F bearing from any of the signals acquired. All telemetry signals received will be recorded. Signal acquisitions, frequency deviations, and bearings will be reported as directed by the HCC Task Force Commander aboard the northern Command RC-121.

A.5.10.5 Available JC-54 telemetry aircraft will be deployed along the satellite flight path as shown in Figure A7-3. Telemetry reception range of these aircraft is expected to be 120 to 150 nautical miles. Placement of these aircraft for a nominal orbit will be as follows:

Aircraft No.	Position Priority	Position
1	2	210 nm north of Dalton Victory
2	1	330 nm south of Dalton Victory

The JC-54 aircraft will be on station by ETPD - 1 hour. For orbits other than nominal, the telemetry aircraft will be positioned to provide telemetry coverage south of the predicted impact point as shown in Figure A7-4.

A5.10.5.1 The JC-54 telemetry aircraft positioned north of the Dalton Victory will be under the direction of the southern area Command RC-121 and will establish communication with this aircraft on the assigned southern primary HF frequency. The aircraft staged south of the Dalton Victory will be under direction of the HCC and will establish communication with the HCC through the telemetry station at Christmas Island over the assigned UHF or HF frequency. If actual positions do not permit using UHF because of distance, communication will be established between Christmas Island and the telemetry aircraft over the assigned HF frequency. Backup reception may be accomplished by operating one of the SSB receivers at Christmas Island in the AM mode. All transmissions from the telemetry aircraft to Christmas Island will be relayed as soon as possible to the HCC over the SSB link.

A5.11 Airborne Recovery Force Operations

A5.11.1 The RC-121 aircraft radar will search for the chaff and the reflective parachute. All radar and D/F returns from elements of the Recovery Force and bearings from the surface stations will be plotted as soon as possible to determine the most probable capsule location. C-119J aircraft will not be vectored toward a radar return until the radar return has been correlated with sufficient D/F bearings to establish a fix.

After a fix has been established, the Task Force Commander will notify the nearest C-119J and then vector the C-119J to an intercept flight path. The C-119J pilot will follow the RC-121 instructions and use the D/F gear for homing.

A5.11.2 When the recovery aircraft makes visual contact with the capsule parachute, an air recovery will be accomplished. Repeat passes will be made, if necessary, until recovery is successful or until the capsule impacts in the water. The aircraft completing recovery will return to Hawaii as directed by the HCC and will be escorted by either a C-119J, an RC-121, the C-130, or an SC-54 (Air Rescue) aircraft. The remainder of the Recovery Forces will return to Hawaii as directed by the HCC.

A5.11.3 If air recovery is unsuccessful, the recovery aircraft will circle the area of water impact and assist in direction of the surface ships to effect water recovery. The capsule beacon and flashing light operation will continue for 20 hours and the capsule will float for 48 ±8 hours. Five RADARC drop marker buoys will be distributed among the recovery aircraft and will, at the direction of the HCC, be dropped to aid in surface recovery. Each RADARC is equipped with an acquisition transmitter and flashing light having the following specifications:

<u>Acquisition Transmitter</u>

Frequency	235 mc
Pulse Width	30 μsec ±3 μsec
Repetition Frequency	500 cps + 75 cps - 0 cps
Power Output	60 watts peak, 1.25 watts av power
Operating Life	48 hours continuous

<u>Neon Flashing Light</u>

Flash Frequency	1 pps ±20 percent
Operating Life	48 hours continuous

A5.11.4 If recovery operation conditions permit, the northern Command RC-121, or alternate, will transmit brief best available information reports to the HCC over SSB radio at ETPD + 10 and 20 minutes (±2 minutes); similarly, the southern Command RC-121 will submit brief best available information reports to the HCC at ETPD + 15 and 25 minutes (±2 minutes). If the re-entry capsule is not sighted before ETPD + 30 minutes, the northern

Command RC-121 will report a brief recap of most reliable data received to the HCC for relay to the STC at that time. Similarly, a southern Command RC-121 recap will be submitted at ETPD + 35 minutes.

The data to be reported are aircraft station position, magnetic signal bearing, and local time for each reliable signal acquisition. Range and azimuth with local time and aircraft station position will be reported for each valid sighting. The report shall also contain the Task Force Commander's conclusions regarding the quality of reported signals and bearings, results of triangulation attempts, and most probable impact location. These data will be relayed to the STC immediately upon receipt by the HCC to enable the PAC to determine the most productive search areas.

A5. 11. 5 If the capsule has not been located by ETPD + 30 minutes in the northern area or ETPD + 35 minutes in the southern area, the Airborne Recovery Forces will initiate a corridor search south along the probable impact trajectory. At the discretion of the HCC, or as directed by the STC, a complete recap may be requested. The Forces will continue the southerly search, within fuel limitation, unless the HCC directs a search of the most probable impact areas as determined from tracking triangulation and other available data.

A5. 11. 6 The southern JC-54 telemetry aircraft will maintain UHF and HF communication with Christmas Island using the assigned frequency during the recovery operation for exchange of acquisition and tracking data.

A5. 11. 6. 1 The JC-54 telemetry aircraft will search for the capsule telemetry signal and the beacon signal. All capsule signals acquired will be recorded on magnetic tape with a timing signal. Capsule signal acquisitions will be reported immediately to the southern Command RC-121 over the primary southern HF frequency or to Christmas Island over the assigned UHF or HF frequency.

When the parachute deployment telemetry sequence is received, it will be reported. The telemetry aircraft will attempt to determine the capsule bearing at fade or at parachute deployment. If this can be accomplished, the bearing and aircraft position will be reported to the southern Command RC-121 or Christmas Island.

A5.11.6.2 If one of the telemetry aircraft visually acquires the capsule in the air or in the water, the position will be reported immediately to the southern Command RC-121 or Christmas Island. The telemetry aircraft will circle the capsule while maintaining 100 percent visual lock-on until arrival of a surface vessel or until fuel supply requires return to base. While hovering over the floating capsule the telemetry aircraft will attempt to provide a transmission compatible with the receiving equipment on Christmas Island so that the capsule bearing from Christmas Island may be more accurately determined.

A5.12 <u>Hawaiian Control Center Recovery Operations and Communications</u>

A5.12.1 The HCC-STC communications will be augmented by the addition of two voice lines (toll telephone) that will be effective from ETPD - 1 hour until ETPD + 4 hours.

A5.12.2 The HCC will direct and control acquisition, recovery, and search operations of the Christmas Island facility, the telemetry receiving aircraft, and the Recovery Forces. The primary communication link between the HCC and the surface elements will be the SSB frequency. The two Victory Ships will communicate with the HCC through PMR and the PMR representative at the HCC.

A5.12.3 The HCC will maintain a real-time analysis for integration of all incoming data to determine the most probable impact point and search areas and will relay all reported data to the STC immediately. Bearings from [redacted] South Point, Barking Sands, and the ships will be plotted. The [redacted] TLM-18 bearing after the azimuth rate becomes zero and bearings reported from South Point and Barking Sands will be relayed to the Command RC-121's by the HCC as soon as possible.

A5.12.4 The accuracy of all reported bearings must be considered. The accuracy of the [redacted] TLM-18 antenna is within 1/2°. The accuracy of the South Point TLM-18 antenna is within 1°. The accuracy of the Barking Sands tri-helix antenna is within 5°. The accuracy of the quad-helix antennas at South Point and on board the recovery ships is within 2°.

A6 POST-RECOVERY OPERATIONS

A6.1 WV-2 Aircraft No. 137890 Data

A6.1.1 The aircraft will return to the Kodiak Naval Air Station and will deliver all data to the C-54 courier aircraft for delivery to LMSD/61-44, Sunnyvale. The tapes will be reproduced at LMSD and a copy transmitted to PMR Pt. Mugu for evaluation of the aircraft telemetry system.

A6.2 Dalton Victory Data

A6.2.1 If the Dalton Victory acquires telemetry data from the capsule, an aircraft may pick up the data. This will be done at the discretion of the STC.

A6.3 Haiti Victory Data

A6.3.1 The Haiti Victory will proceed toward Pearl Harbor at the best speed of advance immediately after termination of the search operation. If capsule telemetry data have been acquired, the two HRS-3 helicopters will fly it to the HCC as soon as the ship reaches HRS-3 range of Hickam Air Force Base.

A6.4 Christmas Island and JC-54 Telemetry Aircraft Data

A6.4.1 An aircraft will pick up recovery capsule data acquired by the Christmas Island facility and fly it to Hickam AFB on the day of recovery operations. Christmas Island and JC-54 telemetry aircraft data will be delivered to the HCC as soon as possible.

A6.5 South Point and Barking Sands Data

A6.5.1 Data from South Point and Barking Sands Tracking Stations, including magnetic tapes, set-up sheets, maps and/or logs of the tracking operation, will be hand-carried by PMR personnel, flown to Hickam AFB, and delivered to the HCC.

A6.6 Transport of Data to Sunnyvale

A6.6.1 All recovery capsule data acquired by the receiving facilities in the recovery region will be hand-carried to Flight Data Reports, LMSD/61-44, on the first available commercial airline flight.

A6.7 Tracking Station Post-Recovery Operations

A6.7.1 The tracking stations will continue observations of the Discoverer Satellite S-band beacon and telemetry transmission until the battery power is exhausted. The orbital programmer is programmed as shown in Figure A2.7. Command transmission and tracking after the recovery pass will be at the direction of the STC.

A7 PERSONNEL SUBSYSTEM EVALUATION

Observation of personnel subsystem operations will be required at STC, HCC, [redacted] and [redacted] The data collected will concern:

a. Operational procedures for which no manuals or other documentation exist

b. Any disparities in operational procedures among the various stations, or among the various procedures manuals or documents

c. Certain critical operations pertaining to tracking, commanding, and data acquisition wherein a failure in the personnel subsystem could result in serious degradation in Discoverer system performance.

The specific procedures and operations to be observed will be determined by LMSD Personnel Subsystem with the concurrence of Operations Integration. Additional required data will be obtained from the various voice tapes.

A8 TABLES AND ILLUSTRATIONS

The following tables and illustrations are applicable to the flight of Discoverer Satellite 1058/Discoverer Booster 246/AET Payload only. Each table or figure is given the basic number of the section of the general STD to which it applies, the letter A to denote Appendix material, and a number to sequence items in the same category.

Table A2-1
NOMINAL FLIGHT PLANNING DATA

Item	Data
DISCOVERER	
S/N	1058
Payload	AET
Fuel	UDMH, 1870 lb
Oxidizer	IRFNA, 4815 lb
Launch weight	8693 lb
THOR	
S/N	246
Launch weight	117,949 (includes payload)
Fuel	RJ-1
Oxidizer	Liquid oxygen
LAUNCH	
Site	VAFB, SM-75-3, Pad No. 5
Date	September, 1960
Pad azimuth	218°24'17.24"
Launch azimuth	172°
Nominal airborne Command 5 backup	20 sec
Orbital boost time	117.5 sec
Downrange T/M ship location (<u>AG-161</u>)	16°00'N, 117°43'W
Downrange T/M ship heading	353°T
Programmer setting	5610 seconds (step setting 22)
INJECTION	
Time	T + 383
Location	24°12.7'N, 119°7.1'W
Altitude	117 sm, 102 nm
Azimuth (inertial)	168°52.2'
Nominal velocity	26,049 ft/sec
ORBIT	
Period	93.43 (5606 sec)
Apogee	438 sm, 380 nm
Perigee	117 sm, 102 nm
Eccentricity	0.0377
Average regression rate (17 passes)	23.53° [redacted]
Reset latitudes	20°N [redacted] 30°N [redacted]rthbound) or 40°N [redacted]uthbound) 42°N [redacted] northbound) or 45° [redacted] southbound) 60°N [redacted]
Inclination angle	79.41° [redacted]
RE-ENTRY	
Re-entry T/M aircraft location (WV-2 No. 137890)	48°54'N, 164°49'W
RECOVERY	
Aircraft (type and quantity)	C-119's (9 or 10), RC-121's (4), JC-54 telemetry receiving (2), C-130 (if available)
Surface ships (recovery)	<u>Dalton Victory</u> and <u>Haiti Victory</u>
Surface ship initial locations	16°N, 157°39'W and 24°N, 158°48.7'W
Surface ship helicopters	HR-3 (2 on each ship)
Recovery pass	17 nominal - 15, 16, or 18 by special command
Predicted impact area center	24°N, 158°48.7'W
ETPD	T + 26.6 hours

Table A2-2

NOMINAL ACQUISITION TIMES

Pass	Station	Acquisition Time (minutes)	Fadeout Time (minutes)	Duration Time (minutes)
Launch	[redacted]	0.5	8.1	7.6
		0.0	7.9	7.9
	T/M Ship	4.6	12.0	7.4
1	[redacted]	87.3	95.1	7.8
2		182.8	187.5	4.7
		191.2	197.2	6.0
6		533.2	542.4	9.2
7		626.9	636.7	9.8
8		717.7	728.9	11.2
9		811.1	815.3	4.2
		811.7	823.4	11.7
		818.9	826.9	8.0
10		902.1	915.2	13.1
		910.9	922.1	11.2
*11		998.1	1005.2	7.1
		1006.3	1019.1	12.8
*12		1104.9	1108.8	3.9
13		1213.2	1220.3	7.1
15		1395.7	1399.8	4.1
		1402.4	1408.8	6.4
16		1489.3	1496.9	7.6
		1498.9	1500.5	1.6
17		1584.2	1590.4	6.2
		1592.8	1599.6	6.8
*23		2120.9	2129.7	8.8
24		2222.7	2227.6	4.9

* Acquisition only - no T/M readout

Table A4-1

INSTRUMENTATION AND CAPSULE EQUIPMENT REQUIRED TO BE OPERATIVE AT LAUNCH

1. Agena Telemetry

   a. Continuous Channels:

      7 - Payload quantity. Subcarrier must be present

      9 - Payload quantity. Subcarrier must be present

      10 - Payload quantity. Subcarrier must be present

      18 - Payload quantity. Subcarrier must be present

   b. Commutated Channels

      12 - Subcarrier must be present and commutator running; point 38 must be present

      13 - Subcarrier must be present and commutator running

      15 - Subcarrier must be present and commutator running; points 9, 15, and 17 must be present. Channel 17, commutator points 7 and 21 are an acceptable substitution for Channel 15, commutator points 15 and/or 17.

      16 - Subcarrier must be present and commutator running; points 2, 4, 6, 8, 10, 22, 25, and 26 must be present. Channel 3 is an acceptable substitution for Channel 16, points 24 and/or 26. Channel 11 is an acceptable substitution for Channel 16 points 2, and/or 4, 6, 8.

      17 - Subcarrier must be present and commutator running

2. Capsule Telemetry and Equipment

   a. Continuous Telemetry Channels

      7 - Subcarrier must be present

      8 - Subcarrier must be present

      11 - Subcarrier must be present

   b. Acquisition Beacon

      The frequency must be within 1.5 mc of the nominal frequency

Table A5-1

SS/D SEQUENCE FOR DISCOVERER VEHICLE SERIAL 2205-1058

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
	-0.1	Timer reset
0	0	Start SS/D timer
0.1	0.1	Timer reset
0.1	0.1	Timer safety circuit
167	167	Uncage gyros
167	167	Programmed destruct lockout
179	179	Start orbital programmer (paralleled)
180.5	180.5	Command 27°/min yaw rate (5.0° yaw left)
180.5	180.5	Isolate K24 from Beacon 5
180.5	180.5	Vehicle pneumatic control
180.5	180.5	Open pneumatics valve
180.5	180.5	Fire explosive bolts
181	181	Fire explosive bolts
181	181	Fire retro-rockets (paralleled)
181	181	Arm pitch and yaw pneumatic control
181	181	Arm integrator correction
192	192	Remove 27°/min yaw rate
192	192	Command -45°/min pitch rate (pitchover 20.8°)
192	192	Arm roll H/S command
192	192	Fire H/S cover squib
192	192	Break 28v to N_2 valve, shut down separation monitor
192	192	Fire H/S cover squib
204	204	+28v to SS/D for brake control (not effective until 221 sec)
221	221	Command -2°/min pitch rate from integ. potentiometer (stop - 45°/min pitch rate)

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
221	221	Connect pitch H/S command
221	221	Arm Beacon 5 timer brake control
221	221	Arm integ. uncaging circuit
221	221	Actuate delay via orbital programmer
221	221	Roll H/S signal shunt
*221	221	Programmed SS/D timer delay
223		Initiate ground Commands 5 or 6
241	221	Stop SS/D timer delay (nominally 20 sec)
257	237	Fire ullage rockets
257	237	Preactivate hydraulics
257	237	Deactivate Beacon 5 timer brake control
257	237	K21 hold-in (Commands 5 and 6 interlock)
269	249	Arm gas generator squib. Energize K28 (pitch and yaw pneumatic Off)
269	249	Connect accelerometer to integrator
269	249	Fire helium valve and gas gen. squib (par.)
269	249	Engine ignition
270	250	Pitch and yaw pneumatic off (backup)
270	250	Open gas generator and He squib fire circuits
270	250	Open gas generator squib arm circuit
270	250	Close circuit to T/M off switch

*This sequence is based upon a nominal trajectory: Orbital programmer set for 20-sec timer brake delay and no timer brake modification from Beacon Channel 5 or 6.

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
270.5	250.5	Steady state thrust
383	363	Arm pneumatic (pitch and yaw)
383	363	Engine cut-off safety switch
**386.5	366.5	Disconnect accelerometer from integrator
386.5	366.5	Engine shut down by integrator
386.5	366.5	Activate pneumatic controls (de-energize K28)
394	374	SS/L +28v dc unregulated
394	374	Hydraulic controls shut down; shut off ullage rockets (paralleled)
394	374	Command -40°/min yaw rate
394	374	Command 0°/min pitch rate
394	374	Fire oxidizer, helium, fuel vent valves (paralleled)
492	472	Start T/M calibrate
502	482	Stop T/M calibrate
502	482	Open engine shut down circuit, switch antenna, and switch roll and yaw gyro T/M gain
502	482	Enable Commands 5 and 6. (Alternate recovery pass capability)
664	644	Command +3.55°/min pitch rate
664	644	Connect roll H/S to yaw gyro, yaw command complete
664	644	Roll accel. output grounded
664	644	Shut down +28v reg. ascent only power (paralleled)
664	644	Auxiliary heater on
664	644	Flight control gain change

**The dial reading of the integrator when caged is approximately 1725 representing a velocity-to-be-gained of 13,800 + 60, -0 fps.

Table A5-1 (Continued)

Time (Sec)		Signal Control Function
Nominal Time From Launch	Computer Running Time	
664	644	Integrator shut down
890	870	Phase balance ∅ A
890	870	Phase balance ∅ B
890	870	Open accelerometer power amp return
890	870	Telemetry off
890	870	SS/D timer off, H/S to low gain
890	870	Arm SS/D timer for recovery phase
890	870	Stop integrator caging
***X	870	SS/D timer on, H/S off
X + 15	885	Command -45°/min pitch rate (stop +3.5°/min pitch rate)
X + 15	885	Arm capsule ejection (squib)
X + 92	962	Command 3.55°/min pitch rate (stop -45°/min pitch rate)
X + 92	962	SS/L Transfer Circuit 1
X + 92	962	SS/L Transfer Circuit 2
X + 92	962	Disconnect capsule from electrical P.S.
X + 94.5	964.5	Shutdown SS/D timer, F/C off, gyro spin motors off
X + 94.5	964.5	Command eject (paralleled)

***Time of initiation of recovery phase

Table A6-1

NOMINAL ORBIT SCHEDULE

(Based on a 93.5-Minute Period)

Phase	Event	Time T (min)	Location N Latitude (deg)
Launch	Launch	0	34.8
	Separation	2.98 (179 sec)	- - -
	Start orbital timer	2.98 (179 sec)	- - -
	Nominal fire time	4.48 (269 sec)	- - -
	Nominal burnout and orbit injection	6.38 (383 sec)	- - -
	First crossing of equator	12.37 (742 sec)	0
	Beacon and T/M off	14.83 (890 sec)	12 (S)
Pass 1 (N-S)	Beacon and T/M on - reset enable	86.9	74
	Acquire [redacted]	87.3	72.7
	65°N latitude (ref)	89.5	65
	Reset signal/command	91.1	60
	57.6°N latitude (ref)	91.5	57.6
	[redacted]		
	Beacon and T/M off - reset disable	103.3	10
	End of Orbit 1	153.4	0
Pass 2 (N-S)	Beacon and T/M on - reset enable	180.5	74
	Acquire [redacted]	182.8	65.7
	Reset signal/command	184.4	60
	57.6°N latitude (ref)	185.0	57.6
	[redacted]		
	Acquire [redacted]	191.2	32.3
	21.6°N latitude (ref)	194.0	21.6
	[redacted]		
	Beacon and T/M off - reset disable	196.8	10
	End of Orbit 2	246.9	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Passes 3 thru 5	End of Orbit 3	340.4	0
	End of Orbit 4	433.9	0
	End of Orbit 5	527.4	0
Pass 6 (S-N)	Acquire [redacted]	533.2	19.7
	Beacon and T/M on - reset enable	535.0	26
	Reset signal/command	539.4	42
	42.9°N latitude (ref [redacted]	539.6	42.9
	Beacon and T/M off - reset disable	543.8	58
	End of Orbit 6	620.0	0
Pass 7 (S-N)	Acquire [redacted]	626.9	24.1
	Beacon [redacted] T/M on - reset enable	628.5	26
	Reset signal/command	632.9	42
	42.9°N latitude (ref [redacted]	633.1	42.9
	Beacon and T/M off - reset disable	637.2	58
	End of Orbit 7	714.4	0
Pass 8 (S-N)	Acquire [redacted]	717.7	12.7
	Beacon [redacted] T/M on - reset enable	718.8	16
	Reset signal/command	722.7	30
	34.8°N latitude (ref) [redacted]	724.0	34.8
	Beacon and T/M off - reset disable	727.1	46
	End of Orbit 8	807.9	0
Pass 9 (S-N)	Acquire [redacted]	811.1	12.3
	Acquire [redacted]	811.7	14.7
	Beacon [redacted] T/M on - reset enable	812.3	16
	21.6°N latitude (ref [redacted]	813.8	21.6
	Reset si[redacted]/command	816.1	30
	Acquire [redacted]	818.9	40.2
	57.6°N [redacted]titude (ref [redacted]	823.6	57.6
	Beacon and T/M off - reset disable	826.2	66
	End of Orbit 9	901.3	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 10 (S-N)	Acquire [redacted]	902.1	2.7
	Beacon [redacted]/M on - reset enable	903.0	6
	Reset signal/command [redacted]	906.9	20
	21.6°N [redacted]e (ref) [redacted]	907.3	21.6
	Acquire [redacted]	910.9	35
	57.6°N [redacted]itude (ref) [redacted]	916.8	57.6
	Beacon and T/M off - reset disable	918.5	62
	End of Orbit 10	994.8	0
Passes 11 and 12	End of Orbit 11	1088.3	0
	End of Orbit 12	1181.8	0
Pass 13 (N-S)	Beacon and T/M on - reset enable	1212.3	61
	Acquire [redacted]	1213.2	57.5
	Reset [redacted]/command	1216.4	45
	42.9°N latitude (ref [redacted]	1216.9	42.9
	Beacon and T/M off - reset disable	1219.1	34
	End of Orbit 13	1275.2	0
Pass 14 (N-S)	57.6°N latitude (ref [redacted]	1306.8	57.6
	Beacon and T/M on - reset enable	1307.1	56
	Reset signal/command [redacted]	1311.2	40
	34.8°N latitude (ref [redacted]	1312.3	34.8
	Beacon and T/M off - reset disable	1315.1	24
	End of Orbit 14	1368.7	0
Pass 15 (N-S)	Beacon and T/M on - reset enable	1395.5	74
	Acquire [redacted]	1395.7	73.5
	Reset s[redacted]al/command	1399.7	60
	57.6°N [redacted]tude (ref [redacted]	1400.3	57.6
	Acquire [redacted]	1402.4	48.5
	34.8°N latitude (ref) [redacted]	1405.8	34.8
	Beacon and T/M off - reset disable	1408.6	24
	End of Orbit 15	1462.2	0

Table A6-1 (Continued)

Phase	Event	Time T (min)	Location N Latitude (deg)
Pass 16 (N-S)	Beacon and T/M on - reset [redacted]e	1489.2	74
	Acquire [redacted]	1489.3	72.7
	Reset signal/command [redacted]	1493.1	60
	57.6°N [redacted]ude (ref [redacted]	1493.8	57.6
	Acquire [redacted]	1498.9	37.3
	34.8°N latitude (ref [redacted]	1499.4	34.8
	Beacon and T/M off - reset disable	1502.1	24
	End of Orbit 16	1555.7	0
Pass 17 (N-S)	Beacon and T/M on - reset enable	1582.7	74
	Acquire [redacted]	1584.2	67.6
	Reset si[redacted]/command [redacted]	1586.6	60
	57.6°N latitude (ref [redacted]	1587.3	57.6
	Acquire [redacted]	1592.8	34.2
	21.6°N latitude (ref [redacted]	1595.7	21.6
	Beacon and T/M off - reset disable	1598.9	10
	End of Orbit 17	1649.2	0
Pass 18 (N-S)	Beacon and T/M on - reset enable	1676.2	74
	Reset signal/command [redacted]	1680.1	60
	57.6°N latitude (ref [redacted]	1680.8	57.6
	21.6°N latitude (ref [redacted]	1689.2	21.6
	Beacon and T/M off - [redacted] reset disable	1692.4	10
	End of Orbit 18	1742.7	0

Table A6-2

FIRST-PASS PROGRAMMER CORRECTION BASED ON TIME OF CROSSING
(LAUNCH ORBITAL PROGRAMMER SETTING - 5610 SECONDS)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude)							
		65°N		57.6°N		25°N		22°N	
		T From Launch Time (sec)	T + Launch System Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)	T (sec)	T + Launch Time (sec)
5376	Decrease 22 steps	5152		5262		5749		5794	
5400	Decrease 20 steps	5175		5285		5774		5819	
5460	Decrease 14 steps	5228		5340		5834		5880	
5520	Decrease 8 steps	5281		5394		5894		5940	
5580	No change	5334		5449		5954		6001	
5640	No change	5388		5503		6014		6061	
5700	Increase 8 steps	5441		5558		6074		6121	
5760	Increase 14 steps	5494		5612		6134		6182	
5820	Increase 20 steps	5547		5667		6194		6242	
5880	Increase 25 steps	5600		5722		6254		6302	
5940	Increase 31 steps	5654		5776		6313		6363	
6000	Increase 37 steps	5707		5830		6373		6423	
6060	Increase 42 steps	5760		5885		6343		6483	
6120	Increase 48 steps	5813		5939		6493		6544	
6180	Increase 53 steps	5866		5994		6553		6605	

Table A6-2 (Continued)

Period (sec)	Programmer Correction	Cross Latitude (Reference Latitude) 65°N T From Launch Time (sec)	65°N T + Launch System Time (sec)	57.6°N T (sec)	57.6°N T + Launch Time (sec)	25°N T (sec)	25°N T + Launch Time (sec)	22°N T (sec)	22°N T + Launch Time (sec)
6240	Increase 59 steps	5919		6048		6613		6665	
6300	Increase 65 steps	5973		6103		6673		6725	
6360	Increase 70 steps	6026		6157		6733		6786	
6420	Increase 76 steps	6079		6211		6792		6846	
6480	As directed	6133		6266		6852		6906	
6540	As directed	6186		6321		6912		6967	
6600	As directed	6239		6375		6972		7027	
6660	As directed	6292		6429		7032		7088	
6720	As directed	6346		6484		7092		7148	
6780	As directed	6399		6539		7152		7208	
6840	As directed	6452		6593		7212		7269	
6900	As directed	6505		6647		7272		7329	
6960	As directed	6558		6701		7332		7390	
7020	As directed	6612		6756		7392		7450	
7080	As directed	6665		6810		7452		7511	
7140	As directed	6718		6865		7512		7571	
7200	As directed	6772		6920		7572		7632	

Table A8-1

REAL-TIME DATA READOUT AND REPORTING REQUIREMENTS

	MEASUREMENT		CHANNEL	PRIORITY	REAL TIME READOUT REQUIRED*	PASS	TRACKING STATION					T/M SHIP**	T/M A/C	NOTE
	NAME	NUMBER					[redacted]					FS SHIP AG-161	WV-2 NO. 137890	
LAUNCH	Liftoff Signal	---	---	1	X	Ascent	X	X						
	Thor Main Engine Cutoff	---	Thor 12	1	X	Ascent	X	X						
	Agena Engine Ignition and Cutoff	B6	14	1	X	Ascent	X	X				X		
	Tone Verifications A, B, C, D	H64, 65, 66, 67	16-2, -4, -6, -8	1	X	Ascent	X	X						
	Command Verifications 1, 2, 3, 4	H112	11	1	X	Ascent	X	X						
	Programmer Step Readout (Console)	H108, 109	16-24, -26	1	X	Ascent	X	X						
	10 Second Step Switch Position	H108	16-24	1	X	Ascent	X	X				X		
	100 Second Step Switch Position	H109	16-26	1	X	Ascent	X	X				X		
	Increase/Decrease Switch Position	H107	16-22	1	X	Ascent	X	X				X		
	Payload Function Selector Setting	AET 14/15, 17/18, 20/21, 23/24	13-18 thru 13-24 13-48 thru 13-54	1	X	Ascent	X	X						
	Wave Train	AET 49	18	2		Ascent						X		11
	Wave Train	AET 50	8	2		Ascent						X		11
ORBIT	Tone Verifications A, B, C, D	H64, 65, 66, 67	16-2, -4, -6, -8	1	X	1 thru 16	X	X	X	X	X			
	Command Verifications 1, 2, 3, 4	H112	11	1	X	1 thru 16	X	X	X	X	X			
	Programmer Period Readout (Console or Remote)	H110	3	2	X	1 thru 16	X	X	X	X	X			
	Programmer Step Readout (Console)	H108, 109	16-24, -26	1	X	1 thru 16	X	X	X	X	X			
	10 Second Step Switch Position	H108	16-24	1	X	1 thru 16	X	X	X	X	X			
	100 Second Step Switch Position	H109	16-26	1	X	1 thru 16	X	X	X	X	X			
	Increase/Decrease Switch Position	H107	16-22	1	X	1 thru 16	X	X	X	X	X			
	Reset Monitor Signal	H70	16-10	1	X	1 thru 16	X	X	X	X	X			
	Re-entry Selector Switch Position	C22	16-25	1	X	1 thru 16	X	X	X	X	X			1
	Payload Function Selector Setting	AET 14/15, 17/18, 20/21, 23/24	13-18 thru 13-24 13-48 thru 13-54	1	X	1 thru 16	X	X	X	X	X			
	Control Gas Supply Pressure	D95	12-38	2		1 thru 16	X	X	X	X	X			
	Battery Bus Voltage	C1	16-15	3		1 thru 16	X	X	X	X	X			
	Horizon Scanner - Pitch	D37	17-22	3		2,6,9,13,15	X		X	X	X			2
	Horizon Scanner - Roll	D39	17-26	3		2,6,9,13,15	X		X	X	X			2
	SPI Temperature	D130	15-9	3		2, 9, 15	X		X	X				3
	SPI Pitch Angle - No. 1	D128	15-15	3		2, 9, 15	X		X	X				3
	SPI Yaw Angle - No. 1	D127	15-17	3		2, 9, 15	X		X	X				3
	SPI Pitch Angle - No. 2	D138	17-7	3		2, 9, 15	X		X	X				3
	SPI Yaw Angle - No. 2	D139	17-21	3		2, 9, 15	X		X	X				3
	Wave Train	AET 49	18	2		1 thru 16	X		X	X	X			11

Table A8-1 (Continued)

	Measurement: Name	Measurement: Number	Channel	Priority	Real Time Readout Required*	Pass	Tracking Station [redacted]					T/M Ship**: FS Ship AG-161	T/M A/C: WV-2 No. 137890	Note
ORBIT	Wave Train	AET 50	8	2		1 thru 16	X		X	X	X			11
	No Name Assigned	AET 26	12-2	2		9	X							12
	No Name Assigned	AET 32	12-5	2		9	X							12
	No Name Assigned	AET 36	12-7	2		9	X							12
RE-ENTRY	Programmer Period Readout (Console or Remote)	H110	3	3	X	Recovery Pass			X	X				
	Programmer Step Readout (Console)	H108, 109	16-24, -26	2	X				X	X				
	10 Second Step Switch Position	H108	16-24	2					X	X				
	100 Second Step Switch Position	H109	16-26	2					X	X				
	Reset Monitor Signal	H70	16-10	1	X				X	X				
	Re-entry Selector Switch Position	C22	16-25	1	X				X	X				1
	Control Gas Supply Pressure	D95	12-38	3					X	X				
	Battery Bus Voltage	C1	16-15	3					X	X				
	Horizon Scanner - Pitch	D37	17-22	3						X				2
	Horizon Scanner - Roll	D39	17-26	3						X				2
	SPI Temperature	D130	15-9	3						X				4
	SPI Pitch Angle - No. 1	D128	15-15	3						X				4
	SPI Yaw Angle - No. 1	D127	15-17	3						X				4
	SPI Pitch Angle - No. 2	D138	17-7	3						X				4
	SPI Yaw Angle - No. 2	D139	17-21	3						X				4
	Pitch Programmer	D41	17-20	1	X					X				5
	SS/D Timer Restart	D85	12-54	1	X					X				
	Capsule Separation Event	AET 51	16-21	1	X				X	X			X	6
	Payload Connector Disconnect	AET 26	12-2	2	X				X	X				7
	Spin Valve Actuated, Retro-Rocket Ign., Despin Valve Actuated, Electrical Disconnect/Thrust Cone Separation	---	Capsule 7	1	X				X	X			X	8
	Thrust Cone Thermal Battery Volt., Electrical Disconnect/Thrust Cone Separation	---	Capsule 8	1	X				X	X			X	8
	Longitudinal Acceleration	---	Capsule 11	1	X				X	X			X	9
	5G Switch Closure, Parachute Cover Off, Cutters, Parachute Deployed, Ablative Shell Off	---	Capsule 7	1	X				X	X			X	8
	Thermal Battery 2 A8 Voltage, Timer Switch Closure	---	Capsule 8	1	X				X	X			X	8
	Capsule T/M Signal Strength	---	Capsule 7, 8, 11	2		Recovery Pass			X	X			X	10

Table A8-1 (Continued)

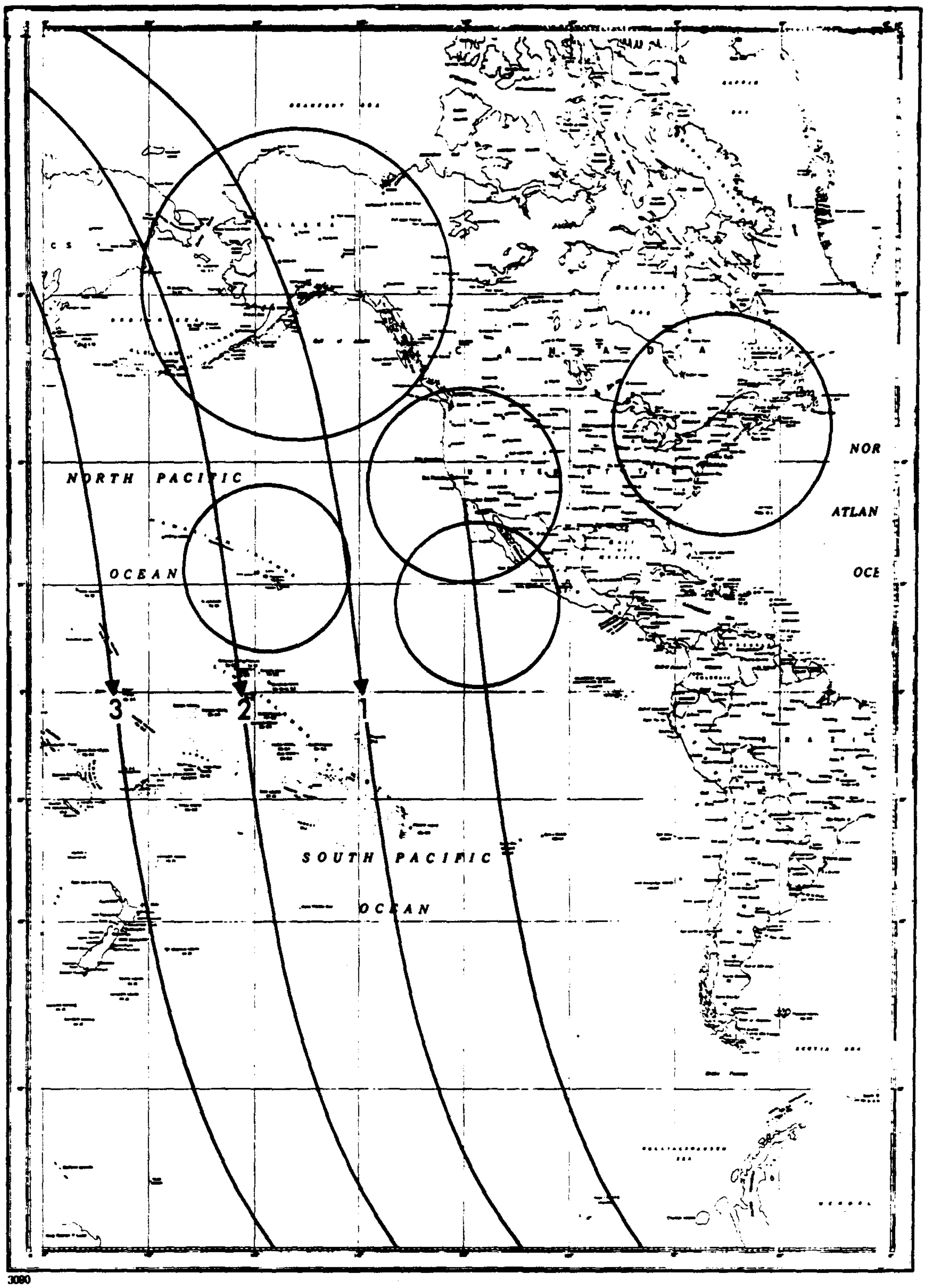
NOTES:

1. Reads 1 volt for normal Pass 17 re-entry, 4 volts for alternate re-entry.
2. [redacted] and [redacted] read whenever sun position indicator data are required in note 3 and note 4 (until turn off at start of reorientation) to determine the degree of attitude stabilization. [redacted] reads at lease 3 points at approximately 5 second intervals. [redacted] reads the recovery pass if SS/D restart event, D85, is invalid.
3. [redacted] and [redacted] read 3 times on Pass 2 at approximately 2-minute intervals correlated with system time. [redacted] reads on Pass 9 and on Pass 15; readings at one system time only are required on Pass 9; 3 readings required on Pass 15 are to be obtained as far north as possible. [redacted] transmits data on Channels 15 and 17 to SV on 100-wpm/voice line after Pass 2; three 10-second data samples at 2-minute intervals required.
4. Read at 1-minute intervals before reorientation, 20-second intervals during reorientation and immediately prior to separation; correlate with system time. If data on Channel 17 does not appear to be valid on flight, Channel 15 data will be read instead. [redacted] transmits data on Channels 15 and 17 to SV on 100-wpm/voice line after pass; 10-second data sample starting at separation minus 110 seconds and continuous transmission from separation minus 30 seconds to separation.
5. Read system time at start and finish of reorientation, voltage level prior to start of reorientation, and average voltage level during reorientation.
6. Reads 4.67 volts prior to separation, 1.33 volts after separation. Correlation within 2 seconds of exact system time is satisfactory for initia[redacted] and WV-2 report. [redacted] verifies that event has occurred by voltage level check.
7. Reads 1 volt prior to separation, out of band after separation.
8. The verbal report will contain general comments on the sequence. The performance summary will contain the sequence of events to the nearest second of system time.
9. Th[redacted] and WV-2 verval report will contain the system time of initiation, average value, and duration. As soon as possible, [redacted] will report a complete time history of acceleration which will include the system time of each data dropout and the time duration of dropout[redacted] reads values 5 seconds prior to, at, and 5 seconds after parachute deployment.
10. Provide a qualitative evaluation of signal reception.
11. A qualitative comparison with the wave train forms in Figure A8-2 with the system times of initiation and termination of the series of pulses is required.
12. Record voltage level at beginning, middle, and end of pass. Readout is to be accurate to at least 0.1 volt (2% bandwidth). Readout AET 32 and AET 36 after priority 1 items and report them to the STC by voice within 5 minutes after the pass.

---

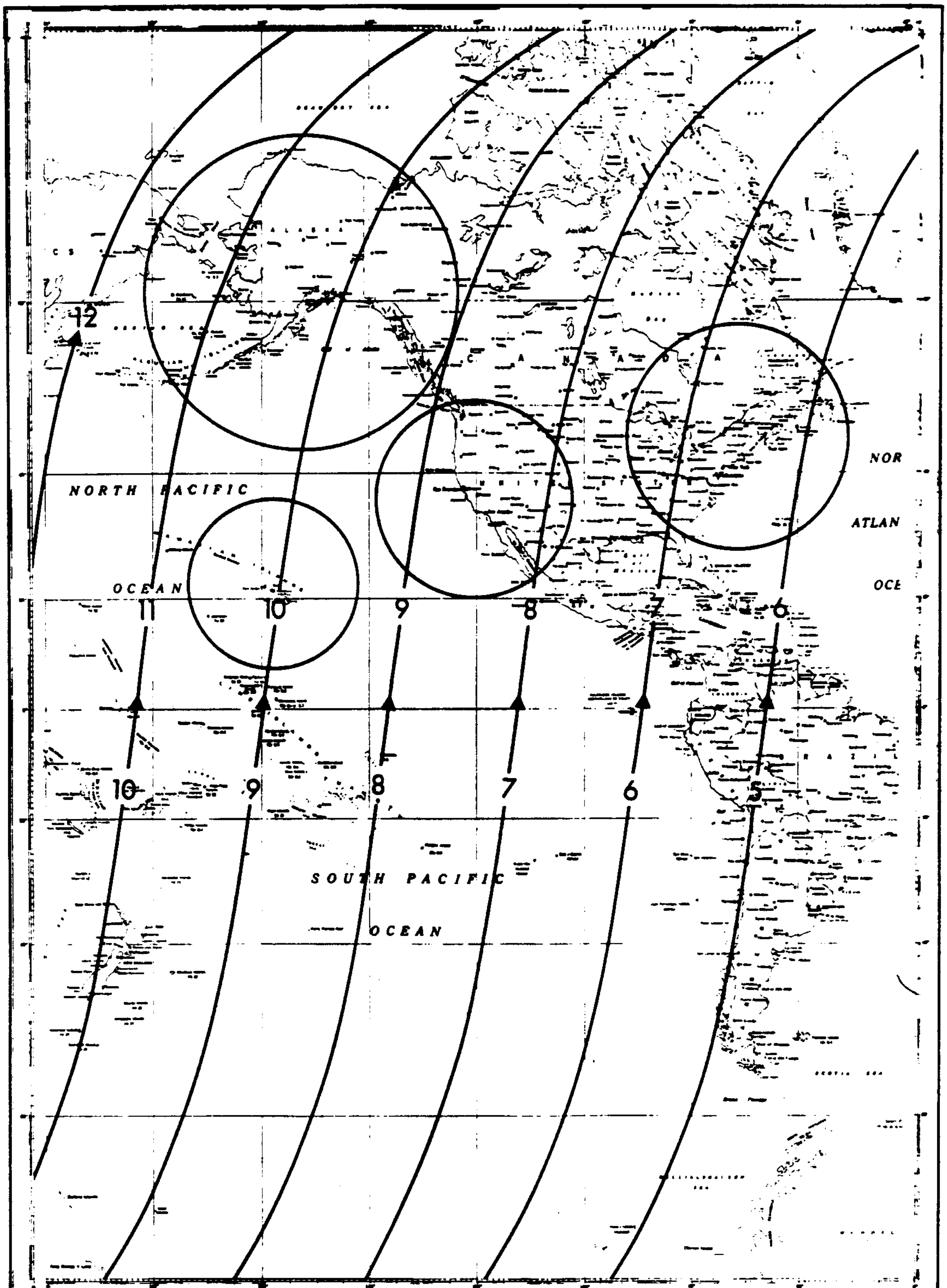
* *Measurements to be read in real time and reported to the STC by voice are checked. Other measurements may be read after the pass. All data listed are to be reported to the STC by 60-wpm teletype as soon as possible.*

** *T/M ships will transmit real-time data immediately after signal fade so no interference with the telemetry signals will be generated.*



445720-A7-001

Figure A2-1 Nominal Orbit Traces – Passes 1 Through 3



445720-A7-002

Figure A2-2 Nominal Orbit Traces – Passes 5 Through 12

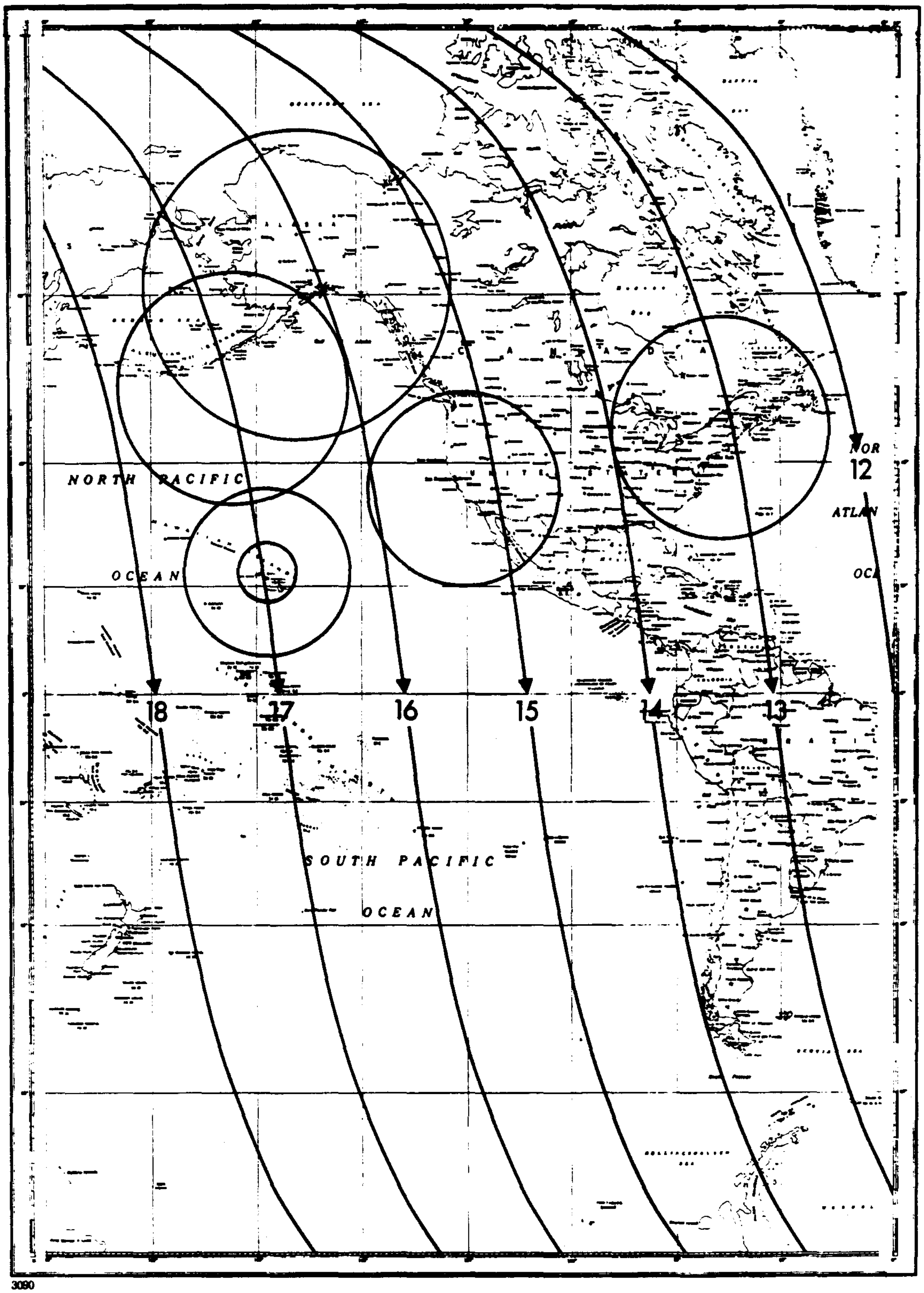


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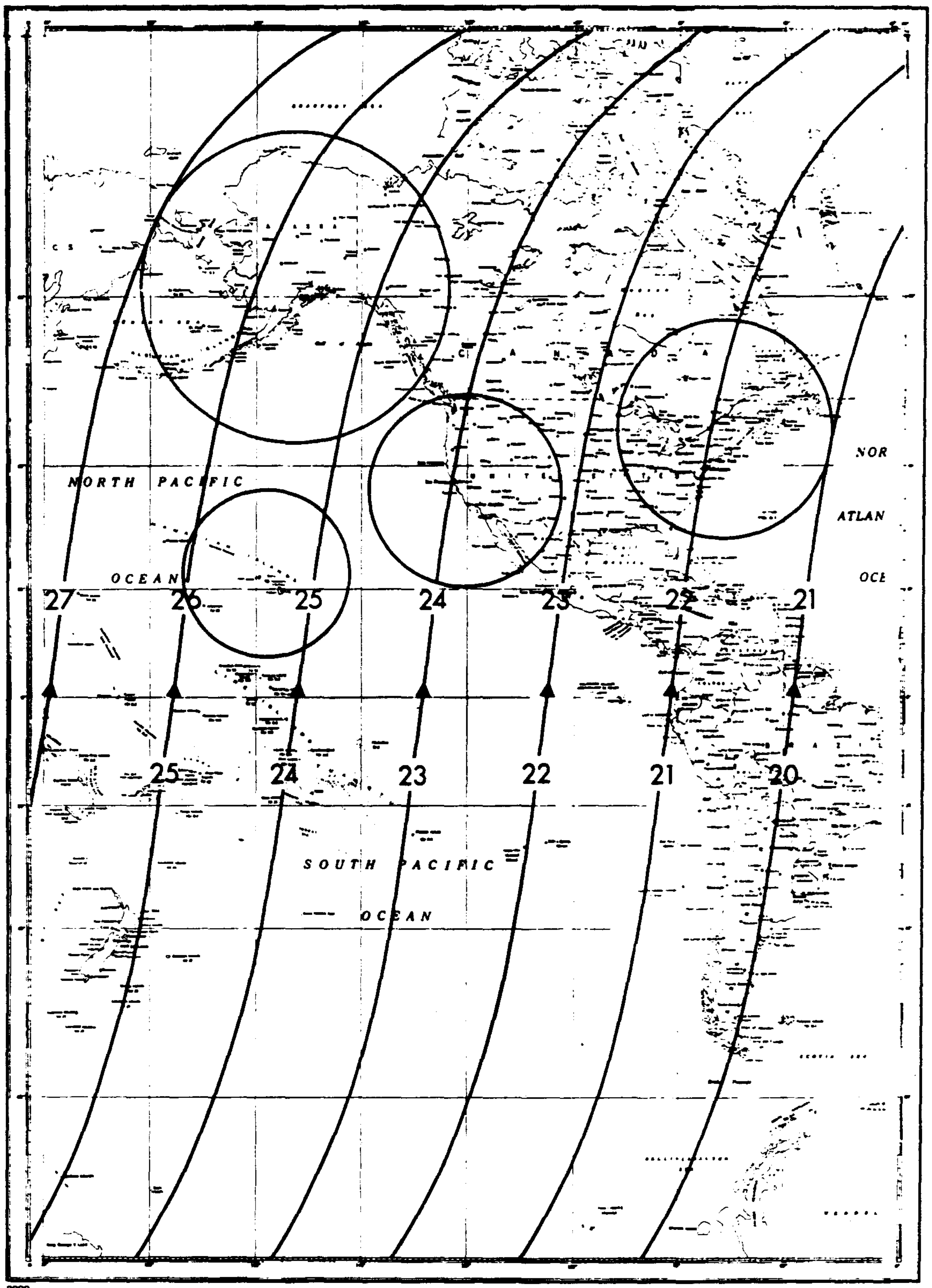
Figure A2-3 Nominal Orbit Traces – Passes 12 Through 18



3090

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Figure A2-4 Nominal Orbit Traces – Passes 20 Through 27

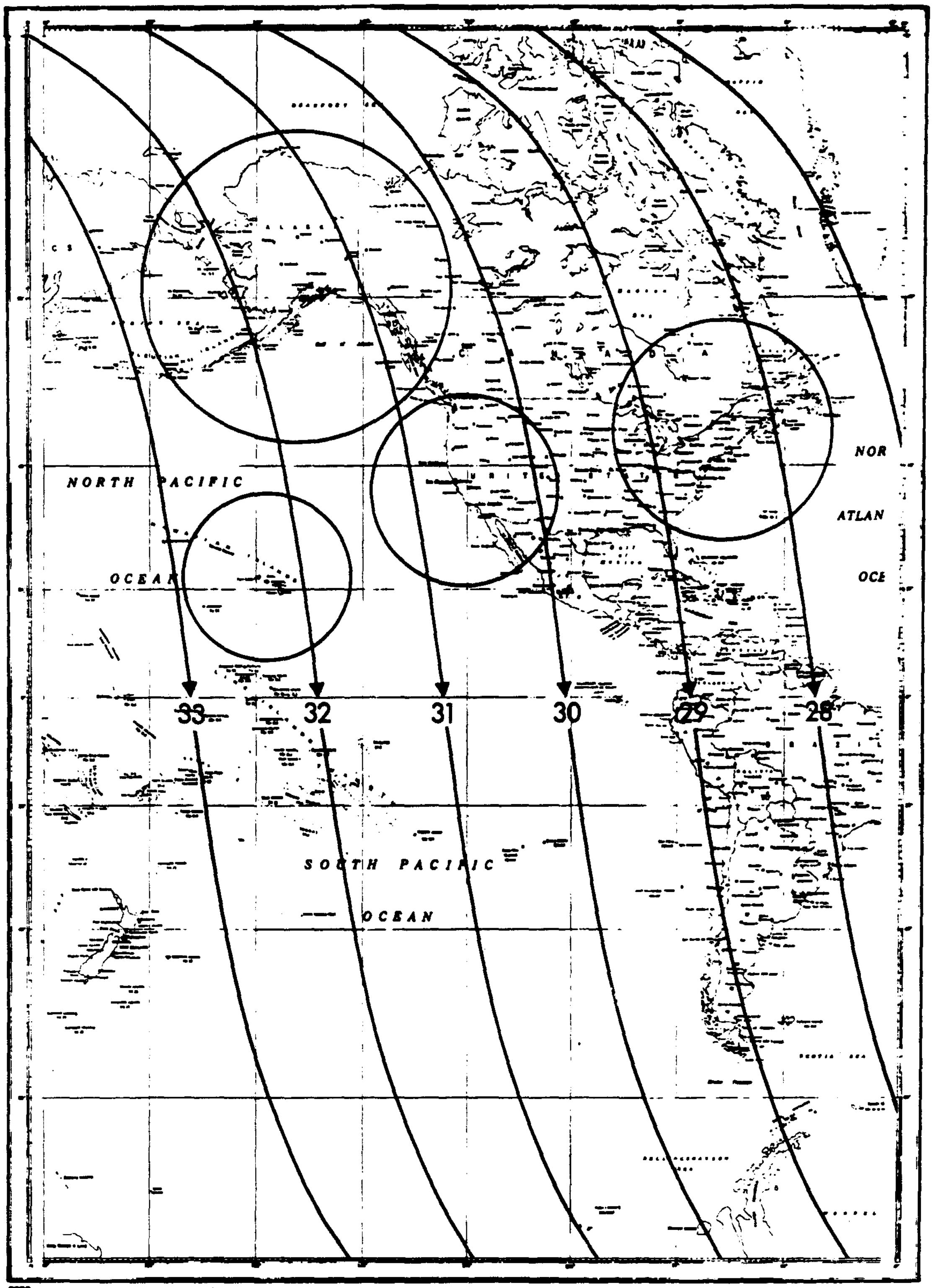
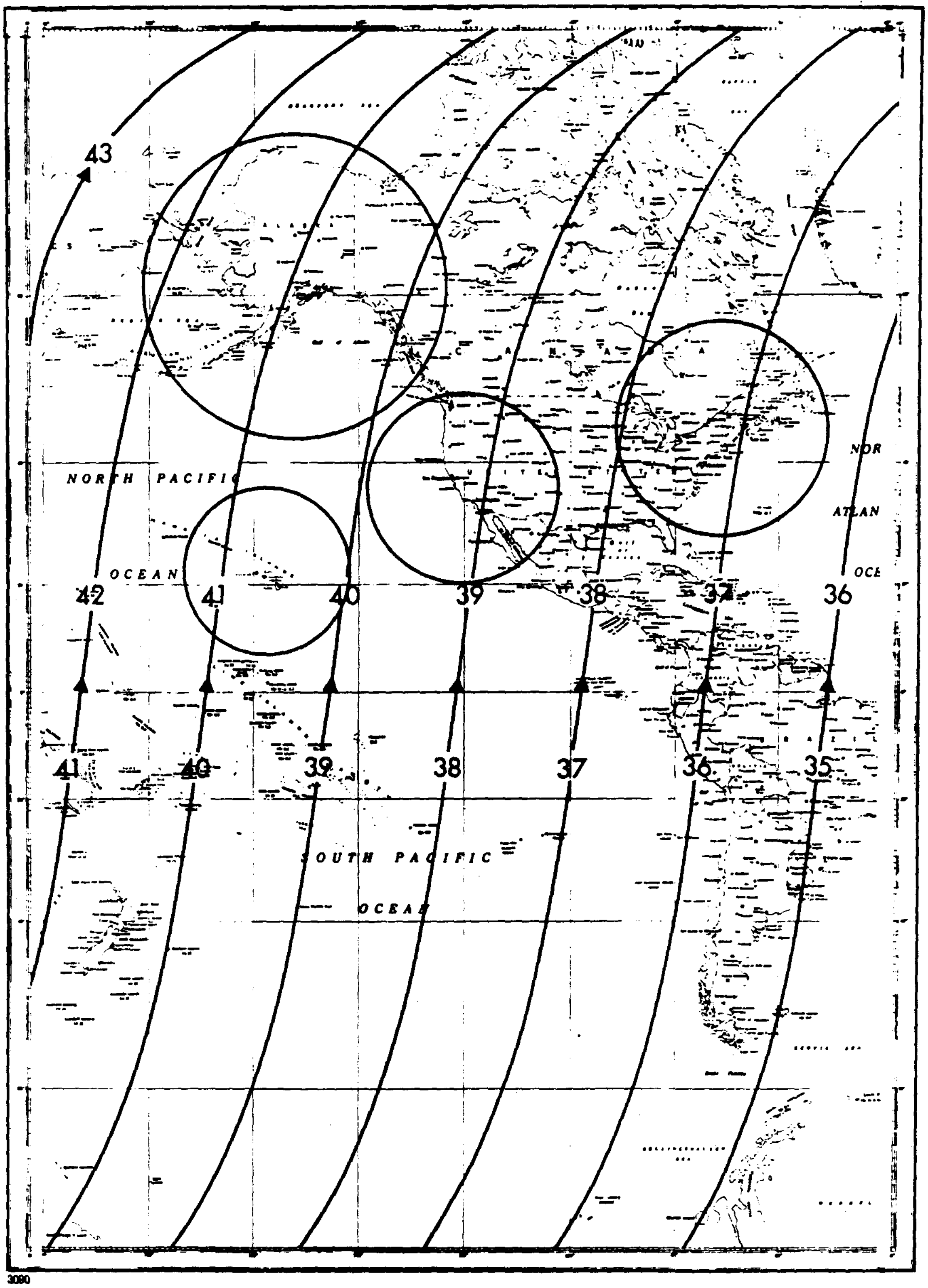


Figure A2-5 Nominal Orbit Traces – Passes 27 Through 33



3080

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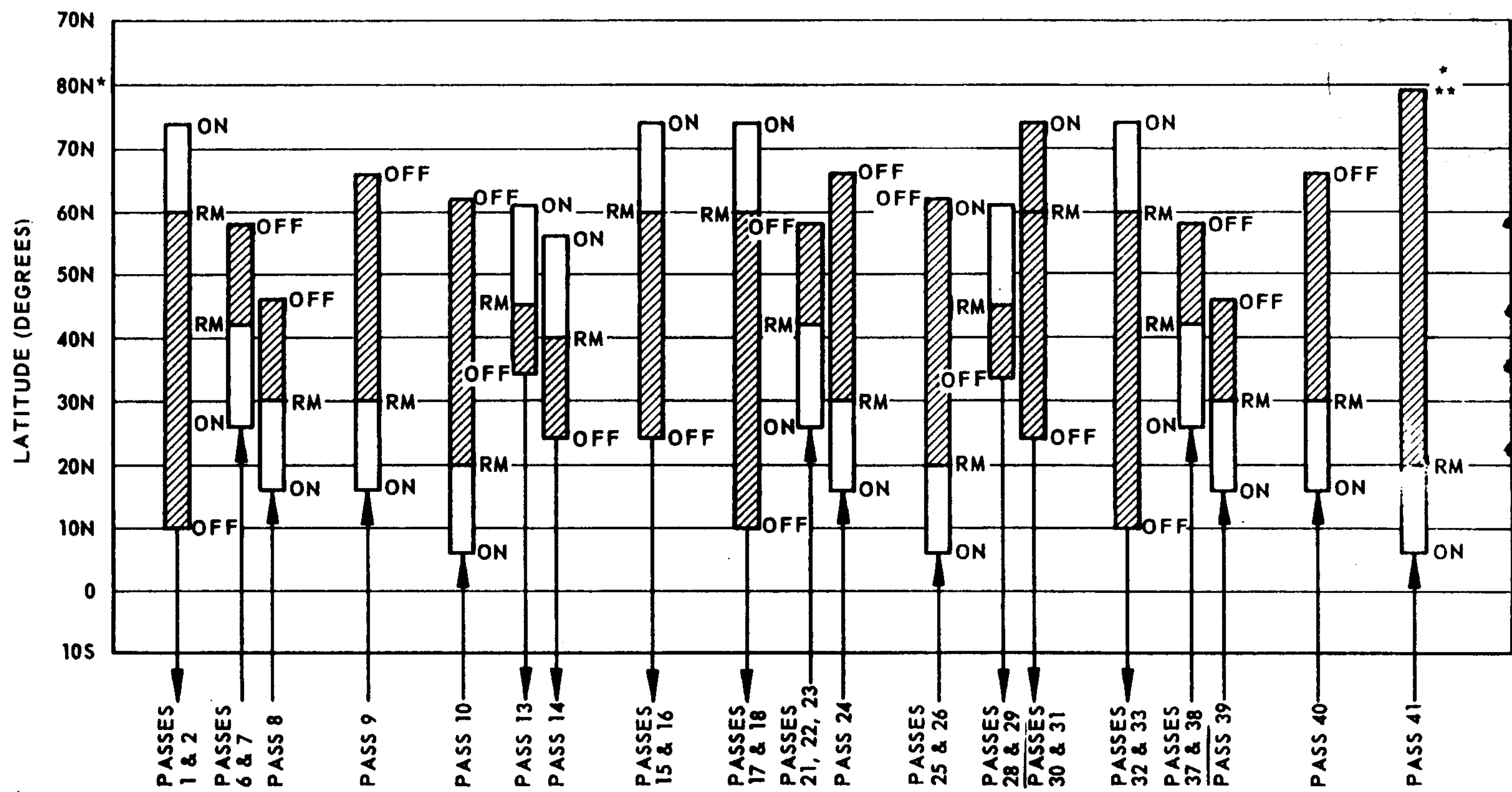
Figure A2-6 Nominal Orbit Traces – Passes 35 Through 43



[redacted]

ON = RESET ENABLE, RADAR PULSE BEACON ON, TELEMETRY PLATES ON
OFF = RESET DISABLE, RADAR PULSE BEACON OFF, TELEMETRY PLATES OFF
ON THRU OFF = RESET COMMAND CAPABILITY
= RESET MONITOR (RM) SIGNAL OFF
= RESET MONITOR (RM) SIGNAL ON
* = MAXIMUM LATITUDE REACHED WITH ORBIT PLANE INCLINATION IS APPROXIMATELY 79.4°N
** = RESET ENABLE, RADAR PULSE BEACON, AND TELEMETRY PLATES REMAIN ON AFTER PASS 41.

445720-A7-007

Figure A2-7 Readout and Reset Programming

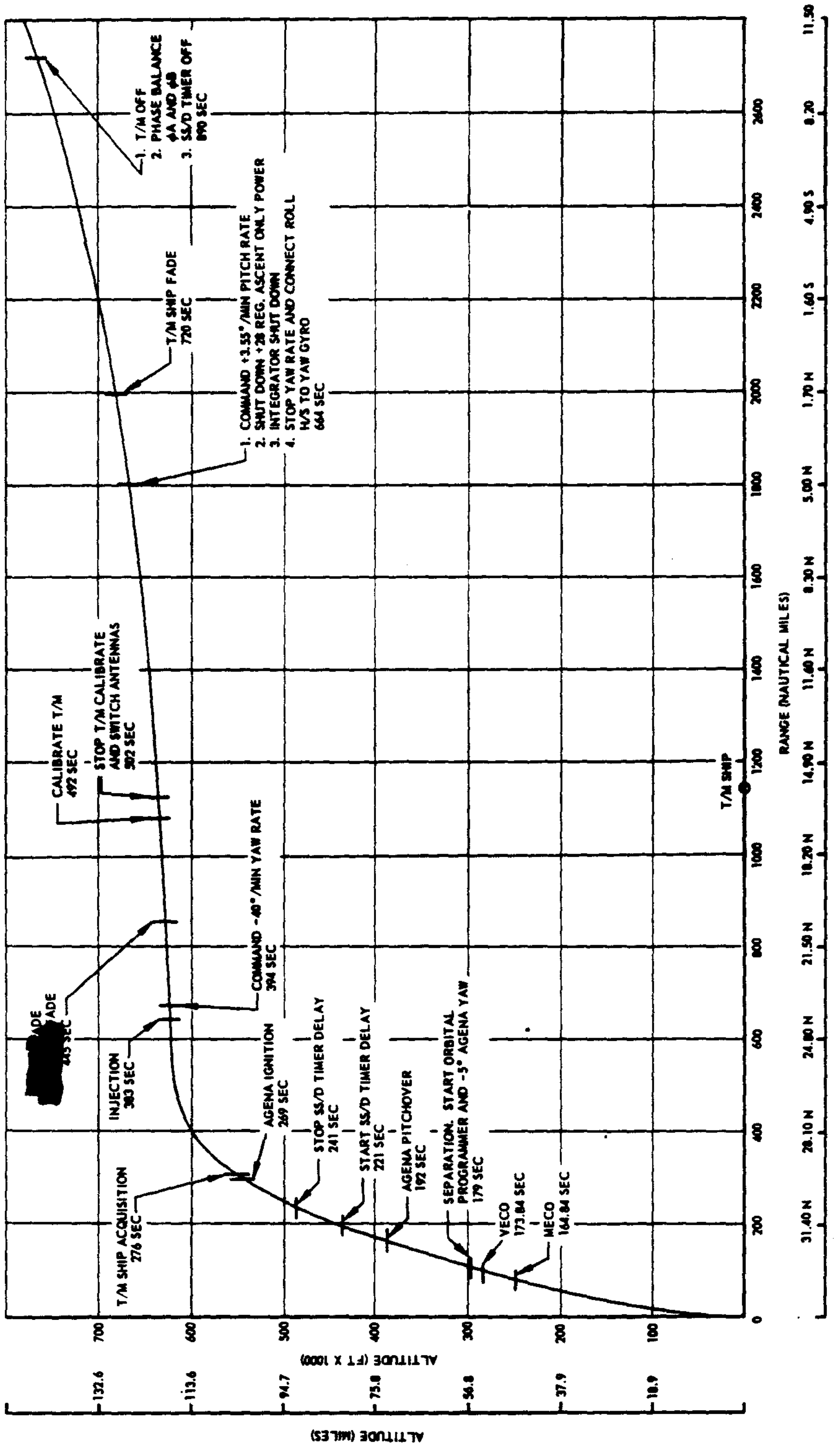


Figure A5-1 Launch Phase Nominal Trajectory

445720-A7-008

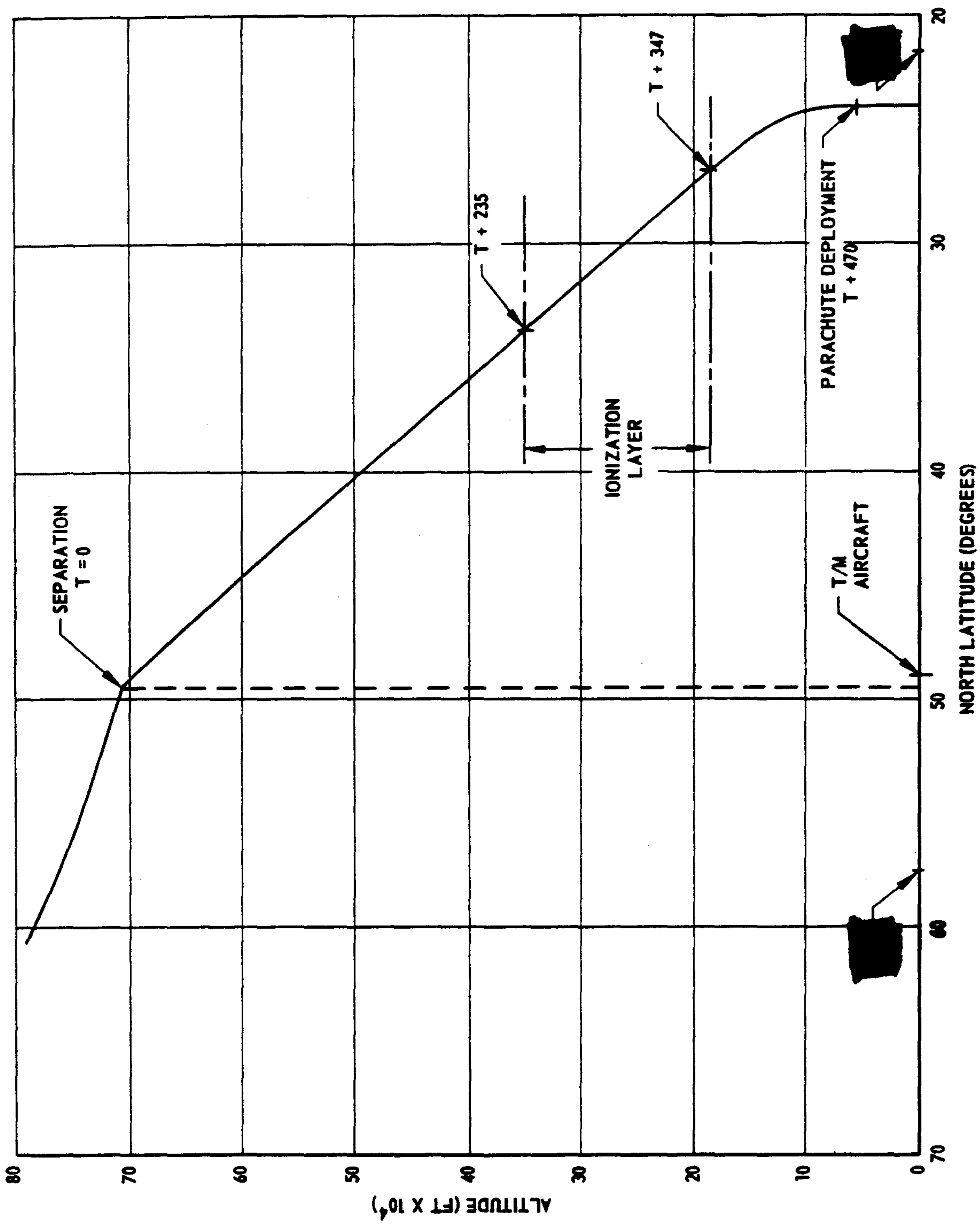
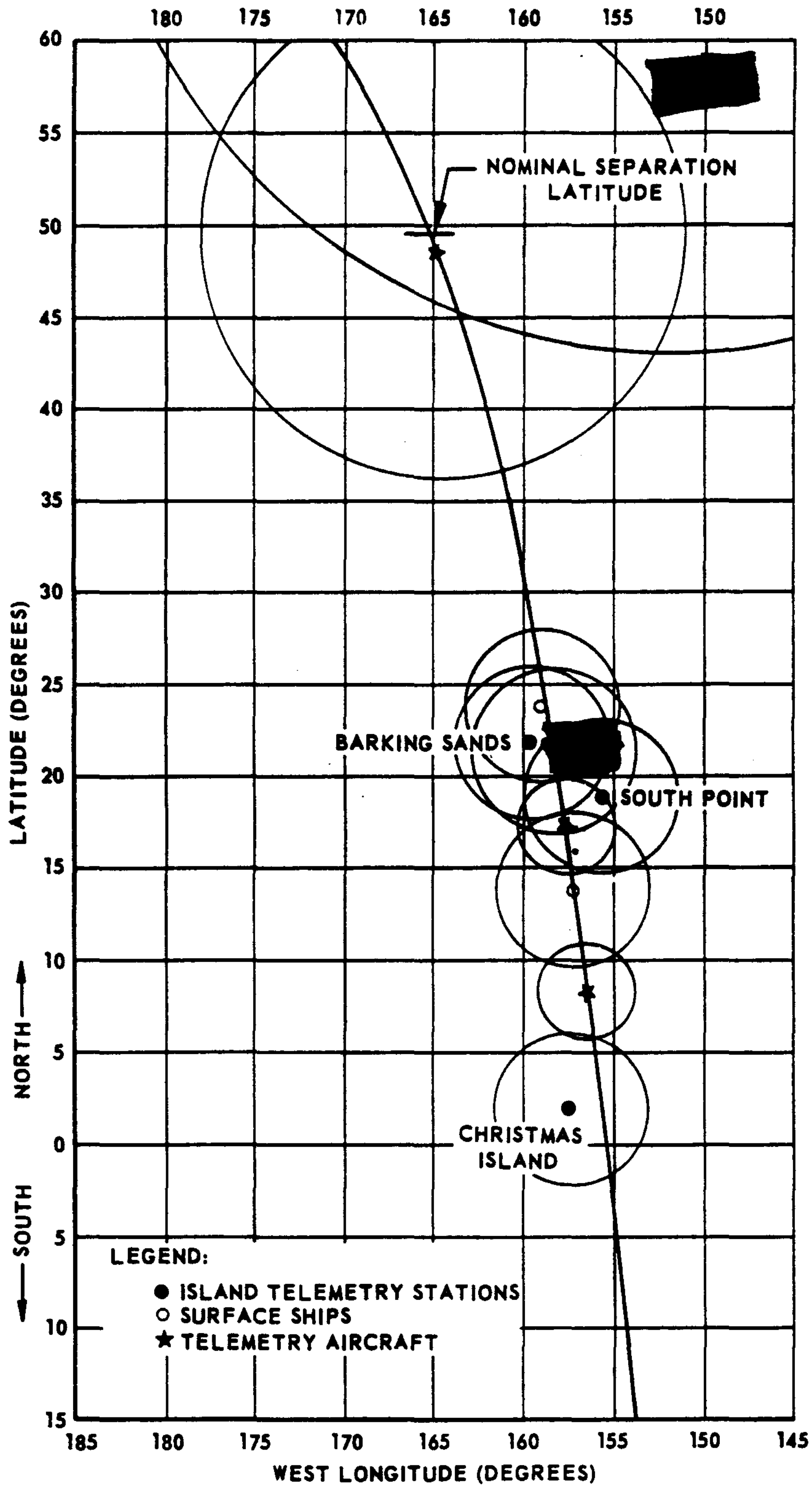


Figure A7-1 Capsule Re-entry Trajectory

445720-A7-009

[redacted]



445720-A7-010

Figure A7-2 Recovery Pass Telemetry Coverage

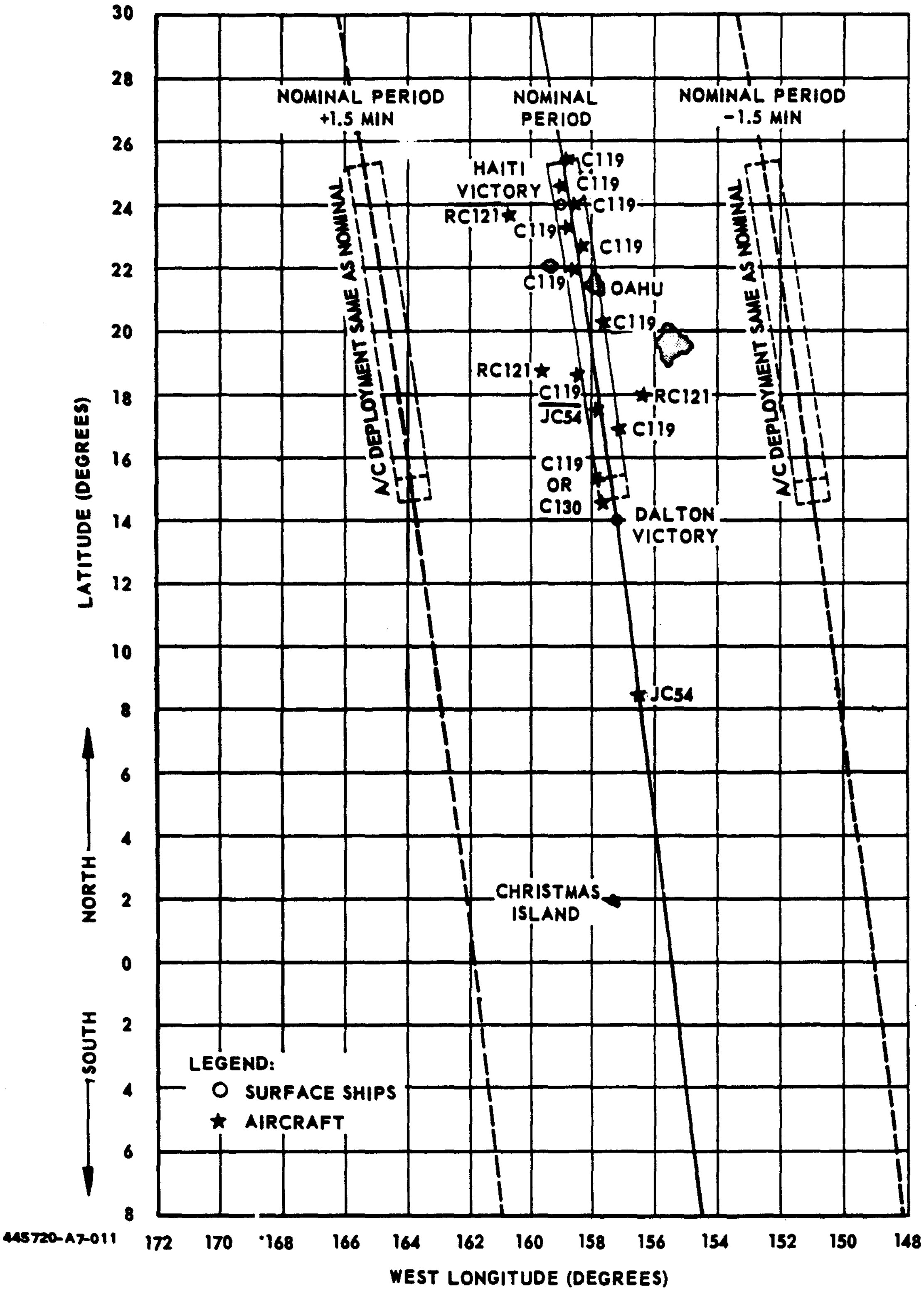


Figure A7-3 Recovery Force Deployment

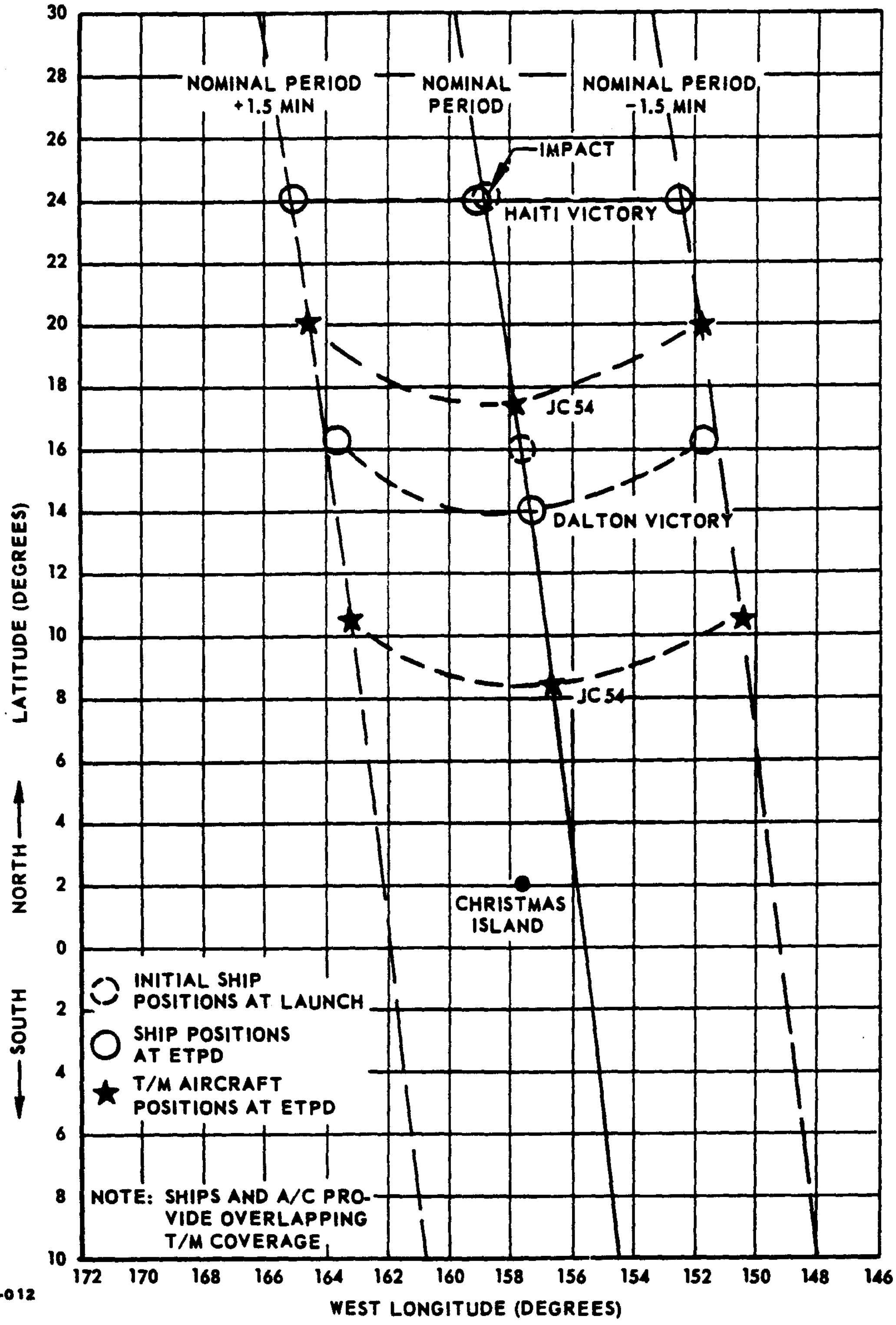


Figure A7-4 Recovery Surface Force and Telemetry Aircraft Deployment

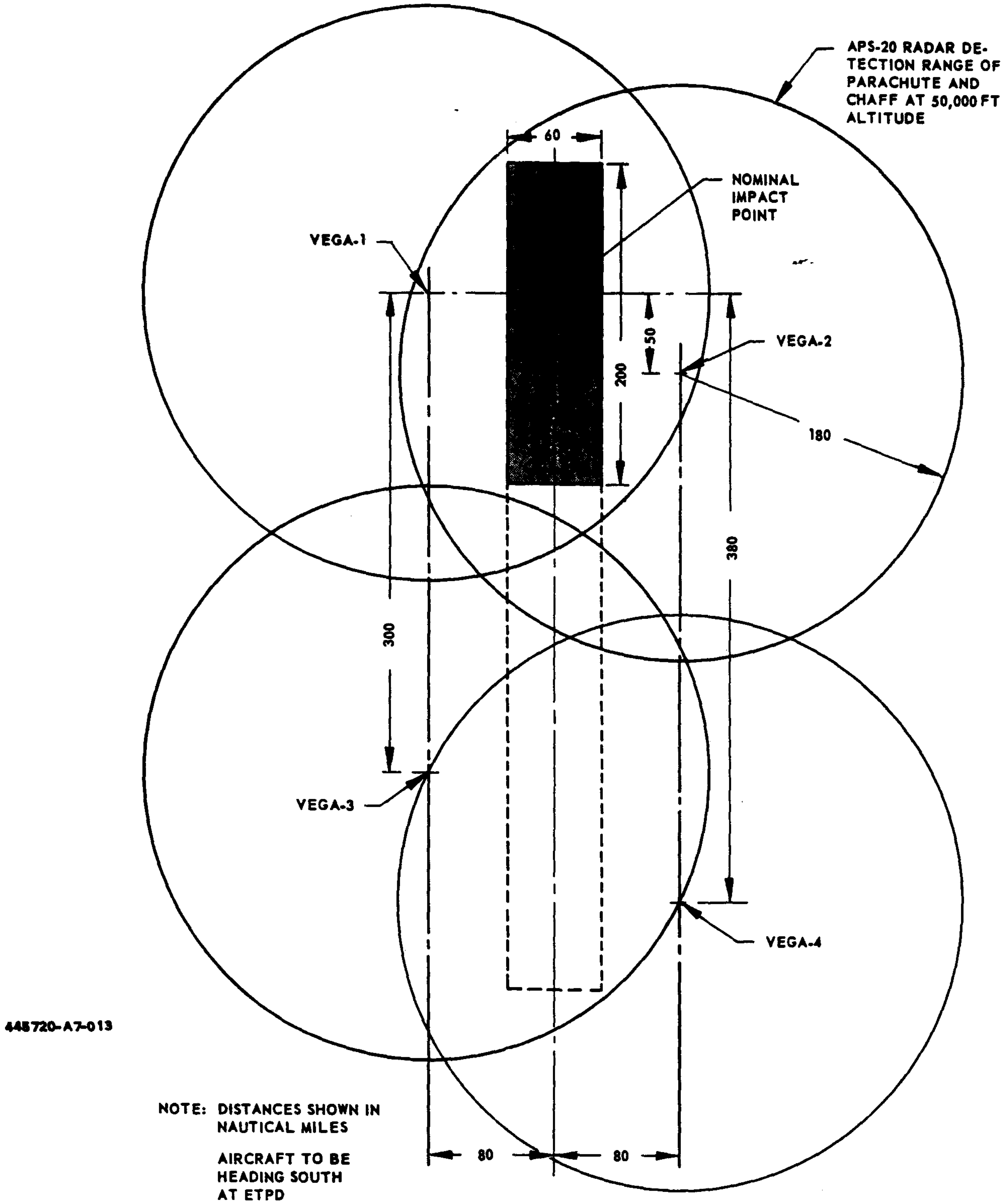
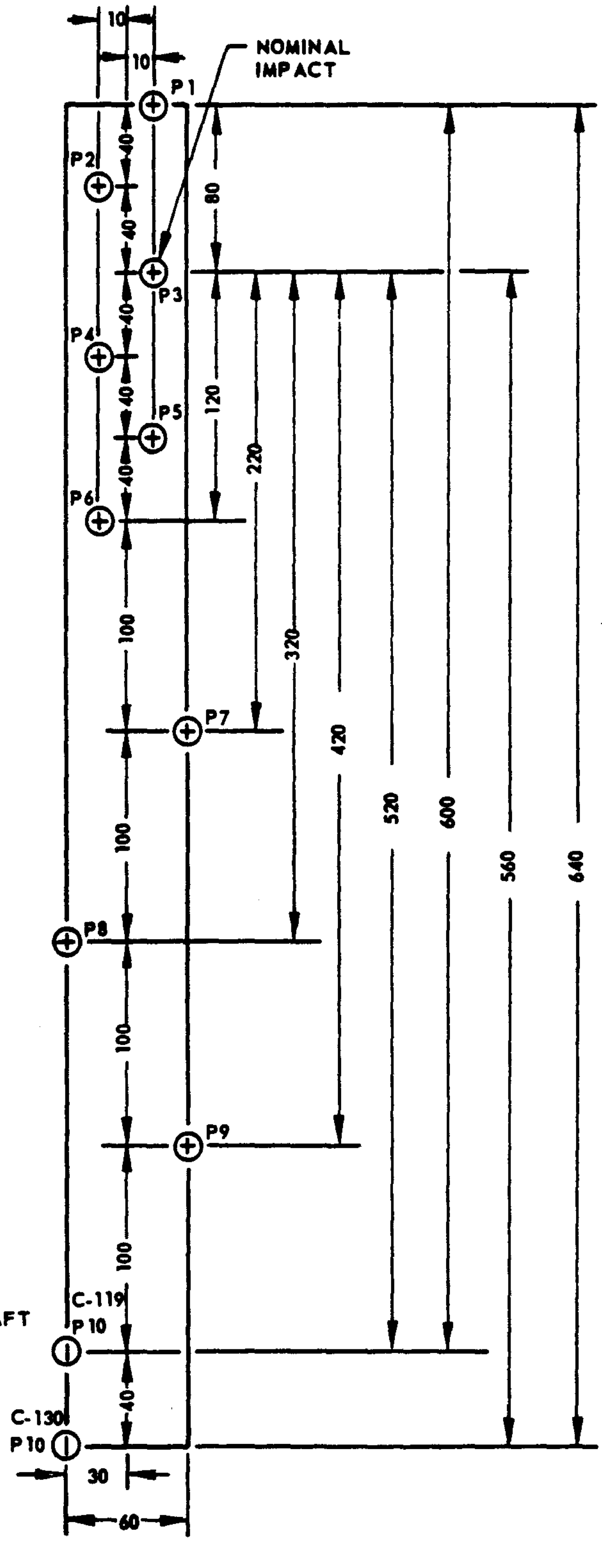


Figure A7-5 RC-121 Aircraft Deployment



P1 THRU P9 ARE C-119 AIRCRAFT
P10 IS EITHER A C-119 OR A C-130 AIRCRAFT
DISTANCES SHOWN IN NAUTICAL MILES

445720-A7-014

Figure A7-6 C-119 and C-130 Aircraft Deployment

[redacted]

Revised Page
18 July 1960

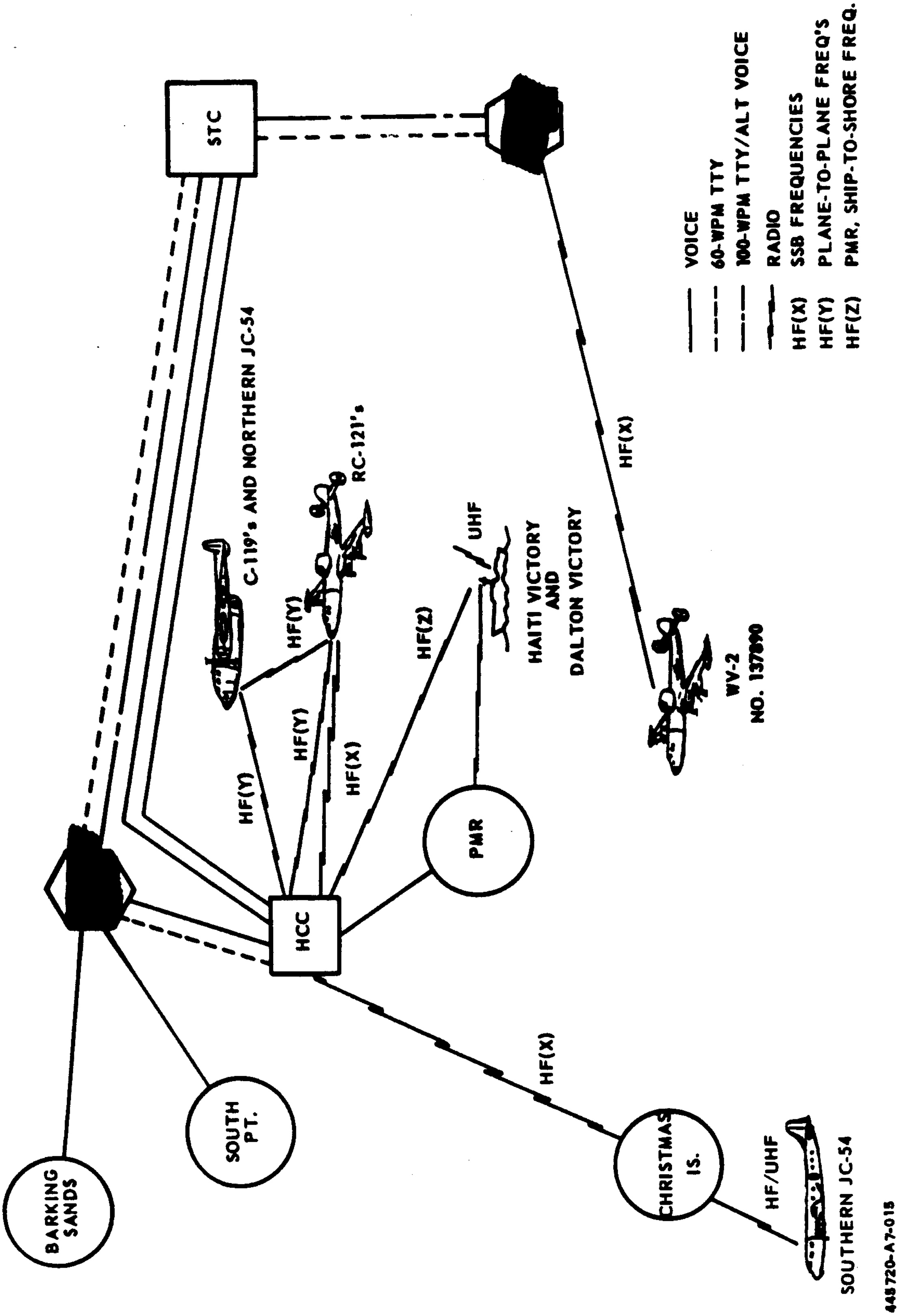


Figure A7-7 Recovery Operations Communications

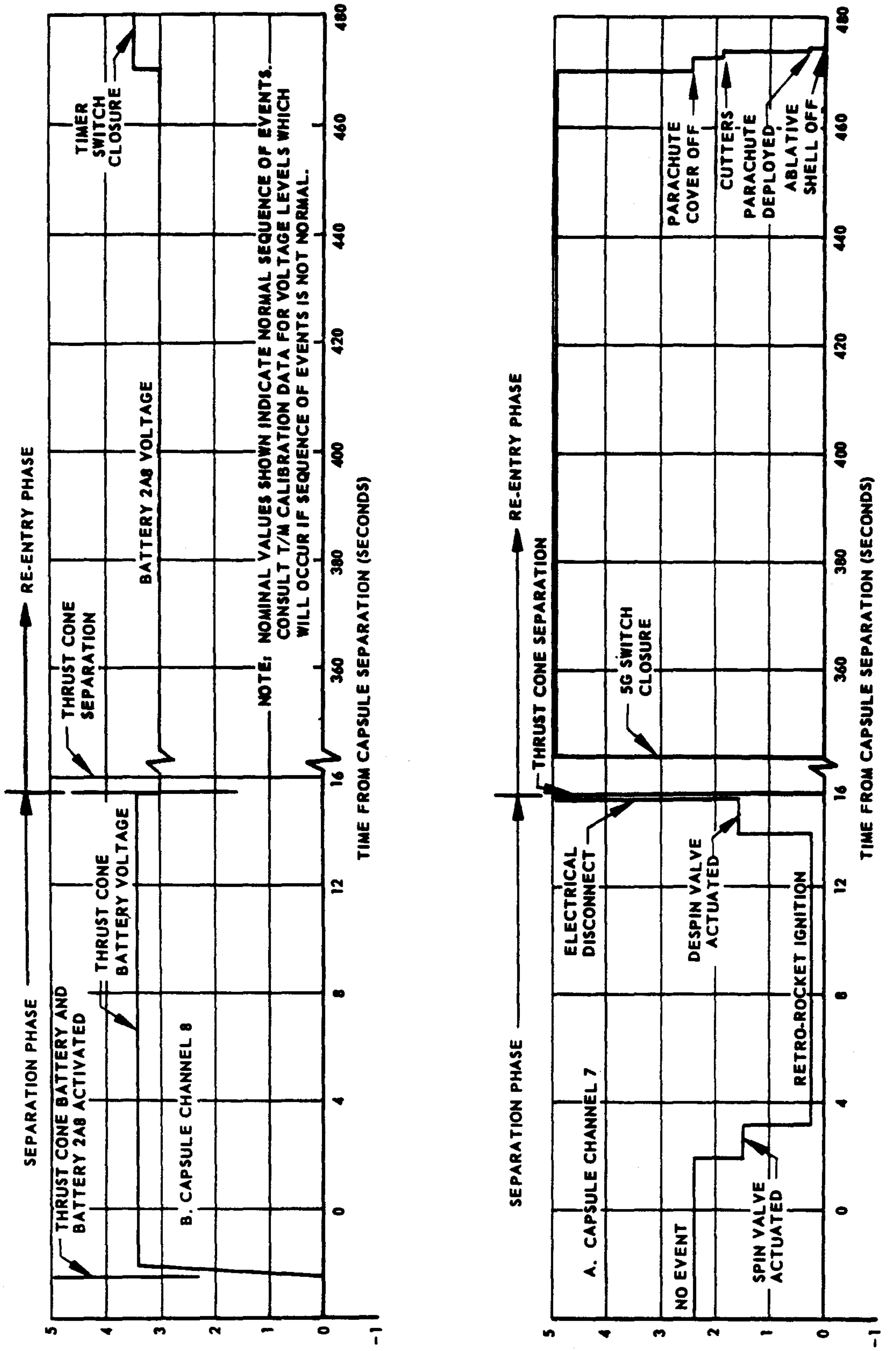
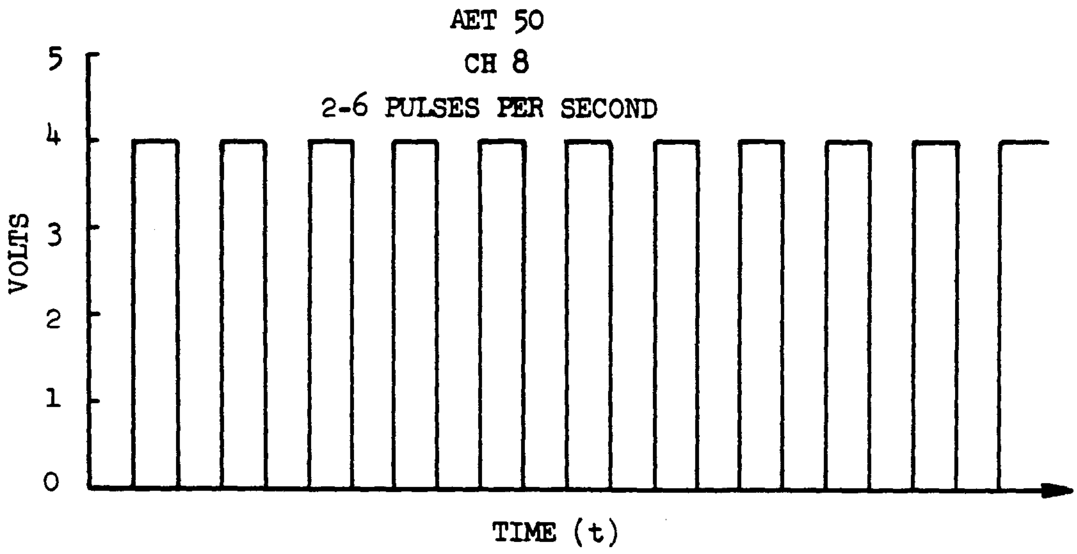


Figure A8-1 Nominal Capsule Telemetry Voltage Levels



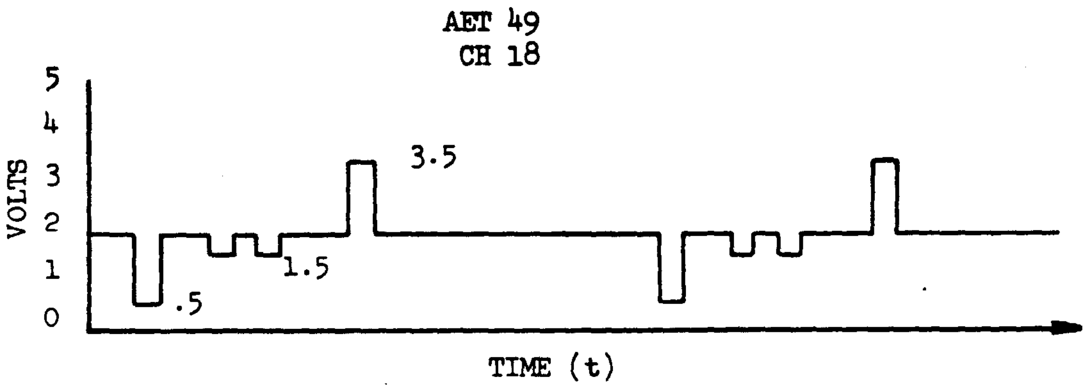


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Figure A8-2 Nominal Payload Function Wave Trains

Notice of Page Substitution

Appendix A - TAB 1
SATELLITE 1114/Booster 324

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

30 August 1961
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APPENDIX A – TAB 1
ORBITAL TEST DIRECTIVE
FOR
DISCOVERER SATELLITE ORBITAL OPERATIONS
DISCOVERER SATELLITE 1114
DISCOVERER BOOSTER 324

Prepared by

TEST DIRECTIVES BRANCH (TWRDT)
6594TH TEST WING

APPROVED:

[redacted]

COLONEL, USAF
DEPUTY COMMANDER
SPACE SYSTEM TEST
6594TH TEST WING (SATELLITE)(AFSC)

 [redacted]

CONTENTS

TABLES

ILLUSTRATIONS

[redacted]
1114/324

APPENDIX A – TAB 1
SUPPLEMENTAL TEST INFORMATION

A1 INTRODUCTION

This Appendix contains material which supplements the basic text of the Orbital Test Directive for Discoverer Satellite Orbital Operations, [redacted] (OTD), and is applicable only to the flight of Discoverer Satellite 1114. Each paragraph, table or figure in this appendix is given the number of the section of the basic OTD to which it applies.

A4 FLIGHT OPERATIONS INFORMATION

A4.1 Discoverer Satellite 1114 will carry an AET-L payload in a Mark IV recovery capsule. A Discoverer Research Payload will be carried by the Agena as described in paragraph 4.3.1 of the basic OTD. In addition, the Discoverer Satellite 1114 will carry a "Vela Hotel" payload as described in paragraph 4.3.2.1 of the basic OTD. The AMR Ascension Island Tracking Station will support Vela Hotel data recording during this operation.

A4.1.1 AMR participation will consist of recording Vela Hotel payload information by means of the TLM-18 antenna and associated equipment located at Ascension Island. This information will be transmitted via the Satellite Telemetry Link 2 (frequency 228.2 mc, Channels 17, 18, and F). Transmitter power will be 8 watts.

A4.1.2 The Vela Hotel Telemetry Link 2 will be controlled by the vehicle orbital timer; therefore, no external commands will be required to initiate data transmission. Brush 9 of the timer will turn on Link 2 only while the satellite is within range of Ascension Island. Brush 4 will turn off Link 2. The timer is programmed to turn on the transmitter at preselected latitudes for both southbound and northbound passes. However, a one minute warm-up time is designed into the transmitter control system; therefore, although the telemetry will be turned ON at definite latitudes, the satellite will not actually transmit until approximately four degrees later, depending on the satellite velocity.

A4.1.3 The programmed turn-on and turn-off latitudes are as follows:

a. Southbound passes, turn on at 14° N latitude, turn off at 22° S latitude

b. Northbound passes, turn on at 28° S latitude, turn off at 8° N latitude.

A4.1.4 Passes that have been designated for Ascension Island support are as follows: (northbound) 3, 18, 19, 34, 50, 65, 66, 81, 82, and (southbound) 11, 27, 42, 43, 58, 59, 74, and 90. The first active pass, 3, will occur approximately four hours after vehicle liftoff.

A4.1.5 The STC will support AMR by the following means:

a. Launch schedule notification, vehicle liftoff time and operation completion or launch cancellation messages will be sent by the STC with the first of the series to commence with the T - 48 launch notification message.

b. A tracking message will be transmitted to AMR in time to be received by AMR no later than thirty minutes before vehicle acquisition. This message will be sent for each active pass over Ascension Island. The message will include the satellite acquisition beacon and Link 2 frequency deviations if any, the antenna pointing information of azimuth and elevation in degrees and the expected time of acquisition. The pass mid-point and fade point will also be defined by antenna position and time.

A4.1.6 This information will be transmitted to the AMR superintendent by means of 60-wpm teletype patched into the Range Operations Building at Cape Canaveral.

A4.1.7 It is presently planned that all communication will take place via the 60-wpm teletype line; however, a voice line between the STC and AMR will be placed on standby status for emergency use.

[redacted]

A4.1.8 A pass summary is to be relayed by voice from Ascension Island to the Range Operations Building and then placed on the 60-wpm teletype to the STC following each pass. This message should consist of verification of satellite acquisition and data recording, time of acquisition, total time of recording, frequency deviations and other commentary deemed appropriate. There are no real-time data reporting requirements to be placed on AMR.

A4.1.9 The Discoverer Satellite will be transmitting a continuous wave beacon (10 milliwatts) on 232.4 mc. This beacon will be the means of acquisition by the TLM-18 before the data telemetry commences to transmit. Thus the antenna will require two receivers, one being tuned to the acquisition beacon on 232.4 mc and the second tuned to the Link 2 telemetry frequency of 228.2 mc.

A4.1.10 "Comm" checks of the 60-wpm teletype line will be required during the last eight hours of countdown before liftoff. Other system readiness checks (system runs) will not be conducted due to the AMR work load.

A4.1.11 The magnetic tape recordings made at Ascension Island will be shipped to [redacted] LMSC, Dept. 61-50, Hangar E, AFMTC for forwarding to 6594th Test Wing, Sunnyvale. The final tape will be required at Sunnyvale five working days after the completion of AMR support.

A4.4.5 An additional subcycle identification mark occurs on all multiple station passes such as types C, D, and G. The second station on the satellite's path during these passes will have a reset monitor interrupt of 20 seconds occuring approximately at the second station latitude.

A5 PRELAUNCH OPERATIONS

A5.2.3.3 The list of instrumentation required to be operative at launch will be furnished to the STC and the launch squadron by SSD seven days prior to launch.

A7 ORBIT OPERATIONS

A7.1 Re-Entry Selection — Nominal and Alternate

A7.1.1 Normal recovery based on the nominal period is planned for orbit Pass 65 after four days of active orbital life. Passes 10, 16, 17, 18, 25, 26, 31, 32, 33, 41, 42, 47, 48, 49, 57, 58, 63, 64, 65, 79, 80, and 81 are all programmed for re-entry. Passes 79, 80, and 81 provide the capability to delay re-entry until Day 5. If emergency re-entry is selected for south-to-north nighttime Passes 10, 25, 26, 41, 42, 57 and 58, separation will occur on the numbered pass preceding the selected recovery pass with re-entry impact programmed for 24° N latitude. Passes 16, 31, 47, and 63 provide for re-entry off the West Coast of Mexico with capsule impact programmed for 17° N latitude. The re-entry circuit is enabled by sending Command 5 or Command 6, depending upon the pass selected as shown below. The re-entry enable command will be sent only by direction of the STC.

Command Structure for Enabling Recovery Passes

	Command 5		Command 6	
	N-S	S-N	N-S	S-N
Day 1	16, 18	10	17	
Day 2	31, 33	25	32	26
Day 3	47, 49	41	48	42
Day 4	63, <u>65</u>	57	64, <u>65</u>	58
Day 5	79, <u>81</u>		80, <u>81</u>	

The last southbound pass available for recovery on Day 4 (Pass 65) and on Day 5 (Pass 81) can be enabled by sending either Command 5 or Command 6.

A7.2 Period Deviation

The maximum acceptable period deviations for programmed nominal and alternate recovery passes are shown below. These deviations represent the maximum and minimum periods that will allow the programmed passes to be within the aerial recovery zone.

Maximum Acceptable Period Deviations

Day	Pass	Period Deviation
1	16	95.9 - 103.6
	17	90.2 - 97.5
	18	Min - 92.0
2	31	95.2 - 99.7
	32	92.6 - 96.7
	33	89.8 - 93.5
3	47	93.5 - 96.2
	48	91.6 - 94.1
	49	89.7 - 92.2
4	63	92.5 - 94.4
	64	91.0 - 92.9
	65	89.7 - 91.5

A8 REAL-TIME READOUT REQUIREMENTS

A8.1 There are no real-time data reporting requirements to be placed on AMR.

A8.2 Discoverer Research Payload real-time readout requirements are not available at time of publication and therefore are not included in Table A8-1. They will be provided by TWX when they become available.

Table A4-1

NOMINAL FLIGHT PLANNING DATA

ITEM	DATA
SATELLITE	
S/N	1114
Mission	Low Altitude
Fuel	UDMH, 3762 lb
Oxidizer	IRFNA, 9490 lb
Launch weight	16,069 lb
BOOSTER	
S/N	324
Fuel	RJ-1
Oxidizer	Liquid oxygen
Launch weight (including payload)	123,397 lb
LAUNCH	
Site	VAFB, SM-75-1 Pad 1
Date	Sept 1961
Pad azimuth	295.5°
Launch azimuth	172°
Orbital boost time	237.0 sec
Downrange T/M ship location	6° N, 119° W
Programmer setting	5465 sec (step setting 25)
INJECTION	
Time	T + 445 sec
Location	23.2° N, 119.2° W
Altitude	130 nm (150 sm)
Azimuth	171.0°
Velocity	25,687 ft/sec
ORBIT	
Period	91.0 min
Apogee	223 nm (256 sm)
Perigee	130 nm (150 sm)
Eccentricity	.013
Regression rate – average	22.9°/pass
Reset latitudes	20° N [redacted]
	32° N [redacted] northbound)
	36° N [redacted] southbound)
	40° N [redacted] northbound)
	45° N [redacted] southbound)
	60° N [redacted]
Inclination angle	82.6° [redacted]

Table A4-1 (Continued)
NOMINAL FLIGHT PLANNING DATA

ITEM					DATA		
					NOMINAL IMPACT CENTER		
DAY	NIGHT RECOVERY PASS*	EMERGENCY RECOVERY PASS*	ALTERNATE RECOVERY PASS*	NOMINAL RECOVERY PASS*	WEST LONGITUDE	NORTH LATITUDE	ETPD (HR)
1	10(5)				153.2	24°	T + 14.73
		16(5)			124.7	17°	T + 24.42
			17(6)		148.2	24°	T + 25.91
2	26(6)				159.1	24°	T + 39.00
		31(5)			107.8	17°	T + 47.2
			33(5)		154.2	24°	T + 50.2
3	41(5)				142.2	24°	T + 61.8
	42(6)				165.0	24°	T + 63.3
		47(5)			113.7	17°	T + 71.5
			49(5)		160.0	24°	T + 74.5
4	58(6)				171.0	24°	T + 87.6
		63(5)			119.6	17°	T + 95.8
				65(5 or 6)	165.9	24°	T + 98.8
5			80(6)		149.0	24°	T + 121.5

NOTE: 1. The following additional passes are programmed for recovery: 18(5), 25(5), 32(6), 48(6), 57(5), 64(6), 79(5), 81(5 or 6).*

** 2. The vehicle command required to enable recovery for a given pass is presented in brackets following the pass number.*

CAPSULE WEIGHT DATA **

Nominal Parachute Weight (Unreefed):	14 lbs
Nominal Suspended Capsule Weight:	140 lbs
Nominal Rate of Capsule Descent	26 ft/sec at 10,000 ft

*** Actual weight of capsule may vary ±10% from flight to flight. The effect of this weight change on the descent rate will be less than ±1 ft/sec.*

[redacted]

Table A7-1

NOMINAL ORBIT SCHEDULE

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Launch	Launch	0	34.8
	Start Orbit	0.0416	
	Orbit Injection	0.125	23.4
	Beacon, T/M off	.258 (930 secs)	
Pass 1	Beacon, T/M on	1.4	75
	65°N latitude (ref)	1.5	65
	RM on	1.5	60
	RM interruption I (20)	1.5	58.7
	Cross [redacted]titude	1.5	57.6
	RM interruption II	1.6	25
	25° N ref latitude	1.6	25
	Cross [redacted]titude	1.7	21.6
	Beacon, T/M off	1.7	12
	End of Orbit 1	2.5	0
Pass 2	Beacon, T/M on	2.9	75
	RM on	3.0	60
	Cross [redacted]itude	3.0	57.6
	RM interruption I (60)	3.0	56
	RM interruption II	3.2	25
	Cross [redacted] latitude	3.2	21.6
	Beacon, T/M off	3.2	12
	End of Orbit 2	4.0	0
Pass 3	End of Orbit 3	5.6	0
Pass 4	End of Orbit 4	7.1	0
Pass 5	End of Orbit 5	8.5	0
Pass 6	Beacon, T/M on	8.6	25
	RM on	8.7	40
	Cross [redacted]latitude	8.7	42.9
	RM interruption I (60)	8.7	44
	Beacon, T/M off	8.8	60
	End of Orbit 6	10.1	0
Pass 7	Beacon, T/M on	10.2	25
	RM on	10.2	40
	RM interruption I (20)	10.2	41.3
	Cross [redacted]atitude	10.2	42.9
	Beacon, T/M off	10.3	60
	End of Orbit 7	11.6	0
Pass 8	Beacon, T/M on	11.7	17
	RM on	11.7	32
	Cross [redacted]atitude	11.7	34.8
	RM interruption I (80)	11.7	37.3
	Beacon, T/M off	11.8	52
	End of Orbit 8	13.1	0

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 9	Beacon, T/M on	13.2	17
	RM on	13.2	32
	RM int[redacted]on I (40)	13.3	34.7
	Cross [redacted]itude	13.3	34.8
	Beacon, T/M off	13.3	52
	End of Orbit 9	14.6	0
Pass 10	Beacon, T/M on	14.6	5
	RM on	14.7	20
	Cross [redacted]atitude	14.7	21.6
	RM interruption I (60)	14.7	24
	RM in[redacted]ion II	14.8	55
	Cross [redacted]itude	14.8	57.6
	Beacon, T/M off	14.9	65
	End of Orbit 10	16.1	0
Pass 11	End of Orbit 11	17.7	0
Pass 12	End of Orbit 12	19.1	0
Pass 13	Beacon, T/M on	19.7	61
	RM on	19.7	45
	Cross [redacted]atitude	19.7	42.9
	RM interruption I (60)	19.7	41
	Beacon, T/M off	20.8	34
	End of Orbit 13	21.7	0
Pass 14	Beacon, T/M on	21.2	61
	RM on	21.3	45
	RM int[redacted]tion I (20)	21.3	43.7
	Cross [redacted]atitude	21.3	42.9
	Beacon, T/M off	21.3	34
	End of Orbit 14	22.3	0
Pass 15	Beacon, T/M on	22.3	52
	RM on	22.4	34.8
	Cross [redacted]atitude	22.4	32
	RM interruption I (80)	22.4	29.5
	Beacon, T/M off	22.5	17
	End of Orbit 15	23.6	0
Pass 16	Beacon, T/M on	24.0	75
	RM on	24.0	60
	Cross [redacted]atitude	24.3	57.6
	RM in[redacted]on I (40)	24.3	57.3
	RM in[redacted]tion II	24.2	35
	Cross [redacted]latitude	24.2	34.8
	Beacon, T/M off	24.3	22
	End of Orbit 16	25.1	0

[redacted]
1114/324

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 17	Beacon, T/M on	25.5	75
	RM on	25.7	60
	Cross [redacted] latitude	25.7	57.6
	RM in[redacted]ption I (60)	25.7	56
	RM interruption II	25.9	25
	Cross [redacted]atitude	25.9	21.6
	Beaco[redacted]/M off	25.9	12
	End of Orbit 17	26.7	0
Pass 18	Beacon, T/M on	27.0	75
	RM on	27.2	60
	RM int[redacted]ion I (20)	27.2	58.7
	Cross [redacted]atitude	27.2	57.6
	RM int[redacted]ion II	27.4	25
	Cross [redacted] latitude	27.4	21.6
	Beaco[redacted]/M off	27.4	12
	End of Orbit 18	28.2	0
Pass 19	End of Orbit 19	29.8	0
Pass 20	End of Orbit 20	31.3	0
Pass 21	Beacon, T/M on	31.4	25
	RM on	31.5	40
	Cross [redacted]titude	31.5	42.9
	RM int[redacted]on I (60)	31.5	44
	Beacon, T/M off	31.6	60
	End of Orbit 21	32.8	0
Pass 22	Beacon, T/M on	32.9	25
	RM on	33.0	40
	RM interruption I (20)	33.0	41.3
	Cross[redacted]atitude	33.0	42.9
	Beaco[redacted]M off	33.1	60
	End of Orbit 22	34.4	0
Pass 23	Beacon, T/M on	34.5	25
	RM o[redacted]	34.5	40
	Cros[redacted]latitude	34.6	42.9
	RM in[redacted]ption I (80)	34.6	45.3
	Beacon, T/M off	34.6	60
	End of Orbit 23	35.9	0
Pass 24	Beacon, T/M on	36.0	17
	RM on	36.0	32
	RM interruption I (40)	36.1	34.7
	Cros[redacted]latitude	36.1	34.8
	Beac[redacted]M off	36.1	52
	End of Orbit 24	37.4	0

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 25	Beacon, T/M on	37.4	5
	RM on	37.5	20
	Cross [redacted] latitude	37.5	21.6
	RM interruption I (60)	37.5	24
	RM interruption II	37.7	55
	Cross [redacted] latitude	37.7	57.6
	Beacon, T/M off	37.7	65
	End of Orbit 25	38.9	0
Pass 26	Beacon, T/M on	38.9	5
	RM on	38.9	20
	RM interruption I (20)	38.9	21.3
	Cross [redacted] latitude	38.9	21.6
	RM interruption II	39.1	55
	Cross [redacted] latitude	39.1	57.6
	Beacon, T/M off	39.1	65
	End of Orbit 26	40.4	0
Pass 27	End of Orbit 27	41.9	0
Pass 28	Beacon, T/M on	42.4	61
	RM on	42.5	45
	Cross [redacted] latitude	42.5	42.9
	RM interruption I (60)	42.5	41
	Beacon, T/M off	42.5	34
	End of Orbit 28	43.4	0
Pass 29	Beacon, T/M on	43.9	61
	RM on	43.9	45
	RM interruption I (20)	43.9	43.7
	Cross [redacted] latitude	43.9	42.9
	Beacon, T/M off	43.9	34
	End of Orbit 29	44.9	0
Pass 30	Beacon, T/M on	45.5	61
	RM on	45.5	45
	Cross [redacted] latitude	45.5	42.9
	RM interruption I (80)	45.6	39.7
	Beacon, T/M off	45.6	34
	End of Orbit 30	46.5	0
Pass 31	Beacon, T/M on	46.9	75
	RM on	47.0	60
	Cross [redacted] latitude	47.0	57.6
	RM interruption I (40)	47.0	57.3
	RM interruption II	47.1	35
	Cross [redacted] latitude	47.1	34.8
	Beacon, T/M off	47.1	22
	End of Orbit 31	48.0	0

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 32	Beacon, T/M on	48.4	75
	RM on	48.5	60
	Cross [redacted] latitude	48.5	57.6
	RM interruption I (60)	48.5	56
	RM interruption II	48.7	25
	Cross [redacted] latitude	48.7	21.6
	Beacon, T/M off	48.7	12
	End of Orbit 32	49.5	0
Pass 33	Beacon, T/M on	50.0	75
	RM on	50.0	60
	RM interruption I (20)	50.0	58.7
	Cross [redacted] latitude	50.0	57.6
	RM interruption II	50.2	25
	Cross [redacted] latitude	50.2	21.6
	Beacon, T/M off	50.2	12
	End of Orbit 33	51.1	0
Pass 34	End of Orbit 34	52.6	0
Pass 35	End of Orbit 35	54.0	0
Pass 36	End of Orbit 36	55.5	0
Pass 37	Beacon, T/M on	55.6	25
	RM on	55.7	40
	Cross [redacted] latitude	55.7	42.9
	RM interruption I (60)	55.7	44
	Beacon, T/M off	55.8	60
	End of Orbit 37	57.1	0
Pass 38	Beacon, T/M on	57.2	25
	RM on	57.2	40
	RM interruption I (20)	57.2	41.3
	Cross [redacted] latitude	57.3	42.9
	Beacon, T/M off	57.3	60
	End of Orbit 38	58.6	0
Pass 39	Beacon, T/M on	58.6	17
	RM on	58.7	32
	Cross [redacted] latitude	58.7	34.8
	RM interruption I (80)	58.7	37.3
	Beacon, T/M off	58.8	52
	End of Orbit 39	60.1	0
Pass 40	Beacon, T/M on	60.2	17
	RM on	60.3	32
	RM interruption I (40)	60.3	34.7
	Cross [redacted] latitude	60.3	34.8
	Beacon, T/M off	60.3	52
	End of Orbit 40	61.6	0

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 41	Beacon, T/M on	61.7	5
	RM on	61.7	20
	Cross [redacted] latitude	61.7	21.6
	RM interruption I (60)	61.7	24
	RM interruption II	61.9	55
	Cross [redacted] latitude	61.9	57.6
	Beacon, T/M off	61.9	65
	End of Orbit 41	63.2	0
Pass 42	Beacon, T/M on	63.2	5
	RM on	63.3	20
	RM interruption I (20)	63.4	21.3
	Cross [redacted] latitude	63.4	21.6
	RM interruption II	63.4	55
	Cross [redacted] latitude	63.4	57.6
	Beacon, T/M off	63.4	65
	End of Orbit 42	64.7	0
Pass 43	End of Orbit 43	66.2	0
Pass 44	Beacon, T/M on	66.6	61
	RM on	66.7	45
	Cross [redacted] latitude	66.7	42.9
	RM interruption I (60)	66.7	40
	Beacon, T/M off	66.7	34
	End of Orbit 44	67.7	0
Pass 45	Beacon, T/M on	68.1	61
	RM on	68.2	45
	RM interruption I (20)	68.2	43.7
	Cross [redacted] latitude	68.2	42.9
	Beacon, T/M off	68.3	34
	End of Orbit 45	69.2	0
Pass 46	Beacon, T/M on	69.2	52
	RM on	69.3	34.8
	Cross [redacted] latitude	69.3	32
	RM interruption I (80)	69.3	29.8
	Beacon, T/M off	69.4	17
	End of Orbit 46	70.7	0
Pass 47	Beacon, T/M on	71.1	75
	RM on	71.2	60
	Cross [redacted] latitude	71.2	57.6
	RM interruption I (40)	71.2	57.3
	RM interruption II	71.3	35
	Cross [redacted] latitude	71.3	34.8
	Beacon, T/M off	71.4	22
	End of Orbit 47	72.2	0

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 48	Beacon, T/M on	72.7	75
	RM on	72.7	60
	Cross [redacted] atitude	72.7	57.6
	RM interruption I (60)	72.7	56
	RM interruption II	72.9	25
	Cross [redacted] latitude	72.9	21.6
	Beacon, T/M off	72.9	12
	End of Orbit 48	73.7	0
Pass 49	Beacon, T/M on	74.2	75
	RM on	74.2	60
	RM interruption I (20)	74.2	58.7
	Cross [redacted] latitude	74.3	57.6
	RM interruption II	74.4	25
	Cross [redacted] latitude	74.4	21.6
	Beacon, T/M off	74.5	12
	End of Orbit 49	75.3	0
Pass 50	End of Orbit 50	76.8	0
Pass 51	End of Orbit 51	78.3	0
Pass 52	End of Orbit 52	79.8	0
Pass 53	Beacon, T/M on	79.9	25
	RM on	80.0	40
	Cross [redacted] latitude	80.0	42.9
	RM interruption I (60)	80.0	44
	Beacon, T/M off	80.1	60
	End of Orbit 53	81.4	0
Pass 54	Beacon, T/M on	81.5	25
	RM on	81.5	40
	RM interruption I (20)	81.5	41.3
	Cross [redacted] atitude	81.5	42.9
	Beacon, T/M off	81.6	60
	End of Orbit 54	82.9	0
Pass 55	Beacon, T/M on	83.0	17
	RM on	83.0	32
	Cross [redacted] latitude	83.0	34.8
	RM interruption I (80)	83.0	37.3
	Beacon, T/M off	83.1	52
	End of Orbit 55	84.3	0
Pass 56	Beacon, T/M on	84.6	17
	RM on	84.7	32
	RM interruption I (40)	84.7	34.7
	Cross [redacted] atitude	84.7	34.8
	Beacon, T/M off	84.7	52
	End of Orbit 56	85.8	0

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 57	Beacon, T/M on	85.9	5
	RM on[redacted]	85.9	20
	Cross[redacted]latitude	85.9	21.6
	RM interruption I (60)	85.9	24
	RM in[redacted]tion II	86.1	55
	Cross[redacted]latitude	86.1	57.6
	Beacon, [redacted]/M off	86.1	65
	End of Orbit 57	87.4	0
Pass 58	Beacon, T/M on	87.4	5
	RM on	87.4	20
	RM in[redacted]tion I (20)	87.4	21.3
	Cross[redacted]titude	87.4	21.6
	RM in[redacted]tion II	87.5	55
	Cross[redacted]latitude	87.5	57.6
	Beaco[redacted]/M off	87.6	65
	End of Orbit 58	88.8	0
Pass 59	End of Orbit 59	90.3	0
Pass 60	Beacon, T/M on	91.0	61
	RM on[redacted]	91.0	45
	Cross[redacted]latitude	91.0	42.9
	RM interruption I (60)	91.0	41
	Beacon, T/M off	91.0	34
	End of Orbit 60	92.0	0
Pass 61	Beacon, T/M on	92.4	61
	RM on	92.5	45
	RM interruption I (20)	92.5	43.7
	Cross[redacted]latitude	92.5	42.9
	Beaco[redacted]/M off	92.6	34
	End of Orbit 61	93.5	0
Pass 62	Beacon, T/M on	93.6	17
	RM on	93.6	34.8
	RM in[redacted]tion I (80)	93.6	29.5
	Cross[redacted]latitude	93.6	32
	Beaco[redacted]/M off	93.7	17
	End of Orbit 62	95.0	0
Pass 63	Beacon, T/M on	95.3	75
	RM on	95.4	60
	Cross[redacted]latitude	95.4	57.6
	RM in[redacted]ruption I (40)	95.4	57.3
	RM in[redacted]tion II	95.5	35
	Cros[redacted]latitude	95.5	34.8
	Beac[redacted]/M off	95.5	22
	End of Orbit 63	96.4	0

Table A7-1 (Continued)

PHASE	EVENT	TIME FROM LAUNCH (HRS)	LOCATION (DEG N LATITUDE)
Pass 64	Beacon, T/M on	97.0	75
	RM on	97.0	60
	Cross [redacted] latitude	97.0	57.6
	RM interruption I (60)	97.0	56
	RM int[redacted]tion II	97.2	25
	Cross [redacted] latitude	97.2	21.6
	Beacon, T/M off	97.3	12
	End of Orbit 64	98.1	0
Pass 65	Beacon, T/M on	98.4	75
	RM on	98.5	60
	RM int[redacted]tion I (20)	98.5	58.7
	Cross [redacted] latitude	98.5	57.6
	RM in[redacted]tion II	98.6	25
	Cross [redacted] latitude	98.6	21.6
	Beacon, T/M off	98.7	12
	End of Orbit 65	99.5	0

Table A8-1

REAL-TIME DATA READOUT AND REPORTING REQUIREMENTS

	MEASUREMENT		CHANNEL	PRIORITY	TIME* READOUT REQUIRED	REPORT** TO STC BY VOICE	ORBITAL PROGRAMMER PASS	SATELLITE CONTROL FACILITIES						DOWNRANGE T/M SHIP***	RECOVERY FORCE	NOTE
	NAME	NUMBER						STC	[redacted]				TIS			
LAUNCH	Liftoff Signal	---	---	1	RT	X	Ascent		X							
	Thor Main Engine Cutoff	---	DAC(1) 13	1	RT	X	Ascent		X							
	Booster Separation	A93	16-24	1	RT	X	Ascent		X							
	Agena Engine Ignition and Cutoff ("push one" and "cutoff")	B6	14	1	RT	X	Ascent		X					X		
	Tone Verifications A, B, C, D	H64, 65, 66, 67	16-2, -4, -6, -8	1	RT		Ascent		X							
	Programmer Step Readout (Console)	H108, 109	16-20, -22	1	RT	X	Ascent		X							
	10.6-Second Step Switch Position	H108	16-20	1	RT		Ascent		X					X		13
	106-Second Step Switch Position	H109	16-22	1	RT		Ascent		X					X		13
	Increase/Decrease Switch Position	H107	16-18	1	RT	X	Ascent		X					X		13
	Payload Function Selector Setting	AET 14/15, 17/18, 20/21, 23/24	13-18 thru 13-24, 13-48 thru 13-54	1	RT	X	Ascent		X					X		13
	Control Gas Supply Pressure – High Range	D95	16-33	1	RT	X	Ascent		X					X		13
	Command 5 Monitor	H175	16-53	1	RT	X	Ascent		X							1
	Command 6 Monitor	H176	16-51	1	RT	X	Ascent		X							1
	BTL Discretes	C76	17-13	1	RT	X	Ascent		X							
	Yaw Gyro Torque	D84	17-54	2	PP1		Ascent							X		2
	Longitudinal Acceleration	A103	11	2	See Note 3		Ascent		X					X		3
	Separation Switch Monitor	C79	17-11	2	See Note 3		Ascent		X							3
	Gas Valve Temp #3	D103	15-6	1	PP2		Ascent	X								
	Quad #1 Batt Temp	C115	15-18	1	PP2		Ascent	X								
ORBIT	Tone Verifications A, B, C, D	H64, 65, 66, 67	16-2, -4, -6, -8	1	RT		1 thru 65		X	X	X	X				
	Command Verifications 1, 2, 3, 4	H112	11	1	RT	X	1 thru 65		X	X	X	X				
	Programmer Period Readout (Console or Remote)	H110	1	2	RT		1 thru 65		X	X	X	X				
	Programmer Step Readout (Console)	H108, 109	16-20, -22	1	RT	X	1 thru 65		X	X	X	X				
	10.6-Second Step Switch Position	H108	16-20	1	RT		1 thru 65		X	X	X	X				
	106-Second Step Switch Position	H109	16-22	1	RT		1 thru 65		X	X	X	X				
	Increase/Decrease Switch Position	H107	16-18	1	RT	X	1 thru 65		X	X	X	X				

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1114/324

Table A8-1 (Continued)

	MEASUREMENT		CHANNEL	PRI-ORITY	TIME* READOUT REQUIRED	REPORT** TO STC BY VOICE	ORBITAL PROGRAMMER PASS	SATELLITE CONTROL FACILITIES						DOWNRANGE T/M SHIP***	RECOVERY FORCE	NOTE
	NAME	NUMBER						STC	[redacted]				TIS			
ORBIT (Continued)	Reset Monitor Signal	H70	16-10	1	RT	X	1 thru 65		X	X	X	X				
	Payload Function Selector Setting	AET 14/15, 17/18, 20/21, 23/24	13-18 thru 13-24, 13-48 thru 13-54	1	RT	X	1 thru 65		X	X	X	X				
	Command 5 Monitor	H175	16-53	1	RT	X	1 thru 65		X	X	X	X				1
	Command 6 Monitor	H176	16-51	1	RT	X	1 thru 65		X	X	X	X				1
	Control Gas Supply Pressure – High Range	D95	16-33	1	RT	X	1 thru 65		X	X	X	X				
	Control Gas Supply Pressure – Low Range	D140	16-27	1	RT	X	1 thru 65		X	X	X	X				
	Battery Bus Voltage	C1	16-38	2	RT	X	1 thru 65		X	X	X	X				
	Battery Current Monitor	C27	15-53	2	RT	X	1 thru 65		X	X	X	X				
	Battery Case Temp Quad 4	C120	15-22	2	PP1		1 thru 65	X		X	X	X				
	Wave Train	AET 52	6	2	PP1		See Note 4		X	X	X	X				4
	No Name Assigned	AET 40	12-9	2	PP1	X	See Note 4		X	X	X	X				4
	No Name Assigned	AET 48	12-13	2	PP1	X	See Note 4		X	X	X	X				4
	Horizon Scanner – Pitch	D37	16-35	1	PP2		See Note 5	X		X	X	X				5
	Horizon Scanner – Roll	D39	16-37	1	PP2		See Note 5	X		X	X	X				5
	Gas Valve Temp #4	D104	15-10	2	PP2		1 thru 63	X		X		X				
	Control Gas Valve #6	D106	15-12	2	PP2		1 thru 63	X		X		X				
	Aft Rack Temp	D108	15-21	2	PP2		1 thru 63	X		X		X				
	Gas Valve Heater Duty Cycle	D117	16-45	2	PP2		1 thru 63	X		X		X				
	Control Gas Temp	D94	15-45	2	PP2		1 thru 63	X		X		X				
	Gas Valve Temp #3	D103	15-6	1	PP2		1 thru 65	X		X	X	X				
	Quad #1 Batt Temp	C115	15-18	1	PP2		1 thru 65	X		X	X	X				

*NOTE: *Discoverer Research Program real-time readout and reporting requirements are not available at time of publication. This information will be furnished by TWX.*

[redacted] 1114/324

Table A8-1 (Continued)

	MEASUREMENT		CHANNEL	PRI-ORITY	TIME* READOUT REQUIRED	REPORT** TO STC BY VOICE	ORBITAL PROGRAMMER PASS	SATELLITE CONTROL FACILITIES						DOWNRANGE T/M SHIP***	RECOVERY FORCE	NOTE
	NAME	NUMBER						STC	[redacted]				TIS			
RE-ENTRY	Programmer Period Readout (Console or Remote)	H110	1	3	RT		Recovery Pass ↓				X	X				
	Programmer Step Readout (Console)	H108, 109	16-20, -22	2	RT	X	↕				X	X				
	Reset Monitor Signal	H70	16-10	1	RT	X	↕				X					
	SS/D Timer Restart	D85	17-52	1	RT	X	↕				X					
	Capsule Separation Event	AET 51	16-42	1	RT	X	↕				X	X			X	6
	Payload Connector Disconnect	AET 26	12-2	2	RT		↕				X	X				7
	Control Gas Supply Pressure – High Range	D95	16-33	1	PP1	X	↕				X	X				
	Control Gas Supply Pressure – Low Range	D140	16-27	1	PP1	X	↕				X	X				
	Battery Bus Voltage	C1	16-38	2	PP1		↕				X	X				
	Horizon Scanner – Pitch	D37	16-35	1	PP2		↕				X					8
	Horizon Scanner – Roll	D39	16-37	1	PP2		↕				X					8
	10.6-Second Step Switch Position	H108	16-20	3	PP2		↕				X	X				
	106-Second Step Switch Position	H109	16-22	3	PP2		↕				X	X				
	Pitch Torque Signal	D41	17-38	2	PP1		↕				X					9
	Retro-Rocket Ignition, De-spin Valve Actuated, Thrust Cone Ejection	---	Capsule 7	1	RT, PP1	X	↕				X				X	10
	Spin Valve Actuated, Thrust Cone Ejection	---	Capsule 9	1	RT, PP1	X	↕				X				X	10
	3g Switch, Close, 3g Switch Open, Ablative Shell Off	---	Capsule 7	1	RT, PP1	X	↕				X	X	X		X	10
	Parachute Cover Off	---	Capsule 9	1	RT, PP1	X	↑				X	X	X		X	10
	Capsule T/M Signal Strength	---	Capsule 7, 9, 11	2	RT		Recovery Pass				X	X	X		X	11
	Axial Acceleration	---	Capsule 11	1	PP1, PP2	X					X	X	X		X	12

[redacted]

1114/324

Table A8-1 (Continued)

NOTES:

1. Reads 20% (1 volt) for re-entry disable and 80% (4 volts for re-entry enable.
2. Report the system time of reorientation to the nearest second and follow up with a report to the nearest tenth of a second, the voltage level prior to start of reorientation, and the average voltage level during reorientation.
3. Backup monitors for ascent events.
4. Refer to Table A8-2 for details of readout required.
5. Read 3 times at approximately 2-minute intervals correlated with system time on Pass 2[redacted] on Pass 13[redacted] on Pass 17[redacted], on Pass 29[redacted] on Pass 32[redacted] on Pass 45[redacted] on Pass 47[redacted] and on Pass 60[redacted]s at one sys[redacted] time only are re[redacted]ed of [redacted] on Passes 8, 23, 39, and 54. [redacted] transmits data on Channel [redacted] to Sunnyvale on 10[redacted]m/voice line after Pass 2; three 10-second data samples at 2-minute intervals required.
6. Reads 4.67 volts prior to separation. 1.33 volts after separation. Correlation within 2 seconds of exact system time is satisfactory for initial [redacted] report. [redacted] and TIS verify that event has occurred by voltage level check.
7. Reads out of band after separation.
8. [redacted] reads on the recovery pass to indicate SS/D restart event if measurement D85 is invalid.
9. Read system time at start and finish of reorientation, voltage level prior to start of reorientation, and average voltage level during reorientation.
10. The RT readout will contain a verification that each event has occurred. The PP1 readout will contain the system time of each event. Use event numbers listed in Paragraph 7.4.6 for identification when reporting.
11. Provide a qualitative evaluation of signal reception.
12. The [redacted] PP1 readout will contain the average value and duration. The PP2 readout will contain a complete time history of acceleration and will include the system time of each data dropout and the time duration of dropout. [redacted] TIS read values 5 seconds prior to, at, and 5-seconds after parachute deployment.
13. To be read out in the middle of the pass.

---

*RT – Read in real time.

PP1 – Read immediately after pass.

PP2 – Read immediately after RT and PP1 readouts.

**All data are also to be reported to the STC by 60-wpm teletype as soon as possible.

***T/M ships and aircraft will transmit real-time data immediately after signal fade so no interference with the vehicle telemetry signal will be generated.

Table A8-2

NOMINAL PAYLOAD FUNCTION WAVE TRAIN REAL-TIME READOUT AND REPORTING REQUIREMENTS

PASS NO	TRACKING STATION	MAXIMUM DATA REPORTING TIME ALLOWABLE (MINUTES)			
		CHANNEL 6 (AET 52)			CHANNEL 12 (AET 48 & 40)
		READOUT (a)	READOUT (b)	READOUT (c)	READOUT (d)
1	[redacted]	60	60	60	60
2	[redacted]	--	--	60	60
2	[redacted]	60	60	60	60
6	[redacted]	60	60	60	60
7	[redacted]	--	--	--	60
8	[redacted]	--	--	60	60
9	[redacted]	60	60	60	60
13	[redacted]	60	60	60	60
16	[redacted]	60	60	60	60
17	[redacted]	60	--	--	60
18	[redacted]	--	--	60	60
22	[redacted]	--	--	--	60
24	[redacted]	60	60	60	60
33	[redacted]	60	--	--	60
40	[redacted]	60	60	60	60
47	[redacted]	60	60	60	60
49	[redacted]	60	--	--	60
56	[redacted]	60	60	60	60

NOTE:

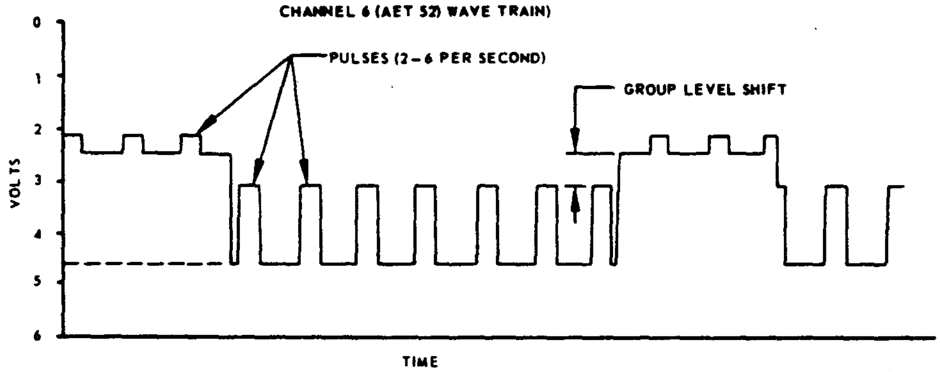
READOUT (a) – COMPARE CHANNEL 6 WAVE TRAIN WITH NOMINAL WAVE TRAIN BELOW. REPORT PRESENCE OR ABSENCE.

READOUT (b) – REPORT THE TIME (±0.5 SEC) OF THE START OF THE WAVE TRAIN AND THE DURATION (±5 SEC) OF THE WAVE TRAIN.

READOUT (c) – REPORT THE ELAPSED TIME (TO THE NEAREST 0.1 SECOND) REQUIRED FOR 100 PULSES COUNTED FROM LEADING EDGE TO LEADING EDGE AFTER AT LEAST 20 PULSES FROM THE WAVE TRAIN START. REPORT THE NUMBER OF GROUP LEVEL SHIFTS WITHIN THIS 100 PULSE PERIOD. REQUESTED DATA ON REV. 9, 24, AND 40 SHALL BE MADE AVAILABLE AT THE EARLIEST POSSIBLE TIME AFTER ACQUISITION.

READOUT (d) – REPORT VOLTAGE LEVEL AT START, MIDDLE, AND END OF PASS OF COMMUTATED POINTS 9 (AET 40) AND 13 (AET 48) ON CHANNEL 12 TO AT LEAST 2% BANDWIDTH (0.1 VOLT).

CHANNEL 6 (AET 52) WAVE TRAIN)



[redacted]

1114/324

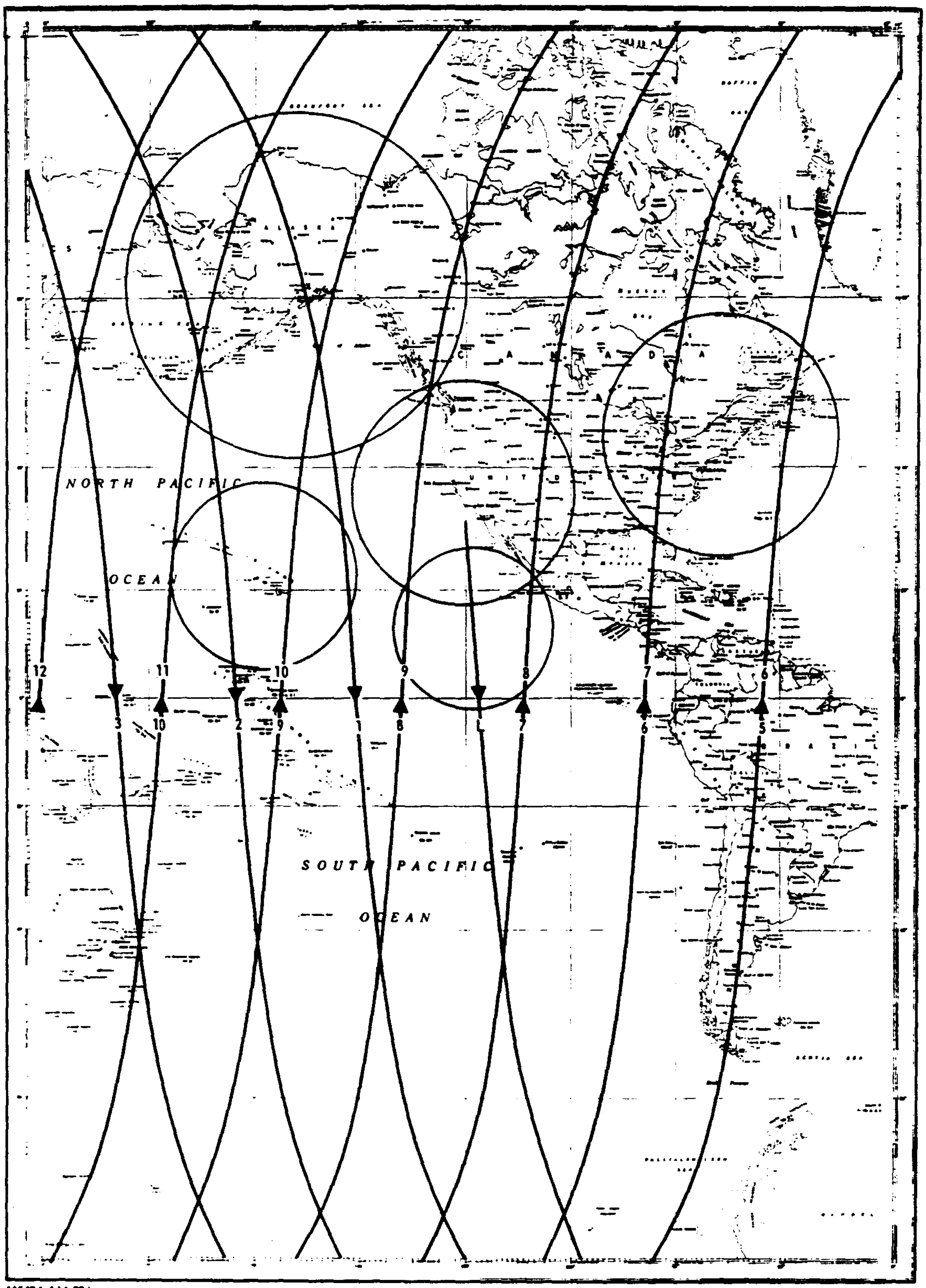


Figure A2-1(a) Nominal Orbit Traces – Launch Through Pass 12

[redacted]

1114/324

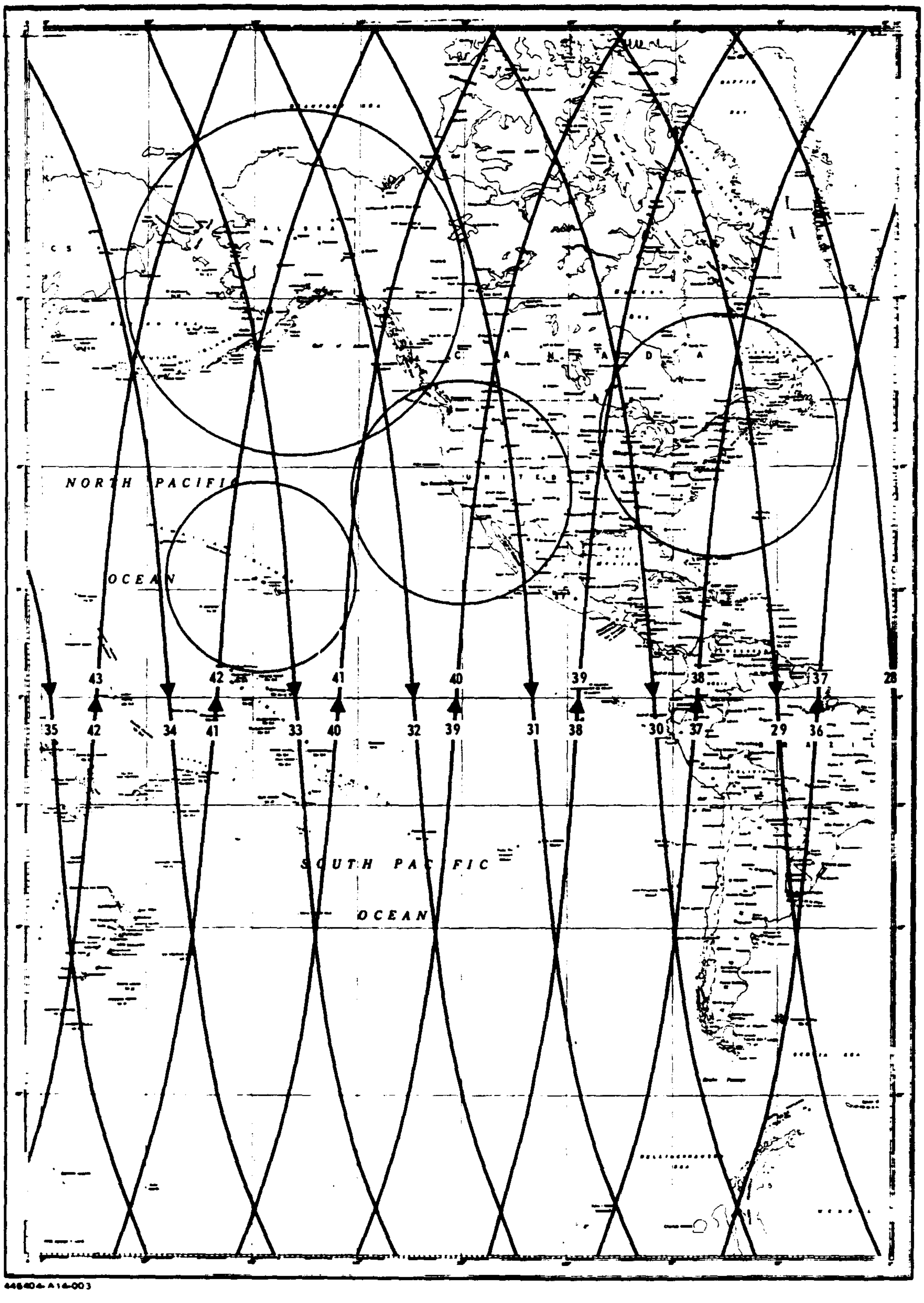
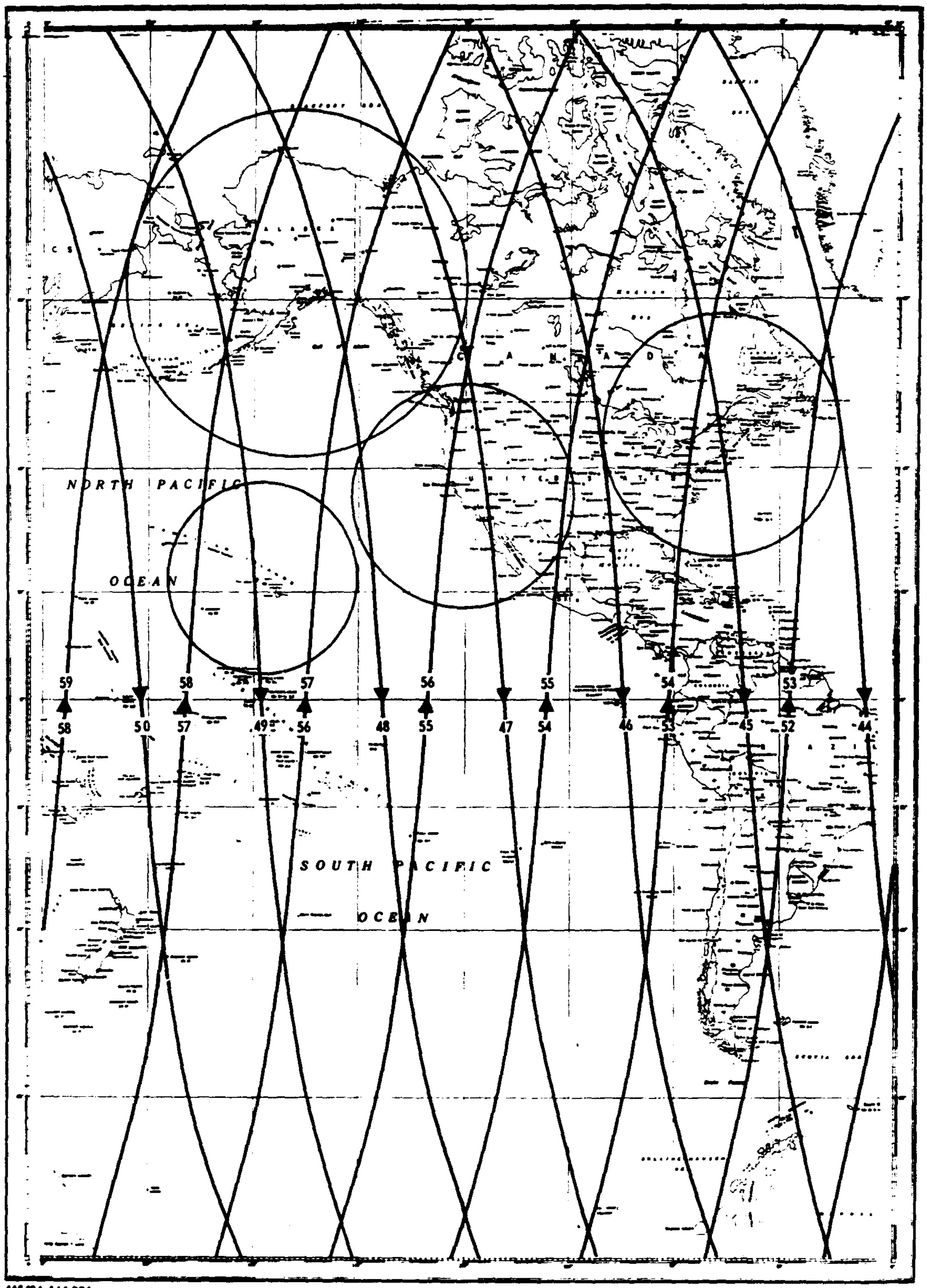


Figure A2-1(c) Nominal Orbit Traces – Passes 28 Through 43

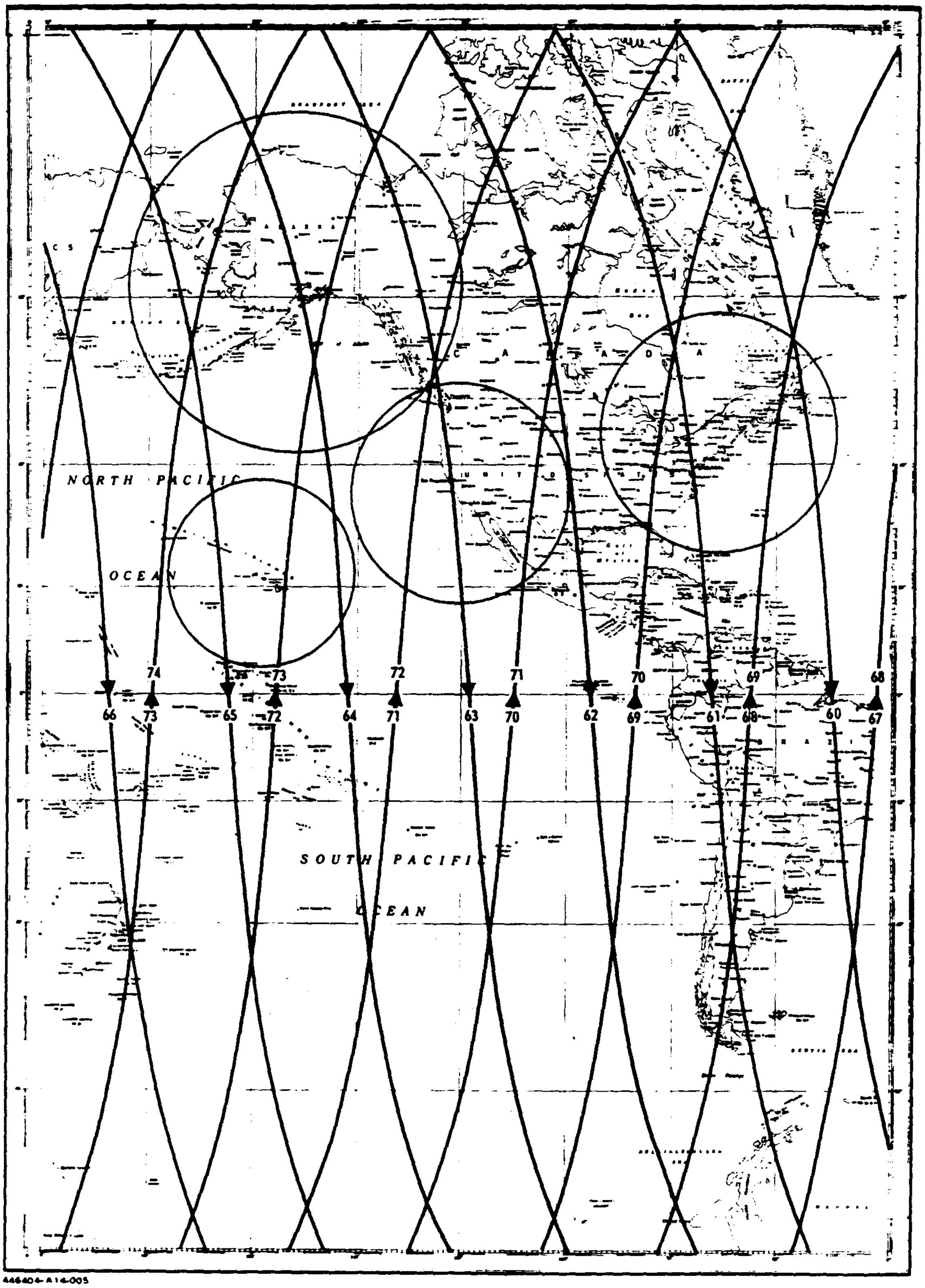
[redacted]
1114/324



446404-A14-004

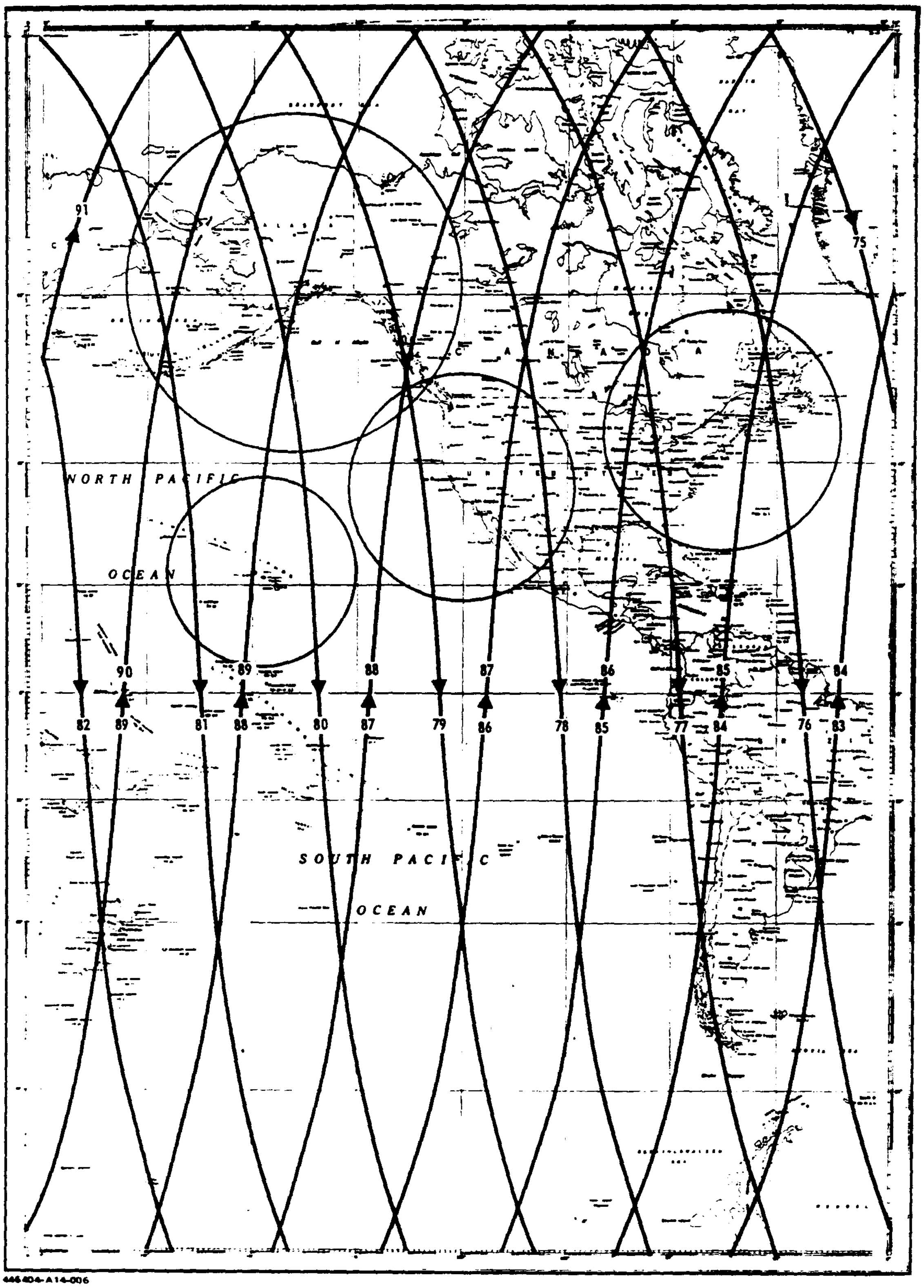
Figure A2-1(d) Nominal Orbit Traces – Passes 44 Through 59

[redacted]
1114/324



446404-A14-005

Figure A2-1(e) Nominal Orbit Traces – Passes 60 Through 75



446404-A14-006

Figure A2-1(f) Nominal Orbit Traces – Passes 76 Through 90

[redacted]

1114/324

TYPE OF PASS						
A	B	C*	D*	E	F	G*
STATION						
[redacted]						
	L(40)		1(20)			
			2(60)	6(60)		
				7(20)	8(80)	
					9(40)	10(60)
13(60)						
14(20)	15(80)	16(40)	17(60)			
			18(20)	21(60)		
				22(20)		
				23(80)	24(40)	25(60)
						26(20)
28(60)						
29(20)						
30(80)		31(40)	32(60)			
			33(20)	37(60)		
				38(20)		
					39(80)	
					40(40)	41(60)
						42(20)
44(60)						
45(20)	46(80)	47(40)	48(60)			
			49(20)			
				53(60)		
				54(20)	55(80)	
					56(40)	57(60)
						58(20)
60(60)						
61(20)	62(80)	63(40)				
			64(60)			
			65(20)			
				68(60)		
				69(20)		
				70(80)	71(40)	
					72(60)	73(20)
76(60)						
77(20)	78(80)	79(40)				
			80(60)			
			81(20)	84(60)		
				85(20)		
				86(80)	87(40)	88(60)
						89(20)
92(60)						
93(20)	94(80)	95(40)				

NOTE: NUMBERS IN PARENTHESIS REPRESENT TIME IN SECONDS FOLLOWING RESET MONITOR INITIATION AT WHICH 30 SEC PROGRAMMER IDENTIFICATION MARK OCCURS. THIS TIME IS TAPE TIME, BASED ON 5200 SECOND PERIOD.

446408-A6-001(10)

* 20 SECOND RESET MONITOR OCCURS APPROXIMATELY AT SECOND STATION LATITUDE

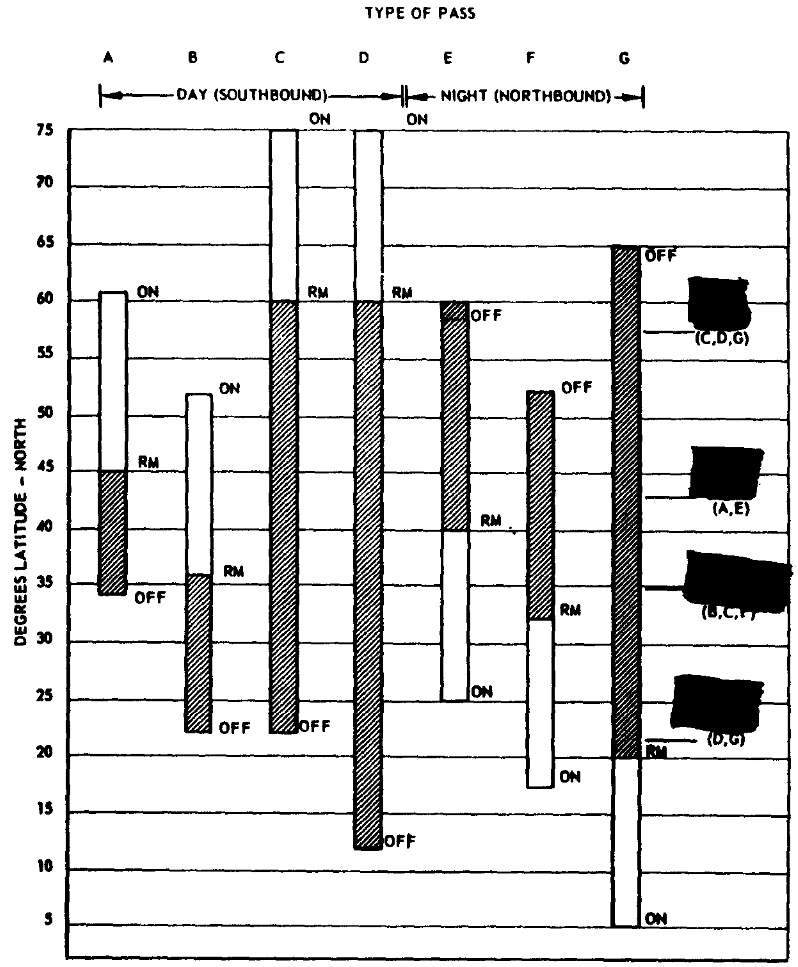


Figure A4-2 Readout and Reset Programming

30 August 1961

Copy No. [redacted]
Sheets

REPORT CHANGE RECORD
FOR
ORBITAL TEST DIRECTIVE FOR DISCOVERER SATELLITE ORBITAL OPERATIONS

The following additions, revisions, or errata corrections, should be incorporated into the document identified above. This Report Change Record page should be inserted as the first page of the affected report preceding the title page. If a page in the original document is eliminated and/or replaced by the instructions which follow, the page must be destroyed according to the Air Force directive governing such destruction.

ADDENDUM PAGE	REVISION		ERRATA		REVISION OR ERRATA CORRECTION (CORRECT IN INK)	CORRECTION MADE	
	REMOVE PAGE	INSERT PAGE	REMOVE PAGE	INSERT PAGE		INITIAL	DATE
Divider Tab 1 App A							
Title Page Tab 1 App A							
A-1-1 thru A-1-29							

[redacted]

1114/324

Notice of Page Substitution

Appendix A - TAB 17
SATELLITE 1115/Booster 328

For the purposes of electronic archiving, this page is a substitute for an unscannable page.

[redacted]

14 September 1961
Copy Number ____
27 Sheets

TAB 17

DISCOVERER FLIGHT TEST DIRECTIVE

APPENDIX A

for

Discoverer Vehicle 1115/328

Contract [redacted]

Contract [redacted]

Approved:

[redacted] Manager
Launch Systems, VAFB
Lockheed Missiles & Space Company
Senior LMSC Member
Flight Test Working Group

Approved:

[redacted]
Douglas Project Engineer, VAFB
Douglas Aircraft Company
Senior DAC Member
Flight Test Working Group

Approved:

[redacted]
Director of
Vandenberg Field Station
Bell Telephone Laboratories, Incorporated

Approved:

[redacted]olonel, USAF
Deputy Commander Space Launches
6565th Test Wing
(Dev) AFSC

[redacted], Colonel, USAF
Commander, 6565th Test Wing
(Dev) AFSC

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Company
Vandenberg Air Force Base, California

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS
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TAB 17

APPENDIX A

CONTENTS

INTRODUCTION

GENERAL

This Appendix A is prepared by the Launch Systems Department (61-73) of LMSC/VAFB under the direction of the Flight Test Working Group. It contains the data and parameters that are applicable to flight testing the Discoverer Vehicle Agena 1115/Thor 328. This Appendix is to be used in conjunction with the basic Discoverer Flight Test Directive, [redacted] In cases of conflict, the information in this appendix supersedes that furnished in the basic text.

DISCOVERER SYSTEM

Discoverer Satellite

An Advanced Engineering Test Payload (AET-L) will be used for this flight. The AET-L configuration will utilize a low altitude orbit of 130 nautical miles perigee. The active life of the satellite will be four days with scheduled recovery on orbit 65.

Discoverer Booster Vehicle

Vehicle 328, as received at VAFB, incorporates ports in the LOX pump inducer in an attempt to reduce 20 CPS longitudinal oscillations.

Discoverer Research Program (DRP). This program consists basically of the development of unique "plug in" modules with which to conduct research test experiments. These modules (DRP kits) are designed for ready interchange-ability between vehicles and the capability of installation or removal at the launch base.

The research test units will be provided as a qualified subsystem in kit form. The research payload kit No. 3B has been selected for 1115; however, certain experiments may be deleted without affecting vehicle readiness and reprogrammed for later vehicles.

The DRP kit for 1115 consists of the following items:

1. Communications Package
2. Research Component Package
3. GRD Package
4. University of Illinois Radio Propagation Package

The research T/M transmitter will operate on the same frequency as the recovery capsule T/M. The research T/M transmitter is interlocked with the recovery system and will not turn on during the recovery pass. Discoverer research components will be programmed by the orbital programmer and will not require ground commands.

LAUNCH CRITERIA

<u>Telemetry Required To Be Operative At Launch</u>

<u>Discoverer Satellite</u>

1. Agena

Notice of telemetry required to be operative at launch will be furnished to the Satellite Test Annex (STA) separately prior to launch.

APPENDIX A.1

FLIGHT TEST DATA AND PARAMETER SUMMARY

ITEMS	DATA AND PARAMETERS
Satellite	
S/N	1115
Payload	AET-L
Fuel	UDMH
Oxidizer	IRFNA
Launch Weight	16,207
Booster	
S/N	328
Fuel	RJ-1
Oxidizer	LOX
Launch Weight (W/Payload)	123,698 LB
Launch	
Site	VAFB, 75-3, Pad 4
Azimuth	172°
Pad Azimuth	181° 29'
Orbit	
Period	91.0 MIN
Apogee	223 NM
Perigee	129 NM
Eccentricity	0.013
Average Regression Rate	22.9 DEG/PASS
Inclination Angle	82.6 DEG
Downrange Ship	
Location	12°N, 117°W

APPENDIX A.2

FIRST STAGE LAUNCH EVALUATION CRITERIA

Nominal Time From Launch (SEC)	Function
T-0	Vertical liftoff with Agena payload and vertical climb for approximately 17 seconds. Sea level thrust 169,000 ± 3% LB.
T + 2 to T + 15	Roll about a vertical axis at a roll rate of 0.7300 DEG/SEC to a pitch plane azimuth of 172 DEG.
T + 17 to T + 130	Pitch-over with a pitch command rate as follows:

Time (SEC)	Pitch Rates (DEG/SEC) From Inertial Reference
0 to 17	0
17 to 35	-0.64614
35 to 70	-0.70310
70 to 90	-0.54425
90 to 130	-0.32304
130 to burnout	0

Nominal Time From Launch (SEC)	Function
149 ± 5	Main engine cutoff (MECO) with velocity not below 500 FT/SEC of nominal value.
MECO + 9	Vernier engine cutoff (VECO) 9.0 (± 0.9) SEC after MECO. Flight path angle at VECO within ± 4 DEG of nominal elevation and azimuth.

APPENDIX A.3

ORBITAL STAGE LAUNCH EVALUATION CRITERIA

Will be released when available.

Pages A-17-8, 9, 10, and 11 will be added at that time.

APPENDIX A.4

DAC GROUND MONITORED PARAMETERS

PARAMETER	RANGE IN PSIG	NOMINAL VALUES IN PSIG
Main Liquid Oxygen Tank Pressure	0 - 50	33
Main Fuel Tank Pressure	0 - 50	28
Nitrogen Storage Tank Bottle Pressure	0 - 8000	6000
High Pressure Missile Bottle Pressure	0 - 5000	3000
Vernier Fuel Start Tank Pressure	0 - 1000	646
Vernier Liquid Oxygen Start Tank Pressure	0 - 1000	646
Engine Regulator Discharge Pressure	0 - 800	646
Liquid Oxygen Storage Tank Pressure	0 - 150	71
Fuel Storage Tank Pressure	0 - 150	53
Control Manifold Pressure	0 - 200	135
Transducer 5 Volt Supply	0 - 10V	5 V
Hydraulic Return Pressure	0 - 200	80

APPENDIX A.5

LMSC GROUND MONITORED PARAMETERS
75-3-4

Recorder 1

Ch.	
1	Gas Valves 2 & 5
2	Gas Valves 1 & 3
3	Gas Valves 4 & 6
4	Not Used
5	Not Used
6	Not Used
7	IRP Block Temp
8	Open

Recorder 2

Ch.	
1	Horizon Scanner Pitch
2	Horizon Scanner Roll
3	Attitude Roll Gyro
4	Attitude Yaw Gyro
5	Attitude Pitch Gyro
6	Resolver Output
7	+ & - Yaw Servo
8	+ & - Pitch Servo

Recorder 3

Ch.	
1	VEH. Fuel Temp
2	VEH. Helium Temp.
3	VEH Acid Temp.
4	VEH Nitrogen Temp.
5	VEH Helium Temp.
6	Helium Supply Press.
7	Lip Seal Press.
8	VEH Acid Tank Press.

Recorder 4

Ch.	
1	Fuel Tank Press.
2	Acid Vent Press.
3	Fuel Vent Press.
4	Internal Power ON
5	VEH Battery Voltage
6	+28V Reg.
7	-28V Reg.
8	LIFTOFF

Recorder 5

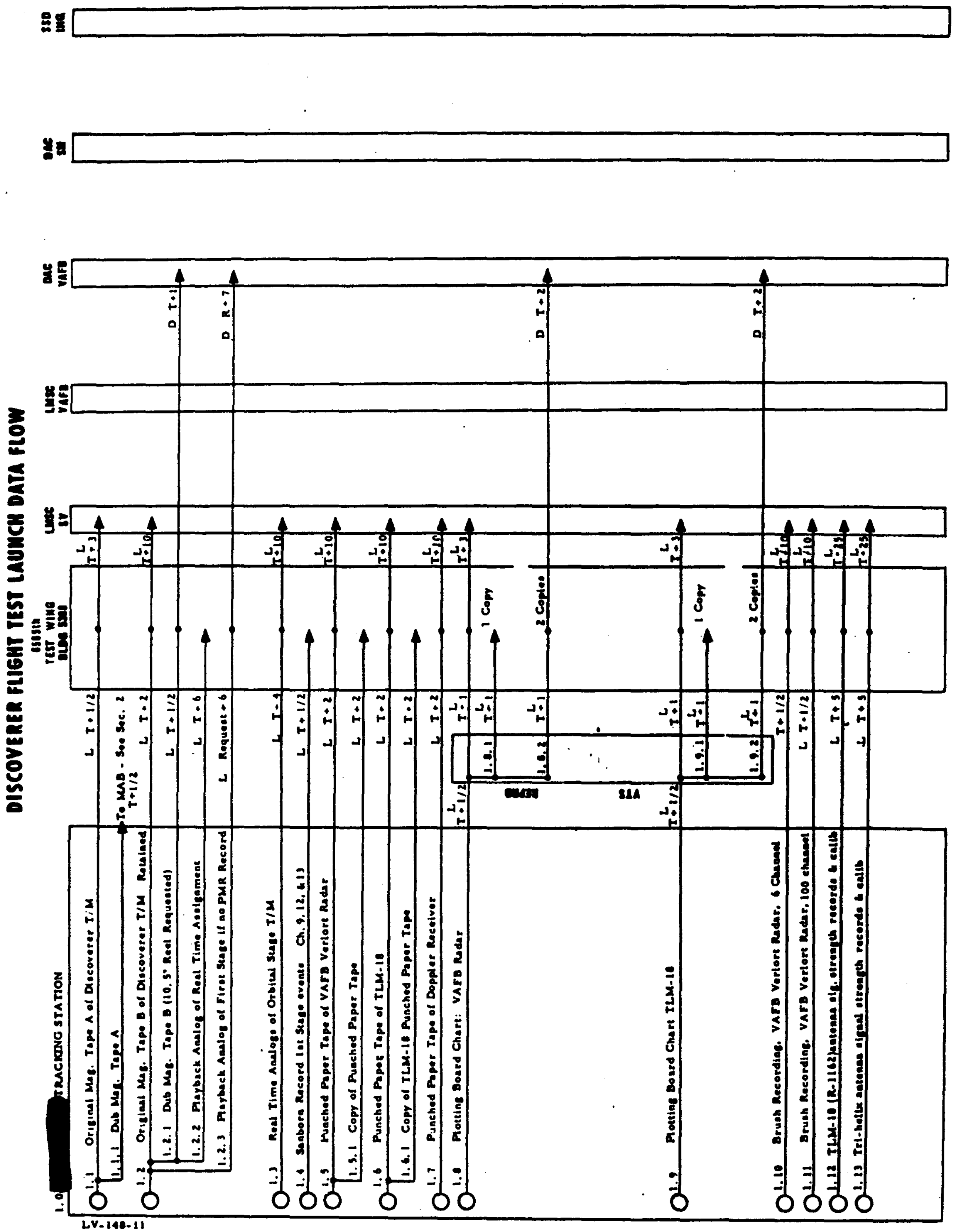
Ch.	
1	LIFTOFF
2	Fuel Vent Umbilical Drop Event
3	Acid Vent Umbilical Drop Event
4	P-900 Disconnect Event
5	Fuel Sniffer
6	Acid Sniffer
7	Open
8	Open

Recorder 6

Ch.	
1	AET 58
2	AET 28
3	AET 53
4	AET 54
5	AET 32
6	AET 52
7	AET 49
8	Payload Skin Temp

[redacted]
1115/328

APPENDIX A. 6 (CONT'D)



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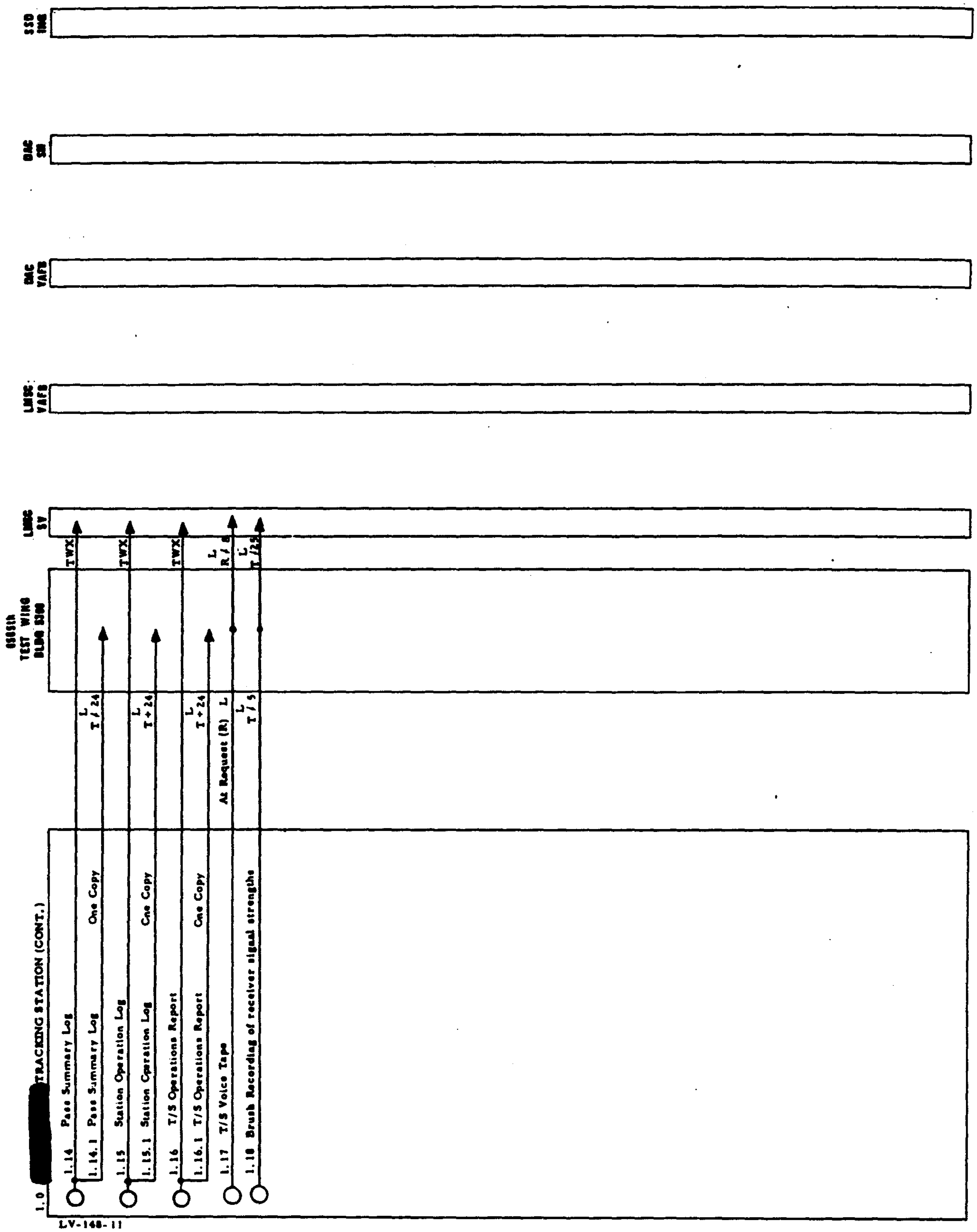
1115/328

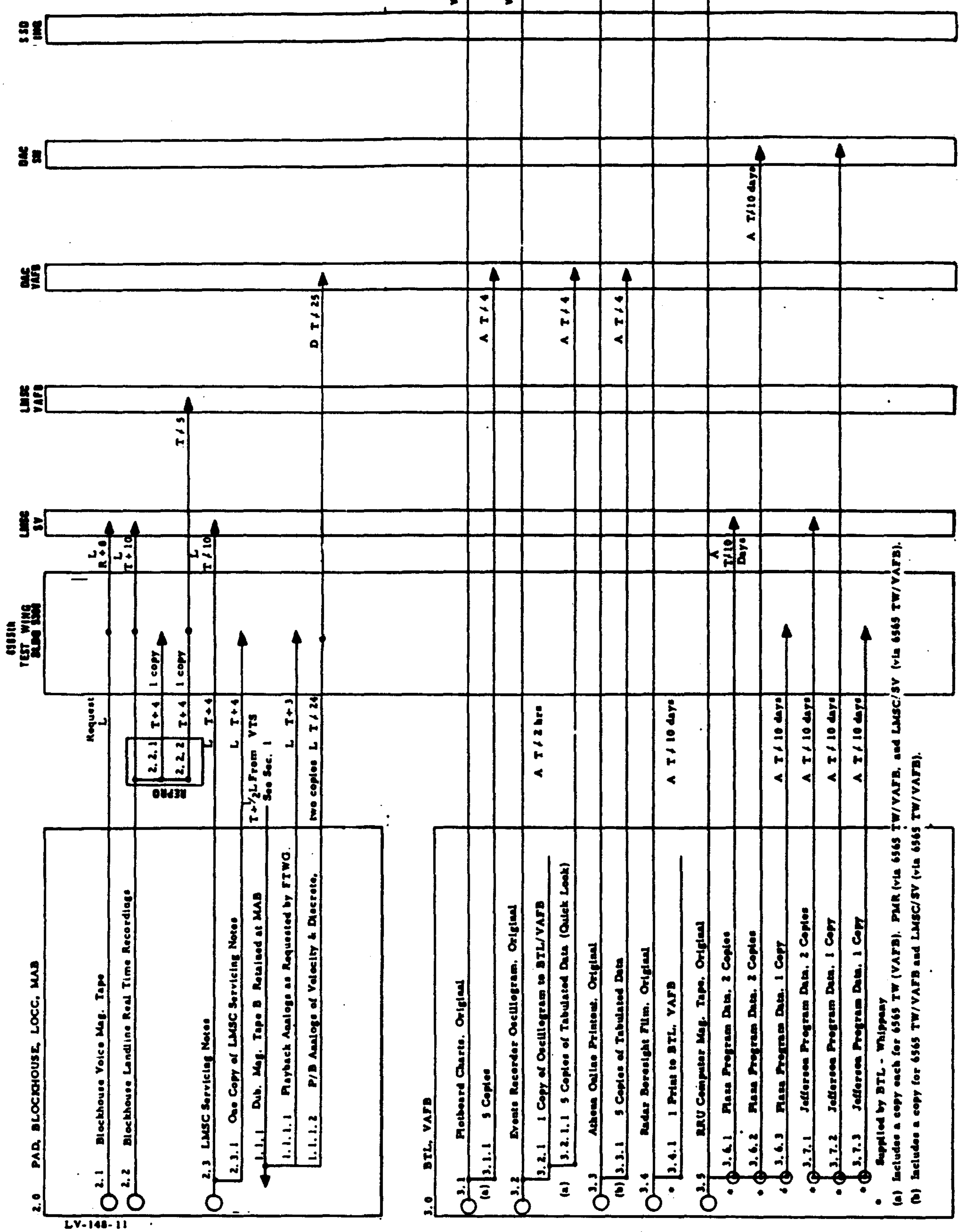
APPENDIX A .6 (CONT'D)



A-17-15

[redacted] 1115/328

APPENDIX A.6 (CONT'D)



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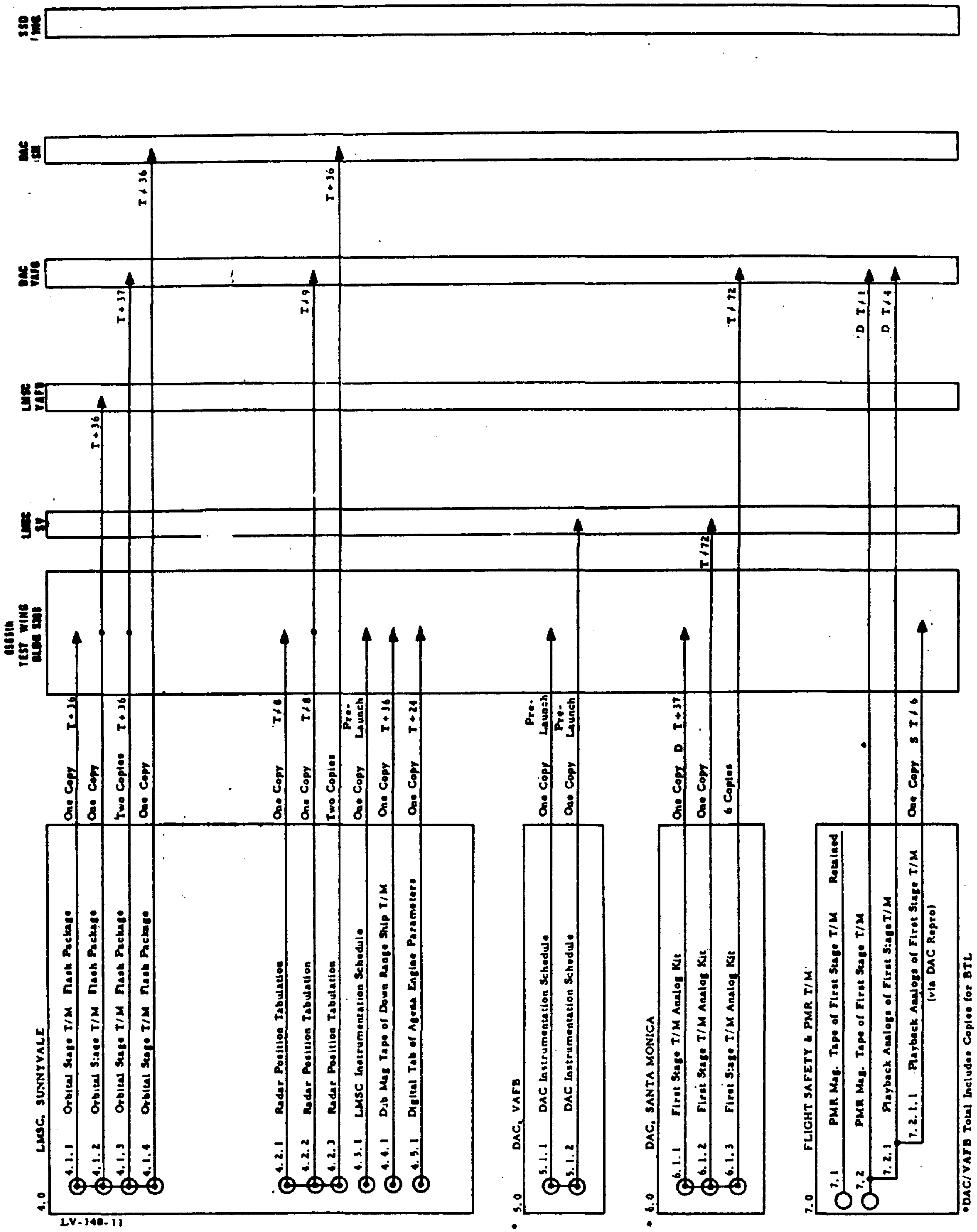

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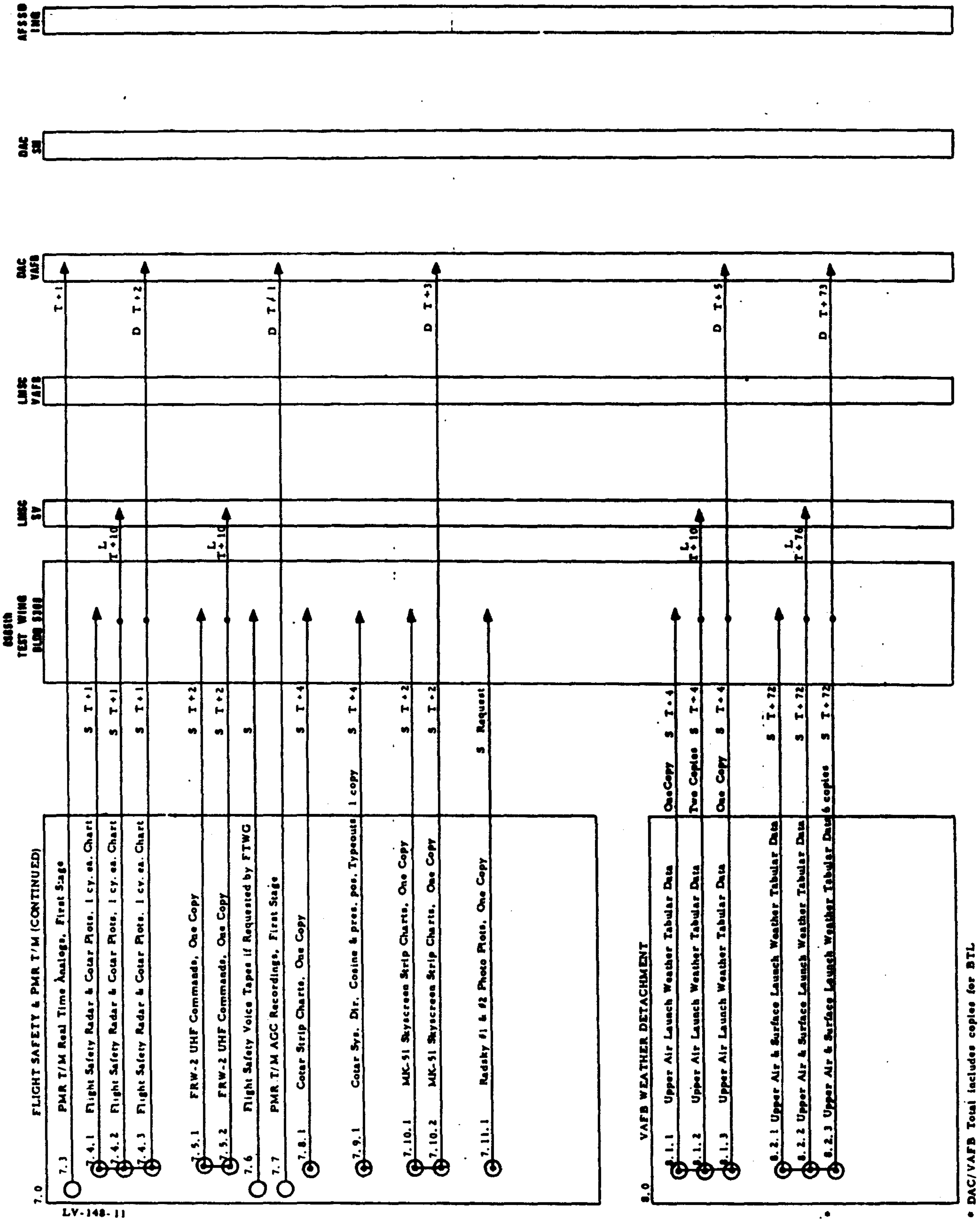
1115/328

APPENDIX A.6 (CONT'D)



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1115/328

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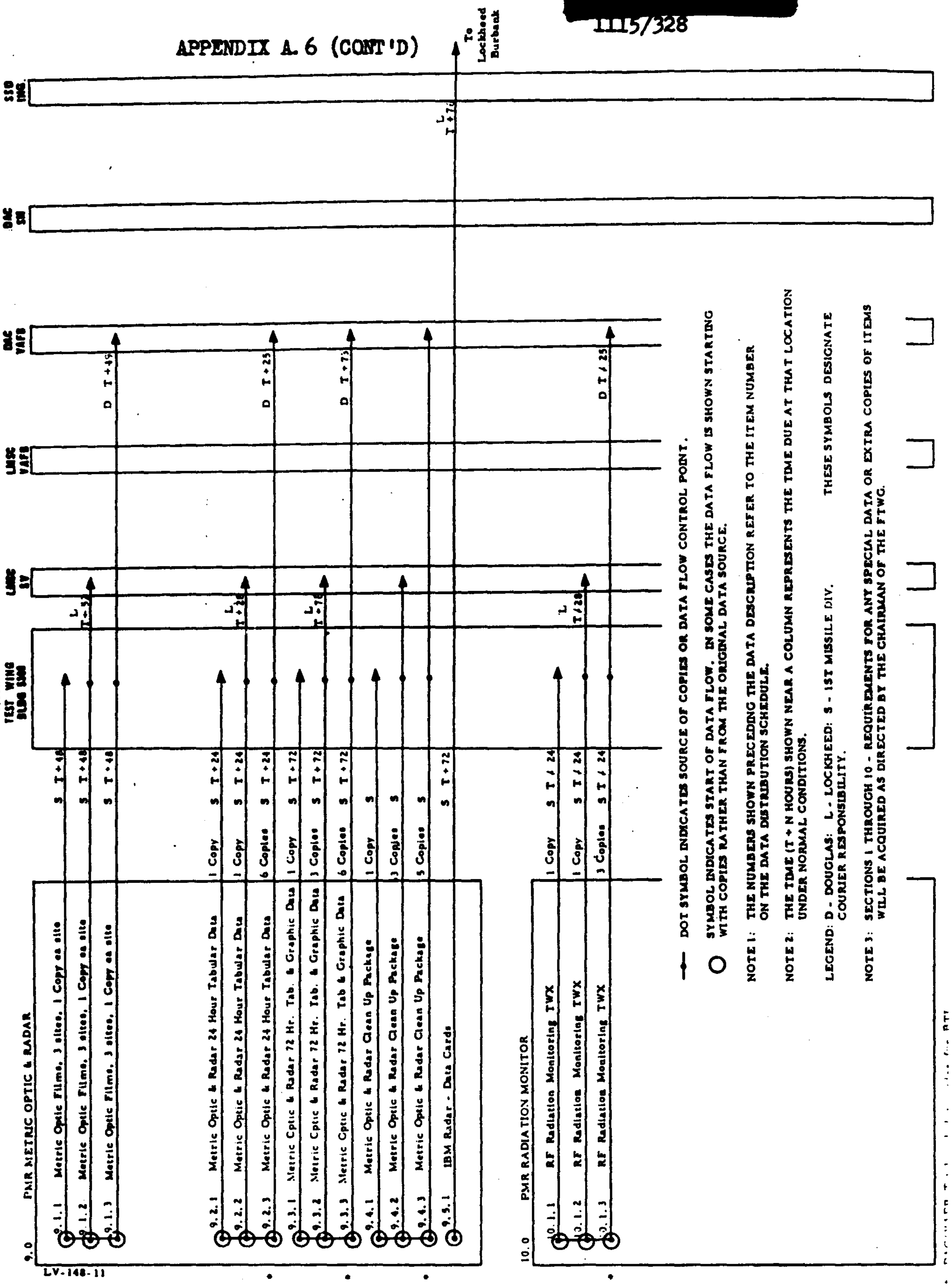


DOT SYMBOL INDICATES SOURCE OF COPIES OR DATA FLOW CONTROL POINT.

SYMBOL INDICATES START OF DATA FLOW. IN SOME CASES THE DATA FLOW IS SHOWN STARTING WITH COPIES RATHER THAN FROM THE ORIGINAL DATA SOURCE.

NOTE 1: THE NUMBERS SHOWN PRECEDING THE DATA DESCRIPTION REFER TO THE ITEM NUMBER ON THE DATA DISTRIBUTION SCHEDULE.

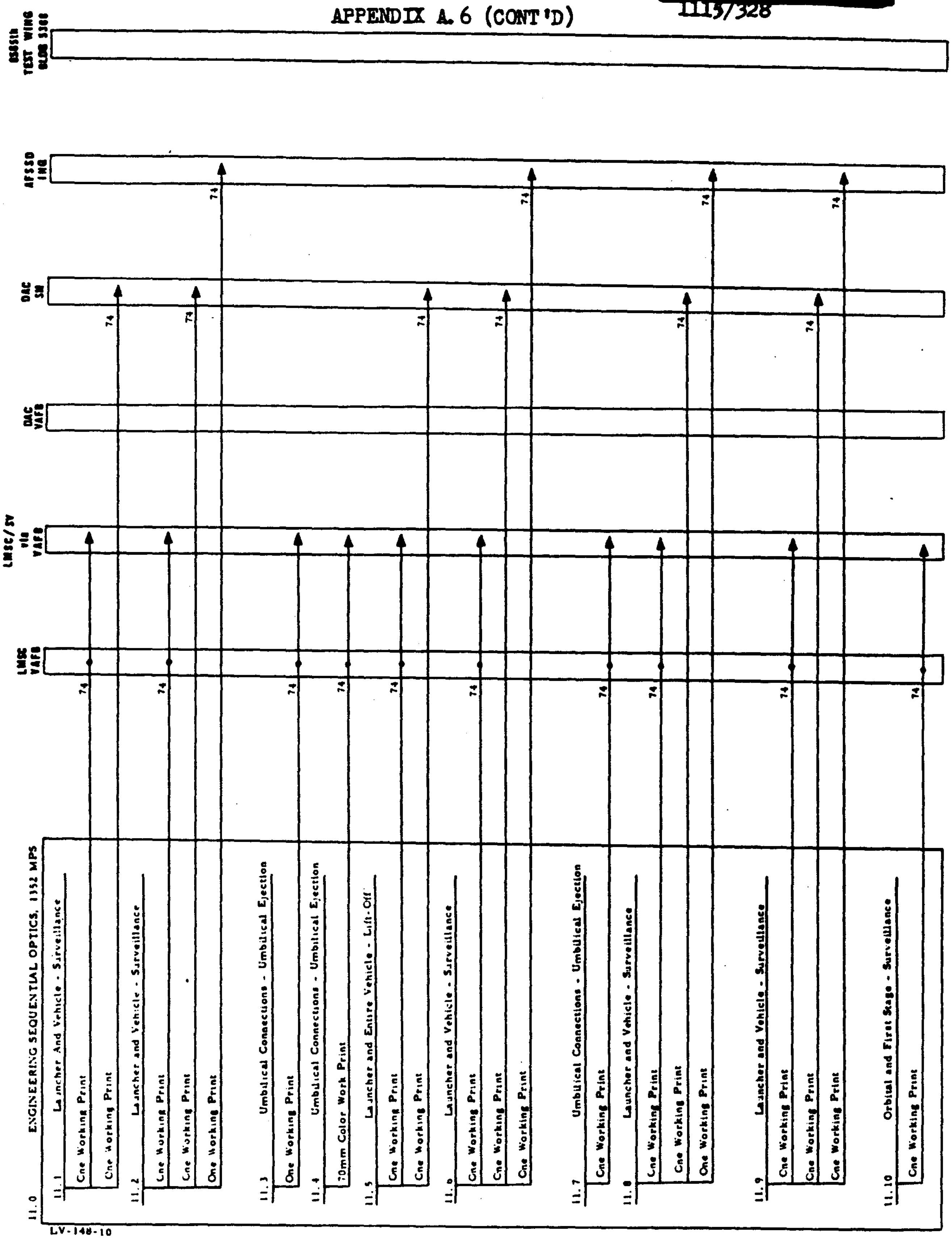
NOTE 2: THE TIME (T + N HOURS) SHOWN NEAR A COLUMN REPRESENTS THE TIME DUE AT THAT LOCATION UNDER NORMAL CONDITIONS.

LEGEND: D - DOUGLAS; L - LOCKHEED; S - 1ST MISSILE DIV. THESE SYMBOLS DESIGNATE COURIER RESPONSIBILITY.

NOTE 3: SECTIONS 1 THROUGH 10 - REQUIREMENTS FOR ANY SPECIAL DATA OR EXTRA COPIES OF ITEMS WILL BE ACQUIRED AS DIRECTED BY THE CHAIRMAN OF THE FTWG.

[redacted]
1115/328

APPENDIX A.6 (CONT'D)



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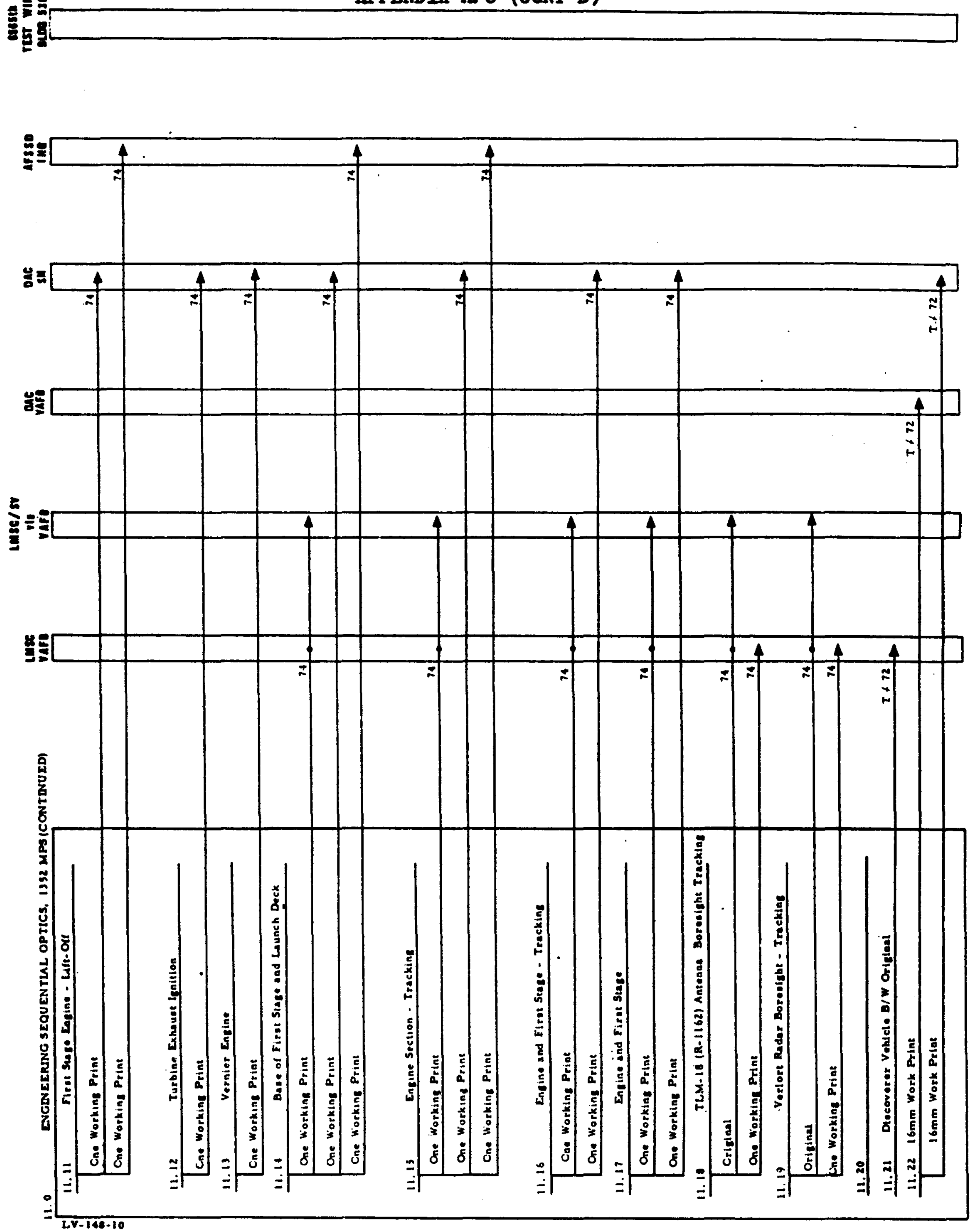
1115/328

APPENDIX A.6 (CONT'D)



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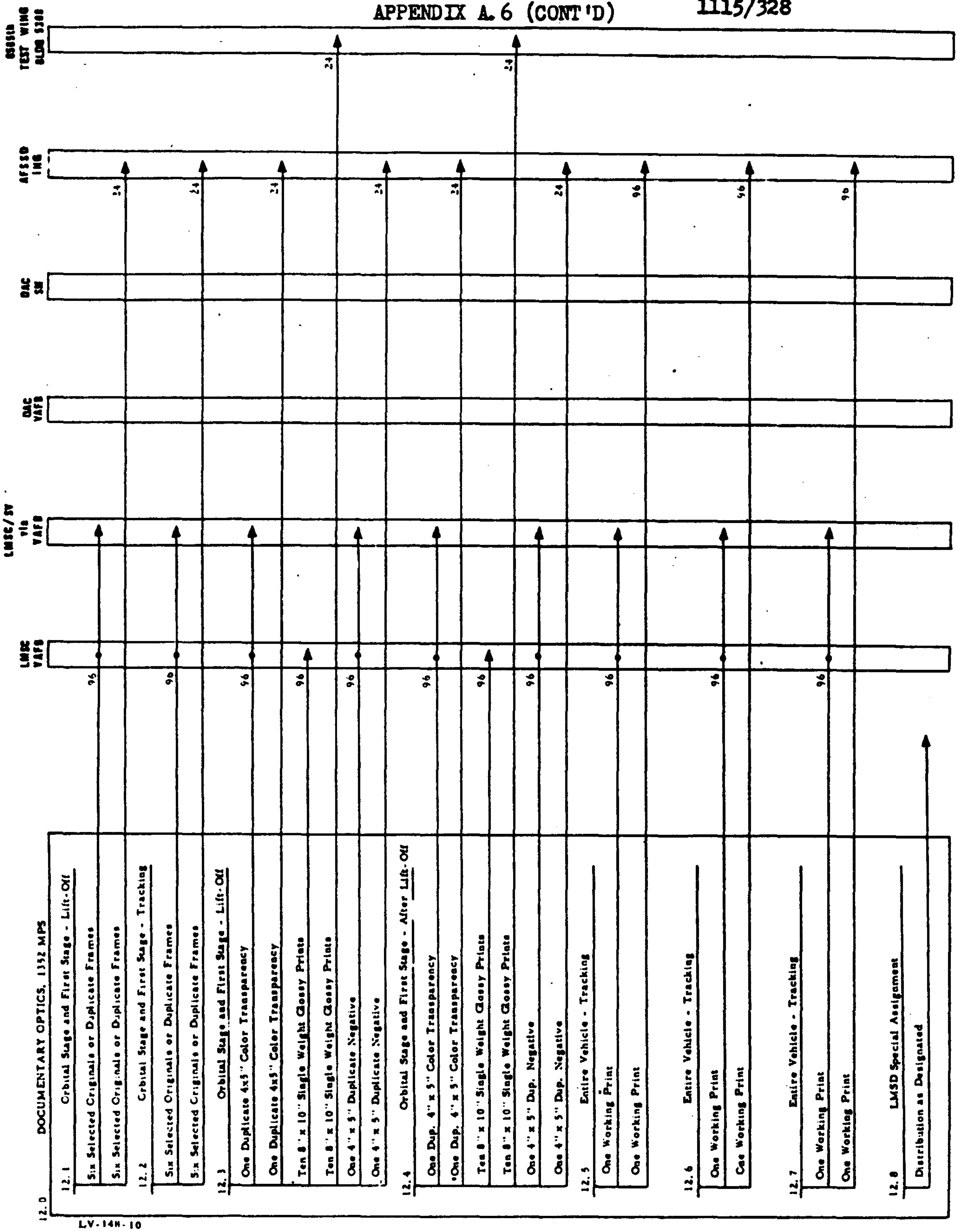
1115/328

APPENDIX A.6 (CONT'D)



APPENDIX A.6 (CONT'D)

	LMSC VAFB	LMSC/SV via VAFB	DAC VAFB	DAC SM	AFSSD ING	6595th TEST WING BLDG 5308

12.0 DOCUMENTARY OPTICS, 1352 MPS (CONTINUED)

12.9 DAC Special Assignment
- Distribution as Designated →

12.10 LMSC Special Assignment
- Distribution as Designated →

12.11 DAC Special Assignment
- Distribution as Designated →

12.8 THRU 12.11

ACQUISITION, COLLECTION, AND DISPOSITION WILL BE THE RESPONSIBILITY OF VAFB/DAC, LMSC, AND AFBMD PHOTOGRAPHIC COORDINATION PERSONNEL, WITH "AS DESIGNATED" DELIVERY TIMES DEPENDENT UPON TYPE, NATURE AND URGENCY OF THE REQUIREMENT.

NOTE: SECTIONS 11 AND 12:

QUICK LOOK DATA WILL BE DESIGNATED BY FTWG AT POST-LAUNCH CRITIQUE. DATA DISPOSITION WILL BE DETERMINED BY CHAIRMAN, FTWG. THE QUICK LOOK FILM PACKAGE WILL BE RETAINED AT AFBMD/FO FOR LOAN TO DAC/VAFB AND LMSC/VAFB ON AN ASSIGNMENT BASIS AFTER THE INITIAL CRITIQUE. ITEMS SELECTED AS QUICK LOOK FOR LMSC/SV AND AFBMD/ING WILL BE IN ADDITION TO THE DATA DISTRIBUTION INDICATED ABOVE. QUICK LOOK ITEMS SELECTED FOR OTHER AGENCIES WILL BE DELIVERED AT T+24 HOURS IN LIEU OF TIMES INDICATED ABOVE. REQUIREMENTS FOR ANY SPECIAL DATA OR EXTRA COPIES OF ANY ITEMS WILL BE ACQUIRED AS DIRECTED BY THE CHAIRMAN OF THE FTWG.

LV-148-10

APPENDIX A.7

BOOSTER MODIFICATIONS

A.7.1 Airframe Modifications

AF 1	Remove the engine work platform.
AF 2	Install Destructor Kit 5726436.
AF 3 (FPR 4)	Install Discoverer Satellite adapter.
AF 4	Install interstage bonding straps.
AF 5 (FPR 63)	Modify missile hydraulic power pack structure.
AF 7 (FPR 79)	Relocate propellant drip shield.
AF 8	Paint booster number and place DAC emblem on booster.
AF 9 (FPR 115)	Place centerline markings on booster.

A.7.2 Propulsion System Modifications

PP 1	Rework turbine exhaust extension duct.
PP 2	Rework lube oil tank vent line.
PP 3	Modify slip connection, fuel start tank overboard line.
PP 5	Drill hole in LOX float switch cup (4722874 B).
PP 6 (FPR 108)	Modify booster LOX tank pressurization line.
PP 7 (FPR 131)	Rework support bracket to provide support for flex hose.
PP 9 (FPR 145)	Modify MECO circuit (FIP switch vent port).
PP 11 (FPR 155)	Install check valve in LOX pressurization line.
PP 12 (FPR 178)	Reroute electrical cables and relocate the heat exchanger flex line support bracket.

A.7.3 Control System Modifications

CS 1	Adjust the gains of the Flight Controller (CEA) to provide proper missile dynamic stability.

APPENDIX A.7 (CONT'D)

BOOSTER MODIFICATIONS

CS 2	Cut the programmer tape for the appropriate flight plan.
CS 4	Shorten the length of each main actuator by 0.140 inch.
CS 6	Replace test tape in the programmer and replace the four fixed pitch program resistors with standard value resistors.
CS 7	Add a capacitor to the HIG networks to reduce gyro "restraint" and adjust HIG and rate tuning networks.
CS 9 (FPR 62)	Install missile hydraulic relief valve.
CS 10 (FPR 179)	Modify pitch rate loop in flight controller.
CS 11 (FPR 181)	Rework actuator potentiometer receptacle.
CS 12 (FPR 182)	Modify shaping network to encapsulate.

A.7.4 Electrical System Modifications

ES 2	Disable the turbine overspeed trip switch.
ES 3	Rework the MECO circuit wiring to permit engine reset when the Discoverer Booster is on internal power.
ES 4	Rework the VE solo time delay to avoid transients.
ES 5	Remove the MECO main engine centering capability.
ES 6 (FPR 69)	Install VECO timer filter network in the booster DC J-Box.
ES 7 (FPR 91)	Change wiring to prevent MECO at liftoff.
ES 9 (FPR 111)	Rework DM-21 wiring for BTL guidance.
ES 10 (FPR 116)	Remove and replace wire splices.
ES 12 (FPR 148)	Modify missile gyro spin motor circuits.
ES 14 (FPR 176)	Add one cell to HR-1 Battery to provide BTL voltage requirement.

APPENDIX A.7 (CONT'D)

A.7.5 Instrumentation System Modifications

I 1	Modify the signal distribution unit in the AN/DKT-15 signal conversion package to accommodate Phase II and BTL instrumentation.
I 2	Install the range safety interface Plug P-1.
I 3	Connect the instrumentation kit ground to the missile ground.
I 4	Add a coaxial tee to the telemetry antenna system.
I 5	Modify the isolation amplifier for environmental strengthening.
I 7 (FPR 56)	Install hydraulic system pressure transducer and associated instrumentation circuitry.
I 8	Install one Yardney silver cell battery to power Range Safety Receiver No. 2.
I 9 (FPR 53)	Modify the AN/DKT-15 telemetry package signal distribution unit to "cross-strap" internally all the super-commutated parameters.
I 10 (FPR 75)	Rework pitch and yaw command instrumentation AC-AMP demodulator.
I 11 (FPR 74)	Rework range safety battery to add one cell.
I 16 (FPR 94)	Provide VCO calibrations for BTL FM Channel 12.
I 20 (FPR 98)	Modify amplifier demodulators for pitch and yaw commands.
I 23 (FPR 119)	Separate VE No. 1 and VE No. 2 yaw position parameters.
I 26 (FPR 125)	Develop instrumentation lines to new pickup port.
I 37 (FPR 162)	Revise channel assignments to conform with design memo 4t.

APPENDIX A.8

DISCOVERER BOOSTER 328

NOMINAL WEIGHT BREAKDOWN

	Weight (LB)	CG (Thor Sta)
DRY DISCOVERER BOOSTER	6,656	
Trapped Propellant	423	
Pressurization Gas	439	
Unused Lube Oil	52	
Residual Propellant	600	
DISCOVERER BOOSTER AT VERNIER BURNOUT (0.6% Residuals)	8,170	525.3
Vernier Propellant Burned	75	
BOOSTER AT MAIN STAGE BURNOUT (0.6% Residuals)	8,245	526.6
Propellant Burned	99,002	
Fuel................32,029		
Liquid Oxygen.......66,973		
Pressurization Gas Overboard	121	
Vernier Propellant Overboard	48	
Lube Oil Used	75	
LIFTOFF	107,491	424.0

[redacted]

APPENDIX A.9

BOOSTER TELEMETRY SCHEDULE

IRIG Channel 14	PAM/FM ASSIGNMENTS	Deviation ± 7.2%**
Commutator Speed 5 RPS	Center Freq-22 KC	Commutator Segments 30
Segment No.	**Parameter**	**Range**
14-1	Transducer-Regulated 5 Volt Supply *	0 to 5 V
14-2	Yaw Rate	± 2 DEG/SEC
14-3	Roll Rate *	± 2 DEG/SEC
14-4	Hydraulic Supply Pressure	0 to 3,500 PSIA
14-5	Yaw Rate *	± 2 DEG/SEC
14-6	Roll Rate *	± 2 DEG/SEC
14-7	Actuator Potentiometer Positive *	0 to 30 V
14-8	Yaw Rate *	± 2 DEG/SEC
14-9	Roll Rate *	± 2 DEG/SEC
14-10	Actuator Potentiometer Balance *	0 to 5 V
14-11	Yaw Rate *	± 2 DEG/SEC
14-12	Roll Rate *	± 2 DEG/SEC
14-13	Input Supply Voltage (BTL)	20 to 36 V
14-14	Yaw Rate *	± 2 DEG/SEC
14-15	Roll Rate *	± 2 DEG/SEC
14-16	VCO Supply Voltage of T/M Set	0 to 20 V
14-17	Yaw Rate *	± 2 DEG/SEC
14-18	Roll Rate *	± 2 DEG/SEC
14-19	Hydraulic Return Pressure	0 to 200 PSIA
14-20	Yaw Rate *	± 2 DEG/SEC
14-21	Roll Rate *	± 2 DEG/SEC
14-22	Actuator Potentiometer Positive *	0 to 30 V
14-23	Yaw Rate *	± 2 DEG/SEC
14-24	Roll Rate *	± 2 DEG/SEC
14-25	Actuator Potentiometer Balance *	0 to 5 V
14-26	Yaw Rate *	± 2 DEG/SEC
14-27	Roll Rate *	± 2 DEG/SEC
14-28	Instrumentation Ground *	0 V
14-29	Framing Signal	5 V
14-30	Framing Signal	5 V

See last page of this table for footnotes.

[redacted]

APPENDIX A.9 (CONT'D.)

IRIG Channel 15	PAM/FM Assignments	Deviation ± 7.2%**
Commutator Speed 10 RPS	Center Freq-30 KC	Commutator Segments 30
Segment No.	**Parameter**	**Range**
15-1	LOX Pump Inlet Temperature	-300 to -275 DEG F
15-2	Fuel Pump Inlet Pressure *	0 to 200 PSIA
15-3	Turbine Inlet Temperature	0 to 1,500 DEG F
15-4	VE No. 2 Chamber Pressure *	0 to 500 PSIA
15-5	Turbopump Speed *	0 to 8,000 RPM
15-6	Gas Gen. LOX Injector Pressure	0 to 800 PSIA
15-7	Pitch Rate	± 2 DEG/SEC
15-8	Yaw Command *	± 3.5 DEG/SEC
15-9	Pitch Command *	± 3.5 DEG/SEC
15-10	Roll Attitude Error	± 4 DEG
15-11	Yaw Attitude Error	± 4 DEG
15-12	Pitch Attitude Error	± 4 DEG
15-13	VE No. 1 Yaw Position	-20 DEG to -6 DEG
15-14	VE No. 2 Yaw Position	+6 DEG to +20 DEG
15-15	Turbopump Speed *	0 to 8,000 RPM
15-16	Main Engine Pitch Position	± 2 DEG
15-17	Main Engine Yaw Position	± 2 DEG
15-18	Fuel Tank Top Pressure	0 to 50 PSIA
15-19	VE No. 2 Chamber Pressure *	0 to 500 PSIA
15-20	VE No. 2 Pitch/Roll Position	± 20 DEG
15-21	VE No. 1 Pitch/Roll Position	± 20 DEG
15-22	Automatic Gain Control (BTL)	0 to 5 V
15-23	Yaw Command *	± 3.5 DEG/SEC
15-24	Pitch Command *	± 3.5 DEG/SEC
15-25	Turbopump Speed *	0 to 8,000 RPM
15-26	Instrumentation Ground *	0 V
15-27	Control Inverter Phase A, 400-CPS Voltage	113 to 117 V
15-28	Transducer-regulated 5 V Supply *	0 to 5 V
15-29	Framing Signal	5 V
15-30	Framing Signal	5 V

See last page of this table for footnotes.

APPENDIX A.9 (CONT'D.)

FM/FM IRIG Channel **	Center Freq. (KC)	TELEMETRY KIT NO. 1 Parameter	Range
9	3.9	Engine Section Axial Acceleration	+ 15 G to -3 G
10	5.4	Main Engine Chamber Pressure (Close-Coupled)	400 to 700 PSIA
11	7.35	Magnetron Current (BTL)	0 to 100%
12	10.5	Combined BTL Commands	0 to 5 V
13	14.5	Sequence:	
		Fuel Float Switch	***
		LOX Float Switch	***
		MECO	***
		VECO	***
14	22.0	PAM/FM	
15	30.0	PAM/FM	

FM/FM IRIG Channel **	Center Freq. (KC)	TELEMETRY KIT NO. 2 Parameter	Range
9	3.9	Transition Section Axial Acceleration	± 15 G
10	5.4	Center Section Axial Acceleration	± 15 G
11	7.35	Main Engine Chamber Pressure (Close-Coupled)	0 to 800 PSIA
12	10.5	Fuel Pump Inlet Pressure * (Close-Coupled)	0 to 200 PSIA
13	14.5	LOX Pump Inlet Pressure (Close-Coupled)	0 to 200 PSIA @
14	22.0	LOX Injector Pressure (Close-Coupled)	600 to 800 PSIA
15	30.0	LOX Tank Bottom Pressure (Close-Coupled)	0 to 100 PSIA

@ A 0 - 100 transducer has been authorized for the flight. If it is not available, the specified 0 - 200 transducer will be installed.

See last page of table for footnotes.

APPENDIX A.9 (CONT'D.)

TRACK	ASSIGNMENT
1	100-PPS, 17-Bit Binary-Coded Timing, Modulated on 1 KC
2	1-PPS, 17-Bit, Binary-Coded Timing, Modulated on 1 KC, 17-KC Speedlock
3	Receiver No. 1, 50-KC Wow and Flutter (Video No. 1 Primary) for Telemetry Kit No. 1
4	Receiver No. 2, 50-KC Wow and Flutter (Video No. 2 Primary) for Telemetry Kit No. 2
5	Receiver No. 3, 50-KC Wow and Flutter (Video No. 1 Secondary) for Telemetry Kit No. 1
6	Receiver No. 4, 50-KC Wow and Flutter (Video No. 2 Secondary) for Telemetry Kit No. 2
7	1-KC Modulated Liftoff Signal, AGC No. 1 (5.4 KC), AGC No. 2 (10.5 KC), AGC No. 3 (22 KC), Voice (30 KC)

NOTE: All Discoverer booster magnetic tapes shall be retained for six months after the recording date.

Footnotes

* Wired on duplicate channels to increase statistical probability of data return.

** The standard deviation for IRIG channels is ±7.5%. Subcarrier oscillators within the AN/DKT-15 telemetry set are designed with a nominal deviation of ±7.2% from the standard IRIG center frequency.

*** Events will be indicated: Fuel Float Switch, 40%; LOX Float Switch, 20%; MECO, 10%; VECO, 5%.